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Oral Presentations

C001

Extra Oral Maxillofacial Prosthetics: Regaining Confidence and Improving Patient's Quality of Life

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Introduction: Maxillofacial prosthetics is a subspecialty of prosthodontics that focuses on the rehabilitation of patients with congenital or acquired deformities or limitations. A facial prosthesis may be recommended for cosmetic and psychosocial reasons. It is also possible to build prosthetic devices to position or shield facial components during radiation therapy. Currently, silicone and acrylic resin are the most prevalent materials utilised to manufacture bespoke prostheses.

Case description: In this case study, maxillofacial prosthetics refers to all artificial prostheses that restore missing facial structures owing to trauma, congenital abnormalities, or surgical removal for malignant, benign, or trauma-related neoplasia. This article details the rehabilitation of an eye defect caused by trauma using an ocular prosthesis in a patient. Recovery from

the loss of one eye needs an adjustment to monocular vision and the use of artificial eyeballs that are meticulously crafted to resemble the remaining natural eye. Maxillofacial prostheses improve the patient's quality of life and encourage them to regain their confidence so they may return to social activities.

Discussion: Overall, the purpose of maxillofacial prostheses is to correct a variety of orofacial deformities and enhance the patient's quality of life. This is an ancient method of treatment that has evolved over the centuries. Current conditions are favourable, and there are optimistic projections for the future.

Keywords: Maxillofacial prosthesis, Ocular prosthesis

C002

A New Approach for Lip Filler Injection Using an Inverted Mercedes Benz Sign

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Abstract: Lip fillers have a great impact on the facial aesthetic industry, where several techniques have been proposed for lip beautification in terms of both the results and delivering a safe injection procedure. The study aimed to report a personal experience with a new lip filler technique, via inserting a microcannula through three entry points, resembling an inverted Mercedes Benz sign. Ten female patients between 22 and 29 years of age had a lip filler treatment with a cross-linked hyaluronic acid injected using a microcannula through two entry

points at both Glogau-Klein points of the upper lip and one entry point at the midline of the lower lip. The filler product was deposited in both retrograde and aliquots fashion in the superficial muscular plane. All patients reported a high degree of satisfaction with the results of the procedure, with slight swelling and bruising transiently present in some of the patients. Unlike the conventional cannula technique, this new technique offers artistry in accentuating the cupid's bow and redrawing the lips.

C003

Dento-Facial Aesthetics: Botox and Fillers

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Abstract: In recent years, many patients have grown an interest in beauty and cosmetic procedures. Multiple methods of rejuvenating the aging face have been suggested where dermatologists and plastic surgeons have been using surgical and non-surgical methods for beauty enhancement, it is without a doubt that dentists are concerned with facial beautification as much as any other specialty where each facial sub-unit plays a role in the overall appearance especially the lips that's considered to be the curtain of the smile framework. Over the years minimally invasive facial enhancement techniques this includes mesotherapy, fillers, neurotoxins and recently threads

have become a mainstream modality due to their minimal downtime, lower incidence of postoperative complications and the chance for an office based aesthetic intervention. With proper knowledge on how to combine threads with fillers and / or neurotoxins into our facial-dental practice will help you to master a technique that will set you apart from most routine cosmetic treatment not to mention that it will enable you to take a step forward into the future of advanced aesthetic procedures where formulating the appropriate aesthetic treatment plan is mandatory for achieving a satisfactory results for the patients and your practice.

C004

Perspectives of Satisfaction in Patients with an Implant-Crown in the Aesthetic Zone

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Objectives of Investigation: This study aimed to better understand patients' lived experiences with a single tooth-implant crown in the aesthetic zone, especially their perceptions of satisfaction.

Methods Used: An interpretive phenomenological analysis approach was the adopted research design. In the maintenance phase, 13 current patients who previously had a maxillary implant placed in the aesthetic zone and restored with a single-unit prosthesis from dental specialty trainees at the participating university were invited to join the study, from which nine participants, ages ranging from 24 to 76 years, were included. Demographics, digital photographs, intraoral scans, and self-administered questionnaires were collected to assist in identifying diversity in the sample. The phenomenological data, comprised of audio-recorded semi-structured one-to-one interviews with the participants, were transcribed verbatim, coded, and analyzed thematically, aided by computer-assisted qualitative data analysis software.

Results: Participants underlined that a single-tooth implant is not simply a technological solution, since they typically perceive it as recovering their normal lives. Patient satisfac-

tion's multidimensional nature was corroborated since the perceived reasons for satisfaction varied widely among the group of participants. It seems that negative feelings of dissatisfaction arose for some participants during the treatment process originating from adverse events, patient-clinician relationships, and/or perceptions of high expectations or uncertainty, whereas these feelings eventually mostly diminished to the extent that participants expressed overall satisfaction with the treatment outcome. Underlying this was usually a perception of improvement in the social aspect of their lives, including in self-esteem and self-confidence, by having their appearance restored in a natural way, despite some of them recognizing that the resulting appearance was not perfectly matching their natural dentition.

Conclusions: Many aspects of the treatment, especially the outcome, influenced participant satisfaction at different stages of the process. The results should provide clinicians with an improved understanding for managing patients' expectations with information reiteratively and efficiently.

Keywords: Patient satisfaction, Patient reported outcome measures.

Interdisciplinary Interface Between Prosthodontics and Periodontics: Case Report

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Introduction: There are several laboratory studies that show that a large amount of complication in fixed prosthodontics is a biological issue, including caries and periodontitis. Despite the major focus on mechanical features of prostheses.

Case description: A 54 years old lady, medically fit, who complained of her teeth, wishing she had smaller teeth. Intraoral examination of soft tissues revealed generalized gingivitis with over contoured prosthesis causing an asymmetrical gingival contour and black triangles. Hard tissue examination showed poorly designed, over-contoured, aesthetically compromised prosthesis and poor oral hygiene. The care plan started with oral hygiene instructions, scaling and polishing as a part of the "preprosthetic phase". Following the removal of the existing defective fixed prosthesis, all teeth were tested for vitality and provisional acrylic single crowns were cemented temporarily once the finishing line was adjusted. 2 weeks later, periodontal reassessment, scaling, and polishing are performed. Follow-up visits and periodontal therapy last for four months. After

stabilization of periodontal condition, we were able to cement the definitive prosthesis (all-ceramic single crowns) which was patients' chief complaint with smaller crowns and more natural appearance.

Discussion: This case was limited by a time constraint because the patient was planning to travel for a long period of time. An appreciation of the relationship between periodontal health and restoration longevity is a key factor in ensuring good function, form and esthetics of the dentition. Minor deviations from idealism may personalize one's smile and would result in a more natural appearance. In such cases, the over contoured prosthesis invades biological width, causing attachment loss and the formation of black triangles, resulting in a compromised appearance. The definitive treatment effected by existing prosthesis, Clinical studies have reported more attachment loss with subgingival crown margins than with equi- or supragingival margins.

Orthodontic-Prosthodontic Treatment of Third Class Case with Variation of Vertical Dimension of Occlusion

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Introduction: The treatment plan of complex cases requires a careful multidisciplinary diagnostic evaluation and may involve variation of the vertical dimension of occlusion (VDO) individually, as well as control of the occlusal plane (OP) inclination. This allows the tridimensional (3D) repositioning of the mandible in the therapeutic position (TRP) using the OM-RT-Bassetti technique. The cephalometric tracing allows the variation of the VDO and the OP individually. The possibility to change the VDO in a predictable way decreases the invasiveness of the treatment and gives enough space to guarantee mechanical resistance to the restorative materials.

Case description: A 50-year-old disfunctional patient with third class of occlusion was unsuccessfully prosthetically treated. He needs multidisciplinary ortho-prosthetic retreatment with 3D repositioning of the mandible and augmentation of VDO. After the Vienna school (VieSID) diagnostic procedure, splint pre-therapy is performed in the lower arch to solve the symptomatology and test the TRP. The next phase involves

orthodontic treatment with the MEAW-Sato technique, subsequent prosthodontics temporaries in the posterior sectors, and orthodontic finalization of the upper and lower incisor sectors. When the TRP is asymptomatic, stable and repeatable the finalization of the case is performed with zirconia-ceramic single crowns and bridges and direct composite restorations.

Discussion: The increase of the VDO by 9mm through orthodontics and prosthetics and the correction of the OP inclination allowed a real 3D repositioning of the mandible in TRP with first-class occlusal relationships. The final prosthesis built with sequential occlusion with canine dominance's concepts, according to TMJ parameters, guarantee a good function without interferences and a good control of parafunction (bruxism). A treatment plan performed on the functional point of view allows to solve dysfunctional problems, to achieve aesthetics and to ensure long-term stability.

Keywords: Occlusion, Vertical dimension, Orthodontics, Function, Prosthodontics

C007

Prosthetically Guided Maxillofacial and Oral Surgery: The Updated Protocol for the Rehabilitation of Cancer Patients

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Objectives of Investigation: To program a correct step-by-step workflow for the rehabilitation of cancer patients, updates of the Prosthetically CAD-CAM guided maxillofacial and oral surgery (PGMOS) methodology are proposed.

Methods: Twenty-one cancer patients scheduled for maxillofacial surgery of benign and low-grade malignant cancer of the mandible were selected for this study. All patients underwent to mandibular reconstruction with the microvascular fibula free-flap (FFF) using a new concept of customized bone plate, the double-level plate. The digital workflow started by designing the final dental wax-up based on the occlusion and dimension of the natural dentition, to project the position of the FFF at the level of alveolar bone, aiming to restore the correct crown/gingival ratio. After healing of the maxillofacial surgery, the same natural tooth anatomy and occlusion guided the insertion of oral implants and represented the final wax-up

of the implant supported fixed rehabilitation, manufactured using digital technology. Occlusal and aesthetic results of the prosthetic rehabilitation were evaluated to compare the pre-op anatomy to the post-op results.

Results: The lower third of the facial anatomy and the correct crown/gingival ratio were preserved, both restoring the native proportion. Using digital manufacturing, the pre-op occlusion and aesthetics of mandibular teeth guided the maxillofacial and oral surgery, and they were replicated in the final prosthetic rehabilitation, manufactured with CAD-CAM technology.

Conclusions: The PGOMS digital protocol, updated with the double-level bone plate morphology, improves the accuracy of the face profile restoration, the natural teeth aesthetics and occlusion of cancer patients scheduled for the mandibular reconstruction with FFF after cancer surgery.

Keywords: CAD-CAM, maxillofacial prosthesis, dental implants

C008

Impact Of The COVID-19 Pandemic On Symptoms Of Temporomandibular Joint Disorders (TMD)

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Objectives of Investigation: The coronavirus disease (COVID-19), officially described by the World Health Organization (WHO), is a virus infection that formed a destructive pandemic worldwide. As a result of this pandemic environment, millions of people radically changed their routines and lifestyles. In addition, due to living in such a stressful era, the current scenario has escalated to severe physical and mental health risks, resulting in increased anxiety and depression. This study aimed to delve into the effects of the COVID-19 epidemic on psychological well-being and Temporomandibular joint disorders (TMD) symptoms in a large group of people randomly selected from the community.

Materials and Methods: A self-administered survey was deployed for anonymous compilation by individuals to report the presence of symptoms of TMDs, orofacial pain, and bruxism along with the Covid-19-related information. DC/TMD Symptom Questionnaire, GCPS: Graded Chronic Pain Scale, PHQ-9: Depression, OBS: Oral Behaviours Checklist, and PHQ-15: Physical Symptoms questionnaire are selected from the DC/TMD. To make it less complicated for this study, the first four questions that give information about bruxism habits from the PHQ-15 are used. Seven basic questions were created to assess the Covid-19

situation. The questions asked about Covid-19 infection, the severity of the illness, infection of a relative person, losing a close relation to the pandemic, the isolation degree, the physical activity, and the degree of facial pain during the pandemic.

Results: Two hundred individuals concluded the questionnaire, of whom 66% were females, and 34% were males. The majority of the participants, 42%, are private-sector employees. 67.5% of the participants had Covid-19 infection. Orofacial pain results show the average number of days with orofacial pain in the last six months is 12,8 days. OBC showed 39.5% TMD onset. In addition, the individuals purported to have restrictions when chewing hard foods. While the orofacial pain of 11% of the participants improved during the pandemic, 46.5% got worse, and 42.5% remained the same.

Conclusions: Many people's psychological and emotional states were exacerbated during such a horrific period as the ongoing worldwide COVID-19 epidemic, likely contributing to an increase in self-reported bruxism behaviors and TMD symptoms.

Keywords: Covid-19, Temporomandibular Joint Disorders, Bruxism, Facial Pain

C009

Efficacy of Botulinum Toxin and LLLT to Treat Myofascial Pain and Regional Oxygen Levels on Masseter Muscles

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Myofascial pain syndrome (MP) is characterized by pain originating from a group of muscles called muscle trigger points. This study was designed to evaluate the treatment efficacy of low level laser therapy (LLLT) as Nd: YAG and diode laser (810 nm), occlusal splint (OS) and Botulinum toxin (Botox) applications. A total of 100 patients were selected after being diagnosed with MP according to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TDM) and written consent form. The patients were divided into five groups (n=20, N=100) randomly. The groups follow as: OS, Nd:YAG laser (1,064 nm, 8 j/cm², 250 mW, Fotona), 810 nm diode laser (8j/cm², Fotona), Botox (Allergan), and placebo group. LLLT was applied to the patients in the study group once a day for 10 days, for a total of ten sessions. OS were used by patients for 21 days. Botox was applied 3 trigger points right and left sides of

masseter muscles separately. The same parameters and application times were used for placebo group similar with LLLT, but the patients were not irradiated. Before all the treatments pain was evaluated with VAS (0-10) scores and algometer. Also oxygen level of masseter muscles was evaluated with regional oxygen saturation (ROS) device as a near infrared stereoscopy. After the treatments OS (3 weeks), LLLT and placebo (10 days) and Botox (1 month) pain and oxygen levels were evaluated again. And datas were analyzed statistically. As a result of this research, statistically significant healing was seen all 4 treatment groups according to placebo group. All treatments except placebo were effective on MP and regional oxygen saturation level according to VAS, algometer and ROS. Botox showed earlier effect than the other treatments.

C010

Retrospective clinical study of 1472 monolithic zirconia restorations with feather-edge margins realized by using a digital workflow

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Objectives of Investigation: To assess the clinical success and survival of monolithic zirconia restorations with feather-edge margins realized by using a digital workflow.

Methods Used: All patients with single or multiple monolithic zirconia restorations in the anterior and/or posterior sites of the upper and/or of the lower jaw with feather-edge margin and realized with a digital workflow were enrolled in this study during the scheduled periodontal maintenance between January and December 2021. For clinical examination, the modified US Public Health Service (USPHS) criteria was used. For periodontal assessment plaque index (PI), pocket probing depth (PBD), and modified sulcus bleeding index (SBI). Technical and biological complications such as the presence of chipping, crack, fractures, hypersensitivity, loss of retention, caries of abutment tooth, endodontic failure, and tooth fracture were recorded. The presence of one or more previous complications was considered for the definition of crown failure. Descriptive

statistical analysis was detected. The estimated survival probability of the crowns was statistically analyzed using the Kaplan-Meier method.

Results: A total of 1472 monolithic restorations with feather-edge margins placed in 1189 patients from February 2017 to September 2020 were analyzed. The mean follow-up was 2.8 years. The overall survival rate of the restoration was 99%.The most common technical complication was the fractures (1%), instead, the hypersensitivity was the most common biological complication (3%). One 3-unit fixed partial denture had to be removed due to the fracture of the root. Twenty-five single crowns presented a loss of retention.

Conclusions: Feather-edge preparations for zirconia restorations fabricated with a digital workflow provided efficient and satisfactory clinical performance.

C011

Fracture Resistance of Individually Formed and Prefabricated Fiber Post in Reinforced Structurally Compromised Teeth

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Objectives of Investigation: The purpose of this study was to evaluate the fracture resistance of structurally compromised teeth restored with individually formed and prefabricated fiber post.

Methods Used: The coronal part of 60 human extracted intact upper central incisors were removed, and the remaining root received endodontic therapy. Root canal spaces were enlarged to reduce dentin wall thickness to 0.5 to 0.75 mm and post space with 8 mm length. Specimens were divided into control and experimental group (n=30) according to the reinforcement of the root canal dentin with composite resin. Each group was further subdivided according to post type used (n=15): individually formed and ready-made fiber posts. A light-transmitting plastic post was used to create root canal space and to cure the restorative composite resin. Dual-cure resin cement was used for post cementation. Standardized composite resin cores and complete cast crowns were fabricated for the specimen using

conventional techniques. Each specimen was then subjected to fracture resistance test in an Instron testing machine with a cross head speed of 0.5 mm/min Data were analyzed with 2-way ANOVA and post-hoc Tukey's test ($\alpha= 0.05$) at 5% level of significance.

Results: ANOVA results demonstrated a statistically significant difference between root canal reinforcement and fiber post type ($P < 0.001$); however, the interaction effect was not significantly different ($P = 0.435$). Individually formed fiber posts with reinforced root canal had higher mean fracture resistance (414.50 ± 22.09 MPa), and the lower mean fracture resistance (372.57 ± 25.66 MPa) was found for ready-made posts in root canal without reinforcement.

Conclusions: Structurally compromised teeth behave significantly better when reinforced with an intermediate layer of flowable composite resin and restored with an individually formed fiber post.

C012

Retrospective Clinical Study of Tooth-Supported Single Crowns: A multifactor Analysis

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Objectives: To investigate the influence of multiple factors on the survival of tooth-supported single crowns (SCs) and assess the biological and technical complications.

Materials and methods: This retrospective study included patients rehabilitated with tooth-supported full coverage SCs with a minimum follow-up time of 6 months after delivery and attended the clinic for follow-up in the last 10 years. Cumulative survival rate (CSR) was calculated over the maximum period of follow-up time and reported in a life-table survival analysis. Univariate and multivariate Cox regression was used to evaluate the associations between clinical covariates and crown failure.

Results: The included cohort group consisted of 1037 SCs delivered in 401 patients and followed for a mean of 134.8 ± 80.2 months. CSR was 89.9% and 80.9% after 5 and 10 years and

70.5% and 61.8% after 15 and 20 years, respectively. The main reasons for SC failure were loss of retention, tooth loss and fracture. Anterior placement, non-vital abutments, and bruxism significantly influenced the survival of SCs. The survival of SCs was not influenced by patient's age and sex, location of the crowns in relation to the jaws (maxilla, mandible), type of tooth (incisor, canine, premolar, molar), presence of post and core, and type of crown material, treatment providers or smoking.

Conclusions: Anterior placement, non-vital abutments and bruxism are factors suggested to increase the risk of SC failure and the prevalence of technical and biological complications.

Keywords: single crown; survival rate; tooth vitality; post and core; technical and biological complications

C013

The Effect of Full-Face and Close-Up Photos of Patients on the Perception of Smile Esthetics

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Objective: To determine the effect of the full-face and close-up image on the esthetic perception of dentists, dental students and laypersons in canting of the occlusal plane.

Material and methods: Eight smile photos were selected for this study; four full faces and four close-ups of male and female volunteers. The photos were divided into two separate sub-groups. The first group considered pleasant smiles, following some principles of an ideal smile. Images were digitally altered to generate with occlusal plane inclinations 2. Final images were arranged randomly into a photo albums and analyzed by dentists, dental students and laypersons (n=100, N=300) who ranked the level of attractiveness using a visual analog scale.

Results: Significant differences in esthetic perception were found in the evaluation of the occlusal plane inclination between the full-face and the close-up male and female photos. Higher scores were obtained in the evaluation of occlusal plane canting in laypersons. Full-face and female photos scored higher than other images.

Conclusions: Occlusal plane inclination is a critical factor in the perception of smile esthetics. Gender and full-face images of patients are other critical factors affecting the esthetic perception of dentists, dental students and laypersons and must be evaluated significantly.

C014

Efficiency of Hepa-filtered suction unit on aerosols during anterior tooth preparation

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Background: With the Covid-19 pandemic, infection control methods have become more important. In particular, aerosols formed during dental treatments have a great risk for the spread of viruses. The aim of this study is to investigate the effects of using an extra-oral suction device during anterior tooth preparation, which causes the most aerosol spread among dental treatments.

Methods: Anterior tooth preparation was performed by one dentist with one patient. Particle measurements were made using an airborne particle counter and were taken at four different locations; chest of patient, chest of dentist, center of the room and near the window. Three groups were determined for the study; Group 1: measurement in a 24-hour ventilated room (before the tooth preparation, empty room), Group 2: measurement with the use of saliva ejector (SE), Group 3: measurement with the use of saliva ejector and HEPA filtered extra oral suction (HEOS) unit.

Results: The particles generated during tooth preparation were separated according to their sizes, the concentration in different locations of the room and the efficiency of the HEOS unit was examined.

Conclusions: The present study showed that as the particle size increases, the rate of spread away from the dentist working area decreases. HEPA filtered extra oral suction unit is more effective on particles smaller than 0.5 micron. Therefore, infection control methods should be arranged according to these results.

Keywords: Extra oral suction unit, Covid-19, Aerosol, infection control

C015

Esthetic rehabilitation with CAD/CAM resin bonded bridge for single edentulous space and ankylosed tooth

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Introduction: Increasing demands for preserving sound tooth structure have stimulated the development of minimally invasive treatment. With the support of contemporary adhesive dentistry and various restoration techniques, this method has presented conservative treatment alternatives for correcting morphological abnormalities, pathological defects, and esthetic problems. The following case report describes a conservative rehabilitation of edentulous space and ankylosed anterior tooth with CAD/CAM resin bonded bridge.

Case Description:

- Chief complaint: I have an unesthetic smile due to missing upper front tooth after trauma
- Sex/Age: F/16
- PMHx/PDHx
- : mild developmental disability
- : dental trauma history (3 years ago) with #7 avulsion, #8,9 intrusion (by universal numbering system)

- : extraction of #7, root canal treatment on #9
- : orthodontic treatment for 3 years
- Present illness
- : #8 percussion(-), mobility(-), metallic sound on percussion
- : #7 extraction wound healing
- Diagnosis: ankylosed tooth on #8, single edentulous space on #7
- Treatment plan: resin bonded bridge on #6=8 using CAD/CAM

Discussion: Esthetically pleasing and functionally adequate restoration is now available with carefully designed CAD/CAM prosthesis. In complex situations such as this case where both ankylosis and edentulous space exist, it can be an alternative to conventional methods using minimal preparation. Therefore, this conservative approach can be a favorable treatment option for patients who need both satisfactory esthetic results and maximal tooth preservation.

C016

Sports Dentistry: Beyond a Mouthguard!

Abdulmajeed Okshah

Sports dentistry was recognized by the FDI as a new specialty of dental medicine in 2016. It is defined as the branch of sports medicine dealing with prevention and treatment of dental injuries and oral diseases associated with sports and exercise. Besides safety of athletes and preventing oral and facial injuries, Team dentists have the aims to improve the oral and system-

atic health of athletes and increasing their performance. This presentation will briefly give an overview of the scopes of this specialty, its importance for the athlete's health and to present the influence of oral diseases on the athlete's performance. Also, some clinical cases will be presented from Anamneses to follow up.

COVID - 19 Consequences in Oral Cavity

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Abstract: Sars-Co or Covid-19 pathology is an infection which causes infection and damage of the mucosal and alveolar cells of the low respiratory paths.

This virus stimulates cytokines, which are small glycoproteins produced by different cells in whole of the body, for instance TNF α (alpha) the necrosis factor, alpha tumor, which may to evaluate in inflammatory substances.

Some important complications of the Sars-cova we should mention:

- a] Respiratory insufficiency,
- b] Acute damage of the kidneys,
- c] Acute damage of myocardia.

According the data collected by Infection Hospital Institution, Tirana, Albania, was concluded that virus accept its distributed in lung, it may to be distributes at the brain, heart, skin etc.

The most important infection of the Covid-19 is the thrombotic disease, which has its consequences into the oral cavity, which is accompanied by necrosis of palatial mucosa or vestibular fornics with teeth moving, as well as by face edema.

Immediately, just to be identify such symptoms, in this case needed to carry out the dose of D-Dimers, which is a proteinase fraction of the fibrin, which shown just has started a coagulation intravascular process. When the patient is represented at the dental doctor, this last one could cooperate with infection specialist doctor to check-out the D-Dimers and PC levels.

Immediately need to begin the treatment of anti-coagulants in order to avoid the heavy impact risk into the oral cavity.

Keywords: Sars-cov, infection, oral cavity, respiratory insufficiency, palatial mucosa, etc.

Impact of Preservation of Tooth on Outcome of Restoring Endodontically Treated Teeth.

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Introduction: The concept of minimally invasive dentistry is recognized and accepted in caries management and adhesive dentistry. A onlay would be more conservative to a full crown, yet most dentists around the world provide a full crown for an ETT. Digital dentistry has advanced significantly. There are very limited clinical trials assessing the survival of CAD CAM onlays on endodontically treated tooth. The aim of this study is to assess the impact of tooth preservation on outcome of restorations of an ETT.

Materials and Methods: A systematic review was first performed to compare the survival of onlays on endodontically treated teeth and vital teeth. Following this, a clinical trial was carried out at Guy's hospital on 127 patients to investigate the success and survival of CAD CAM generated onlays compared to full crowns on ETT.

Two calibrated operators evaluated the restoration using modified USPHS as well as the FDI criteria. Statistical analysis were performed using Person Chi Square test and Fischers Exact test ($p < 0.05$)

To determine survival rate regarding restoration loss Kaplan Meir estimate was performed followed by the log rank test.

Results: There were a total of 13 failures over the 4 year period. Two had to be extracted due to fracture of restoration and tooth. 11 restorations chipped or fractured and were considered as relative failures. Of these 11 failures, 2 were repaired using direct composite and 9 were replaced.

Conclusions: CAD CAM generated onlays provide a conservative option in restoring the ETT. The most common failure was fracture of the restoration. The nanofilled hybrid ceramics had a higher proportion of fracture in full crowns compared to onlays.

Electromyographic assessment of masseter muscle activity: a proposal for a 24hr recording device with preliminary data

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Objective: Instrumental measurement of electromyographic (EMG) activity in the natural environment is the best available strategy to collect information on bruxism. The twofold aim of this study was to: 1. Introduce a novel EMG device for the assessment of awake (AB) and sleep bruxism (SB) in the home environment over the 24 hours and, 2. Present some preliminary data.

Materials and methods: Three healthy volunteers (mean age 22.3 years) underwent two consecutive 24-hr EMG recording trials of their masseter muscle activity (MMA) with a miniaturised wireless device. This device allowed to measure the amount of muscle work, normalised with respect to the maximum potential activity expressed over the 24 hours. Discrimination between bruxism and physiological activities (e.g., chewing, yawning, talking, swallowing) as well as between sleep and awake status was also provided.

Results: For the healthy volunteers, the average percentage of total MMA was $2.6\pm 0.7\%$, of which about half were considered

part of the spectrum of physiological activities (i.e., non-functional MMA = $1.3\pm 0.3\%$). Sleep MMA and awake MMA showed a percentage of $0.3\pm 0.1\%$ and $2.4\pm 0.6\%$ respectively.

Conclusions: This investigation described the technical features of a novel EMG recording device that permits an evaluation of masseter muscle activity in the home environment over the 24 hours. A dedicated elaboration of the EMG signal allowed an assessment of muscle work and not just the count of purported SB/EMG events.

Clinical significance: Based on the multidisciplinary approach on the study of bruxism, such a methodology, thanks to the peculiar features, will allow researchers and clinicians to monitor epidemiology of MMA and get deeper into the awake and sleep bruxism correlates for a tailored management in the clinical setting.

Keywords: Awake bruxism, sleep bruxism, bruxism, masseter muscle activity, electromyographic assessment.

Smile and Profile Aesthetic Parameters of East Asians: A Systematic Review

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Objectives of Investigation: Objective definitions of the characteristics of an aesthetic smile and profile in East Asians is lacking. The primary aim of this systematic review was to summarize evidences of smile and profile parameters used in prosthodontic assessment that define dentofacial aesthetics of East Asians. The secondary aim was to compare the racial differences of these parameters among East Asians and between East Asians and Caucasians.

Methods: A structured literature search was conducted using four-electronic databases to identify English and Chinese language studies published between January 1990 and July 2020, complemented by hand searching. Following the PRISMA guidelines, two reviewers selected relevant studies according to predetermined criteria and extracted relevant data. Risk of bias assessment was executed in accordance to the STROBE statement. Outcomes were analysed and reported qualitatively in a narrative analysis and graphic summaries.

Results: In total 3155-studies were screened and 34-studies were selected. Twenty-two studies addressed 29-different

smile aesthetic parameters and 16-studies evaluated on 6-pre-selected profile parameters. Total number of subjects involved was 4241, including Han Chinese, Japanese and Korean. Majority ($n=24$) of studies had high level of quality and none has low level of quality. East Asians had more gingival display (high smile line), wider tooth dimensions and distinctive lip prominence and anterior lip position comparing to Caucasians, whereas no significant racial differences were found in dentofacial parameters, occlusal parameters and tooth proportional measurement. East Asian attractive faces had different dentofacial features from their population norm, such as more obtuse lip profile.

Conclusions: This review establishes the population norm of smile and profile aesthetics of adult East Asians to inform an evidence-based, objective clinical guideline for aesthetic prosthodontic rehabilitation in this population. East Asians have distinctive smile and profile characteristics from Caucasians. Aesthetic standards established from Caucasians may not be applicable for East Asians.

Keywords: Esthetics, Prosthodontics, Asians

Enamel Wear Caused by Monolithic Zirconia Crowns Following One Year of Clinical Use

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Aims: To compare the amount of tooth wear induced by monolithic zirconia crown restorations placed in posterior region with natural tooth wear on the contralateral side.

Methods: Fifty-one (51) patients in need for single crown restoration were included in this study. Crown preparation was performed according to clinically indicated guidelines and definitive crown impressions were obtained using PVS material. Gypsum master cast models were fabricated and single crown dies were sectioned. Crowns were milled using a CAD-CAM procedure from monolithic zirconia blocks, Prettau Anterior Multistratum (ZirconZahn, South Tirol, Italy) by the ZirconZahn method. The crowns were cemented and adapted intraorally. An impression was obtained immediately following crown insertion of both dental arches. Following one year of functional loading, the patients were recalled to obtain a second impression using the same procedure. The casts models were then optically scanned using a lab scanner (ZirconZahn S600 Arti scanner) and the resulting 3D surfaces were exported in STL file format and imported into CloudCompare reverse engineering software for analysis. The zirconia crown antagonists as well the contralateral tooth antagonists for all 46 cases were segmented and tooth wear was assessed as the negative

space (wear surface difference) between the two surfaces. The root mean square (RMS) surface difference in millimetre between the two impressions was quantified. The resulting tooth wear was quantified in an excel sheet and saved for statistical analysis.

Results: Forty-six (46) patients presented for recall with four (5) dropouts. SPSS statistical analysis software was used for analysis. Mean tooth wear of the zirconia crown antagonist was 12µm (twelve microne) and in contralateral was 11µm (eleven microne). Mean wear of zirconia monolithis crown itself was 9 µm (nine microne) and contralateral tooth to crown was 9 (nine microne) µm following one year of functional loading and the differences were statistically significant at P=0.48. No crowns were lost, chipped or decemented at the follow up visit.

Conclusions: Within the limitations and the short follow up period of this study, it can be concluded that tooth wear induced by monolithic zirconia restoration did not different from naturally induced wear on the contralateral side. More research is required to corroborate the results of the current investigation.

Keywords: tooth wear, monolithic zirconia, dentistry, lab scanner, three-dimensional models

The Effect of Different Post-Process Applications on The Color Stability of 3D-Printed Dental Materials

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Supported by Project No. 39020 from the Research Fund of Istanbul University.

Objectives of Investigation: 3-dimensional (3D)-printed resin modified dental ceramics are widely used, studies on the effects of the post processing parameters of 3D printing on the color stability of these materials are lacking. The aim of this study is to evaluate the effect of different post-curing time on color stability of 3D printed resin modified dental ceramics against different soft drink solution immersion.

Methods: Ninety disk-shaped specimens were prepared from 3D printed resin modified dental ceramic material (VarseoSmile Crown Plus, Bego, Germany) (n=10). The 3D-printed specimens were divided into three groups according to the post-curing time (0, 5, 10 mins) and the specimens were immersed in three different soft drink solutions (artificial saliva, coke, ice tea). Color changes (ΔE_{00}) were measured using a

clinical spectrophotometer (VITA Easyshade V) at different aging times. The data were analysed statistically.

Results: In terms of post curing time, statistically significant difference were found between the groups ($p < 0.05$). Increased post-curing time resulted in lower stainability values in all groups ($p < 0.05$). Immersion time also caused higher ΔE_{00} values in all groups ($p < 0.05$). Coke and ice tea caused higher ΔE_{00} values than artificial saliva ($p < 0.05$).

Conclusion: 3D-printed resin modified dental ceramics have higher color stability against the discoloration agents with increased post-curing time. Dentists should collaborate with the dental technicians or the providers of these materials about the manufacturing stages of these materials.

Keywords: 3D printing, dental ceramics, resin modified dental ceramics, color stability, stainability

Impact Of Ambient Light On The Accuracy Of An Intraoral Scanner; An In Vitro Study

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The objectives of the investigation: The accuracy of digital impressions has reached clinically acceptable levels. However, various factors may influence the scanning accuracy (trueness and precision) such as the ambient light. From that point of view, this in vitro study aims to evaluate the impact of ambient light on the accuracy (trueness and precision) of an intraoral Scanner.

Material and Methods: A complete maxillary arch of a Frasaco model (Franz Sachs, Tettngang, Germany) was selected. The reference standard tessellation language (STL) data were obtained with a high-precision industrial scanner (Solutio-nix C500, MEDIT) with an accuracy of 0.002 mm. Five groups were created based on the ambient light; 3000K (Chair Light, CL), 6500K (Daylight, DL), Fluorescent Light (FL), 3000K-6500K (Room Light, RL), and No Light (NL). Ten digital scans per group were consecutively obtained at each ambient light setting (n = 10). The 3D deviations between the reference data and digital

scans were calculated and depicted on color-difference maps (Geomagic studio 2015; 3D systems). A one-way ANOVA and the *post hoc* Bonferroni test for normally distributed data or the Kruskal-Wallis test with Bonferroni correction for non-normally distributed data was used ($\alpha=0.05$).

Results: Significant difference were found across different ambient light where NL condition obtained the best accuracy values ($p<0.001$). While FL presented the highest discrepancy both for trueness and precision ($p<0.001$).

Conclusion: Ambient light has a significant effect on the trueness and precision of scanning with the intraoral scanner. The buffing effect when light sources hit the surface may have an impact on the accuracy.

Keywords: CAD-CAM, Accuracy, Intraoral scanners

Accuracy of Milled Frameworks Fabricated with Digital and Plaster Impressions: A Clinical Study

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Aim: The aim of this research will allow to highlight the accuracy of a new digital impression system, comparing it to the plaster impression technique already validated for many years of clinical use in the creation of full-arch implant-supported frameworks.

Methods: In the present clinical investigation 11 scans (8 of the upper maxilla and 3 of the lower jaw) were taken on a sample of 9 patients, previously treated with immediate loading full-arch rehabilitation following the Columbus Bridge Protocol (CBP) since at least 4 months. On each patient selected, two impressions were taken: one traditional cast impression using pick-up copings and an open tray technique and a second one using an intra-oral scanner. In the following 48 hours two metal substructures were constructed, using the luting technique. The precision and the passivity of the substructures were analysed through: Sheffield test endo-oral radiographs and comparing the digital scans according to the Hausdorff's method.

Results: The Sheffield test showed an excellent passivity for the frameworks obtained through both the digital and the analogic method. Precisely in 81.81% of cases (n = 9) both substructures were found to have a perfect fit with excellent passivity, in 18.18% (n = 2) of cases the substructures were found to have a slight discrepancy. From the radiographic examination, no gaps between the frameworks and the implant heads or MUAs were highlighted, with 100% accuracy. By superimposing digital files of scans according to Hausdorff's method, a reduced discrepancy was found between the digital scans and for the digital models obtained from plaster impressions.

Conclusions: Despite its limitations, this study clinically demonstrated that full-arch frameworks obtained through a digital scan have an accuracy comparable to those obtained with the traditional plaster impression.

Full Digital Workflow for Complete Rehabilitation of a Severe Wear Dentition Case

Smaranda Buduru, Manuela Taut, Oana Almasan, Andreea Kui

Introduction: Digital dentistry has a huge impact in prosthodontics, modifying the way in which diagnosis and treatments are planned and implemented. All these new technologies, such as: previsualization apps, dental designing softwares, CAD/CAM and printing technology, devices for occlusal and condylar movement analysis, aim at improving the functional and aesthetic results, the speed of restoration manufacturing, and the comfort of both patient and practitioner.

Case Description: The present case report offers an entire digital workflow in terms of restoring both the aesthetic and primarily the occlusal function and stability of a patient in class III Angle with bruxism and a severe and unequal dentition wear. The aesthetic plan was designed using a digital app (Smilecloud) and taking into consideration all aesthetic criteria, and then the virtual plan was designed in a dedicated software (Exocad DentalCAD) after restoring all the functional parameters with the condylar analyzer (Modjaw) following an intraoral scanning. The data was used to print a model of the future

restoration and subsequently tried as a motivational mock-up. Afterwards the teeth were prepared and scanned and a copy of the initial project was obtained in full monolithic restoration in glass ceramic (Empress) and zirconia.

Discussion: The final result was extremely satisfying in terms of insertion, marginal fit, interproximal and occlusal contacts and aesthetics. The occlusal function was restored without the need of retouching and was checked clinically and digitally (TS-can Novus V10). The condylar function was checked at the beginning and at the end of the treatment by digital device (Modjaw). The advantage of this device was that it enabled to place the intraoral scans in the virtual articulator in a correct position in relation to the hinge axis and the jaw motion function to replicate occlusal surfaces in accordance with the muscle and TMJ function.

Keywords: full digital workflow, Modjaw, wear, occlusion

From immediate to definitive complete dentures: a case report treated with fully digital workflow.

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Purpose: To present the digital workflow for the fabrication of removable complete prostheses, from the immediate post-extraction to definitive denture.

Materials and Methods: A 67 year old patient previously rehabilitated with removable partial dentures referred to Siena University Prosthodontic Department complaining functional and aesthetic discomforts. Anamnestic data and picture collected, and the clinical observation and x-rays evidenced hopeless dentition in both arches due to severe periodontal problems. A digital scan was taken for case study. The treatment plan included extraction of all teeth and delivery of an immediate post-extraction prostheses maintaining the previous occlusal and aesthetics parameters thanks to the digital superimposition of the existing partial denture scans to the master models. The immediate denture were obtained by a single step milling procedure of the Ivotion disks (Ivoclar Vivadent). The prostheses were immediately inserted after surgery and maintained until the complete healing, during which the dentures

were relined every 15 days during the first 2 months and then monthly to adapt to new tissue conformation. After 9 months, in accordance with patient comfort, it was decided to scan the immediate dentures to replicate the data required for definitive digital mucosa-supported dentures.

Results: The patient was collaborative during treatment. No symptoms nor pain were reported either during the immediate post-extractive or definitive dentures at 1 year follow-up. In general, the patient reported good aesthetic satisfaction and optimal functional comfort. Masticatory efficiency was improved after definitive treatment comparing to the initial evaluation with a two-colour chewing gum test.

Conclusions: The digital workflow for complete dentures fabrication requires short time and effort. The use of an intraoral scanner, a dental CAD software program, and a milling machine allowed the complete digital finalization of the clinical case, resulting in good prostheses adaptation and enhanced esthetic and functional patients satisfaction.

C027

Accuracy of 3D printed models and implant-analog positions according to the implant-analog-holder offset, inner structure, and printing layer thickness: an in-vitro study

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Objectives: This study aimed to determine how the implant-analog-holder (IAH) offset, inner structure, and printing layer thickness influence the overall accuracy and local implant-analog positional changes of 3D printed dental models.

Methods: Specimens in 12 experimental groups (8 specimens per group) with different IAH offsets, inner structures, and printing layer thicknesses were printed in three dimensions using an LCD printer (Phrozen Shuffle) and digitized by a laboratory scanner (Identica T500). The trueness and precision of the printed model as well as the angular distortion, depth deviation, and linear distortion of the implant analog were evaluated using three-way ANOVA.

Results: The positional accuracy was significantly higher for IAH offsets of 0.04 mm and 0.06 mm than for one of 0.08 mm, for a hollow than a solid inner structure, and for a printing layer thickness of 100 µm than for one of 50 µm (all $P < .001$).

Significance: The accuracies of the 3D printed models and the implant positions were significantly affected by the IAH offset, inner structure, and printing layer thickness. The results of this study indicate that an IAH offset of 0.06 mm, a hollow inner structure, and a printing layer thickness of 100 µm maximized the implant positional accuracy.

Keywords: 3D printing; CAD/CAM; implant-analog-holder offset; inner structure; printing layer thickness

C028

Digital Complete Dentures Fabrication Using an Individualized Teeth Library Created from Patient's Twin Sister

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Introduction: The purpose is to describe a digital workflow of complete dentures fabrication using a newly created, individualized digital teeth library to satisfy special aesthetic requirements.

Case Description: The edentulous patient and her dentate twin sister were scanned intraorally for preliminary impressions. 3D-printed denture bases with occlusion wax rims were used for analog functional definitive impressions and centric relation recording. The registration of maxillomandibular relationship was converted from analog to digital by scanning and aligning the intaglio surfaces of the analog definitive impressions with the corresponding digital impressions of the edentulous jaws. A digital teeth library was created by the lab using the digital impressions of the dentate twin sister. Biofunctional try-in dentures were produced and checked intraorally regarding aesthetics, phonetics, occlusion and overextension. They were properly adjusted, re-scanned and delivered as test-drive dentures for one week. Digital denture design was adjusted according to denture and occlusal adjustments. Definitive dentures were milled in two separate parts which were bonded together, using two separate discs for the permanent denture

teeth and the denture bases and delivered to the patient. One post-insertion visit was needed.

Discussion: All clinical stages were executed utilizing digital methods, except for the one of definitive impressions and jaw relation recording. Clinical efficacy, time efficiency, number of visits and the significant low number of post-delivery appointments satisfied the practitioners. Denture bearing accuracy, stability and retention were satisfactory thanks to the mucostatic digital intraoral impressions. Trial dentures promoted patient acceptance and denture adaptation, although heavier than the final ones and acted as a reference point for necessary adjustments before the final fabrication. Patient satisfaction was positive as expectations regarding aesthetic and functional rehabilitation were fulfilled. The elderly patient appreciated short-time appointments, comfort of intraoral impressions and the one-week try-in. She was enthusiastic with the new digital approach.

Keywords: Complete denture, intraoral scan, computer-aided design, computer-aided manufacturing, dental aesthetics

Digital Applications in Aesthetic Implant Rehabilitation of The Anterior Region After Trauma: A Case Report

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Traumatic oral injuries usually present restorative challenges to clinicians, especially in anterior region. Natural-looking white esthetics and soft tissue architecture are a prerequisite to restore the esthetic zone with implants. Thus, the sequence of treatment planning before implant surgery is important to get an esthetic result. A 36-year-old female patient came to the clinic because of a recent history of trauma, which induced the broken and loose of maxillary left central incisor. She underwent computerized tomographic (CT) scanning and intraoral scanning. The fracture line is about 3mm away from alveolar ridge and about 6mm away from root apex. Reformatted CT and intraoral STL data were utilized to obtain the shape data of maxillary left central incisor. A temporary crown was designed based on the shape of the nature maxillary left central incisor with further slightly concave on the labial side and convex on the mesial and distal side. Then temporary crown and surgical guide were fabricated by stereolithographic (SLA) rapid prototyping. After careful extraction of maxillary left

central incisor, the implant (Nobel Active, 3.5*13mm) was inserted with the guidance, and Bio-Oss powder was filled into the space between the labial alveolar bone plate and implant. Then the digital temporary crown was early loaded without bite and guidance. Screw-retained temporary crown with polished intra-mucosal surface excludes potential cement-induced inflammation and can be removed easily. Approximately six months later, the location of implant and the emergence profile from the temporary crown were obtained by intraoral scanning. The latter, angulated screw channel (ASC) abutment and crown were designed and fabricated with CAD/CAM techniques. To get better aesthetics for the young female, labial side of the all-ceramic crown is individually powdered and stained. Collectively, a careful and staged approach combined with advances in digital techniques is critical to successful implant rehabilitation of anterior region.

Accuracy and Reliability Five Different Dental Color Scales; An *in vitro* study

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The objectives of the investigation: The selection of color is challenging due to its complex nature. Various selection techniques have been described; visual, instrumental, and digital. The aim of this study is to ensure the accuracy and reliability of the color selection with an intraoral scanner and to determine the color change occurring in the conventional shade palette over time.

Materials and Methods: A spectrophotometer (Vita Easy-Shade, Version 110 – Panadent limited, UK), a digital intraoral scanner (3 Shape Trios4, Three visual color scale (VITA Easy-shade® Advance 5.0, VITA Zahnfabrik, Bad Sackingen, Germany) and three conventional shade palettes produced at different time-periods (VITA Classical A1-D4, VITA Zahnfabrik, Bad Sackingen, Germany). Shade-matching was performed three times at standardized ambient light on the cervical, the middle, and the incisal third of the palette teeth. The reliability of each approach was assessed using the Fleiss' kappa statistical test. The agreement between the hues matched by different

approaches was evaluated using the weighted kappa statistical test ($\alpha=.05$).

Results: The Kappa coefficients was described as; "Weak agreement = < .20; Acceptable agreement = .20-.40; Moderate agreement = .40-.60; Good agreement = .60-.80; Very good agreement = .80-1.00". The performance among three different aged shade palettes found 'acceptable' (kappa=0.403, $p<0.05$). The accuracy rates did not differ statistically significantly among the shade palettes ($p>0.05$). The performance between spectrophotometer and intraoral scanner was found 'acceptable' (kappa=0.281, $p<0.05$).

Conclusion: The comparability of the instrumental approaches clearly suggests that shade-matching instruments should be used in addition to visual shade guidance in clinical practice.

Keywords: Tooth color, Intraoral scanner, Dental shade matching

Comparison of Different Digital Programs Used in Occlusal Splint Design: An *In-Vitro* Study

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Objectives of investigation: Digital dentistry and workflow have advanced in recent years due to technological progress, especially in software programs. From this point of view, the aim of this study is to evaluate the efficiency of digital occlusal splint design programs in fulfilling of splint requirements.

Method used: 16 healthy individuals (14 women, 2 men age 28±5 years) were participated in this prospective, double blind clinical study. Two different design programs (Splint Module; Exocad, DentalCAD 3.0 Galway, Darmstadt,DE, Splint Studio; 3-Shape, Dental System 2021, Copenhagen, Denmark) (Study Group 1,2) were compared with conventional full arch stabilization splints fabricated with a traditional vacuum pressing machine and adapted by the physician at chairside (Control Group). For the fabrication of splints in study groups, fully digital workflow was chosen; intraoral scans were obtained (Trios3, 3-Shape, Copenhagen, Denmark) and the splints were produced with a 3D Printer (Solflex350, W2P Engineering GmbH, Vienna; Austria) using biocompatible splint resin material. The mandibular trajectories were recorded with the Zebris JMA System (Zebris Medical GmbH, Isny, Germany). Occlusal

splint thickness, anterior and canine ramps, occlusal contact points, time, overall fitting of the splints as well as VAS scorings of subjective evaluations were evaluated.

Results: There was a significant difference between the groups in anterior and vestibular thicknesses of the occlusal splints ($p < .001$). The results demonstrated that the clinician spent more chair time in control group (28.31 ± 8) than in digital groups (8.06 ± 8 and 9.87 ± 4). However, no difference was calculated in fabrication time. One-way ANOVA test demonstrated significant results among the groups in terms of VAS scorings ($p < .001$) and number of contacts ($p < .001$). Mandibular movements and fit of the splints did not demonstrate any difference.

Conclusion: Fully digital workflow in occlusal splint design and fabrication can be an alternative method to the traditional workflow. Although the digital method has advantages such as saving time and labor, it must be under the control of an experienced physician.

Keywords: CAD-CAM, occlusal splints, temporomandibular disorders

Efficient Fixed-Removable Full Mouth Reconstructions Utilising Novel Techniques in Conventional and Digital Workflows

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Introduction: This clinical case report highlights several novel techniques to streamline the process of delivering full mouth reconstructions to patients with a minimally invasive, cost-effective approach.

Case Description: A 69-year-old gentleman presented in private practice in 2020 with aesthetic and functional concerns. After a thorough history and examination, he was diagnosed with the following:

- Generalised, severe, pathological tooth surface loss – erosion/attrition
- Multiple missing spaces
- Several teeth with chronic apical periodontitis and sup-puration
- Generalised plaque-induced gingivitis

The patient's budget was extremely limited and one of his aims of treatment was to preserve as much of his existing den-tition as possible.

Discussion: Treatment of this case involved:

- Diagnostic records including an efficient, predictable way of transferring cant and midline to the lab utilising the “putty block” technique.
- Oral Hygiene instructions and dietary advice as well as referral to Medical Practitioner

- Periodontal management
- Extraction of hopeless prognosis teeth
- Composite build-ups using a “stamp” technique with clear matrices
- Construction of survey crowns using a conventional workflow
- Construction of upper and lower partial dentures using a fully digital workflow

With the advent of implant-supported solutions there has been a shift away from preserving dentitions with guarded prognoses. However, it is the author's opinion that there is a key place for solutions utilising tooth-based conventional pros-thodontics which allow implant supported solutions to be left as a fallback option in the future. However, as the cost for im-plant treatment reduces, the challenge in private practice can be one of cost-benefit to our patients when deciding whether to conservatively manage failing dentitions or extract teeth of guarded prognosis to make way for supposedly more “predict-able solutions”. By utilising the above techniques, the author hopes this can allow for time-savings in clinical practice allow-ing for more patients to access high-level Prosthodontic care.

Intraoral Scanners on Horizontal and Vertical Deep Subgingival Margins: Three-dimensional Analysis and Accuracy

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Objectives of Investigation: Evaluate the accuracy of 2 intraoral scanners (IOSs) (TRIOS 4 and Medit i700) on both horizontal and vertical tooth-preparations at different depth levels below the gingival margin and assess if the IOS detects the area beyond the finish line of these preparation designs.

Methods Used: Four abutments of a maxillary first molar were designed using CAD software, with vertical and horizontal preparation lines at 1 and 2 mm from the gingival margin. The abutments were printed in resin and placed on a reference typodont. Ten scans were made with the 2 IOSs on each preparation design to obtain 8 experimental groups: about Medit i700 they were named for horizontal preparations "H-1M" at 1 mm from the gingival margin and "H-2M" at 2 mm, while for vertical ones "V-1M" at 1 mm and "V-2M" at 2 mm. About TRIOS 4, they were named "H-1T", "H-2T", "V-1T", and "V-2T". The scans were imported into a dedicated software, then trueness and precision were evaluated

in μm . In addition to descriptive statistics, the Games-Howell was run to analyze differences among groups ($\alpha=.05$).

Results: About the trueness, statistically significant differences were found for H-1T/H-2T, H-1M/V-1M, H-2M/V-2M, V-1M/V-2M, H-1T/H-1M, H-2T/H-2M, V-1T/V-1M, V-2T/V-2M. As regards the precision, significant differences were detected for H-2T/V-2T, V-1T/V-2T, H-1M/H-2M, H-1T/H-1M, V-2T/V-2M. Only for vertical preparations, it was possible to record the area beyond the finish line.

Conclusions: Although only vertical preparations allow for registration beyond the finish line with IOSs, the mean accuracy values for both the vertical and horizontal geometries are within the clinically approved threshold at 1 and 2 mm below the gingival margin.

Keywords: intraoral scanner; optical impression; vertical preparation; horizontal preparation; deep preparation

A Systematic Review of the Literature on Different Scanning Protocols that Render a 3D Virtual Patient

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Objectives of investigation: To systematically appraise the body of the literature, investigate the available technology of scanning and superimposition techniques that render a 3D virtual dental patient, and measure the accuracy of the scanning and file merging workflows.

Materials and methods: A structured literature search was conducted, using 4 electronic databases (MEDLINE, EMBASE, Web of Science, and the chocrane library) from January 2018 to April 2020, for all studies reporting on the available scanning and file merging protocols that render a 3D virtual patient. Relevant journals were hand searched for relevant papers that fit the inclusion criteria.

Results: The first screening was carried out for 269 titles and abstracts. This yielded 208 studies for full-text analysis for the second screening. 22 studies from the second screening were eligible for qualitative analysis. A meta-analysis could not be performed on the data obtained, due to the heterogeneity of the methods. Studies selected for the qualitative analysis reported

merging extra-oral scans, intra-oral scans, and cone-beam computed tomography scans to form a 3D virtual replica of the patient. Most of the studies showed the scans were superimposed and merged through 2-method scanning and file merging protocol, while the remaining articles implemented the 3-method scanning and file merging workflow. The most common superimposition method was surface-based registration.

Conclusion: No conclusions can be drawn on which protocol produces better accuracy. This was attributed to the nature of the included study designs as the vast majority were case reports. Furthermore, there was a lack of comparisons between the digital workflows with analogue conventional analogue workflows and within the digital workflows as well. Although the studies offered detailed methodology on how to operate the scanners and software, there was a lack of standardised methods. The outcome of the studies did not offer concrete conclusions related to real-life clinical scenarios.

Keywords: Virtual patient, Digital, Extraoral scan, Intraoral scan

Accuracy of Interim Printed Fixed Partial Dentures on Printed Casts

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Objectives: The aim of this study was to assess the accuracy of printed interim fixed partial dentures fabricated on printed models

Experimental methods: On a typodont, a mandibular left second molar and a molar were prepared with chamfer finishing line. This model was scanned and printed. On the digital model a 3-unit a fixed partial denture was designed 6 printing angles were chosen: 90°, 75°, 60°, 45°, 30°, 15°. For each angle 10 fixed interim fixed partial dentures (IFPD) and 10 printed models were fabricated. Each FPD was cemented by using glass ionomer cement and pressed equally for all the models in a press. Each sample was embedded in-auto polymerized acrylic resin in a calibrated box. After the resin cure, the samples were cut (in a buccal-oral direction) with diamond discs and were analyzed by using an optical microscope and a digital camera. The measurements were realized for each sample in 100 points

cervical and 100 points axial - occlusal. The null hypothesis was that the angle of printing is not influencing the marginal and internal fit or the crowns. A statistical software (Med Calc) and Kolmogorov-Smirnov test were used for the statistical data analysis. A nonparametric statistical test (Kruskal-Wallis) was also used to further asses the data.

Essential results: The p value of statistical significance level was set to p=0.05. The Kruskal- Wallis test returned a p value of p<0.0001, rejecting the null hypothesis and showing that the results are of strong statistical relevance.

Conclusions: The present study showed that the best results regarding marginal and internal fit of a of printed interim fixed partial denture are obtained when using the 30° printing angle. The 45° printing angle displayed the least satisfactory values despite being recommended by most 3D printer manufacturers.

Fabrication and Characterisation of Polymethyl Methacrylate Denture Base Enhanced with Linseed Oil (PMMA-L)

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Objectives of Investigation: Polymethyl methacrylate (PMMA) is vastly used as denture base material. Previously, Dibutyl phthalate was used as synthetic plasticiser in the PMMA but there are reports of ester leaching which bring awareness about organic plasticisers' usage, like linseed oil. This study aimed to evaluate the cytotoxicity of linseed oil and characterise the linseed oil-enhanced polymethyl methacrylate (PMMA-L) denture base.

Methods Used: The cytotoxicity of linseed oil was evaluated by culturing Human Gingival Fibroblast cells with 1, 3, 5, 7, and 10% linseed oil for 24, 48, and 72 hours. The WST-1 assay was then used to evaluate cell viability, with cell quantification performed using a spectrophotometer at a wavelength range of 420-480nm. Five groups of PMMA-L were fabricated based on the amount of linseed oil used: 1, 3, 5, 7, and 10 wt.%. The samples undergo an ageing procedure involving 5,000 cycles of thermocycling at 5 and 55°C with a 30s dwelling time. PMMA-L compositional and leaching analyses were performed using

Fourier-transform infrared spectroscopy (FTIR) at wavelengths ranging from 400 cm⁻¹ to 4000 cm⁻¹.

Results: The WST-1 Assay demonstrated that linseed oil exhibited greater than 95% cell viability at all doses and incubation durations, indicating biocompatibility. Compositional analysis revealed that the FTIR spectra of PMMA-L and linseed oil were identical at two peaks, 3876 cm⁻¹ and 3656 cm⁻¹, which correspond to O-H stretching vibrations arising from the triglyceride compounds present in linseed oil. In addition, FTIR spectrum analysis revealed no linseed oil leaching from the PMMA-L.

Conclusions: The study provides evidence that linseed oil is biocompatible. Additionally, the fabrication of the linseed oil enhanced denture base (PMMA-L) was a success, as demonstrated by the presence of the linseed oil component in the PMMA-L and the absence of leaching.

Keywords: Polymethyl methacrylate, linseed oil, dentures

C037

Effect of Collagen Powder Supplements on Color Stability of Different CAD/CAM Block Materials

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Objectives: Collagen powder supplements are commonly used for dietary support in adults. However, these preparations may cause color differences on the surface of restorative materials. This study evaluated color stability of CAD/CAM block materials with different chemical compositions after immersion in different collagen powder supplements with different durations.

Methods: Samples of Vita Mark II, Vita Enamic, Cerasmart and Lava Ultimate CAD/CAM blocks were prepared with 2-mm thickness, using a low speed cutting device (n=30). The top surface of specimens was ground with 600-800-1200-2000 grit silicon carbide paper respectively. Initial CIE L*a*b* values were measured with a spectrophotometer on a white background. Samples were randomly assigned into 3 subgroups (n=10) and were immersed in distilled water, Voonka Collagen Powder or Naturanest Collagen Powder Supplements, according to the manufacturer instructions, for 2 min once a day for 96 weeks. CIE L*a*b* values were recorded at 4th, 8th, 12th, 24th, 48th and 96th weeks and ΔE values were calculated. Two-way ANOVA

test was applied to analyze both the effects of restorative material type and the solution type on quantitative variables ($p < 0,05$). Tukey HSD test was used for multiple comparisons.

Results: Both the type of CAD/CAM block material and the solution affected ΔE value significantly. While ΔE value of the samples, kept in distilled water, did not exceed the CIELAB 50:50% acceptability threshold ($\Delta E = 2.7$) for all durations; Vita Enamic exposed to Voonka collagen powder exceeded the acceptability threshold even in 4 weeks. In addition, at 96th week, all CAD/CAM blocks exposed to Voonka collagen powder and Lava Ultimate block exposed to Naturanest collagen powder exceeded acceptability threshold.

Conclusion: Use of collagen powder supplements, especially long-term, may cause discoloration of CAD/CAM block materials, so the clinicians should be aware of this and should inform their patients.

Keywords: CAD/CAM Blocks, Color Stability, Collagen Powder Supplements, Hybrid Ceramics

C038

The Bone Support Rehabilitation in the Pre-Prosthetic Surgical Stage

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Bone support rehabilitation of the edentulous patients is frequently required to improve the clinical and biological indices of the prosthetic field. Techniques used for the bone support rehabilitation are as follows: guided bone regeneration, onlay bone grafting, interpositional bone grafting, distraction osteogenesis, ridge-split, and sinus augmentation techniques. The complexity of the defect and the spatial relation of the alveolar arches dictates the selection of the appropriate technique and bone addition material. Literature data offer a large range of values regarding the success rate of the alveolar bone rehabilitation procedures in relation to the demographic parameters

of subjects, preoperative status, grafting technique and bone addition materials, practitioner experience, follow-up duration, compliance of patients to maintenance post-loading programs. As the alveolar bone loss occurs in a 3D pattern, the use of dental imaging software (Planmeca Romexis, OneDemand, DDS) to plan the surgical procedures (measurements of bone volume and osteodensity, visualization of risk areas, virtual positioning of implants) can increase the accuracy and effectiveness of the bone grafting procedures and implant-prosthetic therapy

Investigation of Different Surface Conditioning Methods and Porcelain-Composite Bond Strength in Immediate Dentin Sealing Procedure

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Objectives: Comparison of different surface conditioning methods applied to the various composite surfaces and investigation of the effect of conditioning method on composite-ceramic bond strength. In this study, it was aimed to enhanced the bond strength between composite and ceramic surfaces that we can apply in clinical conditions.

Methods: Two different types of composite resin as flowable and conventional were used in the present study. Eighty flowable composite and eighty conventional composite discs were prepared. Five different surface conditioning methods applied to composite resin discs. Following groups were prepared; orthophosphoric acid, air-flow, bur conditioning, Er:YAG laser irradiation to composite surfaces and control group with no conditioning. The roughness on the surface of the composite discs was measured with a profilometer. Glass-ceramic blocks were cut with the low speed saw and prepared with a height of 2 mm and a length of 4 mm on each side. Then, composite

and ceramic discs were bonded with adhesive resin cement. The shear bonding test was performed with a universal tester.

Results: There was no statistical difference between the roughening methods applied to flowable composites in terms of bond strength ($p > 0.05$). There was a statistically significant difference between the roughening methods applied to conventional composites in terms of bond strength ($p < 0.05$). Highest mean bond strength value was observed at ER-YAG laser irradiation group in conventional composites that was significantly higher than laser applied flowable composite groups.

Conclusions: It was concluded that similar bond strength values were obtained when using flowable or conventional composites. All results are within clinically acceptable bond strength limits. In addition, both conventional and flowable composite resins require surface conditioning to achieve reliable adhesion to porcelain material.

Key words: Conditioning methods, bond strength, immediate dentin sealing

Investigation of Cytotoxic Effects of Implant Abutments Manufactured from Different Materials on Fibroblast Cells

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Objectives of Investigation: To investigate the cytotoxic effects of 5 different implant abutment materials (IPS e.max CAD, PEEK, PMMA-Telio CAD, titanium-Grade V and IPS e.max ZirCAD) on L929 mouse fibroblasts.

Methods Used: Total of 150 samples prepared in cylindrical shape (5mmx6mm) from lithium disilicate reinforced glass ceramic (IPS e.max CAD), polyetheretherketone (PEEK), polymethylmethacrylate- PMMA (Telio CAD), titanium and zirconia (IPS e.max ZirCAD) abutment materials (n=30) with CAD-CAM principle. 1st, 3rd and 7th day medium extract were collected to test cytotoxic, apoptotic and inflammatory effects of the materials. For this purpose XTT assay, annexin- V/PI staining, interleukin 6 (IL6), transforming growth factor- β (TGF- β) and reactive oxygen species (ROS) were analyzed using L929 mouse fibroblast cell line. Results were evaluated statistically with SPSS Statistics for Windows, Version 25.0. Factorial Variance Analysis and Kolmogorov-Smirnov, Post Hoc Tukey ESD and Dunnet T3 tests were used ($\alpha=0.05$).

Results: No significant difference was found in the abutment material groups in terms of material and day ($p=0.312$). For the

XTT assay test 24th and 48th hour evaluations showed no difference between the materials ($p=0.083$; $p=0.190$), while significant differences were seen on the evaluation days ($p=0.002$; $p=0.008$) respectively. For apoptosis assay, cell viability values are at the highest value on the 7th day for control group; on 3rd day for IPS e.max CAD; on 7th day for PEEK and PMMA; on 3rd day for titanium- Grade V; on 1st day for IPS e.max ZirCAD. For IL6 and ROS results there were no significant difference between control and abutment material groups. The 1st day medium extract of PMMA group showed significant TGF- β increase according to control group ($p=0.041$).

Conclusions: None of the abutment materials can be evaluated as cytotoxic to fibroblast cells; shows similar apoptotic values with the control group. In addition, these materials were evaluated as safe in terms of genotoxicity and immunological properties.

Keywords: Dental implants; abutment; cytotoxicity; gingival fibroblasts; cell viability; apoptosis

C041

Marginal Adaptation of CAD-CAM Partial Indirect Restorations: A Systematic Review of In-vitro Studies

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Objectives of Investigation: Different parameters can influence the adaptation of computer-assisted design and computer-assisted manufacturing (CAD-CAM) Partial Indirect restorations. However, systematic reviews to identify and discuss these parameters are lacking. The aim of this review was to summarize the scientific literature investigating all parameters that can influence both the marginal adaptation of CAD-CAM inlay/onlay restorations.

Material and methods: An electronic search was conducted for studies published in English between December 10, 2012 and July 1, 2021 on the PubMed/MEDLINE, Scopus, and Web of Science databases. Factors investigated in the selected articles included the type of CAD-CAM system, virtual space parameters, version of the software, luting procedure, type of restoration, sample size and aging procedure, evaluation method, and number of measurement points per specimen.

Results: A total of 120 articles were identified, of which 14 articles met the inclusion criteria. Four studies investigated adaptation with different restorative materials, 3 evaluated adaptations according to the type of preparation design, 2

compared adaptation before/after thermomechanical loading, and 2 before/after cementation, 2 study investigated marginal adaptation based on whether the optical scan was made intraorally or extraorally, and 1 assessed adaptation with 4 different intraoral scanners.

Conclusions: Most of the studies reported clinically acceptable values for marginal adaptation. The performance of a CAD-CAM system is influenced by the type of restorative material. A non-retentive cavity preparation exhibited better adaptation than a retentive preparation. Most studies showed that thermo-mechanical loading affected the quality of marginal adaptation. Cementation increased marginal discrepancies. No statistically significant difference was found for marginal fit of Restorations between intraoral and extraoral optical scans using a stone die. The number of milling axes, the type of digital camera, and the region measured were statistically significant in relation to marginal adaptation. Adaptation of CAD-CAM Partial Indirect Restorations should be evaluated under clinical conditions.

Keywords: CAD/CAM; marginal fit; inlays; onlays; overlays; partial indirect restorations.

C042

Which Fabrication Technique Produces the Best Marginal Fit and Flexural Strength for Provisional Restorations?

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Objectives of Investigation: provide recommendations for clinicians on which provisional material and fabrication technique to use given different clinical scenarios for tooth-supported restorations, based on achievable marginal fit and flexural strength.

Methods Used: a systematic search of the electronic databases Embase, Medline, Scopus and Web of Science was conducted to identify all relevant articles published between January 2010 and July 2020. Handsearching was also carried out and grey literature was searched. The PICO framework was used to formulate the research question and the PRISMA guidelines were followed to conduct the review.

Results: the electronic search of the databases and handsearching yielded 909 results. After duplicates were removed, 14 studies satisfied the inclusion criteria. All these studies had an analogue control group for comparison, with at least one

milled or 3D printed group. Marginal fit of materials was assessed using a microscope and the flexural strength of materials was assessed using the 3-point flexural test. Milled provisional restorations appear to consistently outperform conventional analogue techniques in terms of both marginal fit and flexural strength. 3D printed provisional restorations have been shown to have a similar marginal fit to milled provisional restorations, but there is limited outcome data for this. Similarly, there were inadequate studies to draw strong conclusions about 3D printed materials for flexural strength.

Conclusion: it is recommended that PMMA milled provisional restorations are used to provide superior marginal fit and flexural strength for longer-term single unit restorations. 3D printed provisional restorations should be used with caution but may be suitable for single unit scenarios in the short-term.

C043

Depth of Cure of Three Different Composite-Resin Restorative Materials by Means of Surface Hardness Measurements

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Objectives of Investigation: The aim of the present study was to evaluate depth of cure of three different types of composite resin restorative materials: composite resin luting cement, flowable composite resin and short fibre reinforced flowable composite resin restorative materials by means of surface hardness measurements.

Methods Used: Test specimens were prepared using successively placed 3 black moulds with the dimensions of 2mm thickness with 5mm diameter disc hole. Three different materials: composite resin luting cement (RelyX Ultimate, 3M-ESPE) flowable composite resin (G-aenial Universal Injectable, GC) short fibre reinforced flowable composite resin (everX Flow, Bulk Shade, GC) were compared. For each test group 3-test specimens were prepared and surface hardness measurements were obtained using Vickers Hardness Surface Tester. 50gram load were applied for 15 seconds and Vickers Hardness Number (VHN) were calculated from upper- and lower-surface of the each test specimen. From each specimen 3 VHN were determined from

both surfaces after 1-hour and 24-hour after 40 seconds light irradiation with 1400mW/cm² output of high power LED light curing unit (D-Light Pro, GC). Depth of cure was calculated from VHN of upper surface and lower surface measurements.

Results: VHN were varied according to the type of the tested materials both upper- and lower-surfaces. Depth of cure values were also differed from tested different type of materials. For 1-hour and 24-hour VHN values from upper- and lower-surfaces did not show statistically difference between test intervals ($p < 0.05$). Obtained VHN values (Mean \pm SD) from upper-surface and lower-surface for everX Flow, Bulk Shade 44,07 \pm 3,43 and 41,20 \pm 3,13; G-aenial 54,40 \pm 2,07 and 18,15 \pm 2,20; Rely X Ultimate 41,45 \pm 2,74 and 35,30 \pm 1,18, respectively. Depth of cure values for everX Flow, G-aenial and RelyX Ultimate were %93,48; %33,36 and %85,1,6 respectively.

Conclusions: Considering surface hardness and depth of cure values short fibre reinforced flowable composite resin restorative material had beneficial effect.

C044

Influence of Bleaching Agents on the Color Change of Indirect Restorative Materials

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Objectives of Investigation: The aim of this in-vitro study was to investigate the effects of whitening agents of different type, concentration and application procedures, on the color of indirect esthetic restorative materials with different manufacturing methods.

Methods Used: The indirect restoration materials tested in the study are; 3D-printed composite (saremco print CROWNTEC; SAREMCO Dental AG) produced by additive manufacturing, resin nano-ceramic (Lava Ultimate; 3M Espe), by subtractive manufacturing, and composite resin (Enamel plus HRI; Micerium, Italy) by conventional molding technique according to the manufacturer's instructions. 50 disc-shaped samples were prepared from each test material ($\varnothing=8$ mm, $h=2$ mm). The samples were polished with 600-800-1200-2000 grit silicon carbide sheets. The specimens were divided into 5 subgroups for the bleaching agents to be applied ($n = 10$ /group): control (samples were put in the incubator in distilled water for 14 days), Whiteness Perfect (16% carbamide peroxide, applied for 3 hours a day for 14 days), Whiteness HP Blue (35% hydrogen peroxide, applied in one session, for 40 mins), Opalescence PF

(16% carbamide peroxide, 6 hours a day, for 7 days), Opalescence Boost (40% hydrogen peroxide, applied in one session, 20 min applications twice). Color values were measured using spectrophotometer. Normality of data distribution was tested by Kolmogorov-Smirnov test. Statistical analysis was performed using a two-way analysis of variance (ANOVA) and Tukey's multiple comparison tests at a significance level of $p < 0.05$.

Results: ΔE values were significantly influenced by the restoration materials and the bleaching agents ($p < 0.05$). Enamel plus HRI material showed the highest ΔE values ($p < 0.05$), however there were no significant differences between Lava Ultimate and saremco print CROWNTEC materials ($p > 0.05$).

Conclusions: Type of indirect restorative materials and bleaching agents influenced color change.

Keywords: Three-Dimensional Printing, CAD/CAM, Bleaching, Color

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The Effect of Simulated Gastric Juice on The Color Stability of Different Permanent Prosthetic Resin Materials

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Background: The aim of this in vitro study was to evaluate the effect of simulated gastric juice on the color stability of two different laboratory-processed resin composite systems, a resin nanoceramic CAD/CAM material and a permanent 3D printed resin material.

Methods: Forty-eight specimens were prepared from two different indirect composite systems (SR Adoro, Ivoclar Vivadent and Tescera ATL, Bisco); a resin nano-ceramic (Lava Ultimate, 3M ESPE) and a 3D printed permanent crown material (Permanent Crown, Formlabs). All the specimens were coded as A, T, L, F respectively. Surfaces were ground using carbide grinding paper followed by a 30µm Al₂O₃ sandblasting. Then universal polishing paste was applied to the surfaces. The color before and after immersion was measured according to Commission Internationale de L'Eclairage (CIE L, a, b) System and ΔL, Δa, Δb, and ΔE values were calculated with ΔE2000 formula. All specimens were

immersed in the solution for 24h. Changes in colors (ΔE*) was assessed before and after immersion by a digital spectrophotometer (Vita Easyshade, Vita). Data was analyzed with a one-way ANOVA and a Shapiro–Wilk test of normality was performed.

Results: One-way ANOVA test showed that there were statistically significant difference between ΔE mean values of the test groups (p <0,001). While the F group is similar to the L and T groups, it has a higher value than the A group. While group A is similar to L, it has a lower value than group T. There is also a difference between L group and T group.

Conclusion: Within the limitations of the study, the color stability of the tested resin materials was affected by the simulated gastric juice

Keywords: Color stability, gastric juice, dental resin material, permanent restoration.

Profilometric Analysis of Surface Roughness of Enamel and Contemporary Restorative Materials Subjected to Chewing Simulation.

Prof. Syed Rashid Habib

Objective: To analyze and compare the surface roughness of enamel and different restorative materials [metal ceramic; lithium disilicate; monolithic zirconia & composite resin] subjected to chewing simulation.

Materials and Methods: Samples were prepared in disc shapes (N=32) for the four test materials (n=8). 32 premolar teeth extracted for orthodontic reasons were also collected, analyzed and mounted on resin blocks to be used against the test materials as antagonists during the chewing simulation. The mounted teeth specimens were randomly divided into 4 groups of 8 each. Surface roughness of the test materials and antagonist teeth were measured and analyzed before and after subjecting them to chewing simulation of 250,000 chewing-cycles (49N/0.8Hz/5C/50C). A profilometer was used for the measurement of the surface roughness and a digital microscopic was used for the qualitative evaluation of the test specimens and the opposing enamel. One-way analysis of variance and paired t tests were used for statistical analysis of the tabulated data.

Results: Metal ceramics and lithium disilicate showed the least (0.23+0.08µm) and highest (0.68+0.16µm) surface roughness difference before and after chewing simulation, respectively. Analysis of variance revealed significant differences (p<0.05) between the test materials for the surface roughness. Paired samples T-Test revealed significant differences (p<0.05) for the surface roughness difference before and after the chewing simulation for all the test materials. For the antagonistic tooth enamel no significant difference (p=0.987) was found between the groups. However, the surface roughness values recorded before and after subjecting the enamel to the chewing simulation showed significant difference (p<0.05).

Conclusions: Monolithic zirconia and metal ceramic are more resistant to surface roughness opposed to the teeth enamel as compared to lithium disilicate and composite resin. The enamel surface antagonist to the tested materials exhibited similar surface roughness. However, variations were found for the surface roughness values between all the four tested materials opposed to enamel.

C047

The Effect of Different Mouthwash that Recommended for Covid-19 Infection on the Color Change

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Objectives of Investigation: The aim of the present study was to determine the effect on the color change of a CAD/CAM ceramic block of different oral rinses which recommended to use against Covid-19 infections.

Methods Used: In the present study, a total of 40 samples were prepared from feldspathic glass ceramic blocks (Cerec Blocs C, Dentsplay Sirona, Germany). Samples of 2x12x12 mm were prepared from the blocks using a micro cutting machine (Mecatome T180, PRESI, France). Each surface of the samples was polished with diamond polishing discs (EVE Diapol, Ernst Vetter GmbH, Germany) for 30 seconds. The samples were divided into four groups according to the immersion solutions: 0.2% povidone iodine, 2.5% hydrogen peroxide, ethanol-containing mouthwash (Listerine), and distilled water (control group). Initial color values were measured with a spectrophotometer device (Vita Easyshade Advance 4.0, Vita, Germany).

The color values were measured again 12 hours after immersion (equivalent to 1 year for 2 minutes of daily use). The color change (ΔE_{00}) values were calculated based on CIEDE2000 formula. Data were statistically analyzed using Kruskal-Wallis test.

Results: There was no significant difference between mouthwash groups ($p=0.052$) in the color changes of feldspathic glass ceramics ($p=0.52$). The lowest ΔE_{00} value (0.22) was observed in the control group, while the highest ΔE_{00} (0.63) value was calculated in the hydrogen peroxide group.

Conclusions: The color changes on feldspathic porcelain of all the mouthwashes used in the present study, recommended for protection from Covid-19 infection, were below the perceptibility color threshold ($\Delta E_{00}=0.8$).

Keywords: color; Covid-19 infection

C048

Stress Distribution in One-Piece Zirconia Implants: A Finite Element Analysis

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Objectives of Investigation: The aim of this study was to evaluate the stress distribution in single-piece ceramic implant models using finite element analysis (FEA).

Methods Used: From virtual reconstruction bone model of the toothed maxilla from a computed tomography, a 3D model was created. One-piece zirconia implants (Straumann® PURE Ceramic) and zirconium reinforced titanium implants (Roxolid®, Straumann) connected to their superstructures were threaded into second premolar section of the maxillary bone to investigate the implant material types on final stress status. The implants were 4.1 mm in diameter and 10 mm in length. A vertical static load of 200 N was directly applied to the center of the implants; and 100 N oblique load (30 degrees) was applied

to the buccal incline of the palatal cusp for each model. The maximum Von Mises stress values were calculated.

Results: In all models, one piece zirconia implants showed less stress concentration in bone tissue, implants and prosthetic parts. According to the stress analysis, maximum von Mises stress value was detected on the bone tissue of the two-piece implant models.

Conclusion: One piece ceramic implants showed similar overall biomechanical behaviour as compared to two piece dental implants. Long term clinical investigations are needed to validate the results of this in-vitro study.

Keywords: Dental implant, zirconia, finite element analysis.

Physicochemical Behaviour of Preshaded and Internally Shaded Monolithic Zirconia Materials

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Objectives of the Investigation: To investigate the surface roughness and contact angle differences after various surface finishing methods and chemical aging in preshaded and internally shaded translucent and cubic monolithic zirconia.

Methods Used: Preshaded and internally shaded disc-shaped specimens (1.2 mm \varnothing \pm 0.2 mm) (N=144) were prepared from translucent (Vita YZ HT, Vita Zahnfabrik, Bad Sackingen, Germany) and cubic zirconia blocks (CoproSmile, Whitepeaks Dental Solutions GmbH&Co, Essen, Germany). Simulated clinical grinding (Z-Cut, NTI-Kahla GmbH Rotary Dental Instruments, Kahla, Germany) and surface finishing including glazing, intraoral polishing kit (NTI Set 1859, NTI-Kahla GmbH Rotary Dental Instruments, Kahla, Germany) and intraoral polishing set including diamond paste (OptraFine, Ivoclar Vivadent AG, Schaan, Liechtenstein) were performed on the specimens (n=12, 12 groups in total). All specimens were immersed in a 4% acetic acid solution (pH=2.4, 18h) in a thermostatic shaking device (4080 Incubator Shaker, Herasau, Switzerland). Surface roughness and contact angles of all specimens were measured by a manual profilometer and contact angle goniometer microscope at the beginning, after surface finishing

and chemical aging. Statistical analyses were completed with Repeated Measures ANOVA and Bonferroni tests ($\alpha=0.05$).

Results: The mean initial contact angle measurements of 3Y-TZP specimens were 39.21 degrees, while the cubic zirconia specimens' mean value was 36.21 degrees. Contact angle values decreased in all groups of glaze application. After chemical aging, the contact angles increased in all 12 groups. Considering all groups, Ra values were higher after glazing when compared to polishing with intraoral kit and set including paste. Ra values increased in all groups after chemical aging.

Conclusion: Belonging to dental ceramic family, glazing enhanced wettability of the restorations despite causing rougher surfaces. Intraoral polishing set with polishing paste can be recommended for decreasing the surface roughness but it is not advisable considering wettability. Further investigations may be required for maintaining the glaze layer and wettability to improve aging resistance.

Keywords: Wettability, Surface Properties, Yttria Stabilized Tetragonal Zirconia, Dental Finishing and Polishing

In-vitro Mechanical Strength of Monolithic Zirconia of Varying Yttria Concentration: A Systematic Review

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Objectives of Investigation: The purpose of this systematic review was to assess the effect of varying the amount of yttria content in monolithic zirconia polycrystals (ZP) on the flexural strength and the load-to-failure of monolithic zirconia as restorative materials, and to review the effect of hydrothermal and mechanical aging on the flexural strength and load-to-failure on monolithic zirconia.

Materials Used: A structured literature search was conducted through August 2020 in PubMed, Web of Science, Embase and Cochrane Central Register of Controlled Trial for period between 2010 and 2020, targeting in-vitro studies evaluating the effect of yttria content on flexural strength and load-to-failure of monolithic zirconia before and after hydrothermal and mechanical aging. Manual searching was done in relevant journals, references and grey literature. Inclusion and exclusion criteria were applied. Risk of bias assessment was conducted.

Results: The 1810 relevant studies were reviewed independently by two authors. 56 studies were selected for full-text analysis.

22 studies were included in the final analysis. Risk of bias was found to be medium. Conventional zirconia (3mol% yttria-ZP) had significantly higher flexural strength and load-to-failure than zirconia of higher yttria content (4mol% yttria-ZP, 5mol% yttria-ZP, 8mol% yttria-ZP). The mechanical strength of conventional zirconia (3mol% yttria-ZP) was not adversely affected by artificial aging, whereas those of zirconia of higher yttria content (5mol% yttria-ZP, 8mol% yttria-ZP) were reduced after artificial aging.

Conclusions: Changing the yttria content of zirconia affects the in-vitro mechanical strength of zirconia. Zirconia of higher yttria content experiences a decrease in flexural strength and load-to-failure after artificial aging. It is recommended that clinicians limit the use of 4mol% yttria-ZP to single-unit or 3-unit prostheses, and 5mol% yttria-ZP and 8mol% yttria-ZP to single-unit prostheses or 3-unit prostheses not involving molars.

Keywords: Zirconium oxide, Yttria, Flexural Strength

C051

Effects of Tooth Preparation Designs on Tissue Removal and Marginal/Internal Discrepancies in Partial Restorations

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Objectives of Investigation: To evaluate the effects of different finishing lines for indirect partial restorations (IPR) on enamel and dentin tissue removal and on the marginal and internal adaptation of ceramic overlays.

Methods: An .STL file (F0) was obtained from a mCT scan of a human molar and used to 3D-print 40 replicas. Standardized preparations for IPR were performed. The replicas were randomly assigned to 4 groups (N=10) according to the tooth finishing line and to the location of the margin to the dental equator (DE): 1) Rounded shoulder above the DE (SA); 2) Chamfer above the DE (CA); 3) Rounded shoulder below the DE (SB); 4) Chamfer below the DE (CB). The samples were scanned and the .STL files compared to F0 to evaluate enamel and dentin volume removal after preparations (One-way ANOVA). Then, 40 human molars were randomly assigned to the same 4 preparation groups (N=10). Lithium-disilicate overlays were milled and cemented using a universal resin cement. The samples were

scanned (mCT) to evaluate the marginal (MD) and internal (ID) discrepancies (one-way ANOVA). The level of significance was set at $p < 0.05$.

Results: No significant differences in enamel and dentin tissue reduction were found between SA and CA ($P > 0.05$). CB was significantly more conservative in enamel than SB ($P < 0.05$) and showed significantly greater MD than the other preparations ($P < 0.05$). Preparations below the DE (CB and SB) resulted in significantly greater ID than the groups above DE ($P < 0.05$). CA showed significantly smaller 3D internal gaps than SB and CB ($p < 0.05$).

Conclusions: Among the tested finishing lines no differences were found between the groups located above the DE in terms of tissue removal, whilst CB was the most conservative among the groups below DE. Preparations performed above the DE might result in restorations with smaller internal gaps.

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Risk Factors and Protective Indicators of Peri-Implant Diseases Among Psoriatic Subjects. A Cross-Sectional Study.

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Objectives of Investigation: The primary aim was to evaluate the prevalence of peri-implant diseases, i.e. peri-implant mucositis and peri-implantitis, in patients affected by psoriasis vulgaris. The secondary aim was to investigate the risk/protective indicators for peri-implant diseases.

Methods Used: 180 patients affected by psoriasis vulgaris were consecutively screened and only those with at least 1 implant were selected for inclusion. The included patients were examined clinically and radiographically to assess the prevalence of peri-implant health and diseases, identified according to the EFP/AAP criteria. A multilevel multivariate logistic regression analysis was carried out to identify the factors positively associated with peri-implantitis (risk indicators) and those negatively associated (protective indicators). Results. 69 patients with a total of 129 dental implants were analyzed. The prevalence of mucositis and peri-implantitis was respectively 31.2% and 58.8% at patient-level (32.8% and 57.3% at implant-level). The following factors were positively associated with peri-implantitis (risk indicators): smoking (OR=2.3; 95% CI: 1.01-3.2), stage III/IV periodontitis (OR=4.8; 95% CI: 2.2-7.5),

implant malposition (too buccal: OR=1.9; 95% CI: 1.1-3.8), and type of prosthetic restoration (prosthetic bridge: OR=3.2; 95% CI: 2.1-5.4). Conversely, the following factors were negatively associated with peri-implantitis (protective indicators): use of interproximal oral hygiene devices (OR=0.5; 95% CI: 0.2-0.7) and administration of biological medications (vs. systemic or topic medications/no treatment) (OR=0.3; 95% CI: 0.04-0.7).

Conclusions: Peri-implant diseases are highly prevalent diseases among patients with comorbid psoriasis vulgaris. In particular, the prevalence of peri-implantitis and mucositis seem to be higher than the values of prevalence generally found in systemically healthy subjects (i.e. not affected by psoriasis). Smoking habit, an excessively buccal implant malposition and the presence of a prosthetic bridge (as opposed to a single crown) resulted as risk indicators for peri-implantitis. Conversely, the use of interproximal devices and the administration of biological medications resulted as protective indicators.

Exploiting the Universal Resin Cement Possibilities: The Hybrid Bonding Luting Technique (HyBoL)

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Introduction: Universal resin cements allow for either adhesive or self-adhesive cementation, depending on the previous application of a bonding systems. This is clinically advantageous when it is necessary to increase retention (using the adhesive system), but it is not possible to isolate with a rubber-dam (short, unretentive abutments). This study presents a full-mouth rehabilitation finalized with a novel luting technique: hybrid bonding luting technique (HyBoL).

Case Description: A 45-yr old female patient referred to our dental clinic reporting functional and esthetic problems. Anterior teeth microdontia and occlusal wear facets on posterior teeth contributed to a considerable reduction in the vertical occlusal dimension. After medical and dental anamnesis, both digital and traditional impressions, radiographical status and photographs were taken. As patient refused ortho treatment, a full-mouth rehabilitation with lithium-disilicate crowns was planned. A resin mock-up was first delivered and the intermaxillary dimension was registered. The crowns were individually cemented with a

universal resin cement+universal adhesive (Panavia SA cement universal+QuickBondUniversal,Kuraray). The shortness of the abutments precluded rubber-dam positioning. As humidity control in the marginal area of the preparation was inadequate, it was not possible carry out a full-abutment adhesive cementation safely. Hence, the HyBoL technique was used. Briefly, the universal adhesive was applied on the occlusal surface and 2 coronal thirds of the abutment leaving free the marginal area of the preparation. Accordingly, crowns were cemented both adhesively (2/3 of the abutment) and self-adhesively (cervical third). Patient was recalled at 6-months.

Discussion: Although universal cements present advantages in terms of retention when combined with their adhesive systems, clinically, it is not always possible to place the rubber-dam. HyBoL technique exploited the true versatility of universal cements, obtaining simultaneous adhesive and self-adhesive cementation. So, a full-mouth rehabilitation characterized by unretentive abutments was completed in the most conservative way possible.

Effect of Scanbody Material and Mucosa Modification Technique on the Accuracy of Digital Impressions of Edentulous Arches with Multiple Implants.

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Objectives of investigation: Digital impressions of dental implants are being widely used, with lower accuracy results for complete arch scanings of edentulous jaws than for single and partial edentulous spaces. The aim of current research is to evaluate the effect of scanbody material and additional reference markers in the form of artificial landmarks on the accuracy of digital impressions of edentulous arches with multiple implants.

Material & Methods: A model of an edentulous maxilla with six implants (BLT, RC, Institut Straumann, AG) was used as master model. PEEK and PMMA scanbodies were screwed on the implants and digital impressions were obtained with an intraoral scanner (TRIOS4, 3Shape). Reference markers made of flowable composite (C), gingival barrier material (GB), scannable silicone (S) were placed on the edentulous spaces and impressions were obtained. The master model was digitalized with an extraoral high-resolution reference scanner. Deviations of the predetermined points and inter-implant distances were calculated by using superimpositing technique. Mann Whitney U and Kruskal Wallis-H test were performed to identify multiple comparisons.

Results: Inter-implant distance measurements showed that PEEK scanbodies demonstrated better precision than PMMA scanbodies, (Mean deviations; PEEK: 40 ± 4 μ m, PMMA: 127 ± 6 μ m, $p < .001$). In the subgroups, also PEEK groups were more accurate than PMMA groups ($p < .001$). Kruskal-Wallis test also showed statistical difference in deviations of the predetermined points among the groups in precision ($p < .001$). Addition of markers did not influence the precision and trueness in PEEK groups but in PMMA groups both in distance measurements and predetermined point deviations.

Conclusions: Addition of reference markers does not make any significance in the accuracy of digital impressions when PEEK scanbodies are used. PMMA seems not to be an alternative material as scanbody material, addition of markers is needed. However, further studies should be conducted with different scanning technologies.

Keywords: digital impression accuracy; scanbody material; additional reference marker, multiple implant impression

Dental Abutment Clinical Management Affects Clot Formation on Abutment Surface: In Vitro Study

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Background: Blood-implant abutment contact initiates platelet aggregation, fibrin clot formation, and stabilization associated with early wound healing within seconds. This study aims to develop a method for removing contaminants on abutment surfaces before final restoration and its effects on clot formation and clot-abutment attachment.

Materials: 42 titanium abutments were divided into three groups according to the cleanliness of the surface: a brand-new group without contamination, a negative control group contaminated with biofilm, and a test group cleaned with an enzymatic cleaner containing protease. Blood sample and abutment were placed into Liquide-PRF tubes and centrifuged at 2700rpm for 12minutes. After centrifugation, the clots were removed from the tubes and separated from the abutments. They were separated into two parts along their long axis to assess structural changes within the clot and histomorphometric analysis. 12 abutments separated from the clot and 2 untreated abutments in each group were visualized by SEM for surface examination.

Results: Hematoxylin and eosin staining showed that the fibrin clot in all groups has a well-organized structure. After

SEM, a fibrin clot was observed on all abutment surfaces. Clot attachment on the brand-new and decontaminated abutment groups showed better adhesion than the contaminated group. The clot attachment districts on the abutment surface were variable according to groups. Clot attachment areas were more common and monitored over the surface of brand-new and decontaminated abutments than in the contaminated group. To SEM of non-blood-treated abutments, the brand new and decontaminated groups had similar clean surface properties. While no biofilm or residue was detected on the abutment surfaces in either group, the contaminated abutment had residual and bacteria-like structures on the surface.

Conclusion: To our study, clean Ti abutment surfaces may be advantageous for soft tissue attachment's early wound healing and long-term implant abutment mucointegration.

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Color, Gloss and Surface Roughness Changes of CAD-CAM Composite Materials After Three Aging Procedures.

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Objectives of Investigation: To assess the effect of aging procedures on color stability, gloss, and surface roughness of CAD/CAM composite materials.

Methods Used: 6 CAD/CAM composite materials [Brilliant CRIOS (BC), Cerasmart (CS), Lava Ultimate (LU), Tetric CAD (TC), Shofu Blocs HC (SB), Grandio Blocs (GB)] and a lithium disilicate control material [IPS e.max CAD, (EC)] were tested. 30 CAD-CAM fabricated specimens for each material were polished and finished according to manufacturers' recommendations. Specimens of each material were randomly divided into three subgroups (n=10) and each subgroup was subjected to one of the following aging procedures; Gr₁: immersion in coffee solution (30 days at 37°C), Gr₂: water thermocycling (5000 cycles, 5-55°C, according to ISO TR 11450), Gr₃: photoaging. Color, gloss and surface roughness measurements were performed before and after aging procedures. Changes of color (ΔE^*), gloss (ΔG) and

surface roughness (ΔSa) were calculated and analyzed statistically (Two-way-ANOVA, Bonferroni, $\alpha=0.05$).

Results: Color, gloss and surface roughness alterations of the materials tested presented the following range of values: (a) [ΔE^*]; Gr₁:3.03 to 4.41, Gr₂:1.33 to 2.53, Gr₃:2.08 to 2.78, (b) [ΔG (GU)]; Gr₁:-9.48 to -2.11, Gr₂:-7.9 to 0.06, Gr₃:-6.78 to 0.25, (c) [ΔSa (μm)]; Gr₁:-0.025 to 0.047, Gr₂:-0.024 to 0.023, Gr₃:-0.004 to 0.096.

Conclusions: Coffee caused clinically unacceptable color changes ($\Delta E > 3.3$) in contrast to photoaging and thermocycling which induced clinical acceptable discoloration ($\Delta E < 3.3$). The materials tested demonstrated small (<20GU) but visible (>2GU) gloss changes, while surface roughness had no considerable change from baseline levels.

Keywords: computer-aided design, composite resins, aging, color

Three-dimensional Radiographic and Histologic Assessment of Bone Ingrowth into Porous Nickel Titanium Dental Implant

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Objectives of investigation: Porous Nickel Titanium (Porous-NiTi) is a novel dental implant designed to improve clinical performance and accelerate osseointegration. This study aimed to compare the bone response and bone-implant contact percentage (BIC%) at the peri-implant interface of Porous-NiTi implants and commercially available dense titanium (Dense-Ti) dental implants using micro-computed tomography (MicroCT) and histological study.

Methods: Twelve dental implants (six Porous-NiTi and six Dense-Ti) were placed at the distal metaphysis of the femoral bone of twelve New Zealand white rabbits. After 12-week healing period, the animals were euthanized, and bone-implant samples were collected. The BIC% in 2-dimension (BIC-2D) and 3-dimension (BIC-3D) with other bone parameters [bone surface (BS), bone volume (BV), tissue volume (TV), and intersection surfaces (i.S)] were assessed using MicroCT analysis. The samples were then processed for histological analysis, and the BIC% (BIC-histology) was calculated. Light microscopy was used to examine osseointegration and bone ingrowth into implant surfaces.

Results: When compared to the Dense-Ti, Porous-NiTi dental implants had significantly higher values for BS, BV, TV, i.S, and BIC-histology percentage ($P < 0.05$). Histologically, both implant surfaces exhibit a close relationship with the bone. At higher magnification, new bone formation into the porosities of the Porous-NiTi implant was observed (Figure A), as well as close adaptation against the Dense-Ti implant's relatively flat surface (Figure B). MicroCT and histological analysis show that Porous-NiTi implants have a higher BIC% (BIC-2D, BIC-3D, and BIC-histology) than Dense-Ti dental implants.

Conclusions: The results suggest that Porous-NiTi dental implants can achieve comparable osseointegration to commercially available Dense-Ti dental implants. Bone ingrowth into the porous surfaces of a NiTi implant may indicate greater bone-to-implant contact, which could lead to greater implant stability.

Keywords: Osseointegration; Dental Implants; MicroCT; Histology

Comparison of Shade-Matching Accuracy with Various Digital Photographic Techniques: An In Vivo Study

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Objectives of the investigation: Shade determination has always been challenging, and there has been no single method considered as the standard for color matching in dentistry. When appropriate color attributes are correctly modified, dental shade matching using digital photos may be possible. From that point of view, this clinical study aims to evaluate color differences (E) between different types of digital photography equipment used to document tooth color.

Materials and Methods: Maxillary right central incisor teeth of 20 healthy individuals were evaluated. Shade matching was performed with a spectrophotometer (Vita EasyShade, Version 110 – Panadent limited, UK) three times, clinically, as the control group. A total of 400 images were captured by a smartphone (Apple iPhone XS) with a 5500K portable dental photography system with and without a polarising filter (Smile Lite MDP, SmileLine, Switzerland) and with a DSLR camera

with different aperture and shutter speed modes. The CIE L* a* b* colorimetric coordinates values of RAW format images were obtained in a computer program (Adobe® Photoshop® software, Adobe Systems, Inc., San Jose, CA). ΔE calculations were made to obtain perceptibility (PT) and acceptability (AT) of shade matching. The data were analyzed by using a 1-way analysis of variance (ANOVA) and Tukey posthoc tests ($\alpha = 0.05$).

Results: The ΔE among DSLR camera and smartphone was found significantly different ($p < 0.05$). The ΔE among DSLR camera and spectrophotometer was found significantly different ($p < 0.05$) while the discrepancies among DSLR camera subgroups did not show a significant difference ($p > 0.05$).

Conclusion: The DSLR cameras showed significant differences, the shooting parameter should be considered more broadly.

Keywords: Dental shade matching, Digital Photography, Tooth Color

In-Vitro Comparison of the Microbial Leakage in Two Different Implant-Abutment Systems.

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Objectives of Investigation: The microgap in the implant-abutment interface although unavoidable can be minimized by choosing the suitable abutment. The aim of this study is to compare the microbial leakage of two implant-abutment systems before and after dynamic loading.

Materials and Methods: AstraTech Osseospeed EV implant and two different abutments were used; prefabricated ti-base abutment (Group A) and Acuris conometric abutment (Group B) (Dentsply Implants, Sweden). Lithium disilicate (IPS.e.max CAD, Ivoclar Vivadent, Liechtenstein) crowns were fabricated. Bacterial suspension was inoculated into the implant. The samples were immersed in tryptic soy broth for static condition, and then been loaded into a chewing simulator. Bacterial samples were obtained and cultivated after both static and dynamic loading.

Results: Although there was microleakage in both groups in this investigation it was at different levels. Under static conditions ti-base abutment did not show any leakage ($0,0 \pm 0,0$) however 3 out of 6 Acuris conometric abutment showed minimal leakage ($500,0 \pm 547,7$). Both systems produced leakage findings in 4 out of 6 after loading for Group A ($388333,3 \pm 487048,9$) and Group B ($20000,0 \pm 15491,9$). There was no significant difference between and within the groups in both conditions ($p>0.50$).

Conclusion: within the limitation of this in-vitro study it can be concluded that both systems showed similar bacterial leakage before and after loading.

Keywords: Microbial Leakage, Dental Implants, Conometric Concept, Dynamic Loading

Evaluation of the Efficacy of Photodynamic Therapy for Disinfection of Denture Base Material

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Objectives of Investigation: The aim of the current study was to evaluate the efficacy of indocyanine green (ICG) mediated photodynamic therapy (PDT) against *C. albicans* that can grow on denture base material.

Methods Used: In order to imitate the denture base material, 108 polymethylmethacrylate (PMMA) discs of 2mm thickness and 10mm diameter were produced. The samples were contaminated with *C. albicans* and *C. albicans* was allowed to grow on surfaces of samples. Nine groups (n=11) were evaluated each having another disinfection procedure applied to the surfaces of the samples. Groups; control group (K), nystatin (1ml, 100,000IU) applied group (N), microwave disinfection (650W, 3min) group (M), laser-only (810nm, diode laser, continuous mode 30sec, 24J/cm², 300mW) group (L), group treated with only ICG at 10mg/ml concentration (ICG10), and groups treated with ICG-mediated PDT (ICG activated with laser) at different concentrations (10, 5, 2 and 1 mg/ml) (L-ICG10, L-ICG5, L-ICG2 and L-ICG1). Colonies of *C. albicans* biofilms on samples were

counted. Kolmogorov Smirnov test and Kruskal-Wallis test with Bonferroni correction were used for statistical analysis. SEM images of cross-section of one sample from each group was examined for *C. albicans* formation.

Results: L-ICG10, L-ICG5 and ICG10 groups were effective in reducing the number of *C.albicans* colonies on the denture base material. *C.albicans* was not detected in the cross-section of the L-ICG10 group in SEM images. In the cross-sections of the other groups, *C.albicans* were detected in yeast and hyphae forms.

Conclusions: The application of ICG-mediated PDT for disinfection of denture base material has shown promising results, but further studies are needed to apply this method in the clinic and to determine safe protocols.

Keywords: Denture stomatitis, *C. albicans*, photodynamic therapy (PDT), photosensitizer (PS), indocyanine green (ICG).

Effect of Bioactive Glass Particles on Mechanical and Adhesion Properties of Cements

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Objectives of Investigation: The aim of this study was to evaluate the mechanical and adhesive properties of 3 different resin cements with 45S5 bioactive glass incorporated with two different ratios.

Methods Used: Bioactive glass (45S5) was added to each resin cement at 5% and 10% by weight. Three-point bending strength, microhardness and bond strength were then evaluated. After evaluating the bond strength, fracture types were analyzed using a stereo microscope. Statistical analysis was performed using one-way ANOVA and Tukey tests ($\alpha < 0.05$).

Results: The addition of 45S5 bioactive glass reduced the flexural strength of the resin cements ($p < 0.05$). The effect of BAG

addition on Vickers microhardness value was significantly different for each cement group ($p < 0.05$). It was observed that the addition of BAG weakened the bond strength in all resin cements except the GC Link Force group, which added 10% BAG ($p = 0.171$).

Conclusions: In vitro incorporation of 45S5 bioactive glass into resin cement resulted in materials with adequate mechanical properties. Considering this, bioactive glass is a promising material for the development of bioactive and biocompatible resin cement materials for clinical use.

Keywords: Bioactive glass, resin cement.

The Effect of Beverages That Mostly Used in Covid-19 Pandemic on Universal Composite Staining

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The objectives of the investigation: During the Covid-19 pandemic, it has been reported that the consumption of coffee and tea, especially by people who started to work from home, and the use of vitamin C as a supplement have increased. In the light of this information, the coloring effect of coffee and vitamin C on composite resins (CRs) was investigated.

Materials and Method: In this study 3 types of CRs [(Omni-chroma (OC), G-aenialA'CHORD (GC), FiltekUniversalRestorative (FR)] were used and samples prepared as disc shape (8 mm x 2 mm). Color measurements was made with spectrophotometer and there are 4 measurements for total 9 groups (day 0, day 1, day 6, day 12). The Kruskal-Wallis Test and a post-hoc analysis (Mann-Whitney U test) was performed to determine which groups were different. Comparisons of composites were made with Friedman test for each solution.

Results: There was no significant difference in the color change that occurred after the CRs were kept in solutions for

12 days, only between the three composites that were kept in distilled water. After the CRs were kept in vitamin C solution for 12 days, the highest ΔE value was observed in the GC group, while the lowest was observed in the OC group. After the resin composites were left in coffee for 12 days, the highest ΔE value was observed in the FR group, while the lowest was observed in the GC group.

Conclusion: Coloring of CRs against coloring solutions depends on the composite structure, the content of the coloring solution and the exposure time to the solution.

Keywords: composite resins, discoloring agents, color stability

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Influence of Material Composition and Thickness on Color Coordinates and Translucency of Glass-Ceramics Laminate Veneers

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Objectives of Investigation: The purpose of this study was to investigate the effect of the material composition and thickness on the Commission Internationale de l'éclairage (CIE) L*, a*, and b* color coordinates and the translucency parameter (TP00) of different glass-ceramic laminate veneers.

Methods Used: An A2 shade, low-translucency feldspathic (FS), leucite-reinforced feldspathic (LR), and lithium-disilicate (LD) based glass-ceramic blocks (A2 shade, low-translucency) were sectioned into three different thicknesses: 0.5mm, 0.7mm, and 1mm (n=10). All the specimens were polished with ceramic polishing rubbers. CIE L*, a*, and b* color coordinates of the specimens were measured over gray, white, and black backgrounds with a spectrophotometer. TP00 was calculated using CIEDE2000 color-difference formula. L*, a*, b*, and TP00 were analyzed by using two-way ANOVA and Tukey HSD post-hoc tests ($\alpha=0.05$).

Results: The effects of material, thickness, and their interaction were significant for L*, a*, b*, and TP00 values ($P<0.001$). LR group

demonstrated the highest and LD group showed the lowest L* and a* values ($P<0.001$). However, LD group showed the highest b* value ($P<0.001$). Lightness was the lowest in 0.5mm-thick specimens ($P<0.001$) and similar for 0.7mm-thick and 1mm-thick specimens ($P>0.05$). Redness and yellowness were increased as the thickness increased ($P<0.001$). Regardless of the thickness, the highest TP00 was found in the FS group (16.32 ± 1.54), while the lowest TP00 was in the LR group (14.31 ± 1.67). Regardless of the material, 0.5mm-thick specimens showed significantly higher TP00 (17.49 ± 1.10) than 0.7mm-thick (15.45 ± 0.83) and 1mm-thick (13.11 ± 1.12) specimens. There was no significant difference between the 0.5mm-thick FS and LD groups ($P>0.05$) and 1mm-thick LR and LD groups ($P>0.05$). **Conclusions:** Glass-ceramics might exhibit different color and translucency properties due to their different chemical composition and thickness even if they have the same shade. Therefore, clinicians should carefully select the appropriate material and thickness for different requirements of laminate veneer restorations.

Keywords: color, ceramic, translucency, veneer

Effect of Home Bleaching and Thermal Cycling on the Contrast Ratio of Resin Matrix Ceramics

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Objectives: The purpose of this study was to determine the effect of home bleaching treatment and thermal cycling on the contrast ratio of computer-aided design and computer-aided manufacturing (CAD-CAM) resin matrix ceramics.

Methods: Twenty specimens (1x12x14 mm) for 2 different resin matrix ceramics (LU, EN) (10 for each group) and in same dimensions 10 specimens as a control group for 1 feldspathic ceramic (VM) were used in this study (N=30). All specimens were in shade A2 and they were polished mechanically. Then, the specimens were thermally aged (5 °C to 55 °C) with 10 000 cycles in distilled water. Bleaching treatment was applied to the specimens during the 8-day period with 6 hours per day by using 16% CP. The contrast ratio ($CR = Y(b) / Y(w)$) of the specimens was determined from the luminous reflectance over black (Y(b))

and white (Y(w)) backgrounds using a spectrophotometer. Initial CR, CR after thermal cycling and CR after bleaching were determined for each specimen. CR values were analyzed by using Repeated Measures ANOVA test ($P<.05$).

Results: The mean CR values of resin matrix ceramics (LU, EN) and feldspathic ceramic (VM) were influenced by both the thermal cycling and bleaching ($P<.05$). There were no significant differences among the mean CR of the materials ($P>.05$).

Conclusions: The thermal cycling and bleaching had significant effects on the CR of 2 different resin matrix and 1 feldspathic ceramic.

Keywords: Contrast ratio, Home bleaching, Resin matrix ceramics.

Optimization of the Laboratory Testing of Denture Adhesives Using a Novel Artificial Edentulous Mouth

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Objectives: A novel artificial-edentulous-mouth (AEM), developed by 'GlaxoSmithKline', tests denture adhesives (DA) for complete dentures. The aim of this research is to lessen the need for costly clinical trials by enhancing the capability of this device to mimic the oral conditions during clinical testing of DA.

Experimental Methods: The device hardware/software were evaluated and optimized with the development of a material (modified silicone elastomer) that mimicked the physico-mechanical properties of oral soft tissues (OST).

Modified silicone elastomers were prepared in-house and tested against commercial silicones. Porcine OST was used as the control due to its resemblance to human OST. Material wettability, water uptake and Shore A hardness were investigated (n=6). In addition, tensile adhesive strength (TS) of commercial DA against the test samples utilising a model denture base were undertaken (n=20).

Finally, the dislodging of the maxillary denture in the AEM (with a modified silicone elastomer) was tested with 2 DA. The data were analysed and compared to other in vitro and in vivo denture adhesive testing methods.

Results: Experimental hydrophilic silicone demonstrated comparable and favourable physico-mechanical properties to porcine oral mucosa in terms of wettability (contact angle ~40°), water uptake (~0.9% over 24-hr) and Shore-A hardness ~18 (equivalent to porcine oral mucosa). Furthermore, the average TS of commercial DA was greater compared to other tested silicones (25.8kPa) (p<0.05). Dislodging of the maxillary denture occurred after the 43rd±3.8(SE) and 20th±1.1(SE) biting cycle (p<0.05) for the 2 DA tested. In comparison, dislodgment occurred at the 10th cycle in other clinical studies. Therefore these results are encouraging.

Conclusion: The AEM provides an innovative approach for testing DA in the laboratory setting, comparable to the oral environment, therefore potentially lessening the need for clinical trials.

Prosthetic Treatment of a Patient with Non-Syndromic Oligodontia after Failure of Orthognatic Surgery

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Introduction: a 23 years old patient was referred to our attention. He suffered from non-syndromic oligodontia thus missing all the lower premolars and one premolar per side in the upper jaw. He maintained the lower es and the upper right e. He was poorly treated with orthognatic surgery to solve skeletal class 3 malocclusion resulting in a traumatic occlusion between upper and lower front teeth and a bilateral posterior open bite

This iatrogenic malocclusion caused proclination of the upper and lower front teeth and severe pain caused by masticatory overload.

Case Description: photographs, lateral cephalometric radiograph and orthopantography, impressions and face bow and occlusal registration were taken during the first appointment.

The new occlusal plane was defined using the cephalometric radiograph of the skull as guidance to perform the diagnostic wax-up on a semi-adjustable articulator setted using intra oral and extra oral (facebow) registration.

The wax up was directly printed using a silicon index as an interim restoration to check the adaptability to the new vertical dimension of occlusion. The lower left e was deemed hopeless and therefore extracted, upper right and lower right es were maintained. Implants were placed in the following sites 2.4, 3.4, 3.5 And 4.4. A free gingival graft was performed in site 3.4 3.5 To increase the keratinized tissue around these implants. After six months of waiting for the unloaded osseointegration of the implants, while testing the new occlusion and performing a quick orthodontic treatment, the rehabilitation ended with partial hybrid ceramic restorations on natural teeth, hybrid ceramic screw-retained crowns on implants and lithium disilicate veneers on the upper incisors

Conclusion: after two years the patient presented a stable occlusion, mandibular function free from pain and a substantial improvement in aesthetics.

Keywords: Prosthodontics, Maxillofacial,

Prosthetic Rehabilitation of Patients with Amelogenesis Imperfecta and Papillon-Lefèvre Syndrome: A Case Series

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Introduction: Various treatment options are offered for the treatment of genetic disorders and diseases to prevent malfunction of the masticatory system and an unaesthetic appearance. Amelogenesis imperfecta (AI) is defined as an interruption of enamel formation due to genetic inheritance. Papillon-Lefèvre syndrome (PLS) is an infrequent genetic disorder characterised by palmoplantar hyperkeratosis combined with rapidly progressive severe periodontitis affecting both the deciduous and permanent dentitions. The purpose of our case reports is to demonstrate prosthetic rehabilitation of an AI and two PLS patients.

Case Description: The dental treatment comprised of oral prophylaxis, extraction of hopelessly affected teeth and prosthetic rehabilitation. The patient in our AI case showed huge discoloration in permanent dentition in the upper and lower jaws. Prosthetic treatment included full mouth preparation to receive laser-sintered restorations.

Two siblings with PLS was rehabilitated using removable dentures according to bilateral balanced occlusion criteria. Two intraosseous dental implants were placed in the mandibular arch

to ensure the stability of the remaining crestal ridges. Soft-lining material (Molloplast B, Detax, Germany) was used for the removable complete dentures of the elder sister to prevent soft tissue irritation due to negative resorption of the alveolar crest. Younger sister was rehabilitated with maxillary complete and mandibular partial dentures retained with posterior two second molars.

Discussion: Rehabilitating a patient with AI or PLS is challenging from both functional and aesthetic point of view. The complexity of these diseases requires an interdisciplinary approach to achieve optimal treatment results. Prosthetic replacement in such patients is an age specific speciality treatment involving fixed, complete or partial dentures and implant-supported prosthesis. In the present cases, prosthetic rehabilitation was considered in order to provide satisfaction to the patient in terms of esthetics and function. Recall examinations were done periodically. The patients were satisfied by the results.

Keywords: Syndrome, dentures

Managing a Difficult Oral Rehabilitation Through Digital Protocol

Dr. Florin Eugen Costantinescu, Ptof. Dr. Marian Vladimir Costantinescu

The management of successful oral rehabilitation depends on the accuracy, repeatability and recording of a functional mandible-cranial relationship.

Achieving a relaxed masticatory muscles' position gives the planned oral rehabilitation a chance of success.

The recording of mandibular kinematics, with the help of modern devices based on artificial intelligence, ensures the predictability of the digital planning and execution of the oral

C069

VDO Registration Control with a 3D-Printed Bite in a Full-mouth Digital Adhesive Rehabilitation Case

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Introduction: Digital technologies have simplified clinical procedures. Intermaxillary registration is still a crucial step during the increase of the occlusal vertical dimension (VDO) in full-mouth rehabilitations. This clinical case shows the possible use of a 3D-printed resin bite for intermaxillary registration control aiming at limiting any variations occurring during VDO registration.

Case description: A 65-yr old male patient referred to our dental clinic complaining difficulties during mastication and requesting smile esthetic ameliorations. After medical and dental anamnesis, intraoral scans, photographic and radiographical status were performed. A severe tooth wear due to attrition (clenching and bruxism) with considerable reduction in the VDO was diagnosed. The treatment plan consisted in a combination of lithium disilicate and zirconia adhesive indirect restorations. A resin mock-up was used to reach the comfortable VDO. After 1

month, the VDO was confirmed, and the mock-up was scanned. The digital impressions of the posterior abutments and those of the mock-up were superimposed and used to realize definitive restorations at the registered VDO. A 3D-printed resin bite reproducing the space between arches were realized. The try-in of the bite in the mouth confirmed the accuracy of the intermaxillary registration. The case was finalized with definitive lithium disilicate restorations on all teeth (E.Max CAD; Ivoclar) except for a zirconia bridge (Katana, Kuraray) on teeth 2.5 2.6 and 2.7.

Discussion: The clinical case was finalized in 4 months from first consultation. At 6 months follow-up no debondings, chippings or dental, periodontal, TMJ problems were observed. The use of a 3D-printed bite is a cheap, easy, and fast reproducible technique for digital intermaxillary registration control.

C070

Complex Approaches in “Full-Mouth” Implant-Prosthetic Rehabilitation

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“Full-Mouth” implant-prosthetic rehabilitation is one of the most challenging therapeutic approaches for the dental clinicians. In specific cases the rehabilitation of masticatory and esthetic functions can be performed by fixed or mobile implant-supported prosthesis. It is a complex approach as it requires favorable anatomical and morphological conditions and interdisciplinary collaboration between implantologist, oral surgeon, anesthesiologist, and internal medicine specialists. The

techniques and bone addition materials used in the rehabilitation stage of the muco-osseous support influence significantly the long-term success of the “full-mouth” implant-prosthetic therapy. Determining factors that influence the success of this therapeutic approach are as follows: volume and quality of muco-osseous support, number of implants, type of prosthesis, compliance of patient to oral hygiene protocol and maintenance program. Literature data shows variable range regarding implants survival and success, and rate of technical and biological complications.

Management of Over Erupt Tooth Using Tads for Insufficient Restorative Space

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Introduction: There are multiple ways to increase interocclusal space in cases with insufficient restorative space due to overeruption i.e., tooth intrusion, periodontal crown lengthening, increasing vertical dimension and extraction.

Case description: A gentleman came to Centre of Restorative Dentistry, Faculty of Dentistry, Universiti Teknologi MARA to restore partially edentulous space on Q3 with over erupted opposing tooth of the edentulous space with limited interocclusal restorative space for prosthodontic management. The

edentulous space was restore using dental implants followed by implant supported crowns.

Discussion: Tooth intrusion can be achieve using removable or fixed orthodontic appliances including temporary anchorage devices (TADs). Alternatively, tooth intrusion can be achieve using removable Dahl appliance. In this case. TADs were chosen as it gives better control and prediction in localised tooth movement, does not affect occlusion of other teeth, and comfort of the treatment.

Keywords: Tooth Intrusion, Dental Implants

Retained Deciduous Teeth in the Adult Patient - Save or Extract?

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Deciduous teeth are used until, approximately 12 years of age and are substituted by permanent teeth that erupt while resorbing their roots.

In cases of missing permanent teeth or mal ordered eruption, deciduous teeth often stay over retained, and the root resorption process is stopped or delayed.

Reasons to extract these teeth vary from the teeth being Submerged, width discrepancy that can impair orthodontic or prosthodontic therapy, their color or shape.

When choosing to exchange retained deciduous teeth RDT with an implant, one should put to scale the expected service time of an implant vs the expected survival of a deciduous tooth.

The aims of the lecture:

1. Showing cases with long-term follow-ups (up to 20 years) of RDT that was kept in the mouth of adult patients.
2. Reviewing the current literature about the expected survival of RDT in the adult patient.
3. Giving guidelines to the decision-making process of when RDT should be saved or extracted in the adult patient.

Multidisciplinary Aesthetic Restoration of Anterior Teeth: A Case Report

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This case report was involved in orthodontics, prosthodontics, endodontics, etc, which also represented an interdisciplinary treatment concept for diagnostics and prosthetically-driven treatment planning. A 22-year-old female patient came to the clinic with complex diagnostic findings, such as severe crowding, Angle II type, skeletal II type, discoloration after anterior root resin restoration, gingivitis, and impacted wisdom teeth. Mainly, intraoral examination revealed caries on the proximal surfaces of teeth (11 and 12), discolored and partially exfoliated resin restoration, and white spots on the surface of teeth (21 and 22). Model and cephalometric analysis showed the maxillary (9mm) and mandibular (14mm) dentition crowding, the Spee's curve depth (0.5mm), erected upper incisors, and labially inclined incisors. The digital panoramic radiograph showed distal caries in the tooth (11) closed to the pulp, mesial impacted teeth (38 and 48), and vertical impacted tooth (28). Firstly, periodontal scaling treatment relieved gingivitis. Secondly, root canal treatment was performed on the tooth (11). Thirdly, orthodontic

treatment was performed: teeth (14, 24, 35, 45, 28, 38, and 48) were extracted, the upper and lower dentitions were aligned, the extraction gap was closed, and the occlusal relationship was adjusted. During about 2 years of orthodontic treatment, the orthodontist and prosthodontist consulted several times and found that there would be scattered spaces in the anterior region after orthodontic treatment. After orthodontic treatment, the severe discolored tooth (11) was treated with intra-pulpit bleaching, and then restored with intra-dentinal fiber posts and cast all-ceramic crowns. Teeth (12, 21, and 22) were restored with cast all-ceramic veneer to close the scattered spaces in the anterior area and cover white spots on tooth surface. Collectively, for cases with complex and high aesthetic requirements, scientific arrangements of diagnosis and treatment plans and multidisciplinary treatments are prerequisites to obtaining an esthetic result.

Keywords: Prosthodontics, Orthodontics, Multidisciplinary approach

A Combination of Direct Composite Restoration using Injection Moulding Technique and Indirect Full Coverage Restoration in Managing Amelogenesis Imperfecta

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Introduction: Amelogenesis imperfecta is a group of rare genetic conditions that impair the formation of enamel in deciduous and permanent dentition with serious consequences as hypersensitivity poses difficulties in maintaining oral hygiene, function, self-confidence, and the patient's quality of life. Amelogenesis Imperfecta patients frequently require substantial treatment at a young age. However, in managing an adult patient with Amelogenesis Imperfecta, specific clinical challenges are faced by the clinician. The fixed prosthodontic rehabilitation of an adult patient with Amelogenesis Imperfecta was described in this clinical report, which included proper prosthodontically-driven management throughout the treatment process, resulting in functional, biomechanical, aesthetic, and socio-psychological improvements.

Case description: In this clinical report, a prosthodontic intervention was performed on a 35-year-old Austronesian male patient suffering from hypo-calcified type using a combination of adhesive procedures and full coverage indirect restoration on

both upper and lower dentition. The goal of the therapy was to conserve the remaining tooth structure while also improving the patient's aesthetics and masticatory performance. An adhesive rehabilitation was achieved by means of direct composite restoration using an injection moulding technique on the upper anterior teeth. On the other hand, full coverage remains the treatment of choice for all posterior teeth with minimal tooth preparation.

Discussion: A proper diagnosis and treatment planning are the keys to achieving ideal results, especially in cases with specific clinical challenges. For patients who suffer with Amelogenesis Imperfecta, the treatment presents an even higher level of complexity since clinicians are dealing with the severity of tooth destruction, especially on the enamel surface, which complicates the bonding of restorative material. At the end of treatment, the aesthetics, mechanics, and biological success were achieved and maintained, subsequently improving the patient's quality of life.

Implants or Conventional Prosthodontics to Manage Extremely Abraded Dentition in Combination with Partial Edentulism? A Debate Based on Two Case Reports.

Tzanakakis Em, Kamposiora P., Papavasileiou G.

Introduction: Restoring extremely abraded dentition is considered a difficult task for many clinicians. The increased cost of the restoration and the need for multiple and prolonged dental visits makes patients reluctant to accept major complex treatment plans and usually delay the initiation of the dental therapy. Fixed prosthodontics are more comfortable for the patients especially when the alternative treatment requires a removable appliance. However, knowing the catastrophic impact of bruxism on dental implants, clinicians must balance the profits of dental implant treatment. Properly designed combination of fixed and removable prosthodontics is an alternative and well documented treatment plan.

Materials and methods: Two clinical cases are presented. The first case involves dental implants, orthodontic extrusion, and a full-mouth rehabilitation with a combination of all-ceramic

and metal-ceramic restorations. The second case involves a full-mouth rehabilitation with a combination of metal-ceramic restoration in the maxilla and an interesting design of a Kennedy class III removable partial denture. All clinical steps and complications are described in both cases.

Discussion/conclusions: Conventional fixed prosthodontics combined with implant restorations may have an increased acceptance rate than conventional removable devices. Proper design of the treatment plan, a strict recall system in both cases minimize the incidence of clinical complications. Of great importance, the multidisciplinary approach with many dental specialties involved leads to a faster clinical progress and guarantees high quality of dental service.

Alternative Impression Technique of Anterior Implant-Supported Restorations with Soft Tissue Contouring: A Case Report

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Introduction: There are different impression methods for implant-supported restorations to achieve tissue contouring and emergence profile when restoring anterior tooth loss. In this case, an impression technique was tried with a provisional restoration.

Case Description: A 28-year-old woman patient was admitted to the Ankara University department of prosthodontics due to trauma. A vertical root fracture was detected on her left maxillary central incisor. The tooth was extracted atraumatically. Immediate implant placement and immediate loading were performed. The soft tissue was contoured with a provisional restoration with temporary abutment. Osseointegration was completed and the soft tissue contour and emergence profile were at the desired level. Final impression was taken using polyvinyl siloxane impression material without removing the provisional restoration to maintain the emergence profile of the definitive restoration without the technical difficulties of preparing a custom impression post without changes in soft

tissue. The provisional restoration was removed and connected with an implant analogue and placed in the impression to obtain the stone cast.

Then, the provisional restoration was removed from the stone cast and placed back into the implant. The healing abutment was adjusted according to the tissue with PTFE tape in order to prevent soft tissue changes by keeping the time spent by the patient without a provisional restoration to a minimum. Then, definitive restoration was prepared on the digital Variobase. A laminate veneer restoration was fabricated for the right maxillary central incisor to ensure esthetics.

Discussion: The transfer to the stone cast without any change in the soft tissue, elimination of technical sensitivity and difficulty of preparing a custom impression post are some of the main advantages of this technique. One of the difficulties encountered in this case is the aesthetic disadvantages of preparing two different materials in different thicknesses.

C077

A Digitally driven Full Mouth Rehabilitation for a Patient with Generalized Tooth Wear and Loss of Vertical Dimension. Multi-Disciplinary Approach

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The use of intraoral scanners and dental software has improved workflows in Dentistry. In this case report, minimal intervention was adopted to completely rehabilitate a 37 years old female patient following a multi-disciplinary approach (Ortho-Prosthodontics).

After 18 months of orthodontic treatment, there was a proper alignment of all teeth and more posterior occlusal clearance was gained for the prosthetic phase. The first step to proceed after that was to record the centric relation using bimanual manipulation and leaf gauges where the prosthetic rehabilitation phase was implemented based on this record. A bite registration material was applied to save this record and the new vertical dimension was planned as well. The material of choice was Lithium Di-Silicate (Emax) to achieve minimal intervention approach with

maximum aesthetics and function in addition to optimum adhesion in the form of total etch technique & air abrasion.

The sequence of the prosthetic phase was to restore posterior teeth first with 11 occlusal veneers (Table tops) and 3 crowns so that the bite is stabilized on the new vertical dimension followed by restoring upper 6 anterior teeth with Crowns and lower 6 anterior teeth with Veneers. Cementation of ceramic restorations was done under rubber dam isolation.

The upper left first and second premolar showed no tooth wear pattern so the decision was to exclude them from the treatment while they are maintained in the new vertical dimension by using the occlusal clearance for the Table tops of lower left first and second premolars.

Keywords: Mouth Rehabilitation, Centric Relation

C078

Effectiveness of Occlusal Splint Therapy in the Management of Temporomandibular Disorders Pain: A Systematic Review

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Objectives of Investigation: There is not sufficient evidence to show whether or not stabilization splints can reduce pain caused by painful Temporomandibular Disorders (TMD). Therefore, the aim of this systematic review was to evaluate the effectiveness of occlusal splint therapy alone or combined with other therapeutic intervention in the management of TMD pain.

Methods Used: An electronic search was undertaken in the MEDLINE (Pubmed) database to identify the randomized clinical trials (RCTs) published until October 2021. The following, simple or multiple conjunctions, search keywords were selected: occlusal splints and TMD pain, TMD pain management or conservative treatment or therapeutic modalities and TMD pain. Studies included must have subjects of at least 18 years of age, with painful TMD, which diagnosis was performed by Research Diagnostic Criteria for TMD or Diagnostic Criteria for TMD. Outcome variables were pain relief and post treatment pain inten-

sity reduction. Data were analyzed with non-parametric tests and the level of significance was set at P<0.05.

Results: Out of 1260 potentially eligible articles, only 28 relevant RCTs met the inclusion criteria and were included. Occlusal splint therapy alone or combined with different treatment approaches (biofeedback, physiotherapy, low-level laser therapy, photobiomodulation, acupuncture) was compared to control group (placebo, counseling or no treatment). There was a statistically significant difference in the effectiveness of occlusal splint therapy alone or in combination with other treatment approach in reducing TMD pain when compared with the control group.

Conclusions. The findings of this study show that the occlusal splint alone or combined with other conservative therapeutic intervention presented positive effect in short-term TMD pain relief.

Minimal Invasive Preparation Strategies for Misaligned Incisors: A Digital Approach

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Introduction: Advanced techniques along with biomimetic dental materials, combined with digital aided design tools have revolutionized the available treatment options, providing functional, aesthetic and highly resistant dental restorations.

Case Description: A 46-year-old female presented with concerns regarding the appearance of her smile due to misaligned anterior upper teeth. Following the clinical and radiographic examination, the treatment plan included the change of the inclination, form and colour of the central and lateral maxillary incisors. A Digital Smile Design (DSD) software was used in conjunction with the diagnostic data to form, display and communicate the new smile design to the patient. This information was the starting point for the 3D digital diagnostic waxing of the maxillary anterior teeth. Two printed models were used, and two corresponding silicone indices were made. The

first one was fabricated to correct the alignment of the incisors, guiding their selective preparation. This facilitated the smooth placement of the second silicone index which corresponded to the form of the final restoration. The diagnostic mock-up derived from the latter index allowed a preview of the aesthetic outcome and guided the teeth preparations for the monolithic ceramic restorations.

Discussion: Digital Smile Design software when combined to the traditional mock-up technique, offers dentists new perspectives for the diagnosis and planning of the patient's esthetic rehabilitation. Composite mock-up is considered fast, easy and efficient method, that allows better acceptance of the treatment plan by the patient as it visualizes the potential clinical outcome.

Keywords: Digital Smile Design, misaligned incisors, mock-up technique

Outcomes of Dental Porcelain and Ceramic Laminate Veneers: A Rapid Umbrella Review

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Objectives: This study aimed to report the outcomes of ceramic laminate veneer restorations based on recent secondary sources and to appraise the reporting quality of the titles and abstracts of the included literature.

Methods: This rapid overview searched the Embase/Ovid, Medline/Ovid and Cochrane Database of Systematic Reviews in May 2022 to identify reviews reporting on the clinical and laboratory outcomes of ceramic laminate veneers. The reference list from the eligible studies was also screened for identification of other potentially eligible studies. The inclusion criteria consisted of English language systematic reviews or meta-analyses published between 2017 and 2022. The exclusion criteria were primary studies, narrative review, and extraoral scanners. The assessment of reporting quality of abstracts of systematic reviews was performed using the reporting checklist PRISMA extension for Abstracts (PRISMA-A).

Results: Out of the 7 full text screened records, 5 reviews were included. Most studies supported the notion of conservative

laminate veneers being predictable and having excellent survival rates. The leucite (material) and the window (preparation design) seem to be superior to other ceramics and designs. After applying PRISMA-A, recommendations for improvements on titles and abstracts of future reviews of IOS and conventional impressions are provided.

Conclusion: Laboratory data indicated similar accuracy between feldspathic porcelain and leucite, whereas clinical data indicated that the leucite dental veneers were superior to the other materials. In terms of preparation design, the window preparation technique is recommended. Long-term clinical trials are required to determine the clinical effectiveness of zirconium and lithium disilicate dental veneers. No patient reported outcomes were available. Better quality of reporting secondary sources abstract is advised.

Keywords: dental materials, dental veneers, porcelain veneers, preparation design, prosthetic dentistry

Tooth Wear Severity and Temporomandibular Joint Status: A Magnetic Resonance Imaging Study

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Background: The role of tooth wear as a cause of temporomandibular joint (TMJ) disorders has regained attention due to the increase in restorative demands for worn dentition. Despite this subject has been extensively explored, assessing patients by reliable and precise instruments could close this argument at the scientific level. Objective: To assess possible differences in tooth wear (TW) severity in patients with different TMJ findings, as depicted by magnetic resonance images (MRI).

Material and Methods: 141 patients (85.1% females) with TMJ disorders were referred to perform bilateral MRI. TW was evaluated in dental casts obtained from each volunteer, and scored as follows: 0, no TW; 1, slight wear on the top of the cusps/incisal tips; 2, noticeable wear in the form of flattening with respect to the normal contour; 3, marked flattening; 4, total loss

of cusps/incisal tips contour with moderate dentin exposure; and 5, severe TW with marked dentin exposure. ANOVA test with Tukey-Kramer post-hoc test was performed to compare tooth wear levels in patients with different MRI-TMJ findings. Results: A total of 3779 teeth were assessed, with a predominance of score 1 (34.6%) and 0 (34.2%) for tooth wear degree. MRI showed that disc displacement with reduction was the most frequent finding (53.9%). TMJ status was not associated with TW degree ($P > .05$). Conversely, age was significantly correlated with TW ($P < .001$).

Conclusion: TW severity was not different in temporomandibular disorders patients with different TMJ status.

Keywords: Temporomandibular joint disorders, tooth wear, magnetic resonance, osteoarthritis, age factors.

Evaluation of Clinical Performance of Different Occlusal Splint Materials.

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Objectives of investigation: Occlusal splints are the most common treatment modality for temporomandibular disorders (TMD) and accepted as the gold standard. The aims of the current research were to evaluate the clinical performance and production accuracy of the new materials presented for occlusal splint fabrication.

Patients & Methods: 32 patients applied to Istanbul University Faculty of Dentistry Department of Prosthodontics TMJ Unit and diagnosed with TMD/DC protocol were included in the study. The patients randomly divided into 4 groups ($n=8$); PEEK group (PEEK), PMMA-crystal group (PMMAG), Additive manufacturing resin group (ARG) and control group (CG). Dental stone casts of the upper and the lower jaws of the patients were obtained by condensation type silicone impression material and occlusal splints were fabricated in study groups with digital method (designed and milled/additively manufactured with CAD/CAM)

and in control group with traditional vacuum pressing machine and adapted by the clinician at chairside. The patients wore the splints for 6 months. Surface roughness, surface wear, accuracy, fit of the splints and patient satisfaction as well as therapeutic effect of the splints were examined. SPSS package program was used for statistical analysis.

Results: There wasn't any statistically significant difference in the therapeutic effects among the groups. CG and ARG revealed greater surface wear than PEEK and PMMAG ($p > 0.05$). Patient satisfaction was highest in PMMA group, lowest in CG. PEEK and CG demonstrated better fit than the others.

Conclusions: The results suggest that recent CAD/CAM materials for the fabrication of occlusal splints are as good as conventional material and offer promising results in terms of accuracy and therapeutic success.

Keywords: occlusal splint, PEEK, CAD/CAM

Fiber Post-Core-Crown Restoration With Short-Fibre Reinforced Flowable Composite

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Objectives of Investigation: Most of the endodontically treated teeth require a post and core build-up before restoring crown restorations. The main advantages of glass fiber posts: have similar stiffness/modulus of elasticity of dentin and utilizing adhesive cementation technique named as dentin bonded restorations. Recently, flowable composite resin restorative materials can be used for bonding indirect veneer, inlay/onlay and crown restorations, instead of conventional dual cure composite resin luting cements.

The aim of the present study was to evaluate post-core-crown restorations bonded with short-fibre reinforced flowable composite material.

Methods Used: Endodontically treated thirty maxillary teeth (canine n=12; premolar n=10; molar n=8) with extensive coronal tissue loss were restored post-core-crown restorations. After preparation of post space, universal adhesive system with etch-and-dry protocol (Scotchbond Universal Plus, 3M-ESPE) was applied and glass fibre post and core structure (GC FiberPost, GC-Corp Tokyo-Japan) were bonded to short-fibre reinforced flowable composite material (everXFlow, Bulk-Shade, GC-Corp

Tokyo-Japan). All crown preparations were completed by a ferrule with 2 mm of vertical height. Digital impression of crowns were taken using CEREC Omnicam (CEREC, Sirona-Dental-Systems Inc., USA) and monolithic zirconia crown restorations were obtained using CEREC MC-XL (CEREC, Sirona-Dental-Systems Inc. USA). All crown restorations were bonded with flowable composite resin (G-aenial Universal Injectable, GC-Corp Tokyo-Japan) using adhesive cementation technique. During light polymerisation, high power light curing unit (D-LightPro, GC-Corp Tokyo-Japan) was used at 1400 mW/cm² for 40 seconds. All restorations were evaluated after 1 year clinical usage with USPHSC and if any failure was noted as debonding, fracture etc.

Result: At 1-year short clinical period none of the restorations showed any failure.

Conclusion: Within the limitations of these study it can be concluded that short-fibre reinforced flowable composite material is an acceptable material for bonding glass fiber post and core foundation.

Keywords: fiber posts, short-fibre reinforced flowable composite material, adhesive cementation, digital impression, CAD/CAM

Integrating Digital and Traditional Prosthodontic Concepts for the Rehabilitation of a Worn-Down Dentition

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Introduction: This case report refers to the treatment of a middle-aged female patient with a generalized worn dentition due to parafunctional habits.

Case description: The patient wanted to be biologically, functionally and esthetically restored, with an emphasis on a "white attractive smile". A free medical history and no TMJ pathology were registered. The intraoral and radiographic examinations revealed a grade-3 worn dentition. The treatment of this patient included a hybrid approach, with the incorporation of several conventional (analog) and digital steps, to overcome the disadvantages of each step, as these have been discussed in the dental literature. Patient's full face and smile pre-operative photographs were taken and a digital smile design was performed to decide on the ideal teeth proportions. A facebow, a centric relation and eccentric records were then obtained. A diagnostic wax-up and mock-up restorations were fabricated to evaluate the phonetic and esthetic parameters of the patient. An occlusal

splint in the new vertical dimension of occlusion was provided and the patient was evaluated for a period of three months. Teeth were then prepared for full-coverage restorations and provisional restorations were delivered. Analog definitive impressions were made, and master casts were fabricated with Type-IV dental stone. The casts were then mounted on a semi-adjustable articulator and scanned, using a laboratory scanner. A digital mounting and restorations design followed. Single posterior full-coverage zirconia monolithic restorations were fabricated, using CAD/CAM technology, and tried intraorally. Restorations' cementation followed on a subsequent appointment and a definitive occlusal splint was fabricated.

Discussion: The definitive and the five-year post-operative results are documented. The rationale for this hybrid approach and the use of monolithic zirconia restorations are explained through a step-by-step presentation. Published evidence is used to support the choice of techniques and materials for biologically, functionally and esthetically demanding cases like the one presented.

Poster Presentations

Does Fluoride, Eugenol and Cleaning Protocols Affect the Final Bond of Lithium-Di-Silicate to Human Dentin?

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Objectives: Evaluating the bond strength of adhesive cemented lithium-di-silicate restoration to dentin applying different pretreatment and cleaning methods under similar conditions in vitro.

Method Used: 25 human extracted sound posterior teeth were mounted in acrylic mold, flattened to expose mid-coronal dentin and divided based on temporary cement, desensitizing agent and cleaning protocols into 5 groups, i.e., no temporary cement, desensitizing agent or cleaning method (Control), temporary cement containing eugenol and cleaned manually by excavator (TE), temporary cement containing eugenol cleaned mechanically by rotational brush and pumice (TP), desensitizing agent containing fluoride and temporary cement cleaned manually by excavator (DE), desensitizing agent containing fluoride and temporary cement cleaned mechanically by rotational brush and pumice (DP). Teeth were then cemented to IPS E-max CAD blocks with Relyx Universal cement. Samples from each group were sectioned to obtain 1x1x12mm beam, each group yielded 15 beams (n=15). Beams were subjected to thermocycling (5000 cycles) followed by

micro-tensile bond strength test at crosshead speed 1.0mm/m. Micro-tensile bond strength values (in MPa) were calculated from the peak load at failure divided by the specimen surface area. One-way ANOVA and Tukey's HSD were performed at the 0.05 probability level. Failure modes were assessed by light microscope (LM) and the results were tested with chi-square test and the level of significance was set at p=0.05.

Results: No statistical significant difference was observed among all tested groups, however group (TE) was close to statistical significant in term of bonding strength results compare to control. All groups showed similar pattern of bond failure.

Conclusions: The presence of eugenol might affect the adhesive cementation of lithium-di-silicate restoration to dentin. Therefore it is recommended to perform mechanical cleaning rather than manual cleaning with hand instrument. Fluoride containing desensitizing agent has no adverse effect on the final bond between lithium-di-silicate restoration and dentin.

The Effect of Different Pretreatments and Cleaning Methods Prior Adhesive Cementation of Lithium disilicate Restoration

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Objectives of investigation: to evaluate the bond strength of adhesive cemented lithium disilicate restoration to dentin applying different pretreatments and cleaning methods.

Methods Used: 25 extracted human posterior teeth were mounted in acrylic mold, flattened to expose mid-coronal dentin and divided into 5 groups, based on different treatments prior to adhesive cementation: no desensitizing agent, temporary cement, nor cleaning method (control), fluoride containing desensitizing agent and eugenol containing temporary cement cleaned manually by excavator (DE), fluoride containing desensitizing agent and eugenol containing temporary cement cleaned mechanically by rotational brush and pumice (DP), eugenol containing temporary cement, cleaned manually by excavator (TE), eugenol containing temporary cement, cleaned mechanically by rotational brush and pumice (TP). IPS e.max CAD blocks were cemented to the pretreated dentin with Relyx Universal cement. Specimens from each group were sectioned to obtain 1x1x12mm beam, each group yielded 15 beams (n=15) that were subjected to thermocycling (5000 cycles)

followed by micro-tensile bond strength test with a crosshead speed of 1.0 mm/minute. One-way ANOVA and Tukey's HSD were performed with level of significance $\alpha=0.05$. Failure modes were assessed by light microscope and the results were analyzed with Chi-square test and the level of significance was set at $\alpha=0.05$.

Results: The highest bond strength values were found in group control and group DP, while the lowest values were in group DE and group TE, still, the differences did not show any statistical significance. All groups showed mainly cohesive failure without any statistically significant difference.

Conclusions: It is recommended to perform mechanical cleaning to obtain a clean dentin surface and eliminate any possible adverse effect of eugenol containing temporary cement remnants prior to the final cementation of lithium disilicate restoration. This cleaning method showed higher bond strength values when combined with fluorid containing desensitizing agent, although without any statistical significance.

Keywords: Dental Bonding, Dentin Eugenol, Ceramics, Adhesives

Selection of Temporary Cement, Desensitizing Agent and Cleaning Protocol Before Cementation of Ceramic Restorations, Pilot Survey

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Objectives of investigation: to investigate the practice and attitude of dentists in southern regions of Sweden toward the selection of temporary cement (TC), desensitizing agent (DA) and cleaning protocol (CP) before adhesive cementation of ceramic restorations.

Method Used: a survey was performed using questionnaire consisting of 15 open and closed questions. Questions were constructed to obtain information about the practice of the participants toward the selection of TC, DA and CP before cementation of ceramic restorations. Inclusion criteria was general and/or specialist dentists working in public, private and/or academic sectors in southern regions of Sweden (Skane, Halland, Blekinge and Kronoberg). The survey link was sent to 218 dentists by one collaborator representative from each region via Sunet platform which is a web-based survey tool for staff and students of Malmö University.

Results: 70.4% of the respondents were female and 29.6% were male. A majority of them were general dentists (88.9%) and 11.2% were either dental residents or specialists. The most common TC used was eugenol free cement (84.9%). The majority of participants do not use desensitizing agent (88%) and only 7.5% used it sometimes. The most common CP was cleaning with pumice and brush (72%) followed by water and air and hand instrument (59%, 34% respectively).

Conclusions: the present survey showed that selection of TC, DA and CP were in accordance with studies that report possible negative effect of eugenol on the final bonding strength as well as the importance of cleaning the tooth surface prior final adhesive cementation.

Keywords: ceramics, eugenol, dentin desensitizing agents, dental bonding

Minimally Invasive Techniques For The Resolution Of A Bilateral Posterior Edentulism: Case Report

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Introduction: Use of tilted implants in partial edentulous in order to circumvent anatomical limits and reduce invasiveness and intervention times.

Case description: 62-year-old female patient, with a negative history of ASA I systemic pathologies, comes to our attention at the Department of Dentistry - San Raffaele Hospital (Dir Prof E. F. Gherlone), with a partial upper prosthesis and partially toothed on the arch lower (absence of 4.6 and 4.7). After the realization of CBCT with radiological template and consequent development of a prosthetic project with the 3Diagnosis software (3diemme, Cantù, Italy) it was agreed with the patient for the positioning of 4 fixtures: 2 axial (1.4 and 2.4 Winsix Biosafin TTx 3.8 x 11) and two tilts (emergence in 1.6 and 2.6, inclined

approximately 30°, Winsix Biosafin TTx 3.8 x 13). We used 30° MUA prosthetic components (EAX 30 °) for the implants tilted at 30° in position 2.6 and 1.6 and MUA from 17° (EAX 17°). for those in position 1.4 and 2.4 (Winsix-Biosafin method, Trezzano Rosa (MI), Italy).

Discussion: This technique allowed us to bypass noble anatomical structures such as the maxillary sinuses: this significantly reduced the surgical invasiveness for the patient and healing times. Tilted implants therefore represent an excellent alternative in order not to involve noble anatomical structures in our surgeries. This technique has also made it possible to make the most of the patient's residual bone, allowing a high torque (40 N / cm) to be achieved.

The I-Set (Implant-Simplified Edentulous Treatment): Simplification in Implant-Supported Prosthesis

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Introduction: The reduction of the number of clinical appointments combined with maximum respect for theoretical principles is advocated even in the implant-prosthetic treatment.

The purpose of this case report is to show how the technical modules of the Simplified Edentulous Treatment (SET) can be applied in the detection and recording of clinical data in an implant-supported rehabilitation.

Description: An implant assisted rehabilitation was performed in a 51 years old woman with compromised remaining teeth. Four post-extractive implants was inserted in the mandible, two pre existing implants were maintained in the maxilla and the other teeth extracted. A maxillary implant-retained overdenture and a mandibular Ot-Bridge (RHEIN83, Bologna, Italy) implant-supported were performed.

After surgical procedure, SET prosthetic procedures were applied: using photopolymerizing resin, an individualized base was obtained making a combined impression with silicon and a

resin plate. This base was used for the construction of occlusal resin rims and for realizing the final impressions. Neutral zone, labial support, height and orientation of the occlusal plane, intermaxillary relationships and esthetics were determined and recorded in this phase. Implant transfer connections was blocked in the resin base, final prosthetic and implant impression were realized and materials sent to the laboratory.

The prostheses were then delivered the day after the surgery. The upper overdenture was used for two weeks before the retentive cups were inserted. Clinical procedures were concluded in three session.

Conclusion: The procedure allows to control and record in the same clinical session prosthetic and implant information. The SET method can be applied for gaining clinical data in complete rehabilitations both with traditional complete dentures and for teeth supported and implant assisted rehabilitations, especially useful for reducing times in older patients.

Dental Erosion in Gastroesophageal Reflux Disease- An In Vitro Study and Case Report

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Gastroesophageal reflux syndrome (e.g. Hydrochloric acid from gastric juice) is frequently encountered among the intrinsic factors determining dental erosion.

The in vitro study aimed at evaluating the physicochemical characteristics of dental tissues exposed to different concentrations of hydrochloric acid. Human enamel and dentin specimens were exposed (two times daily for 10 minutes) to two different concentration of hydrochloric acid (2,5 mmol/l and 4,5 mmol/l) for a period of 14 days. Quantitative measurements for mineralized tissue composition and physical properties to evaluate qualitative aspects of dentin and enamel were performed at 7 and 14 days of experiment, using the Fourier transform spectroscopy method (FTIR). A profilometer was used to measure roughness average (Ra) values of the initial surface roughness and at each 7-day-interval after the beginning of treatment.

Results: Both enamel and dentin exposed to hydrochloric acid presented an increased weight of the organic component, while the mineral content is decreased. The amount of tissue inorganic reduction is proportional with the period of exposure and

concentration of the hydrochloric acid. Significant differences in surface roughness values for dentin and enamel were observed at both experimental intervals, which showed an increase in roughness over time. The detected particularities of the chemical composition and roughness of dental tissues indicate the considerable reduction of the enamel resistance to acid attack, thus leading to a high risk of dental erosion or new carious lesions.

Conclusions: The FTIR spectroscopy method and roughness evaluation of hard dental tissues offer new opportunities in the study of pathogenic mechanisms involved in the initiation and evolution of dental erosions, to make a prediction of this disorder, to elaborate measures for his prevention and have the most appropriate treatment option.

The current presentation will also highlight treatment options for dental erosion and present a case report where a conservative approach was considered.

Keywords: dental wear, hydrochloric acid

Different Build IP Procedures of Endodontically Treated Posterior Teeth

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Objectives: To investigate the clinical behavior of endodontically treated (ET) posterior teeth (premolars and molars) restored by various fiber-reinforced post-core composites (FRCs) or fiber posts (FP).

Methods: 120 ET posteriors, with 50% or less of coronal residual structure were selected and randomly divided into four groups (n=30). Group 1:FP GC FIBER POST, GC (FP) luted with GRADIA CORE, GC (GC) + Initial LiSi Press, GC partial crown luted with G-CEM LinkForce, GC (LF) (as control); Group 2: everX Flow, GC (EXF) core build up + Initial LiSi Press partial crown luted with LF; Group 3: EXF + G-aenial Universal Injectable, GC (GUI); Group 4: FP + EXF + GUI. Natural teeth were as opposing dentition and patients were free from parafunctions. Patients were recalled at six months, 1 year and 2 year from baseline. Mechanical and biological parameters were evaluated accordingly with Functional Index of Teeth (Ferrari Cagidiaco *et al.*, 2020). FIT was used for the objective assessment of outcomes including clinical

and radiographic examinations. FIT is made up of 7 variables (Interproximal, Occlusion, Design, Mucosa, Bone, Biology and Margins), each of them to be evaluated using a 0-1-2 score. The Mann-Whitney U test was applied for statistical analysis and the level of significance was set at $p < 0.05$

Results: At one year recall all the restorations were in place without any biological or mechanical complication. FIT scores for each restoration ranged between 13.4 and 14. No statistically significant differences were founded.

Conclusions: Under the limitations of this study, posterior ET showed no difference when restored with or without a fiber post, and when occlusal surface was covered by an adhesive partial crown or not. Longer observation time of this study is needed to confirm these findings.

Keywords: Build up, endodontic outcomes, posterior teeth.

Rehabilitation of Maxillary Edentulism with Monolithic Zirconia Implant-Supported Protheses Reinforced by Metal Milled-Bar Framework.

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Introduction: Dental implants and implant-supported restorations are widely used nowadays. Implant-supported protheses present long-term benefits and high survival rates, even in regenerative ground. They provide an alternative treatment plan for the rehabilitation of partial or fully edentulous patients, without using removable protheses.

Case Description: A 54-year-old female presented to the post-graduate clinic complaining about her old complete denture. Following extensive clinical and radiographic evaluation the proposed treatment plan included a full-arch maxillary implant-supported rehabilitation. The patient underwent bilateral sinus-lift procedures. Additionally, bone augmentation was achieved at the front side of alveolar ridge. These procedures made possible the placement of 6 implants with optimal antero-posterior spread.

One of the implants did not osseointegrate, creating a long span between two of the remaining implants. After a 6-month waiting period the proposed prosthesis was a hybrid full-arch restoration by monolithic zirconia, supported and retained by a metal milled-bar framework, shaded in such a way to represent dental and periodontal tissues.

Discussion: A full-arch rehabilitation delivered to a fully edentulous patient supported by dental implants can be very challenging in achieving both durability and aesthetics. Monolithic zirconia as a treatment option has been introduced in an effort to reduce some technical complications associated with bilayered ceramics such as the risk of porcelain chipping. Supporting this material with a metal substructure increases its tensile strength, making it possible to be used in long spans cases.

Digital Dentures and Patient Perceptions: A Literature Review

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Category: Digital prosthodontic research

Objectives of Investigation: The prosthetic rehabilitation of edentulous patients has always been a challenge for the clinical dentist. The fabrication of conventional dentures has been an effective and successful treatment option on the long term in dentistry and recently new digital technologies have been introduced in this field as well. The purpose of this paper is to review the literature on the perceptions and satisfaction of patients themselves regarding digital dentures.

Methods used: An electronic search was conducted via PubMed and Scopus using keywords, selecting studies only in English language without any time limit. The literature search aimed to retrieve comparative studies regarding the performance of digital dentures and the patients' attitudes and assessed quality of life.

Results: Digital workflow involves intraoral scanning for impression taking and digital fabrication methods (cad/cam). Digital fabrication can be performed either by subtractive techniques such as milling or additive techniques through 3D printing. Among the advantages reported by patients are the reduced number of sessions, greater comfort and ease and less anxiety concerning the clinical procedures, which is even more important in the case of older patients or those with mobility difficulties. Furthermore, there seems to be less need for modifications and repairs, thus improving the cost-benefit ratio for the patient.

Conclusions: Digitally fabricated dentures seem to be a promising alternative to the conventional ones. Of course, more long-term clinical studies are needed for more certain conclusions.

Effectiveness of Low Level Laser Irradiation on Management of Temporomandibular Joint Disorders: Clinical Cases

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Introduction: Conservative therapies such as occlusal splints (OS), exercises, acupuncture and Low Level Laser Irradiation (LLLI) were suggested for TMDs management. The aim of this study was to investigate LLLI effectiveness on pain relief.

Cases description: Four treatment protocols were investigated. Patient who treated at Group 1 with LLLI at 8j/cm², Group 2 with LLLI at 8j/cm² and OS, Group 3 with OS protocol and Group 4 with LLLI at 0,1j/cm² (placebo group). Clinical examination was contacted initially, at the end and one month after treatment by the researcher. Two sessions of LLLI per week were performed for four consecutive weeks (Biolase, Epic X, InGaAs Psemi-conductor diode laser, 940 nm, in continuous mode, 0.2 W). Anti-inflammatory or analgesic drugs were forbidden. Patients with tumor, injury, fibromyalgia, neurological and psychiatrically disturbances, pregnancy or patients who were taken drugs for depression were excluded. Visual pain scale (scale: 0-10) was completed before, immediately and one month after treatment. Before treatment all patients reported 6 to 7 score in visual scale pain. Patients reported at: Groups 3 and 2 score 2 after

treatment and 1 month later, Group 1 score 2 after treatment and 4, 1 month later and Group 4 score 3 after treatment and 6, 1 month later, leading to the conclusion that in case of application of LLLI psychological factors may affect the treatment result, initially. OS and LLLI presented efficacy on pain management. Only short-term improvement in TMD pain was reported.

Discussion: The results are in agreement with other studies indicating that OS and LLLI were effective on TMD pain management. LLLI is a none invasive treatment with no side effect. Identification of pain biomarkers and investigation of molecular pathway of LLLI could clarify pain pattern and lead to the establishment of treatment protocols, effective on painful symptoms.

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In vitro Comparative Analysis of Marginal Fit in CAD/CAM Full Crowns

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Objectives of Investigation: To evaluate and compare the marginal fit of the computer aided design and manufacturing (CAD/CAM) crowns fabricated from three restorative materials by measurement of marginal discrepancies through scanning electron microscopy (SEM).

Methods Used: Three groups of molar crowns (n=18) were fabricated from CAD/CAM materials: IPS Empress CAD (Ivoclar Vivadent), Cerasmart (GC), Graphene (Graphenano Dental) and cemented adhesively on the 3-dimensional (D) resin abutments. The samples were divided into three subgroups (SG) based on the crown thickness and evaluated under SEM. The qualitative and quantitative analysis of microscopic images was performed using Cell D image analysis software (Olympus Soft Imaging Solutions GmbH, Münster, Germany). Four surfaces were investigated on each sample (buccal, mesial, distal, palatal) at the interface between crowns-abutments. After performing the calibration of images, the marginal gaps were measured in μm . Data were analyzed using the Shapiro-Wilk and Chi-squared statistic tests.

Results: Mean scores for the gap size were statistically significantly different between groups of samples made from different materials: Empress CAD (N=103), Cerasmart (N=202), Graphene (N=350), $\chi^2(2) = 14.781$, $p = 0.001$. A *post hoc* analysis revealed statistically significant differences in scores between the samples made from Graphene (Mean rank = 301.55) on one side and Cerasmart (Mean rank = 360.71) ($p=.001$) and Empress (Mean rank =353.71) ($p=.042$) on the other side. Mean values for the gap length were not statistically significantly different between samples with different crown thickness: SG1 (N=243), SG2 (N=264), SG3 (N=148), $\chi^2(2) = 4.125$, $p = 0.127$.

Conclusions: The measurement of marginal discrepancies showed that graphene had significantly more gaps than the other two materials. However, the marginal gaps for the three CAD/CAM materials were within clinically acceptable limits.

Digital Versus Analogue Impression Accuracy for the Denture Bearing Edentulous Maxilla- A Systematic Review

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Objectives of investigation: The aim of this study is to present current data on the comparison of accuracy outcomes of digital and analogue impression techniques for the denture bearing edentulous maxilla.

Methods used: The authors followed the PRISMA protocol for systematic reviews. An electronic database search was conducted through PubMed, Scopus and Cochrane using keywords derived from the PICO question "Is there a difference in accuracy between digital and analogue impressions of the edentulous maxilla that will receive a removable denture?" An additional hand search through the initial results' bibliography was made. No chronological restrictions were made. Inclusion and exclusion criteria specified prior to the search were used to eliminate unrelated articles. Final results were assessed for risk-of-bias using the QUADAS-2 tool with customized questions.

Results: The e-database search resulted in 338 results. After the elimination of 11 doubles, 269 unrelated titles, 53 unrelated abstracts and 2 articles after reading the full text, 3 final studies were included. Hand-search turned 2 more studies for

inclusion. In total 5 studies were included in this review. Due to heterogeneity of the included studies, meta-analysis of the retrieved data wasn't possible.

Conclusions: Two studies supported the efficacy of intraoral scanning for final impressions of denture bearing edentulous maxillae, two studies contraindicated it and one author reported statistically insignificant differences between the impressions suggesting further investigation with larger sample is needed. Each study reported either the statistical insignificance of the differences between the two impressions or the clinical insignificance of statistically significant findings, due to the comparison being conceptually incorrect. Thus, the focus shifted from the comparison of accuracy outcomes to the clarification of multiple causative factors that are currently not controlled. It is concluded that there is need of defining standardized research protocols so that comparable literature data can be produced.

Keywords: dental impression technique, digital technology, complete denture, maxilla

Are Mini Dental Implants Suitable for Support of Crowns or Small Bridges in the Mandibular Incisor Region? A 5-year Longitudinal study

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Objectives of Investigation: It is not known whether one-piece, category 1 narrow dental implants (≤ 2.5 mm wide) can successfully support crowns or small bridges in the mandibular incisor region. The purpose was monitoring mini-implants (MDIs) marginal bone level (MBL) change, success and survival rates, dPROMS, and oral hygiene, comparing splinted and unsplinted groups during 5-years.

Methods Used: In the prospective cohort study fixed-type one-piece MDIs, replacing single or multiple mandibular incisors, supporting metal-ceramic single crowns (Unsplinted group), or splinted crowns/small bridges (Splinted group) were studied. The primary outcome variables were perimplant MBL change, success and survival rates; the primary predictor variable was the splinting status. Secondary outcomes were dPROMS, and oral hygiene. Statistical analysis comprised descriptive methods, Kaplan-Meier survival analysis, Log-Rank (Mantel-Cox) comparison, Cox proportional hazard analyses (with bootstrapping) adjusting for number of implants, and Repeated measures.

Results: From 44 participants (baseline; mean age 56.02 ± 5.72 years), 40 completed the study: 23 in the Splinted and 17 in the

Unsplinted group. Three subjects did not respond and one MDI failed in the Unsplinted group. Mean MBL change for all participants was small, and increased over time: -0.22 ± 0.38 mm after one, and -0.54 ± 0.56 mm after five years ($p < 0.05$). After five years MBL loss was 0.59 ± 0.71 mm (Unsplinted group), and 0.50 ± 0.41 mm (Splinted group) ($P > .05$). No significant difference existed between the "Unsplinted" (85.7% successful MDIs, 4.8% failures, and 9.5% satisfactory survivals) and the "Splinted" group (93.4% successful, and 6.6% satisfactory survivals) ($P > .05$; Log-rank test). Significant improvement in OHRQoL and orofacial esthetics ($P < .05$) after rehabilitation remained unchanged over 5-years ($P > .05$). Modified plaque index increased over time, and was significantly correlated with MBL.

Conclusions: Mini-implants supporting crowns and/or small bridges in the mandibular incisor region showed small rates of marginal bone loss, acceptable success, and survival rates, and improved dPROMs over 5-years.

Keywords: mini-implants (MDI), mandibular incisor region, marginal bone level change, survival, success, dPROMS, oral hygiene

Restorative Treatment of a Patient with Amelogenesis Imperfecta: A Case Report

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Introduction: Amelogenesis imperfecta (AI) includes a group of inherited disorders that affect enamel formation, both in quality and quantity. It may cause anomalies either in a number or group of teeth, or may be present in the whole dentition. Intraoral clinical features of AI include abnormally rough and pitted tooth surfaces, discoloration of teeth and hypersensitivity. These abnormal tooth surfaces attract plaque and calculus, increasing the risk of caries and attrition from a young age. The defective enamel or lack of enamel leads to tooth hypersensitivity. Therefore, full-coverage restorations are often needed to ensure function, comfort, and esthetics.

Case Description: A 20-year old female patient presented for treatment of her dentition. The patient was diagnosed with AI at a very early age and was following regular supportive dental treatment from a pediatric dentist. The initial clinical and radiographic examination revealed characteristic discoloration, irregular enamel surface and abfractions. Prefabricated metal crowns had been fitted on the patient's molars, while the incisors

and canines were provisionally covered by composite restorations for esthetic reasons.

Study casts were fabricated, scanned, and a digital wax-up of a full-mouth restoration was preformed. The teeth were prepared for full-coverage restorations, and PMMA provisionals were milled, using CAD/CAM technology. Small alterations were made, both for esthetics and a better occlusal scheme. After the final impression, the changes were tried and tested via printed acrylic crowns, which were later copied into the final restorations. Twenty-eight monolithic zirconia crowns were cemented intraorally with dual-polymerization resin cement.

Discussion: The treatment of patients with AI is always challenging. Extensive treatment plans are required at a young age, highlighting the need for conservative restorations that offer high long-term success rates. In this case, this was achieved with the aid of monolithic zirconia crowns, requiring minimal preparation while retaining the maximum tooth structure possible.

Minimally Invasive Esthetic Rehabilitation of Congenitally Missing Lateral Incisors: A Clinical Report

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Introduction: Replacing a missing incisor is always a challenge in the dental practice and several options have been proposed. These include an implant-supported prosthesis, a conventional fixed dental prosthesis, and a resin-bonded fixed dental prosthesis (RBFDP) in the field of Fixed Prosthodontics. The treatment of choice should be the least invasive option that also combines the expected esthetic and functional objectives.

Case description: A 15-year-old female patient with congenitally missing maxillary lateral incisors was referred to the Graduate Prosthodontics Clinic, Department of Prosthodontics, University of Athens. Treatment plan included an initial orthodontic rearrangement of teeth, thus opening spaces for fixed prostheses in the place of the missing laterals. Taking into consideration her young age as well as her chief complaint of the unesthetic appearance in the anterior zone and the possible risks of implant placement in the anterior zone in this age, two lithium disilicate RBFDPs were selected as the treatment of choice. The overjet and overbite of the anterior teeth were within the normal limits with a Class I Angle classification of the

occlusion which made possible to opt for a no-prep protocol. Polyvinylsiloxane was the impression material chosen, followed from the laboratory manufacturing with the pressing method (IPS e.max Press, Ivoclar-Vivadent). The clinical procedure of the final cementation included etching the RBFDPs with hydrofluoride 9%, application of silane agent and afterwards application of the esthetic luting composite. The preparation of the tooth surface involved etching with orthophosphoric acid 38%, application of an adhesive agent and, finally, the cementation of the prostheses.

Discussion: The achieved final outcome, concerning color match and overall esthetic and anatomic integration, confirmed that a prepress approach for all-ceramic restorations may be safely implemented, especially in clinical cases where minimal invasion is a high priority, provided that strict rules for patient selection and finish line placement are adopted.

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High Flowability into Wet Sulcus of Paste-type Alginate Impression Material

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Objectives of Investigation: A new impression material we have released in Japan, Aroma Injection (ARI), is the only paste-type alginate impression material filled in a cartridge and can be used as wash material for precise impression combined with conventional alginate products. To make accurate impressions, the flow of the impression material into the gingival sulcus is important.

Hydrophobic impression materials such as Vinylpolysiloxane (VPS) are disturbed by moisture in the gingival sulcus, while hydrophilic materials such as alginate, agar and polyether are not. Therefore, hydrophilicity is important for flowability as well as generally known consistency. The aim of this study was to evaluate flowability of ARI into wet sulcus by consistency test and shark-fin test, comparing the results with different types of impression materials.

Method Used: ARI or Aroma Loid (Agar)/Aroma Fine Plus (Alginate) (ARI or ARL, GC, Japan), Imprint4 Light/Heavy Body (VPS) (IPS, 3M ESPE, Germany) were used in combination (wash/

base). Impregum Penta Soft (Polyether) (IPS, 3M ESPE, Germany) was used alone. The consistency test was performed according to ISO 4823:2021 and the result was statistically analyzed (Tukey's, $p < 0.05$). For shark-fin test, each material was mixed, applied to the 10mL reservoir after 30sec (in 1:5 volume ratio of wash:base), subjected to pressure with the mold after 30sec (10mm depth), hardened (35°C, following the manufacturer's instructions) and checked for distortion of fin-shape.

Results: ARI showed the same degree of value as IP4 at consistency test. The hydrophobic VPS material, IP4 showed distortion of fin-shape, while hydrophilic materials (ARI, ARL, and IPS) didn't.

Conclusions: ARI is a material that has both good consistency and high flowability into wet sulcus so that it can take precise impressions of the gingival sulcus even with fluids such as saliva and blood.

Peri-implant Tissue Health in Implant-Supported Fixed Partial Rehabilitations

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Objectives of Investigation: to investigate peri-implant tissue health and bone resorption in patients with implant-supported fixed partial rehabilitations.

Methods Used: 44 patients rehabilitated with fixed partial implant-supported rehabilitations were included. The following parameters were recorded: spontaneous bleeding, suppuration, bleeding on probing (BOP), probing depth (PD), plaque index (PI). Periapical radiographs were taken to measure crestal bone loss (BL). A non-parametric test (Spearman's rank coefficient) was used to identify possible correlations between the clinical parameters recorded.

Results: 121 implants have been analyzed. Mean PI and BOP were 1.98% and 0.80% respectively; there were no cases of suppuration (0.00), and only two implants showed spontaneous bleeding. Mean BL was 1.53 mm (SD 0.98). There was a very weak statistically significant correlation between PI and BL $r_s = 0.04$ p (2-tailed) = 0.65, and between PI and the other peri-implant parameters (BOP $r_s = 0.13$ $p = 0.13$, PD $r_s = 0.04$, $p =$

0.6). A very weak correlation was also found between BL and BOP ($r_s = 0.1$ $p = 0.2$) and between BL and PD ($r_s = 0.02$ $p = 0.7$). Correlation was found between BL and age ($r_s = 0.13$, $p = 0.81$) and between the other peri-implant parameters and age (≥ 65 years) using dichotomized: (PI $r_s = -0.14$, $p = 0.11$; PD $r_s = -0.21$ $p = 0.01$; BOP $r_s = -0.21$ $p = 0.01$; SB $r_s = 0.05$ $p = 0.53$). No statistically significant correlations were found between the clinical parameters evaluated and sex or the dental arch treated (maxilla vs. mandible). In contrast, the correlation between periodontal parameters and years elapsed since surgery (follow-up) was significant ($p = 0.75$, z -score = 12.9).

Conclusions: the present research suggests that in implant-supported fixed partial rehabilitations, dental implants with greater plaque accumulation are more likely to present peri-implant health problems, although the correlation was statistically very weak.

Keywords: dental implant, perimplant tissue

Immediate Loading of Implant-Supported Full-Mouth Hybrid Prosthesis Using CoDiagnostiX®: An Alternative Solution for Severe Cases

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Introduction: Loss of teeth with aging is one of the most prevalent issues that has been addressed by many dental practitioners. However, the most challenging scenario occurs if the patient is early-to-middle-aged, and despite the major periodontal/functional loss the primary concern is to attain beauty ideal. Hence, demand to regain ideal smile and being defiant to stay edentulous throughout the treatment lead dentists to opt for immediate protocols. Immediate loading of provisional prostheses (PPs) after computer-guided implant surgery with prototyped surgical guides (SGs) is an effective method for realizing optimum function and desired esthetic.

Case Description: A 44-year-old woman presented compromised esthetic, advanced mobility of mandibular incisors and progressive pain in chewing. Intraoral examination revealed increased overjet, polydiastema between maxillary incisors, high maxillary lip-line, periapical lesions/mobility in molar teeth. Impression could not be taken using irreversible hydrocolloids due to prominent mobility of incisors; therefore, diagnostic models were obtained via Trios 4®. Overall study on X-rays and diagnostic models concluded that the patient was having severe chronic periodontitis with insufficient oral hygiene and aggressive bone resorption.

CoDiagnostiX®_software was preferred to merge DICOM and .STL formats, as well as planning of implant locations, PPs and SGs. Following surgery, scan bodies were placed and scanned to build up PEEK PPs which were delivered the day after surgery. Controls were done on the next week, 1-month and 3-month periods.

Discussion: Through the advancements in digital dentistry, full-mouth rehabilitations can no longer last at a dragging pace which grants them high precedence over traditional methods. Fabricating SGs and planning PPs beforehand let practitioners be more confident about both surgical and prosthodontic outcomes. Likewise, the patients undergo much more comfortable processes due to increased perception of the immediate aftermath. Completing the groundwork on CoDiagnostiX®_environment hereby maximize accuracy and time-efficiency which eventually satisfies both parties.

Keywords: Immediate loading, Guided surgery, CoDiagnostiX, Hybrid prostheses

The Presence of *Enterococcus faecalis* in Saliva as a Risk Factor for Endodontic Infection

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Aim: The purpose of the present study is to investigate the prevalence of *Enterococcus faecalis* in primary and secondary endodontic infections and its presence in saliva.

Methodology: Sixty-six patients were recruited at Unit of Endodontic and Restorative Dentistry, School of Dentistry, University of Siena and divided in 5 Groups based on different pulpal and periapical conditions: healthy vital teeth (HVT), healthy treated teeth without lesion (HTT), necrosis (N), post-treatment apical periodontitis (R), irreversible pulpitis (IP). Saliva, rubber dam sterility control and pre-treatment samples were taken and microbiologically processed by culture method. Whole genomic sequencing was then performed to verify the strains and correlate to those found in saliva.

Results: *Enterococcus faecalis* were found in 16 cases in pre-treatment canal samples and its presence was associated with endodontic infections ($P=0.014$ /Chi squared test). The presence of *E. faecalis* in saliva was strongly associated with its presence in the root canals ($P=0.000$ /Chi squared; Logistic regression test).

Conclusion: The results of this pilot study indicate the correlation between the presence of "*Enterococcus Faecalis*" in saliva and root canal system before the treatment. The results of this pilot study indicate that saliva represents the main pathway of root canal infection with *E. faecalis* and its presence could be a risk factor for periapical lesion.

Keywords: Endodontic infections, *Enterococcus faecalis*, risk factor, saliva.

In Vitro Evaluation of Accuracy and Precision of New Medit i700 Intra-Oral Scanner

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Aim: the aim of this in vitro study is to evaluate the precision and accuracy of the new Medit i700 Intra-oral Scanner, comparing it to an industrial Alicona scanner model Inspect Professional.

Methods: A specially-made implant abutment simulating a mandibular right first molar was taken as model for this study. The same operator took a single scan with the Alicona industrial scanner model Inspect Professional, used as the control group, and a total of 9 scans were taken with the Medit i700 intraoral scanner, used as the test group. For each of these 9 scans, a pairing with the control scan was performed for confrontation. 10 measurements were made in the vestibulo-lingual

and mesial-distal directions, on the axial walls, the margin and the top of the abutment. Descriptive analysis were conducted using the mean, standard deviation and median to determine the discrepancy between the two scanners.

Results: The Medit i700 demonstrated excellent results in terms of precision and accuracy, but in agreement with the literature, angle reproduction remains critical.

Conclusion: With this study we can understand how it is of primary importance the accuracy and precision of an intraoral scanner to obtain prosthetic manufactures that are as precise as possible.

BioHPP: A New Alternative Material for Hybrid Implant Prosthesis

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Introduction: The most common problems with the framework materials in implant supported hybrid prosthesis which is one of the treatment options for edentulous patients are, it isn't as elastic as bone, low biocompatibility, non-esthetic appearance due to the reflection of gray opaque color of the framework material, chipping due to poor bonding to composite. BioHPP was introduced as an alternative to the other framework materials.

Case Description: A 67-year-old edentulous male patient presented to our clinic for fixed prosthesis. After planning, 6 implants on each jaws were inserted. The treatment plan consisted of monolithic zirconia hybrid prosthesis for the upper jaw and Toronto prosthesis for the lower jaw due to aesthetic and mechanical advantages. Despite the use of an angled multiunit, Toronto prosthesis was preferred because the exit profiles of some screws were located on the buccal side. Open impressions were taken from the lower and upper jaws using custom open tray. After recording the relationship between the jaws, the framework production phase was started. Monolithic zirconia was preferred as the framework material for the upper jaw. For the mandible,

BioHPP-based (BioHPP, Bredent GmbH, Senden, Germany) Toronto prosthesis were restored with IPS empress crowns.

Hybrid prosthesis was applied to the lower and upper jaws and the patient was treated in terms of function, aesthetics and phonation.

Discussion: After 2 years follow-up, there were no complications. Patients' feedback was very satisfactory in terms of function and aesthetics.

BioHPP is as successful as the opposing monolithic zirconia prosthesis. BioHPP as a framework material in implant-supported hybrid prostheses is lighter than other framework materials, shows high aesthetics, is non-allergenic, biocompatibility, close to bone elasticity module, high connection with composite. The limitation of the use of BioHPP is the lack of sufficient scientific studies regarding its mechanical durability by time.

Keywords: Implant supported hybrid dental prosthesis; BioHPP; PEEK; Toronto bridge; edentulism

Combining Teeth and Implants as Abutments for Partial Removable Dentures: Report of two cases

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Introduction: Rehabilitation with fixed implant-supported restorations is a routine treatment, however removable dentures may be a more appropriate treatment option in certain circumstances. Certain factors can influence treatment planning, such as patient age, esthetic demands, treatment costs, patient ability to maintain oral hygiene, extent of alveolar ridge resorption, and interocclusal space. If the distribution of potential abutment teeth is unfavorable for rehabilitation using a conventional removable partial denture (RPD), the placement of dental implants in strategically advantageous regions under RPDs suggests adjunctive scope for achieving optimal symmetric support and stability in a cost-effective way.

In the present report two cases in which implants are combined with teeth for the retention and support of removable partial dentures.

Case Description: The first case regards a medically impaired patient who had lost two implants due to implant fractures. The medical record did not allow for the placement of extra implants to support fixed partial dentures. The treatment plan included utilization of the last remaining implant to support a removable partial denture and avoid preparation of natural teeth.

The second case concerns a patient whose financial condition did not allow for the placement of adequate number of implants to support fixed partial dentures. Due to the young age of the patient, it was decided that two implants should be strategically placed bilaterally to modify the Kennedy Class I to Kennedy Class III. Thus, a quadrangular support and a more favorable biomechanical scheme can be achieved.

Discussion: Implant assisted removable partial dentures (IARPD) constitute a viable solution in cases where the restorative options are restricted due to medical, financial or other reasons. According to the literature the survival of IARPD ranges between 90-100% with limited biological complications. Moreover, both teeth and implants present high survival rates. Regarding patient satisfaction there is evidence that IARPDs have a more positive effect on oral health related quality of life than RPDs.

Consequently, IARPDs represent a simple and cost-effective treatment approach to achieving symmetric prosthesis support and stability, as well as to improving patient satisfaction.

Keywords: implants, implant assisted removable partial dentures, removable prosthodontics

The Indirect Onlay Restoration of an Extensively Damaged Lower Molar: A Collaborative Case Report

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Introduction: Restoring the dentition whether fully or partially is considered a challenge when the periodontal circumstances are not in the clinician's favor. Especially in cases where the cavity/lesion margin extends to the gingiva, a collaborative solution between periodontics and prosthodontics is inevitable. Even when there is not a need for periodontal intervention, the clinician must remember the periodontal principles and act accordingly.

Case Description: A 23-year-old female patient consulted the clinic presenting an endodontically treated right lower first molar with coronal destruction with a subgingival margin. In order to reestablish the biological width and a supragingival margin around the cavity, a compromised therapy consisting of clinical crown lengthening (CCL) and margin elevation (ME) was conducted. Following ME, immediate dentin sealing (IDS) procedure

was performed, followed by the fabrication of a partial-indirect lithium–disilicate restoration in order to conserve the remaining tooth tissue. The restoration was cemented following adhesive protocols.

Discussion: The improvement of adhesive protocols in dentistry led the rise of conservative dentistry. Considering the patient's age and the condition of the remaining tooth tissue, a conservative treatment was planned. The partial CCL and ME procedures on the distal aspect of the tooth made a supragingival margin possible, which in return aided in isolation/fabrication processes and prolonged the estimated life of the restoration. The patient was satisfied with the functional and esthetic aspects of her restoration.

Keywords: Crown Lengthening, Dental Bonding, Onlay

Aesthetic Rehabilitation of a Patient with Previously Unsuccessfully Treated Upper Incisors Using Lithium Disilicate Crowns

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Introduction: We present a 1-and-a-half-year follow-up clinical evaluation of a patient with a severely compromised right maxillary canine and first and second right incisors.

Case Description: A 46-year-old man complained about his smile. The intraoral clinical examination revealed the presence of worn and aesthetically unsatisfactory crowns of right maxillary incisors and a broken maxillary canine. Periapical radiographs revealed poor endodontic treatment of the teeth. Intraoral documentation and impressions were made, followed by a treatment plan. In order to improve the shape of crowns, a wax-up was made. After the removal of old crowns, temporary PMMA crowns were made and supragingival chamfer margin was chosen.

Endodontic treatment included the removal of a metal post in tooth 12, which was placed in the wrong direction. A perforation was repaired by placing MTA during the same visit. During the next appointment, endodontic retreatment of tooth 12 and 13 was done. Due to dark discoloration of the tooth, "walking"

internal bleaching was done and when the colour was sufficient, placement of FRC-post followed.

We proceeded with prosthetic rehabilitation two months later. The final impression was made using addition silicones. In order to achieve a natural appearance, we followed the eLAB protocol and adhesive cementation of lithium disilicate glass-ceramics crowns with colour-matching composite cement.

Discussion: Replacing aesthetically and functionally compromised crowns, especially on the upper incisors, can be challenging. It often includes more than just refreshing preparations and placing new ones. But as the steps are discussed and explained to the patient before treatment, the focus should always be on conservative treatment, even if the tooth is compromised. With the patient, we decided not to wait too long before placing the final restorations and he was aware of the risks. After one and a half years, there is no pathology and the patient is satisfied.

Keywords: Glass ceramics, root canal therapy, dental restoration, tooth bleaching

Endodontic Irrigants and Their Activation Efficacy on Cleansing Post Space Root Canal Walls

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Abstract: Background: The aim of this study was to evaluate the efficacy of activated irrigants (EDTA e NaOCL) on the cleansing of root walls, of the smear layer, of the debris, and gutta-percha after the preparation of the restorative space.

Methods: Twenty single and multi-rooted (n= 20) have been collected. All the samples were prepared by the same operator, using Nickel-titanium (Ni-Ti) rotating instruments (Mtwo, Sweden & Martina) through the Simultaneous Shaping Technique. The Continuous-wave of condensation technique of obturation was used. To all specimens, the restorative space has been made, leaving 5 mm of apical gutta-percha and performed postoperative periapical X-Rays. The samples were randomly divided into two groups: Group (A): cleansing of the root walls with ultrasonic activation of the irrigants (NEWTRON P5 XS; Satelec Acteon), Group (B): radicular walls wash without ultrasonic activation of endodontic irrigants (NaOCl 5,25% and EDTA 17%). Both dental sample groups were cut longitudinally with a lowspeed saw (Isomet, BUEHLER Co., USA); the samples were observed using a scanning electron microscope (Jeol, Jsm-6060LV Scanning Electron Microscope) in order to evaluate: 1. Amount of debris/ smear layer, 2. Amount of obstruction of dentinal tubules found in the two groups, 3. Evaluation of the presence of gutta-percha. Then, other 5 samples each group (with and without ultrasonic activation) were prepared following the same

protocol. Then, a universal bonding system (G-Praemio Bond, GC Co., Tokyo, Japan) and a layer of a flowable resin composite (Gae-nial Flow, GC) were light-cured using Valo LED Cordless light curing device (Ultradent) on top of prepared root canal walls. The samples were cut in two pieces along the long axis of the root. Then, half sample teeth were kept in an acidic solution (37% HCl) for 48 hours in order to completely dissolve dental structures and to have a direct view of resin tags formation under SEM. The other half was prepared to observe the adhesive interface under SEM.

Results: The amount of debris was not satisfactory in 9 out of 10 in Group B, as concern for Group A, which has been treated with ultrasounds the result is either good or great in most of the samples. For the sample group treated with ultrasound, the tubules are evaluated as perfectly clean in 9 out of 10 cases, instead, the results are unsatisfactory for 9 out of 10 cases of group B not treated with ultrasound. Differences between Group A and B were statistically significant.

Conclusions: As concern for the presence of debris and tubules obstruction treatment with ultrasonic activation, it offers with no doubt better results. When ultrasonic activation is used in combination with endodontic irrigants, a clean dentin substrate will be obtained for the adhesion of restorative materials, but in order to confirm the findings of this study, further in vivo trials are needed.

Effectiveness of Antimicrobial Agents Incorporated into Soft Denture Liners: A Systematic Review

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Objectives: Soft denture liners encourage fungal adhesion and colonization. Therefore, their modification with antimicrobial agents has been suggested to reduce the risk of biofilm formation. The objectives of the study were to evaluate the effectiveness of the various antimicrobial agents used and to determine their efficient concentrations against *Candida Albicans*.

Methods used: A systematic review was conducted in Medline, Embase, and Cochrane Central databases using the appropriate Mesh terms and predetermined eligibility criteria. The last search took place in May 2022. Data were classified based on study information, specific characteristics of the intervention and comparator, and information related to the outcome measures.

Results: From the 791 articles initially identified, 28 studies met the inclusion criteria based on the review question. Various concentrations of antifungal agents, metal oxides, and herbs

have been incorporated into tissue conditioners, acrylic- and silicon-based soft denture lining materials. Tissue conditioner was the material of choice for the integration of the antimicrobial agents while Nystatin was the most used drug in both in vivo and in vitro studies. Most agents used at specific concentrations significantly decreased the *Candida Albicans* accumulation. Chlorexidine hydrochloride and Undecylenic Acid had no inhibitory effect while Amphotericin B showed very little inhibition of fungal growth.

Conclusions: Data analysis and synthesis revealed the beneficial effect of certain antifungal additives on soft denture lining materials, when used in specific concentrations.

Keywords: soft denture lining material, soft denture liner, antibacterial agent, antimicrobial agent, *candida albicans*

Implant-supported Full-mouth Rehabilitation in Patient with Squamous Cell Carcinoma after Reconstructive Surgery

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Introduction: Oral squamous cell carcinoma is the most common type of mouth cancer. For patients who have undergone surgery and radiotherapy, oral rehabilitation may prove complex. Aim of the present case report is to illustrate a prosthodontic solution after massive reconstruction of oral soft and bone tissues.

Case description: A 55-year-old female was referred to our clinic with an unhealing wound in the mandible. Histological examination of the ulcer revealed a squamous cell carcinoma with infiltration of the mandible, chin, and tongue. The treatment plan included surgical resection of the cancerous lesion, partial resection of the chin, neck dissection and glossectomy. The defect was covered with latissimus dorsi muscle graft, neck skin grafts, while the mandible was reconstructed using pelvic bone. Six dental implants were placed at the maxilla and six at the mandible. All teeth had to be extracted except for the upper canines. Two implants were lost due to insufficient osseointegration in the transplanted tissues. The final treatment plan

included a removable maxilla overdenture on telescopic crowns on the canines and telescopic abutments on the implants. The telescopic implant prosthesis was luted intraorally on galvano mesostructures to improve passive fit (three-piece construction). In the lower jaw, a removable prosthesis on locator abutments was manufactured due to lack of vertical space.

Discussion: The present clinical case illustrates the management of an oncological patient after severe loss and reconstruction of hard, soft and bone tissues. Poor osseointegration, loss of vertical dimension, lack of space, as well as difficulties in speaking and mobility of the transplanted areas are some of the main concerns when restoring such patients. Prostheses with galvano mesostructures provide with adequate fit when combining implant and teeth abutment in one construction. Furthermore, locator abutments present a good alternative for areas with decreased vertical dimension.

Keywords: squamous cell carcinoma, implants, rehabilitation, locators, telescopic copings

Prosthodontic Rehabilitation of a Young Patient with Langerhans Cell Histiocytosis: A Clinical Case Report

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Introduction: Langerhans cell histiocytosis (LCH), previously known as histiocytosis X, is the most common histiocytic disorder. It can appear as focal or multi-systemic and is characterized by aberrant proliferation of marrow-derived Langerhans cells with variable inflammatory infiltration, leading to bone and soft-tissue lesions when affecting the oral cavity. Patients undergoing surgical treatment for this condition experience lower quality of life, as tooth and bone loss are usually an inevitable outcome. Evidence-based literature for the prosthodontic rehabilitation of these patients is relatively scarce, rendering the management challenging for the clinicians.

Case description: A 25-year-old woman with a history of LCH was referred to the Graduate Prosthodontic Clinic, Department of Prosthodontics, National and Kapodistrian University of Athens. The intraoral examination revealed loss of posterior teeth support, while the patient complained for impaired mastication. Following completion of the course of chemotherapy and surgical treatment, clinical, radiographic, and microscopic evaluation

showed complete remission and she appears to be disease-free during a 24-month follow-up period. The prosthodontic treatment plan included the construction of two removable partial dentures, since there is not sufficient evidence regarding the placement of implants and/or bone graft materials in young LCH patients.

Discussion: Oral lesions of LCH may mimic other common periodontal lesions misguiding the clinician. Multidisciplinary monitoring is essential to achieve early diagnosis and detect or prevent multisystem involvement. Chemotherapy, targeted therapies and surgical treatment are the most preferable management options, but may impact severely the patient's quality of life, especially from a young age. Contemporary prosthodontic rehabilitation can be a viable solution for cases, where implant therapy is not indicated. Cases with long follow-up are needed to close the gap in the literature regarding the prosthodontic management of these patients.

Authors declare no personal or co-author potential conflict of interest.

Mandibular Single Implant Retained Overdenture: Functional, Radiographic and Prosthetic Results at Ten Years Follow-Up

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Introduction: mandibular single implant retained overdenture is a more conservative approach for the rehabilitation of the edentulous patients, due to the reduced surgical invasiveness, the favorable cost-effectiveness and the clinical outcomes comparable to overdentures retained by two implants. This study sought to verify whether the insertion of a single implant to support a mandibular complete denture may improve thickness discrimination thresholds and masticatory performance over a period of 10 years. Implant survival, radiographic peri-implant bone resorption, and prosthetic maintenance data were also recorded.

Materials and Methods: Thirteen edentulous patients (seven males and six females, mean age sixty-seven years) were selected from the patient group seeking complete denture treatment at the Dental School, University of Torino.

Complete dentures were made according to traditional protocols, followed by single implant placement (Biomet3I™) and a delayed load protocol. Prosthetic connection took place three months post-surgically together with placement of Locator® attachments (Zest Dental Solutions, Carlsbad, CA 92010 USA).

Thickness discrimination thresholds and masticatory performance recordings were carried out five times in each patient: with complete dentures in place before the implant insertion, three months, one year, six years and ten years after the prosthetic connection. Radiographs were taken at one, three, six months, one, two, six and ten years after the prosthetic connection.

Results: Three patients were considered dropouts at the last recall evaluations, as they were deceased.

Thickness discrimination and masticatory ability improved up to the first year of follow-up and remained stable throughout the following ten years of follow-up. No implant was lost, and radiographic findings highlighted a medium bone loss of 1.34 mm at ten years. Prosthetic maintenance data supported findings present in the literature.

Conclusions: Mandibular single implant retained overdenture may be considered a viable treatment option, especially for frail patients.

Keywords: overdenture, mastication

Assessment Of Information About Oral Appliance Therapy For The Obstructive Sleep Apnea On Websites

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Sleep apnea syndrome is a very common sleep disorder. It is the involuntary cessation of breathing that develops during sleep for at least 10 seconds or more, combined with a decrease in the amount of oxygen in the blood. Obstructive sleep apnea (OSA), the more common form that occurs when throat muscles relax. Continuous positive airway pressure (CPAP) therapy is the most successful method in OSA patients. CPAP use mild air pressure to keep the airways open. Since CPAP use is difficult and uncomfortable most patients are intolerant. Therefore, the alternative method in the treatment of OSA is Oral Appliance Therapy (OAT).

Aim: The aim of this study was to investigate the correctness of the sharing information on the websites that treat OSA with OAT. DISCERN (Quality Criteria for Consumer Health Information) tool was used for this study.

Methodology: An internet search was conducted in February 2022, using webpages for the keyword: sleep apnea therapy, dentistry. A total of 100 websites were evaluated by a researcher using the DISCERN tool. A spreadsheet (Excel v2016, Microsoft Corp) was used to evaluate statistical data calculated as mean and frequency. Statistical analyzes were made with SPSS 25 and minitab 19 program.

Results: All websites scored are fair (25%) or poor (30%). Only 16% of websites scored excellently, and 22% scored well. In our study, third question was the highest score (4.55). The lowest score was the fifth question (1.46).

Conclusion: Within the limitations of this study, the information provided on the websites about oral appliance therapy was found to be incomplete. Patients should be warned about the incomplete information.

Keywords: Sleep apnea therapy, dentistry

Fully Guided Immediate Implant Placement and Immediate Loading for Full-arch Rehabilitation: A Clinical Report

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Introduction: The process of osseointegrated implant-supported rehabilitations of edentulous, or partially edentulous, jaws is considered nowadays a viable and successful treatment plan. Especially for full-arch implant restorations, they still consist a challenge for the clinician. Thanks to recent digital advances, a fully guided protocol for the surgery phase and also for the prosthesis manufacturing can help overcome many clinical and laboratory difficulties.

Case description: A 60-year-old male patient with terminal dentition in the upper jaw was referred to the Graduate Prosthodontics Clinic, Department of Prosthodontics, University of Athens. Treatment plan started based on an initial CBCT scan to evaluate the bone substitute for implant placement, since the patient's chief complaint was to have an immediate fixed restoration without any removable prosthesis involved. Digital planning of the implant placement was carried out prior to the

surgery with the aid of a digital smile design software and the CBCT scan which were superimposed together with the patients existing dentition scan. The quality and quantity of the alveolar bone made it possible to plan for an immediate placement and loading of 6 implants in the maxilla. A surgical guide was constructed, being tooth-supported in three of the remaining natural teeth and further stabilized with surgical pins in the palate and in the buccal plate. A second guide was manufactured to lock in the existing surgical pin to ensure the right insertion of a PMMA full-arch fixed provisional prosthesis.

Discussion: Digital approaches for the rehabilitation of total edentulism consist a valuable tool that leads to esthetic and functional clinical outcomes that also enhance patient satisfaction. Therefore, in so demanding clinical cases with immediate implant placement and loading digital workflow can lead to successful and predictable clinical outcomes.

Factors Affecting the Clinical Efficacy of Metal-Free Double Crown Systems

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Objectives: The objectives of the study were to identify the factors that influence the clinical performance of metal-free double crown systems and to evaluate how the relevant parameters affect these factors.

Methods used: Medline, Embase, and Cochrane Central databases were searched, using the appropriate Mesh terms and predefined eligibility criteria. No restrictions were placed on the language or date of publication. The last search performed in May 2022. Data were classified based on study information, specific characteristics of the system used, the parameters tested and the outcome measures. The quality of the evidence was also assessed.

Results: Out of a total of 258 articles, 16 articles were included for data analysis. The material type, the design, the manufacturing method, the combination of materials for the primary

and secondary crowns, the crown conditioning and cementation proved to affect the efficiency of the double-crown system. The evolution of the retention forces between the primary and secondary telescopic crowns seemed to depend on the crown taper, space, and convergence angle, the surface wear patterns, and the material thickness.

Conclusions: Regardless of the effect of the parameters tested, the retention force recorded was in accordance with the recommended optimal retention force, indicating the efficiency of the metal-free double crowns. The magnitude and duration of the efficiency was determined by the material-specific double crown design.

Keywords: double-crown, metal-free restorations, zirconia, yttrium-stabilized zirconia, PEEK, CAD/CAM

Digital Project Combined With Functional Evaluation In Implant-Prosthetic Rehabilitation In Aesthetic Area

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Introduction: in this study we evaluate the occlusal and myoelectric characteristics of a prosthetic rehabilitation through digital project.

Case description: A 52-year-old healthy female patient was referred to our Dentistry Department (IRCCS San Raffaele Hospital – Milano-Dir. Prof E. Gherlone). She presented dental blemishes at the level of the frontal group, a reduced vertical dimension and imperfection of the lips. After clinical and radiological evaluation, a prosthetic treatment plan was proposed through digital smile design protocol Smile LYNX (Smile Lynx, 3D LYNX srl, Varese). A double full arch Mock-Up was realized with CAD-CAM technology supported by digital drawing Software CAD-LINX. Occlusal-aesthetic mock-up test and EMG pre-post treatment were performed. Then the extraction of elements 14-15-16 and integration of post-extraction implants were carried out. The

provisional step was performed and afterwards that the double cord impression technique taken. A PEEK manufact was tested in the oral cavity and the definitive double zirconia arches were produced. The final EMG test was done. The patient was added into a maintenance program.

Discussion: At time T0 the patient presents in the electromyography an initial occlusal and muscular balance of 82%. At time T1 post provisional prosthetic rehabilitation the patient presents a good occlusal and muscular balance with a 90% increase. At time T2 post definitive prosthetic rehabilitation the patient presents a good maintenance equal to 90% as at time T1.

So the digitization of the diagnostic phase and the computerized EMG control of muscle activity, can help the clinician improve the patient's understanding of the rehabilitation project and to maintain the initial design during the work phases.

2D And 3D Project Rehabilitation In Aesthetic Area: A Case Report

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Introduction: the following case report was carried out in order to evaluate whether new technologies can optimize times and results on an aesthetic level. Specifically, a 2D scanning technique and a CAD project was used.

Case description: A 42-year-old female patient, with a negative history of ASA I systemic diseases, comes to our attention at the Department of Dentistry - San Raffaele Hospital (Dir Prof E. F. Gherlone), to improve the aesthetics of her smile. After the appropriate clinical and radiographic assessments of the future abutments and the implant in site 1.2, the following was proposed treatment plan:

- Lithium disilicate veneers on natural elements 11,21 and 22 preceded by laser gingivectomy on 2.1 and 2.2
- Lithium disilicate crown on 1.2 (fixture)

The treatment was divided into the following phases:

1. Obtaining a project of a 2D digital project starting from photographs with specific reference (3D LYNX srl Milan)
2. CAD project of the new tooth shape and subsequent 3D molding of the project: a silicone " key " is then created for the application of the mock-up in the mouth (3D-LYNX srl Milan)
3. Laser gingivectomy on 2.1 and 2.2: (Laser DMT Technology-Lissone-Italy) fiber thickness 300nm, wavelength 980 nm, continuous wave mode, 2W of power.

Discussion: The new technologies have allowed us to carry out the chosen treatment plan without affecting the final result of the treatment, in this case, aesthetic.

Effect of the Abutment Materials on Tissue Health and Stability - A Network Meta-analysis

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Objectives of Investigation: the aim of this systematic review was to evaluate the effect of the abutment material on peri-implant soft tissue health and stability.

Methods Used: an electronic and hand search was conducted until February 2022. Only prospective randomized trials (RCTs) and controlled clinical trials (CCTs) comparing titanium abutment with abutments made of different materials, with a follow-up of at least 6 months, were selected by 2 independent reviewers. Data on marginal bone loss (MBL) and peri-implant tissue indexes, i.e., plaque index (PI), bleeding on probing (BOP), probing depth (PD), and recession (REC) were collected. Risk of bias was evaluated according to the tool reported in the Cochrane Handbook for Systematic Reviews of Interventions. Both pairwise and network meta-analysis (NMA) were undertaken.

Results: eighteen relevant studies, from 1437 identified, were included. Overall, 612 patients were treated, and 848 abutments inserted. Five studies presented a low risk of bias. Pairwise meta-analysis showed that, as compared to titanium, zirconia abutment presented a significantly reduced MBL (0.20 mm [95%CI [0.14 to 0.26], $P < 0.00001$). No significant differences were found for the other outcomes. In NMA, zirconia abutments demonstrated 83.3% probability to achieve the highest rank in PI, 87.0% in BOP and 65.0% in PD outcome, suggesting that zirconia abutments generally performed better than titanium and alumina abutments.

Conclusions: within the limits of the present study, zirconia abutments seem a viable alternative to titanium ones.

Keywords: systematic review, network meta-analysis, dental implants, abutment, peri-implant tissue

Laser Soft Tissue Design in Aesthetic Prosthetic Rehabilitation

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Introduction: Laser is a device that produces a monochromatic (one color), collimated and coherent beam of light. The laser examined during the following study is a diode laser, which has been used in modern aesthetic dentistry, as a support in implant-prosthetic procedures for shaping soft tissues. The purpose of the following work is the evaluation of the application of the diode laser in oral mucogingival tissues surgery in order to obtain useful changes to improve the aesthetic and functional result of the rehabilitations under consideration. The laser soft tissue design is applied in the post-diagnostic phase of prosthetic rehabilitations during the dental temporaries and preparation of the involved dental elements, as soon as the aesthetic-functional diagnosis leads the clinician to the choice of performing tissue resections or not (or in other cases of tissue additions) to obtain an ideal harmony of the white component of the dental elements and the pink component of the surrounding tissues.

Case description: In this study, 50 natural elements were treated, distributed on 20 periodontally healthy adult patients (range 18-68 years) who underwent implant-prosthetic rehabilitation and a laser soft tissue design intervention was performed on each element for aesthetic-functional purposes. The laser parameter used was: previously activated 300-micron fiber,

2-Watt power, CW (continuous Wave) surgical mode, fiber perpendicular to the tissue to be treated. In particular, the atraumatic and post-surgical stability of laser-assisted tissue resections will be evaluated.

In particular will be assessed the atraumatic and stability post-surgical resections tissue laser assisted. The parameters examined were:

1- type of gum tissues treated with laser assisted interventions of gingivectomy/remodeling

2 - measuring the amount of gum tissue (adherent) healthy present at t_0 = pretreatment, t_1 = post-treatment, t_2 : 30 days after treatment

3- Index of bleeding at t_0 = pre-treatment

And at t_1 = 30 days after treatment to evaluate the State of periodontal health and stability.

Discussion: In the experiments performed, we found excellent post-surgical tissue stability at both T_0 and $T = 30$ days. It was also highlighted the absence of bleeding on probing, both immediate and at 30 days, a sign of good periodontal healing of the treated tissues.

Rehabilitation with Mini Invasive Techniques of the Lateral Mandibular and Edentulous Sector: A Case Report

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Introduction: Use of tilted implants in partial edentulous in order to circumvent anatomical limits and reduce invasiveness and intervention times

Case description: 67-year-old female patient, with a negative history of ASA I systemic pathologies, comes to our attention at the Department of Dentistry - San Raffaele Hospital (Dir Prof E. F. Gherlone), with a total upper prosthesis and a rehabilitation supported by implants and natural teeth, with edentulous saddle between 4.5 and 4.8. Following the aforementioned edentulousness, the proposed treatment option was the insertion of two implant fixtures, in 4.3 positioned axially (Winsix Biosafin TTX 3.3X13), and one tilted in 4.5 with an angle of approximately 45° (TTX 3.8X13), using a 30° MUA prosthetic component (EAX

30°) for the latter (Winsix-Biosafin method, Trezzano Rosa (MI), Italy). The case was designed on CBCT with 3Diagnosys software (3diemme, Cantù, Italy).

Discussion: At the annual follow-up with relative radiographic control, the rehabilitation appears well tolerated by the patient and there are no biological and mechanical complications, neither prosthetic or implant related. The use of this technique has brought about the following advantages:

- 1) Increased bone-implant contact
- 2) Better distribution of chewing loads
- 3) Reduction of the distal cantilever

Applications in Aesthetic Prosthesis of Diode Laser Soft Tissue Surgery and Laser Biostimulation

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Aim: The purpose of the following case report is to investigate the application of an experimental protocol using the laser biostimulation following the surgical laser treatment of gingival tissue, in order to improve the responses to pain of patients and to reduce the healing time of the treated tissues.

Methods: This case report is made on an adult patient, male, 64 years old, candidate to a complex fixed prosthetic rehabilitation in aesthetic area.

Elements from 1.2 to 2.2 were treated using a diode laser at 980 nm with surgical protocol: optical fiber 300 microns, power 2 watts, surgical mode in CW (continuous wave) activated fiber. After the surgical procedures, we applied to experimental laser biostimulation protocol at the baseline, at 3 days, 7 days and 14 days, using a 645 nm diode laser power of 0.5 watts with defocused handpiece. The following parameters, were then evaluated:

pain perceived by the patient on the VAS scale (Visual Analogue Scale) and clinical indices of healing tissue, probing depth and bleeding index.

Results: In terms of the absence of pain and reduction of inflammation after the gingival surgery, the use of the experimental biostimulation protocol allowed us to obtain a satisfying result. This protocol has allowed to obtain healing in terms of clinical indices of optimal post-surgical outcome.

Conclusion: In view of minimally invasive prosthetic dentistry, the application of new technologies for the improvement of tissue healing and patient compliance in surgical and prosthetic rehabilitations, is definitely to be considered valid.

The laser appeared to be a valid equipment, both as surgical instrument and as biostimulation of the healing tissues.

Innovative and Digital Technologies in Aesthetic Fixed Prosthodontic

G. Sciacero, M. Barbini, C. Coppo, F. Mazzoleni, F. Monosi, R. Sgreccia

Aim: The purpose of this study is the evaluation of the pertinency in an aesthetic viewpoint of new technologies, applied to a single case report, in order to confirm the clinical efficiency of these technologies, starting from the diagnosis to the end of the treatment.

Materials and Methods: For diagnostic and therapeutic design, we used the Dental digitized design technique (Digital Smile Design), followed by a traditional objective and functional evaluation to confirm the diagnostic project. Laser Soft Tissue Design was used through the surgical protocol.

Then an optical impression was taken using an Intraoral Scanner (Carestream CS3600).

The technical construction of the prosthodontic elements was processed via CAD/CAM.

The patient is an adult, female, 24 years old, who needs restoration of the natural elements 11 and 21. The element 11 is not vital, already reconstructed and needs an aesthetic crown in Lithium disilicate adhesively cemented. For the element 21, vital, was planned an adhesively cemented Lithium disilicate aesthetic veneer.

Results: The clinical case has been dealt with innovative methods and there has been a good match of the digital design with the functional and aesthetic needs of the patient, both verified in the oral cavity in the provisional as well as in the definitive stage. At last there was an ideal healing of the tissues post laser guided surgery and precision in the final artifacts.

Conclusions: The use of the latest digital and surgical technologies, both in diagnostics and treatment, aims to maximise the final result, both from a prosthetic and aesthetic point of view.

Accuracy of Fit of Full-Arch, Implant-Supported Prostheses Fabricated Fully Digitally: A Clinical-Simulation in Vitro Study

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Objectives: Intraoral scanners (IOS) have become an integral part of clinical practice for impression making in Prosthodontics. Nevertheless, few studies have evaluated the accuracy of fit of full-arch implant-supported restorations fabricated through a fully digital workflow. Aim of the study was to evaluate the accuracy of fit of maxillary, complete-arch (all-on-six), implant-supported fixed prostheses simulating different clinical scenarios. The impact of splinting of the scan bodies was also an objective of this study.

Methods: Two models of edentulous maxilla, with six implants at the positions #12, 14, 16, 22, 24, 26 were digitally designed (ANSA, Beta CAE Systems) and 3D printed (FDM, IEMAI Magic HT-PRO) in PEEK material. In the first scenario, all implants were parallelized, while at the second, implants #12 and #22 had a 20-degree angulation buccally, while implants #16 and #26 had a 20-degree angulation distally. All implants were submerged 2-mm subgingivally and received balance-base abutments (ElosMedtech Dental). The models were scanned (Carestream 3600, Carestream) using either non-splinted or splinted scan bodies, the latter by using an-

extensional structure (Universal scan template, La Struttura Digital Dentistry Solutions). The scans were exported to an .stl file and CAD/CAM zirconia frameworks were fabricated (IPS e.maxZirCAD, Ivoclar Vivadent). Marginal fit was assessed by the Sheffield test and by micro-computed tomography.

Results: Both clinical scenarios provided frameworks with accuracy of fit within clinically acceptable limits (<120 µm). Implant angulation and splinting of the scan bodies had a significant impact on the fit of the restorations.

Conclusions: Implant angulations due to lack of bone tissue may complicate accuracy of fit after digital impression making. Splinting of scan bodies with an extensional structure is a novel technique to optimize marginal discrepancy problems. These factors should be taken into consideration when manufacturing full-arch implant prostheses in a fully digital workflow.

Keywords: intraoral scanner, digital impression making, implants, edentulous

Dimensional Stability of 3D Printed Fixed Prosthetic Restorations

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Purpose: The aim of these *in vitro* study was to compare the accuracy and stability of four 3D printed resin full arch restorations at 24 hours and 7 days from fabrication.

Materials and methods: A reference full arch gypsum model was scanned with Aadva lab scanner. A complete maxillary arch restoration was designed using the CAD software "Exocad (Exocad GmbH, Germany, 2010)" and the STL file was exported to the DLP printer. Four biocompatible (II class) resins developed for temporary crown were used to realize the restorations. Eight models were printed for each resin using the DLP printer Asiga MAX UV (wavelength= 385nm; pixel resolution = 62 µm) for a total of 32 printed restorations that were scanned using the lab scanner "Aadva Lab Scanner 2" to generate STL files. The scans were performed in four different moments: 1. Time = 0: scans were done immediately after printing; 2. Time = 24h: scans are done 24 hours after the first scan; 3. Time = 48h: scans are done 48 hours after the first scan; 4. Time = 7days: scans are done 7 days after the first scan. Eight models for each resin were scanned in four different moments, for a total of 32 scans for each resin and 128 total scans. The STL files were exported to a surface matching software (Geomagic Control X; 3D systems, Rock Hill, SC). The scan at T=0 of each model was taken as the reference model and the 24h scan was superimposed to it. The "3D compare" function was used to create color surface maps.

A maximum critical value of ± 100 mm (0,100mm) and a maximum nominal value of ± 25 mm (0,025mm) was set for color spectra. Each superimposition allows to obtain two percentage (%) values: correspondence and variation. Thanks to these two values it was possible to quantify the behavior of tested prosthetic restorations over the first day (T=24h), the second day (T=48h), and the seven following days (T=7days) since printing. To analyze each resin, the two % values (correspondence and variation) of each 3D printing were collected and their arithmetic mean was calculated to have one % for each resin in each of the four times. One-way ANOVA was used for comparing different measurement errors between groups.

Results: For all 3D-printed resins a change of stability was recorded; changes were affected by time and type of resin. There were statistically significant differences among the four resins after 24 hours and 7 days.

Conclusions: Within the limitations of this study, the results of the present research rejected the two null hypothesis as time factor and type of resins had effect on the stability on resin restorations. The Tempt PRINT resin showed to be more stable than the other three tested resins after 1 and 7 days. The variance in stability of FreePrint, C&B MFH and Temp PRINT was not statistically significant between 1 and 7 days, whilst VarseoSmile Crown showed a statistical significance change at the two times controls.

Comparison of Two Intraoral Scanners for the Realization of Lithium Disilicate Crowns

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Objectives: To compare precision of digital impressions taken with two different intraoral scanners (IOS) and to evaluate the marginal and internal fit discrepancy of lithium disilicate single crowns fabricated with CAD/CAM technology.

Methods: 20 molars prepared for single crowns with vertical margins were scanned in a model scanner, creating master scans. Two IOS were used to perform impressions on the 20 teeth: Trios 3 Basic (3 Shape) and Experimental Aadva (GC).40 .stl files of the impressions were overlapped with the master scan with software Aadva GC 2.1.2 Dental DB so that the discrepancy along the impressions bigger than 0,08 mm was evaluated. The Mann-Whitney U test was performed on the data. 40 lithium disilicate crowns were fabricated with CAD/CAM technology and 10 from each IOS were randomly luted to the 20 prepared teeth. The crowns were tested for marginal leakage by means of aluminum nitrate solution. The samples have been cut into

slices of 1 mm in thickness each with diamond blade cutting machine (Buehler Isomet) and observed under optical microscope to evaluate the amount of leakage, if any. The Mann-Whitney U test was performed (Shapiro-Wilk's test $p < 0,05$). The samples have been sputter coated with gold and observed under SEM to evaluate the thickness of the cement along all the interface between abutment and restoration. Cement thickness values were analyzed with Student t test (Shapiro-Wilk's test, $p > 0.0$ and Levene test, $p > 0.05$)

Results: no statistically significant difference has been found between the two different IOS regarding the .stl files. Also, no statistically significant differences were found between the two groups about neither leakage at the margins nor cement thickness.

Conclusions: Both IOS tested showed good performances and, from the results of this *in vitro* study, can be considered useful for clinical application.

Differences in Dental Arches Best-fit Superimposition Methods: An In-vitro Study

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Objectives: The aim of this study was to present a new method of dental arches 3D superimposition for in-vitro comparison of the accuracy and precision of digital or conventional dental impressions

Materials and Methods: An upper dental arch model was provided of a Scan body in the retroincisive area and scanned by a laboratory scanner to create a digital reference model. Then, it was scanned 5 times by an experienced operator using an intraoral scanner (Trios4) with the scan strategy recommended by the manufacturer. The STL file obtained from the IOS was three-dimensionally superimposed to the STL file of the reference model with 3 different methods by using a 3D point cloud processing software: full-arch best-fit alignment, best-fit alignment only at the Scan body and best-fit alignment at the tooth

where the scan started. 3D discrepancies of the mesh file from the reference model were registered for each superimposition

Results: The Gaussian distribution of the discrepancies between the two models shows different levels of accuracy depending on the method of superimposition used: 28±95µm for full-arch best-fit alignment, 38±165µm for best-fit alignment at the Scan body and 95±190µm for best-fit alignment at the tooth where the scan started. Furthermore, the distribution of discrepancies between the models visibly changes according to the superimposition method

Conclusions: Different 3D superimposition methods result in different values of accuracy and precision for complete dental arch impressions. A systematic method of comparison should be investigated to obtain more reliable results.

Reliability of RFA and DCA for Implant Stability Measurement According to Devices' Accessibility to Implants

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Objectives: The aim of present study is to evaluate the reliability of implant stability devices in different conditions of accessibility.

Methods: Six implants with 4.0mm diameter and 10.0mm length were installed into artificial bone models. The location of implants was determined to be evenly distributed in the oral cavity; upper right first molar (URM), upper left central incisor (UCI), upper left first molar (ULM), lower right first molar (LRM), lower right central incisor (LCI) and lower left first molar (LLM). The implant stability was measured in three conditions including outside (control group), supine, and upright. Supine and upright mean to state in which patient's upright and supine position were simulated using phantom head with implant placed at artificial bone. One RFA (Osstell®) device and two DCA devices (Periotest™ and Anycheck™) were used for examining the implants stability. RFA measurements were first made for each implant (N=15) according to three conditions, then healing abutments were connected to implants. DCA was measured in

Anycheck™ and Periotest™ alternately same as RFA. All values of devices were measured in buccal direction by one examiner.

Results: The paired t-test revealed no significant differences in the ISQ between outside and inside positions. On the other hand, there were statistically significant difference in ULM, LRM and LCI in the supine position of PTV (P<0.001). Also, ULM and LRM in upright position of PTV were statically significant difference (P<0.001). In contrast, there are significant differences where UCI and LCI in supine position of IST (P<0.001).

Conclusions: RFA was not affected by the patient's position and the site of installed implant. DCA can be affected by the patient's position, the site of installed implant and the kinds of devices. To obtain reliable measurement results, it should be used according to the instructions of the instrument. Also, it is recommended to measure in the upright position to measure more reliable values by DCA.

Different Build up Procedures of Endodontically Treated Anterior Teeth

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Objectives: The aim was to investigate the clinical behavior of endodontically treated (ET) upper anterior teeth (incisors and canines) restored by various fiber-reinforced post-core composites (FRCs) or fiber posts (FP).

Methods used: 80 ET posteriors, with 50% or less of coronal residual structure, were selected and randomly divided into four groups (n=20). Group 1:FP GC FIBER POST, GC (FP) luted with GRADIA CORE, GC(GC) + Initial LiSi Press, GC crown luted with G-CEM LinkForce, GC (LF) (as control); Group 2: everX Flow, GC (EXF) core build up + Initial LiSi Press crown luted with LF; Group 3: EXF + G-ænial Universal Injectable, GC (GUI); Group 4: FP + EXF + GUI. Natural teeth were as opposing dentition and patients were free from parafunctions. Patients were recalled at six months, 1 and 2 year from baseline. Mechanical and biological parameters were evaluated accordingly with Functional Index of Teeth (Ferrari Cagidiacc *et al.*, 2020). FIT was used for the

objective assessment of outcomes including clinical and radiographic examinations. FIT is made up of 6 variables (Interproximal, Occlusion, Design, Mucosa, Bone, Biology and Margins), each of them to be evaluated using a 0-1-2 score. The Mann Whitney U test was applied for statistical analysis and the level of significance was set at $p < 0.05$.

Results: At one year recall all the restorations were in place without any biological or mechanical complication. FIT scores for each restoration ranged between 13.5 and 14. No statistically significant differences were found among groups.

Conclusion: Under the limitations of this study, anterior ET showed no difference when restored with or without a fiber post, and when occlusal surface was covered by a crown or not. Longer observation time of this study is needed to confirm these findings. Also, similar studies on patients with different degree of parafunctions are desirable.

SEM Evaluation of the Marginal Precision of Lithium Disilicate Crowns Milled with CAD / CAM Method on Single Elements: An In Vitro Study

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Abstract: The objective of this in vitro study is to evaluate the marginal accuracy using the scanning electron microscope (SEM) of crowns milled with the CAD / CAM method of Dentsply Sirona with 2 preparation lines: shoulder and feather edge. The material used for the milling of the crowns is lithium disilicate. Two customized chrome-cobalt (Cr-Co) implant abutment simulating a maxillary right first molar were fixed in two hemi-maxillary stone model and scanned by Cerec Primescan. Created the Project directly from Cerec Primescan, 18 crowns in Cerec Tessera were fabricated, including nine with shoulder preparation and nine with feather edge preparation using Cerec inLab MC XL milling machine. Descriptive analysis were performed using mean, standard deviation, and median, while the Pearson correlation index, test T Student and Wilcoxon test were performed to determine whether the marginal discrepancies were significantly

different between each group. The crowns were then positioned on the abutment and observed with a scanning electron microscope (SEM) Phenom Pro X. The measurements of the gap present between the crown and the abutment were carried out at the vestibular, palatal level, at the point of maximum height of the mesial, distal and intermediate points to these, for a total of 12 detection points for each element produced. The data obtained were subjected to statistical evaluation.

The mean and standard deviation of crowns with feather edge preparation is 61.41 ± 22.5 ; shoulder preparation 62.85 ± 51.58 . A difference was noticed between the two preparations when the marginal gap was related to the dental topography (mesial, distal, vestibular, palatal). The digital flow has proved to be precise and reliable as demonstrated by other scientific works.

In Vivo Comparison of Bone Response Between Titanium and Zirconia Implant Surfaces

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Objectives of Investigation: The present study aimed to evaluate the in vivo bone response to a zirconia implant surface compared to osseointegration into titanium (Ti) surfaces. **Methods Used:** Scanning electron microscopy, confocal laser scanning microscopy, and x-ray photoelectron spectroscopy were performed to assess the surface characteristics of implant specimens. For the in vivo evaluation, eight Ti implants, which were made by computer numerical control milling, and eight zirconia implants (ZrO-AM), which were made by additive manufacturing, were used. Then, the surface of four Ti implants was sandblasted, large-grit, and acid-etched (Ti-SLA). The surface was left untreated for the other four Ti implants (Ti-turned). The Implant specimens were inserted into the tibiae of four rabbits; two rabbits received the Ti-turned and ZrO-AM implants and the other two received Ti-SLA and ZrO-AM implants. After four weeks of implant placement, all the rabbits were sacrificed and the undecalcified slides were prepared for light microscopic histomorphometry. One-way ANOVA was used to compare means between the groups at a significance level of 0.05.

Results: The degree of surface roughness showed that Ti-SLA was the highest, followed by ZrO-AM and Ti-turned surfaces ($p < 0.05$). The ZrO-AM surface ($83.4 \pm 3.5\%$) showed similar bone-to-implant contact (BIC) to the Ti-turned surface ($83.2 \pm 4.1\%$), and Ti-SLA ($90.5 \pm 2.6\%$) had the highest BIC ($p = 0.012$).

Conclusions: The ZrO-AM implant surface is biocompatible in bone response, compared to the Ti-turned surface. However, an adequate surface modification of the ZrO-AM surface is needed for clinical application, considering the result that the Ti-SLA surface was superior in BIC to ZrO-AM.

Keywords: Animal experimentation; bone-implant interface; osseointegration; microscopy.

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GBR Using Pre-contoured Titanium Mesh Simultaneously with Implant Placement to Obtain Favorable Crown-Implant Ratio

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Introduction: Tooth extraction after destructive bone loss due to periodontal disease causes vertical and/or horizontal defects in alveolar bone. Although short implants are used as an alternative, a large crown-implant (C/I) ratio may increase marginal bone loss (MBL). In this case report, a pre-contoured titanium mesh (TM) that can be anchored to the implant was used for vertical bone augmentation (BA) in order to obtain a favorable C/I ratio.

Case Description: A 51-year-old male patient visited our hospital for implant placement on right mandibular first molar area. The tooth had fallen out on its own five months ago due to severe periodontitis. The radiographic examination showed severe vertical bone loss. Considering the distance to inferior alveolar nerve and the C/I ratio, vertical BA seemed necessary. BA using pre-contoured TM simultaneously with implant placement was performed. Five months after the first stage surgery, TM was

removed during second stage surgery, and 2mm of mineralized bone tissue was found to have been regenerated vertically. Prosthetic restoration was completed, and the C/I ratio was 1.94.

Discussion: The smaller the C/I ratio, the less the MBL can be obtained. In this case, if a 6mm short implant was placed, C/I ratio of 3.16 would have been obtained. However, by placing an 8.5mm implant with vertical BA, C/I ratio of 1.94 was obtained. Pre-contoured TM has risks, such as membrane exposure and practitioner proficiency, but it does not require additional pins for fixation and has advantage of shortening the treatment period, as it can be applied simultaneously with implant placement. In conclusion, implant placement with simultaneous BA using pre-contoured TM can successfully and predictably be used in severe vertical and/or horizontal bone defects and can contribute to lowering the C/I ratio.

Quality of Life from Complete Denture to Implant Supported Fixed Denture 26 Years in Function.

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Introduction: The aging of population brings specific demands on the national health service systems. Gerontological Stomatology is focused on the preservation or improvement of the previous function of the whole maxillofacial system. Dysfunction of mastication can seriously affect the general welfare of individuals. A lowered number of teeth to edentulism without optimal treatment can lead to malnutrition and the worsening of cognitive functions. Comfort of removable complete denture is compared to the implant supported fixed denture in the presented case report.

Case description: A man B.S. 74 age with both edentulous jaws was treated by complete dentures in 1996. He was a top executive manager. The cause of lost teeth was progressive periodontitis. During four years with the two sets of complete dentures he suffered from oral discomfort, problematic mastication, retention and stability of denture and social handicap. Unsatisfactory conditions of denture bearing tissue resulted in solution with implants. Atrophic lower jaw was treated with 6 implants immediately loading fixed temporally denture after

transposition of the mental nerve bilaterally in 2000. The interforaminal position of the implants was refused by the patient due to the long recovery period, there was thin alveolar bone in frontal area. The upper jaw was treated with 8 implants and screw retained dentures. During the time several adjustment and repairs were needed. The patient filled up OHRQoL 14 concerning complete dentures and implant supported dentures during his life within 26 years.

Discussion: The patient as a top executive manager was not in conformity with removable complete dentures. Were presented no dietary restrictions with implants and fixed dentures. This treatment had a significant impact on his general health and higher level of social and professional contacts. Results of questionnaires presented significant relationship between quality of his life and methods of treatment of edentulous jaws.

Keywords: oral health, quality of life, complete dentures, implant supported denture, elderly.

Funding Sources: Cooperatio 207030 Dental Medicine/LF1

Effect of Oxygen Shielding and Post-Curing Temperature on Color Stability of 3D-Printed Resin

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Objectives of Investigation: The purpose of this study was to evaluate the effect of post-curing conditions such as oxygen shielding and post-curing temperature on the color stability of 3D-printed resin.

Methods Used: For specimen production, a 3D printing denture tooth resin was used and printed by a DLP printer. 3D-printed specimens were cleaned, dried, and placed in post-curing equipment under the conditions of oxygen exposure, vacuum, glycerin immersion, and various post-curing temperature (35°, 60°, and 80°). Post-cured 3D-printed resins were immersed by distilled water as a control group and grape juice, coffee, and curry as colorant for 30 days and color stability was evaluated. Degree of conversion (DC), color measurement (ΔE), water absorption and solubility, pH of the solution used as a colorant, specimen cross section, surface free energy, surface roughness and waviness were analyzed.

Results: As a result of the DC analysis through infrared spectroscopy, the glycerin immersion specimen was significantly higher, the oxygen exposure specimen was the lowest, and the DC according to the post-curing temperature was significantly higher in the order of 80°C, 60°C, and 35°C. As a result of the three-way ANOVA test to verify the difference in ΔE between groups according to oxygen shielding, temperature, and colorant, ΔE was significantly low at glycerin with 80°C.

Conclusions: This study has confirmed that the post-curing conditions according to oxygen shielding and temperature had an effect on the color stability of the 3D-printed resin. As oxygen shielding (glycerin, vacuum, oxygen exposure) and post-curing temperature (35°, 60°, 80°) increased, the DC of 3D printed resin was high and the color stability was high.

Supra-Room Temperature 3D Printing Favorably Modifies the Physical Properties and Accuracy of Resin Material

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Objectives of investigation: To evaluate the impact of increasing resin temperature during 3D printing on dental resin's physical properties and accuracy.

Methods: Before printing, a heat transferable Indium Doped Tin Oxide (ITO) glass plate was appended under a resin tank of a commercially available stereolithography type 3D printer. The heat was transferred to the resin using an external power supply module to achieve desired heating parameters. Specimens fabricated with resin temperatures at Room (R/T), 35°, 40°, 45°, and 50° were evaluated. The mechanical properties were quantified by Vickers micro-hardness, flexural strength (FS), elastic modulus (EM), and modulus of resilience (MOR) (n=10). In addition, a three-dimensional accuracy analysis of 3D printed crowns (n=4) was conducted. Scan data using the table-top scanner and designed data were compared using 3D morphometric software. One-way ANOVA and Tukey's *post hoc* test were performed to check the differences between groups.

Results: The temperature of the resin during 3D printing significantly affected the mechanical properties. Significant ($p < 0.001$) differences in micro-hardness between the groups were observed in the order of 35° (7.66±0.40), 40° (7.74±0.49), 50° (6.86±0.72), 45° (6.53±0.29) and R/T (5.68±0.38). Significant ($p < 0.05$) differences were observed in both FS and EM properties. In the 50°C group, the highest FS (90.33±11.56MPa), EM (3618.88±339.73MPa), and MOR (1.14±0.25 MPa) were observed, while R/T had the lowest (FS: 59.24±5.52 MPa; EM: 2526.48±127.58 MPa; MOR: 0.70±0.11Mpa). FS and EM showed differences with increasing temperature; however, MOR differences were not statistically significant. In addition, it was found that the accuracy of the 3D printing was not affected within the heating temperature range used in this study ($p = 0.019$).

Conclusions: Within the same printing conditions of the study, the temperature of the printing resin can have a positive effect on the physical properties of the resin.

Keywords: 3D printing resin, SLA 3D printer, temperature

Effect of Post-curing at Nitrogen Gas on Mechanical Properties of Water-Stored 3D-printed Hard Occlusal Splint

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Objectives of Investigation: to evaluate effect of post-curing at nitrogen gas on mechanical properties of water-stored 3D-printed hard occlusal splints. Investigated mechanical properties were flexural strength, flexural modulus, fracture toughness, and Vickers hardness.

Methods Used: forty bar-shaped specimens (KeySplint Hard, Keystone Industries) were 3D-printed and water-stored (100°C, 16h). Half of them were printed by liquid crystal display (LCD) printer with 405nm (Creo™ C5, PLANMECA) (Creo group), while the other half were printed by digital light processing (DLP) printer with 385nm (Asiga MAX™, SCHEU-DENTAL) (Asiga group). Each group was divided into two subgroups according to post-curing condition: stroboscopic post-curing with 2000 flashes on each surface (Otoflash G171, BEGO) at nitrogen gas and stroboscopic post-curing with 2000 flashes on each surface in air atmosphere. Flexural strength and flexural modulus were evaluated (n=10/subgroup). Specimens were selected from each subgroup for evaluation of Vickers hardness. Thirty-two additional specimens were prepared for evaluation of fracture

toughness (n=8/subgroup). Data were statistically analyzed (ANOVA, Tukey's, $p < 0.05$).

Results: 1-way ANOVA revealed significant difference among tested groups/subgroups on investigated mechanical properties ($p < 0.001$). In Creo and Asiga groups, specimens post-cured at nitrogen gas showed significantly higher Vickers hardness than those in air atmosphere ($p < 0.001$). In Creo group, specimens post-cured at nitrogen gas showed significantly higher flexural strength and modulus than those in air atmosphere ($p < 0.001$), while no significant difference in those mechanical properties among subgroups in Asiga group. 2-way ANOVA showed that post-curing condition significantly affected all investigated mechanical properties other than fracture toughness ($p < 0.001$).

Conclusions: post-curing at nitrogen gas can enhance mechanical properties of water-stored 3D-printed hard occlusal splints. Additionally, type of 3D printer can affect their mechanical properties.

Keywords: occlusal splints, 3D printing, Nitrogen

Temporomandibular Joint Acoustic Signals Database

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Objectives of Investigation: The activity of joints is always related to movement which generates acoustic signals. Sounds which occurs during opening and closing of the mouth are easily detectable within people with temporomandibular disorders. However, even healthy temporomandibular joint might generate various sounds during activity.

So far, no documented database of temporomandibular joint (TMJ) acoustic signals has been reported. The analysis of sounds generated by masticatory system together with clinical examination is a part of diagnosis based on the RDC/TMD questionnaire.

Because the manual RDC/TMD diagnosis is time-consuming and prone to errors the objective of this research is to implement a computer application which automatically makes the diagnosis for each patient based on provided input data from the questionnaire. Another goal was to create a database of the sounds of temporomandibular joints which would be integrated with the designed application.

Methods Used: First medical interview and clinical examination according to RDC/TMD questionnaire was performed. Then

evaluated patients were auscultated with electronic stethoscope Littmann 3200 and all digital recordings were stored in waveform audio format (WAV). The designed software was developed in Python 3.8 using PyQt5 application framework, Matplotlib data visualization library and SQLite database engine.

Results: The computer application which automates TMJ/RDC diagnosis was developed and tested. The database of TMJ sounds was created and it contains signals and diagnosis from 120 patients. The automatic generation of the diagnosis allowed to reduce the time to the level of 16% compared to the standard procedure.

Conclusions: Conducted research proved that it is possible to automate the TMJ/RDC diagnosis with the use of computer tools. Further research should involve expansion of the database with new records and implementation of the support for newer version of TMJ/RDC which is DC/TMD questionnaire.

Keywords: Auscultation, Temporomandibular Joint, Database, Sound

Evaluation of the Thermographic Examination of Blood and Lymphatic Vessels' Presence in Teeth Qualified for Fixed Prosthesis Performance

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The objectives of the investigation: Caries or iatrogenic thermal trauma of the teeth have a significant impact on the dental pulp structure connected with stimulation of angiogenesis. Therefore, the aim of the study was to identify the difference in the rate of heat dissipation by vessels present in the dental pulp of healthy and carious teeth qualified for fixed prosthesis performance using thermography.

Experimental methods used: Samples of healthy and carious teeth were heated with a lamp to a temperature of approx. 40 °C. Recording of the sequence of thermograms to reach a temperature of about 25 °C by the samples was made using an infrared thermographic camera ThermoCAM P640. From the so-called zero thermogram - made at the beginning of the free cooling process, the results of subsequent thermograms were subtracted. Subsequently, regions showing asymmetry of temperature distribution were located. Graphs of temperature drop in three regions (ROI) were made and values of dimensionless temperature indicators for each sample were calculated. The sensitivity and specificity of the thermographic technique were assessed on the basis of ROC curve analysis (determination of cut-off values for each of the indicators). The sequences of recorded thermograms were subjected to computer analysis using

digital image analysis. Specialized software for the analysis of Thermograms Optris PIX Connect was used.

Results: Thermographic examination of healthy and cariously changed teeth revealed areas of increased tissue fluid flow combined with heat release, which may indirectly indicate the existence of vessels in these areas. In caries-affected teeth, intracanalicular fluid flows are different than those of healthy teeth. Therefore, it can be concluded that the pulp vessels enabling circulation of body fluids – blood and lymphatic – increases with the intensity of inflammation.

Conclusions: The circulation within the dental pulp is of great importance in the process of maintaining the proper reaction of sub-odontoblastic plexus. The enlargement of vessels and increased number of capillaries, significantly increases volume of blood and interstitial fluid flow thorough the dental pulp. This phenomenon may be detected by thermography. Understanding the mechanisms of angiogenesis and lymphangiogenesis during these processes can be beneficial for more effective treatment of diseases however further research is needed.

Keywords: Thermography, Dental Pulp, Lymphatic Vessels, Blood Vessels, Prosthodontics

Comparison of Wear Resistance of Cement Line of Resin Cements

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Objective: Recently, prosthetic restorative fabricated by CAD/CAM system has become popular. It is generally thought that the cement space with CAD/CAM restoration is thicker than it with cast restoration. Especially in CAD/CAM inlay case, wear resistance of cement material is important because the cement line is exposed at the occlusal surface. In general, the wear resistance of cement material is lower than the restoration or tooth structure and wear of cement line can cause marginal chipping and discoloration. Therefore, this study evaluated wear resistance of the cement line by resin cements using three body wear tests.

Methods: Three resin cements (G-CEM ONE (GCO, GC), RelyX Universal (RXU, 3M) and PANA VIA SA Cement Universal (PSU, Kuraray)) were used in this study. The three body wear test was carried out by the wear testing machine (K842-01, TOKYO GIKEN). Each resin cement was sandwiched and bonded between two CAD/CAM resin blocks (CERASMART300, GC) according to the manufacturer's instructions (the cement-layer was set at

100 μ m using plastic tape, light curing mode), and the specimens were stored in distilled water at 37°C for 24h. The specimens were cut to 4 \times 4 \times 2mm and embedded in acrylic resin. Exposed cement-layer was subjected to three body wear test with 300g load for 100,000-cycles. After the test, wear depth was measured by LASER MICROSCOPE (VK-X200, KEYENCE). Three specimens were prepared for each resin cement and wear depth was measured at three points in each specimen (N=9). The data was analyzed by ANOVA and Tukey's test (p<0.05).

Results: GCO showed statically lower wear depth than the other products. The different letters indicate significant differences in the figure.

Conclusions: In this study, G-CEM ONE showed the highest wear resistance among resin cements tested. This result suggests that G-CEM ONE might be suitable resin cement for esthetic indirect restorations.

Masking Evaluation of Multi-layered Hybrid Resin Blocks for CAD/CAM

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Objectives: In recent years, CAD/CAM systems in dentistry have been rapidly expanding. Especially in Japan, the hybrid resin crown has been covered by National Health Insurance and CERASMART LAYER (CSL, GC), which has a gradation appearance composed of 3 different color layers (Enamel, Middle and Dentin), for anterior was launched in 2020. Recently, a novel CSL shade was developed which is not only aesthetical, but also has masking properties. In this study, the masking properties of this novel shade was evaluated.

Methods: 1.0mm and 1.5mm thickness plates of each layer were prepared from CSL original shade (A2EL) and novel shade (A2MO). They were polished with DIAPOLISHER PASTE (GC). Assuming the metal/resin core, CASTING SILVER CORE (GC) and UNIFIL CORE EM (GC) were selected. The color was measured with spectrophotometer (SD 7000, NIPPON DENSHOKU) for each plate on both core materials with glycerin in between them. The difference of L*, a* and b* values between metal (M) core and resin (R) core (ΔL^*_{M-R} , Δa^*_{M-R} , Δb^*_{M-R}) were calculated.

Results: The cervical region is clinically important to discuss about the masking properties, therefore the dentin layers were compared. ΔL^*_{M-R} values of both shades showed negative values under every condition (Table). It suggests that the aesthetics of the resin block crowns are affected by the color of the core. However, it was indicated that A2MO could effectively mask the metal core color because of the smaller ΔL^*_{M-R} value than A2EL. The masking property of 1.0mm thickness A2MO was almost same as 1.5mm thickness A2EL, therefore A2MO would be useful for limited crown thickness cases.

Conclusion: By adding this novel shade to the current CSL series, it would be possible to cover various clinical cases aesthetically because of the efficient masking properties against discolored teeth core and metal core.

Keywords: CAD/CAM, resin composite, dental materials

Evaluation of Tensile Bond Strength of Self-Adhesive Resin Cement and Glass-Ionomer Cement to Zirconia

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Objectives of investigation: Several types of cement are used for zirconia-based restorations, such as Resin-modified-glass-ionomer-cement (RMGIC) or Self-adhesive-resin-cement (SARC). The purpose of this study is to compare the bonding property of SARC and RMGIC to zirconia by evaluating the effect of the surface roughness of zirconia.

Methods Used: Three SARC, G-CEM ONE EM (GO, GC), RelyX Unicem2 (RU, 3M ESPE) and MAXCEM Elite Chroma (ME, Kerr), five RMGIC, FujiCEM Evolve (FE, GC), FujiCEM2 (F2, GC), RelyX Luting Plus Automix (RL, 3M ESPE), ZirCAD Cement (ZC, Ivoclar), NEXUS RMGI (NR, Kerr) and one glass-ionomer-cement, Ceramir cement (CC, Doxa) were used. Two surface roughness of Yttria-stabilized-zirconia (Aadva Zr-Block, YSZ, GC) were prepared (sandblasted or 1500-grit SiC-paper polished). The samples (n=8/

gp) were regulated (Φ 3mm-diameter-sticker), cemented with tensile-bond-test-jig (sandblasted YSZ), stored (37°C water, 24hrs), thermo-cycled (TC, 5-55°C/30sec), tested (1mm/min.) and statistically analyzed (Kruskal-Wallis test, Dunn test, $p < 0.05$).

Results: GO indicated the highest bonding strength and it was not affected by TC. ME and NR were decreased after TC. RU was decreased in case of polished surface. FE, F2 and RL were not affected by surface roughness or TC.

Conclusions: Bonding durability is independent of the type of cement. GO has the highest bonding durability and it may therefore be suitable for the situation that bond strength is required, such as low-retention preparations or high-stress locations. In other most cases, FE, F2 and RL may be recommended because of ease of uses and these bonding durability.

Immediate Implant Placement and Restoration of a Failing Lateral Upper Incisor Through a Digital Workflow

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Introduction: Utilization of digital workflow in immediate implant placement is an everyday clinical choice in contemporary dental clinics. This case report discusses a digital process to restore a failing upper lateral incisor, from treatment planning to implant placement and final restoration.

Case description: A young female proceeded to our clinic seeking aesthetic and functional rehabilitation. Clinical and radiographic evaluation of the patient revealed that tooth number #12 needed to be extracted. Immediate implant placement and provisionalisation were decided to be conducted, through means of digital technology.

The patient's arches were scanned using Carestream-3600 Intraoral scanner and a diagnostic set-up was delivered through Exocad-software-design. Intraoral and extraoral photos steered the set-up process.

A CBCT scan of the relevant area was also acquired. Dicom files and STL files of the diagnostic set-up, were processed via Co-Diagnostics software and a surgical guide was 3D printed. A narrow sky implant (Bredent Medical, Germany) was placed in the

post-extraction site and was restored a few hours later. Initial implant stability was measured by Penguin device (Bredent Medical, Germany) via magnetic resonance analysis and ISQ values 70-75 were considered satisfying in order to load the implant immediately. A peak scan-body was screwed on the implant and an optical impression was obtained. After sealing the implant with a healing abutment, a PMMA prefabricated Maryland-Bridge was cemented to the adjacent central incisor and the canine and the patient returned the following day to receive the fixed implant screw retained provisional PMMA crown. Four months later, the final restoration was delivered along with aesthetic and functional rehabilitation of the rest of the maxillary dentition.

Discussion: The technical advances of the digital workflow are valuable, for designing the treatment plan as well as executing the surgical and restorative procedure. From intraoral scanning, to guided implant placement and immediate loading, digital devices and software collaborate harmoniously to provide restorations of predictable outcomes in terms of ease, aesthetics and function.

Keywords: immediate implant placement, digital workflow, ISQ

Single Crowns versus Fixed Dental Prostheses: A 10-Year Prospective Clinical Study.

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Objective: To assess the influence of the type of prosthetic restoration and the degree of hard tissue loss on 10-years clinical performance of endodontic treated teeth (ETT) restored with fiber posts.

Materials and Methods: Two groups (n=60) were defined depending on the type of prosthetic restoration needed: 1) single unit porcelain-fused-to-metal (PFM) crowns (SCs) and 2) 3- to 4-unit PFM fixed dental prostheses (FDPs), with 1 healthy and 1 endodontically-treated and fiber post-restored abutment. Samples were divided into 2 subgroups (n=30) according to the amount of residual coronal tissues after abutment build-up and final preparation: A) >50% of coronal residual structure or B) = or <50% of coronal residual structure. The clinical outcome was assessed based on clinical and intraoral radiographic examinations at the recalls after 6, 12, 24, 36, 48, 84 months and ten years. Data were analyzed by Kaplan-Meier log-rank test and Cox regression analysis.

Results: The overall 10-y survival rate of ETT restored with fiber post and either SCs or FDPs was 69.2%. The highest survival

rate was recorded in group 1A (90%), whereas teeth in group 2B exhibited the lowest performance (56.7% survival rate). The log-rank test detected statistically significant differences in survival rates among the groups (P=0.048). Cox regression analysis revealed that the amount of residual coronal structure (P=0.041; hazard ratio [HR], 2.026; 95% confidence interval [CI] for HR, 1.031–3.982) and the interaction between the type of prosthetic restoration and the amount of residual coronal structure (P=0.024; HR, 1.372; 95% CI for HR, 1.042– 1.806) were statistically significant factors for survival.

Conclusions: Teeth restored with single unit porcelain-fused-to-metal crowns showed a higher survival rate especially when coronal residual structure was more than 50%. 3- to 4-unit PFM FDPs, with 1 healthy and 1 endodontically treated and fiber post-restored abutment with less than 50% residual structure showed lowest survival rate.

Keywords: post-retained abutment, endodontics, fixed dental prostheses

Factors Influencing the Frequency of Denture Adjustments After Delivery of Complete Denture: A Retrospective Study

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Objective of Investigation: The purpose of this study was to analyze the frequency and duration of adjustments after delivery of complete denture according to age, sex, insurance coverage of denture, type of opposite dentition, the experience of wearing denture, the period of edentulism and the type of denture base.

Methods used: From July 1, 2012, to June 30, 2017, medical records of patients aged 65 or older who had full dentures were assessed for the frequency and duration of follow-up visits after complete denture delivery. Difference of frequency of follow up visits and duration of follow-up was analyzed by Mann-Whitney U test for Sex, insurance coverage, arch with full denture, type of denture base, Kruskal-Wallis H test for type of opposite dentition,

experience of wearing denture, Spearman's correlation for age, healing period between extraction and the delivery of denture.

Result: In total, 247 complete dentures were involved in this study. The median frequency of follow-up visits was 3, and the median duration of follow-up was 36 days. Upper dentures had significantly lower frequency of follow up visits than lower dentures (p=0.036), and dentures opposing a complete denture had significantly higher frequency of follow-up visits dentures opposing a removable partial denture (p=0.016). There was no statistically significant difference by age, sex, insurance coverage, healing period between extraction and the delivery of denture, type of denture base.

Conclusion: Upper complete denture or dentures opposing a complete denture increase the frequency of follow up visits.

A Success Rate of Digital Methods in Colour Measurement of Teeth

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Objectives of Investigation: The aim of this study was to compare the visual assesment of tooth shade with the measurement using the digital devices; intraoral scanner (IOS) and spectrophotometer.

Methods Used: The colour for a single unit zirconia oxide monolythic implant supported crown was measured visually by one experinced operator under given conditions and with using IOS and spectrophotometer. The results of the digital methods were compared with the visual measurement. The gathered data were analyzed in MS Excel using the methods of descriptive statistics, chi-square test and Fisher's exact test. The level of statistical significance was set at $\alpha = 0.05$.

Results: A total of 21 patients (11 men, 10 women) participated in the study. The complete colour match with the visual measurement was in 42.9% of cases for IOS, and in 47.6% of cases for spectrophotometry. The match in the colour value, hue, and chroma were in 61.9%, 95.2%, and 66.7% of cases, respectively, for the IOS; and in 61.9%, 85.7%, and 66.7% of cases, respectively, for the spectrophotometry. The differences between the IOS and spectrophotometry were not statistically significant.

Conclusions: The most reliable method for tooth colour selection is the visual measurement by an experienced dentist. IOS and spectrophotometer can be used as an initial method for colour assesment, but both of them need the visual verification.

Keywords: colour match, intraoral scanner, spectrophotometer

A Success Rate of Digital Methods in Colour Measurement of Teeth

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Conclusions: The most reliable method for tooth colour selection is the visual measurement by an experienced dentist. IOS and spectrophotometer can be used as an initial method for colour assesment, but both of them need the visual verification.

Keywords: colour match, intraoral scanner, spectrophotometer

Framework Materials for Full-Arch-Implant-Supported Rehabilitations: An in vitro study

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Objectives of Investigation: Fiber-reinforced composites (FRC) have been proposed as an alternative to traditional metal alloys for the realization of rigid frameworks to splint the implants together and distribute the loads homogeneously. The aim of this study was to evaluate the deformation of seven prostheses, endowed with frameworks made of different materials, through compression tests.

Methods Used: The samples were upper full-arch fixed prostheses, realized with the same shape and size using the same master cast, screw-retained and supported by four implants in correspondence of the two lateral incisors and the two first molar. The materials were: gold alloy+resin(Au+R), titanium+resin(Ti+R), FRC with multi-directional carbon fibers+resin(ICFRC+R), FRC with unidirectional carbon fibers+composite(UCFRC+C), FRC with glass fibers+resin(GFRC+R), FRC with glass fibers+composite(GFRC+C), resin(R,full-acrylic prosthesis). The prostheses were subjected to compression tests using Zwick/Roell Z 0.5 machine and the deformation of the lower surface of the prosthesis was measured in order to obtain load/deformation graphs.

Results: Greater rigidity and less deformation were recorded for UCFRC+C, GFRC+C, followed by Ti+R, R and Au+R. The greatest deformations were observed for ICFRC+R and GFRC+R. The results were slightly different in the incisal region probably due to the greater amount of veneering material in this area: there was less deformation in GFRC+C and UCFRC+C followed by Au+R and Ti+R. The greatest deformations were recorded for R, ICFRC+R and GFRC+R.

Conclusions: When used to realize full-arch frameworks, Au and Ti allow a predictable mechanical behavior with gradual deformations with increasing load. UCFRC demonstrated good outcomes and allowed a better distribution of load than ICFRC. The GFRC full-arch framework may be an alternative, however further studies are needed in order to investigate its mechanical characteristics, also in relation to the aesthetic coating used. The acrylic resin alone, using the thickness simulated in this research, does not provide a sufficiently rigid structure to guarantee loads control in full-arch rehabilitations.

Keywords: framework, fiber-reinforced composites

Correct Programming And Choice Of The Type Of Preparation In Prosthesis: Case Report

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Introduction: Complex prosthetic cases on natural teeth often involve particular programming with a careful protocol to try to reach a complete maturation and stability of the tissues. One of the main clinical complications of the fixed prosthesis on natural teeth is the unsatisfactory aesthetic result due to the apical migration of the gingival margin.

The tendency of the gingival margin to migrate apically over time is related to various factors such as the inadequate quality and quantity of keratinized gingiva.

The presence of thin biotypes inadequately treated appears to be a factor favoring this migration.

Often these types of tissue demonstrate a greater likelihood of undergoing recessions, the brushing trauma combined with thin tissues is a further cause.

Materials and methods: An indirect factor would be the violation of the biological width of a prosthetic margin due to chronic inflammation.

The final result often turns out to be the uncovering of the prosthetic edge following the recession of the gingival margin with a final cosmetic defect.

In our work we want to describe the BOPT preparation method, a prosthetic preparation method on natural teeth designed to preserve the stability of the soft tissues around the prosthetic products for as long as possible.

Discussion: All the various concepts of the technique will be summarized by describing the steps that characterize this type of dental preparation.

Zygomatic Implants Combined with Anterior Regular Implants: Retrospective Analysis with 36-Month Follow-Up

Marco Gamalero, Tiziano Tealdo T, Francesco Bagnasco F, Paolo Pesce, Francesco Pera, Maria Menini

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Objectives of the investigation: The aim of this study was to retrospectively evaluate the clinical outcomes of immediately loaded zygomatic implants combined with anterior regular implants (hybrid zygoma) for the fixed rehabilitation of atrophic maxillae.

Methods Used: Eighteen patients were enrolled in the present study and treated with the hybrid zygoma concept by one experienced surgeon. Follow-up visits were planned after 1, and 3 weeks, 4, 6 months and then annually. At the last follow-up appointment (mean: 36 months after surgery; range: 24-52 months), prostheses were unscrewed, and the implants and peri-implant tissues were examined. Implant success was the primary outcome evaluated: following the criteria proposed by Aparicio implant success was classified in four grades, with grade I representing the best condition and grade IV representing a failure. At the annual check-up patients were asked to fill-up a questionnaire to evaluate their satisfaction towards their oral rehabilitation.

Results: 80 implants (34 zygomatic and 46 regular implants) were inserted. One zygomatic implant was lost in one patient and two regular implants failed in other two patients. 24 zygomatic implants (70.6%) presented a success grade I, 9 (26.5%) a success of grade II, and 1 (2.9%) a grade IV. Sinusitis was the most common biological complication and occurred in 2 patients (5.6%). Two patients showed unilateral upper lip paraesthesia, persistent at the latest follow-up. At the annual follow-up visit, from the data of the questionnaire, 72%, 89% and 94% of patients declared to be satisfied with their phonetic ability, chewing ability and aesthetics respectively.

Conclusions: Zygomatic implants combined with anterior regular implants, although presenting an higher risk of complications than traditional implantology, allow immediate loading full-arch fixed rehabilitation of patients with advanced atrophy of the posterior maxilla providing satisfactory chewing ability, aesthetics and phonetics.

Keywords: Dentistry, Implant, Oral Surgery, Zygomatic Implant, Prosthetic

Outcomes of Zygomatic Implants Combined with Anterior Regular Implants: Retrospective Analysis with a Mean Follow-Up of 36 Months

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Hybrid Digital Complete Denture: From Set (Simplified Edentulous Treatment) Clinical Data to Digital Denture. Case Report

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Introduction: All information obtained from the traditional procedure for realizing complete dentures are fundamental and cannot be disregarded. It required multiple clinical sessions, as well as numerous exchanges between the laboratory and the clinic. The S E T method allows to obtain all necessary clinical data in one session without losing quality and leave out fundamentals principles. Through digitization, it is possible to achieve further improvements in this technical clinical process: a hybrid technique is proposed with a first clinical and “materic” phase and a subsequent virtual and digital phase, by scanning and digitalizing clinical data. In this clinical case report try-in denture and final complete denture were printed.

Description: A 45 years old edentulous woman came with the request of new complete dentures. The first appointment was dedicated to the first assessment and treatment plan discussion.

Through a single clinical session with the S.E.T. procedure, a block containing all clinical data was obtained: definition of the height and orientation of the occlusal plane, neutral zone and lip support, intermaxillary relationships, esthetics and final impressions. After this clinical procedure, a laboratory scan of this block (3Shape Desktop Scanner) was realized, and clinical data digitized. CAD (3 Shape Software) and CAM (Nextdent 5100 3D printer) procedures were then realized.

Conclusion: SET method can be a viable method for gaining clinical data in one session and proceeding with a digital workflow. The digital planning of a complete denture is for an expert operator a time saving procedure, able to identify and solve some clinical and technical difficulties better than traditional techniques. Printing is very useful and easy for try in and very cost effective for definitive denture.

A 16-Year Prospective Clinical Study on Maxillary Lateral Incisor Agenesis Treated With Narrow Diameter Implants

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Objectives of the Investigation: the main objectives of the present clinical prospective study were to evaluate the marginal bone resorption and the peri-implant soft tissue conditions around narrow diameter implants in the implant–prosthetic treatment of the agenesis of maxillary lateral incisors using metal-ceramic and all- ceramic abutment and crown systems.

Methods Used: seventy-two patients affected by monolateral or bilateral agenesis of the maxillary lateral incisors were included into the study and a total of 105 narrow diameter implants were inserted. The final restorations were realized 3 months after the surgical procedure by means of either titanium abutments with aureo-galvan crowns veneered with feldspathic ceramics (group 1) and zirconia abutments with all-ceramic (alumina or zirconia) crowns layered with dedicated veneering ceramics (group 2). Both marginal bone resorption and soft tissue quality were evaluated after 16 years of clinical function. The data were statistically analyzed using analysis of variance (ANOVA) for repeated measures, one-way ANOVA and Tukey’s *post hoc* test ($P = 0.05$).

Results: no statistically significant differences in functional and aesthetic outcomes were found between group 1 and 2. At 16-year follow up, no implant showed either pain and sensitivity or mobility. A cumulative survival rate of 98.1% and a cumulative success rate of 95.2% were reported. In group 1, a survival rate of 97.1% (1 loss at follow-up) and a success rate 94.1% (1 aesthetic failure) were calculated. Conversely, in group 2, survival and success rates of 98.6% (1 loss at follow-up) and 94.4% (1 chipping, 1 ceramic fracture, 2 unscrewings) were recorded, respectively.

Conclusions: in cases of maxillary lateral incisor agenesis, the implant–prosthetic approach by means of narrow diameter implants loaded with aureo-galvan or all-ceramic crowns on both titanium and zirconia abutments has shown long-term satisfactory values of marginal bone resorption and optimal aesthetic results.

Influence of Thermocycling and Thickness on Fracture Resistance of Resin Cements Between Two Titanium Surfaces: An In Vitro Study

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Purpose: The aim of this study was to evaluate the fracture resistance of two different resin cements with 5 different thicknesses between two titanium surfaces before and after thermocycling.

Methods: One hundred grade 5 titanium models composed of two titanium surfaces that simulate the interface between an OT-Equator and its housing in a retentive bar for overdentures, were tested. Fifty models were cemented using the OT-Cem (Rhein83, Bologna, Italy) while the other 50 using SoloCem (Coltene, Altstätten, Switzerland). Five groups representing 5 different cement thicknesses (50 µm, 100µm, 150µm, 200µm, 250µm) were created for each resin cement basing on the diameter of the cylinder, simulating the OT-Equator housing. All the sample models produced were evaluated for fracture resistance by using traction tests, in two different times: at T0, 24h after the cementation, and at T1, after the 30000 thermic cycles from 5°C to 55°C, simulating a 3-years of aging.

Results: Statistical differences were found between the two cements both at T0 and T1; the mean values of traction force of SoloCem were three times higher than those of OT-Cem. The thermic cycles determined a reduction of the traction force values for the two cements, statistical evidence was found only for the SoloCem except for the 100µm thickness group. Significant differences were also found between the cement thicknesses, the lowest ones expressed the best fracture resistance.

Conclusions: From this study SoloCem showed a better fracture resistance than Ot-Cem, but SoloCem has been more stressed by the termocycling tests. For each group the cement thickness influenced the fracture resistance values. The 50 µm and 100µm thicknesses expressed the best fracture resistance for OT-Cem and SoloCem.

Wireless Technologies Compared. Precision and Accuracy on Screw-Retained Full-Arch Implant Rehabilitation

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Aim: The aim of this in vitro study is to measure and compare the reading depth detectable by three intra-oral scanners with wireless acquisition technology: Medit i700 w, Trios4 and CS3800.

Materials and Methods: Measurements were conducted on a titanium model representing an arch in an extended implant-prosthetic rehabilitation situation on six implants.

For each scanner to be examined, 9 scans of the entire model were taken by a single operator in order to avoid operator-dependent factors.

Each scan was matched (by means of the comparative software) to the individual scan-body scan, in which a point was placed in the exact center, so that the same reference points were used for each scan and each scanner and, therefore, the possibility of error during the path calculations was reduced.

Results: From the results obtained, it can be confirmed that there are differences in terms of accuracy between the different scanners examined compared to the reference values

Conclusion: There are differences in the accuracy of the scanners examined in regard to the reference measurements, particularly in the measurement of shorter distances compared to longer ones.

A Randomized Controlled Trial on Lithium Disilicate Partial Crowns Using a Novel Prosthodontic Functional Index For Teeth (FIT)

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Purpose: The aim of this clinical trial was to evaluate two lithium disilicate systems using a novel prosthodontic Functional Index for Teeth (FIT).

Materials and Methods: Thirty patients in need for partial posterior restoration were selected. Thirty teeth have been prepared and restored with partial adhesive crowns. Patients have been randomly divided in two groups, Group 1: restorations made with e.max press (Ivoclar), Group 2: restorations made with LiSi press (GC Co) and annually followed-up for 5 years. Seven variables (Interproximal, Occlusion, Design, Mucosa, Bone, Biology and Margins) were defined by FIT for evaluation using "0-1-2 scoring scheme", resulting in a maximum score of 14 per restoration. The patients' level of satisfaction was recorded and correlated with FIT.

Results: All crowns revealed survival rates of 100% without any biological or technical complications. At 5 years recall, the mean total FIT score was 13,26 and 13,66 respectively for Group 1 and 2. All seven variables were evaluated and scored with a media ranging from 1,73 to 2. No statistically significant differences were found between the two Groups. Patients expressed a high level of functional satisfaction at or above 80 on the VAS for both questions. A statistically significant positive correlation was found between total FIT score and Q1 ($\rho = 0,673$; $p = 0,006$) and Q2 ($\rho = 0,809$; $p < 0,001$).

Conclusions: Results showed that it is possible to point out the clinical behavior of partial crowns using FIT. The FIT score was an effective tool to evaluate the satisfactory outcome of the patient, know the possible risk of failures and check at each recall the performances of restorations.

Reliability of Digital Shade Selection: An In Vivo Study

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The objectives of the investigation: Clinicians are concerned with visual shade matching since it is a subjective issue. Various measurement instruments have been developed to aid in color selection. With the innovations of digitalization in dentistry, shade matching also shifted to that environment. From that clinical point of view, this study aims to in vivo evaluation of the reliability of instrumental shade matching methods.

Materials and Method: Twenty-two healthy individuals were selected. Shade matching was performed at the maxillary right central incisor tooth with a spectrophotometer (Vita EasyShade, Version 110 – Panadent limited, UK) clinically as the control group and two different intraoral scanners (3 Shape Trios4, 3Shape, Copenhagen, Denmark) (Planmeca, Helsinki, Finland)

digitally, three times. The Fleiss' kappa statistical test was used to examine the reliability. The weighted kappa statistical test ($\alpha = 0,05$) was used to assess the agreement between the colors matched by different methodologies.

Results: The color discrepancy rates did not show statistically significant difference among the 3 Shape intraoral scanner and the spectrophotometer ($p > 0,05$) while the Planmeca intraoral scanner showed statistical difference $p < 0,05$.

Conclusion: Instrumental methods for color shade matching were more reliable than the digital methods tested

Keywords: CAD-CAM, tooth color, Intraoral scanner, Dental shade matching

Accuracy of Digital Dental Models Obtained by Intraoral and Extraoral Scanning: An In Vitro Comparison

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Objectives of investigation: The aim of the present study is to comparatively analyse the accuracy of digital dental models obtained by intraoral (IO) and extraoral (EO) full-arch scanning.

Experimental methods used: A reference maxillary model (Frasaco GmbH, Tettngang, Germany) was scanned using an industrial scanner (XT H 225 ST, Industrial CT scan, Nikon Metrology Inc., U.K.), thus obtaining a reference digital dental model (REF). Two series of ten successive scans of the same reference model were subsequently performed, by both an extraoral (EO) scanner (Swing Dental Scanner, Dof Inc., Seoul, South Korea) and an intraoral (IO) scanner (TRIOS 3 Battery Cart, 3Shape, Copenhagen, Denmark), producing two groups of dental digital models, respectively ten EO and ten IO digital models. The first digital model in each group (1-EO, respectively 1-IO) was virtually compared to REF (within tolerances of ± 150 and $\pm 50\mu\text{m}$) using a 3D metrology software (Geomagic Control X) in order to

assess the trueness of the digital models. 1-EO and 1-IO were also virtually compared to the other nine digital models in each of their groups (within a tolerance of $\pm 50\mu\text{m}$) in order to evaluate the precision of the digital models.

Results: The overall dimensional compatibility with REF was 90.03% for 1-EO and 90.04% for 1-IO at a tolerance of $\pm 150\mu\text{m}$, respectively 83,66% for 1-EO and 80.21% for 1-IO at a tolerance of $\pm 50\mu\text{m}$. The percentage of the scanned data points found within tolerance limits was $93.57\pm 1.56\%$ for the EO digital models and $97.99\pm 0.65\%$ for the IO ones.

Conclusions: The EO digital dental models showed a slightly higher trueness - at a tolerance of $\pm 50\mu\text{m}$ - while the IO digital models demonstrated superiority in terms of precision.

Keywords: digital technology; dental models; accuracy; intraoral scanner; extraoral scanner

Effects of Post-Curing Light Intensity on Mechanical and Biological Properties of 3D Printed Resin

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Purpose: The purpose of this study was to evaluate the mechanical and biological properties of 3d printed crown and bridge resin with light intensity and post-curing time during the post-curing process.

Materials and methods: 3D printed specimens were post-cured for various times (5, 10 and 20 min) under different light intensity [20 intensity (526 mW/cm^2), 60 intensity (818 mW/cm^2), 80 intensity (1049.5 mW/cm^2), 120 intensity (1338 mW/cm^2)] and evaluated their flexural properties, Vickers hardness, degree of conversion (DC), cell cytotoxicity and cell viability. In addition, confocal laser scanning was used to assess the condition of human gingival fibroblasts.

Results: Flexural strength/modulus improved significantly as light intensity and curing time were increased. The Vickers hardness

was significantly higher in the 20-minute group than in the 5-, 10- minute groups. In comparison to green stage specimens, Vickers hardness increased dramatically with post-curing time and light intensity, and it gradually increased in all groups as light intensity and time increased. The same pattern of improvement was observed in the degree of conversion and cell viability.

Conclusions: This study has confirmed that the post-curing light intensity influences the final mechanical and biological properties of the 3D printed resin. In addition to light intensity and post-curing time, further research on various post-curing factors and post-curing conditions is required to improve the physical properties of 3D printed prostheses.

Keywords: additive manufacturing; three-dimensional printing; post-curing; CAD/CAM; flexural strength; Vickers hardness

How Digital Workflow Improves Efficiency and Predictability of Composite-Resin in the Treatment of Erosive Toothwear

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Introduction: As patients retain their dentitions' for longer, the management of the tooth wear has become increasingly relevant. The estimated global prevalence of erosive tooth wear in the permanent dentition lies between 20-45%. Composite resin offers an additive, conservative approach to the restorative of these cases. To increase the treatment efficiency we have harnessed digital workflow techniques to predictively treat erosive toothwear.

Case description: A 33 year old male patient was seen on the restorative department. Following a history and examination, the patient was diagnosed with generalised moderate-severe erosive tooth wear, caused by undiagnosed intrinsic acid reflux. After preventative advice and liaison with the patient's general medical practitioner, articulated study casts were used to prescribe diagnostic wax ups for indirect palatal composite veneers from the UR3-UL3 at an increased occlusal vertical dimension. Injection moulding was used to improve the appearance of the buccal surfaces and direct composite buildups were completed to restore the posterior defects.

Discussion: Additive techniques in the treatment of tooth-wear conserve the remaining tooth structure, whilst attenuating sensitivity, improving function, and restoring aesthetics. Composite-resin has been shown to be an excellent restorative material in the management of toothwear due to its favourable wear characteristics, versatile application methods, aesthetics, and ability to be bonded to underlying tooth structure. A range of techniques are available for its placement which include indirect palatal veneers, injection moulding and direct placement. The use of digital workflow for the design and manufacture of diagnostic wax ups, indirect restorations and application stents has enhanced these techniques further to increase chair side efficiency whilst producing predictable, functional, and highly aesthetic restorations. This clinical case abstract illustrates a range of techniques and discusses their relative merits to highlight the repertoire of techniques available to clinicians in the conservative management of erosive toothwear.

Keywords: composite, veneers, erosion

S.E.M. Evaluation Of The Marginal Accuracy Of Zirconia, Lithium Disilicate, And Composite Single Crowns Made By CAD/CAM Method: Comparative Analysis Of Different Materials

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Abstract: The objective of this in vitro study is to evaluate the marginal accuracy of crowns made by CAD/CAM method of Dentsply Sirona. A customized chrome-cobalt (Cr-Co) implant abutment simulating a maxillary right first molar was fixed in hemi-maxillary stone model and scanned by Cerec Primescan. Created the Project directly from Cerec Primescan, 27 crowns were fabricated, including nine Katana Zirconia, nine Cerec Tessera and nine Katana Avencia using Cerec inLab MC XL milling machine. The zirconias were sintered using Cerec SpeedFire. Descriptive analysis was performed using mean, standard deviation, and median, while the Kruskal-Wallis test was performed to determine whether the marginal discrepancies were significantly different between each group (significance level $p < 0.05$).

The mean and standard deviation of crowns by Katana Zirconia is 21.5 ± 4.2 ; Katana Avencia 45 ± 5.7 ; Cerec Tessera 62.3 ± 22.3 . The lowest marginal gap value by Katana Zirconia (21.5 ± 4.2). The Kruskal-Wallis tests revealed a statistically significant difference (p -value < 0.5) in the mean marginal gaps between different materials. The Dentsply Sirona digital workflow can be a viable alternative for fixed prosthetic rehabilitations. The best performance in terms of marginal gap was by Katana Zirconia crowns, but all three materials demonstrate marginal closure below the 120 microns taken as reference values.

Keywords: CAD/CAM; digital impression; marginal accuracy; scanner; SEM; Zirconia, Lithium Disilicate; Composite

Trueness of Intraoral Scanners in Implant-Supported Rehabilitations: An In Vitro Analysis

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Background: Intraoral scanners (IOS) are widely used in prosthodontics. However, a good trueness is mandatory to achieve optimal clinical results. The aim of the present in vitro study was to compare two IOS considering the operator's experience and different implant clinical scenarios.

Methods: Two IOS (IT—Itero, Align Technology; and OS—Opera MC, Opera System, Monaco) were compared simulating three different clinical scenarios: single implant, two implants, and full-arch rehabilitation. Ten scans were taken for each configuration by two different operators (one expert, one inexperienced); influence of operator experience and the type of scanner used was investigated.

Results: Trueness of the scans differed between the experienced and non-experienced operator and this difference was statistically significant in all the three scenarios

($p = 0.000-0.001, 0.037$). A significant difference was present between the scanners ($p = 0.000$), in the two-implant and full-arch scenarios ($p = 0.00$).

Conclusions: Experience of the operator significantly affected trueness of IT and OP scanners. A statistically significant difference was present among IOS in the two-implant and full-arch scenarios.

Deviation between Arbitrary and Kinematic Hinge Axis of the Mandible through Instrumental Functional Analysis

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Objectives of Investigation: Many diagnostic and rehabilitation concepts are based on the hinge axis determination and its transfer to articulation systems. The accuracy and the reproducibility of the methods used are crucial. In everyday practice an arbitrary hinge axis (AHA) is used. However, sophisticated electronic devices are also available for the determination of a "true" or kinematic hinge axis (KHA). Many authors suggest that a deviation of 3 to 5 mm is acceptable. The objective of the present study was to investigate the variation in terms of distance and direction in the sagittal plane between AHA and KHA localized during instrumental functional analysis.

Methods Used: Fifty (50) subjects, underwent instrumental functional analysis. The AHA was defined as a point on Campers line 10 mm from the superior border of the tragus. Cadiac 4 (Gamma, Vienna, Austria) was used for the axiography and

dynamic localization of the KHA. The distance between the two points and the direction of redeployment of the KHA relatively to the arbitrary one were measured. All measurements were performed twice by the same researcher.

Results: Intra-examiner reliability was high with no significant difference between the two measurements for both sides (t-paired test, $p > 0.05$). The mean deviation between KHA and AHA was 5.44 mm for the right side and 6.48 mm for the left side. The most frequent direction of KHA redeployment relatively to AHA was antero-inferior, 28% for the right side and 32% for the left side.

Conclusions: Under the limitations of this study, differences were found between the KHA and the AHA, both in terms of distance and location, suggesting that in complex prosthodontic cases, KHA localization should be seriously considered.

Evaluation of Shear Bond Strength of two Highly Translucent Monolithic Zirconia to Self-Adhesive Cement after Different Surface Pretreatment

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Objectives of Investigation: Aim of the study was to assess the effect of different surface pretreatments on the shear bond strength of self-adhesive resin-cement to highly-translucent CAD/CAM monolithic zirconia.

Methods Used: 2 brands of highly-translucent CAD/CAM-monolithic zirconia were evaluated: Zenostar-Zr-translucent(Wieland Dental;Pforzheim,Germany) and Ceramill-Zolid-fx preshade(Amann Girrbach AG, Koblach, Austria). 152-disc monolithic zirconia of two brands were used and prepared from pre-sintered blocks using 5-axis CAD/CAM system (VHF K5, Germany) and then sintered to the final required dimension(10 mm diameter, 3 mm height) in a special high-temperature furnace. After those 140-discs were divided into seven groups according to the surface treatment received:no treatment(control), 9.5% hydrofluoric(HF) acid-etching, sandblasting with 50µm Al₂O₃, sandblasting with 50µm Al₂O₃+Z-Prime-Plus, Cojet, Siljet, Fiber laser. Composite cylinders were bonded to zirconia disc with RelyX-U200 self-adhesive resin-cement according to manufacturer's instructions. All specimens were thermocycled (5000cycles, 5C/55C). 12-samples were used for surface roughness evaluation using SEM. Shear bond test was performed using the universal-testing machine. Failure modes were examined

using stereomicroscope and SEM. Data were analyzed statistically by using two-wayANOVA and posthoc Tukey's test.

Results: The bond strength was not statistically significantly different between two highly-translucent CAD/CAM zirconia (p:0.055;p>0.05). The bond strength was significantly affected by the surface treatment(p:0.000;p<0.05). The highest shear bond strength for Zenostar was reported as fiber laser(17,81±2MPa). The highest shear bond strength for Ceramill was reported as fiber laser(21,7±3,55MPa). There was no statistically significant difference between bond strength of tribochemical silica-coating(Cojet,Siljet) and sandblasting Z-Prime-Plus for both monolithic zirconia. The predominant failure mode was cohesive failure for fiber laser groups and mixed failure for Cojet, Siljet, and sandblasting Z-Prime-Plus groups.

Conclusions: HF-acid surface treatment for one-hour is not effective for bond of monolithic zirconia. Cojet, Siljet, and sandblasting with Z-Prime-Plus is the best available cementation protocol for highly-translucent monolithic zirconia. Fiber laser enhanced shear bond strength of two highly-translucent CAD/CAM monolithic zirconia, however it led to discoloration of zirconia.

Keywords: Shear bond strength, CAD/CAM, monolithic zirconia, self-adhesive resin cement, surface pretreatment.

Mouthguard Usage: Knowledge and Awareness of Sports-related Dental Injury Among National Paralympic Athletes

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Background and Aim: Higher incidence of sports-related dental injury among Paralympic athletes was reported compared to able-bodied athletes. The risk of getting dental injury can be minimized by using a properly fitted mouthguard. In Malaysia, information on dental injury and mouthguard usage among national Paralympic athletes is still lacking. Thus, the study aimed to determine the knowledge of dental injury and awareness of the utility of mouthguards among athletes.

Method: Athletes were recruited randomly from different types of sports at the National Sports Institute. A cross-sectional survey evaluating knowledge, self-reported dental injury, and mouthguard usage was extracted from the structured questionnaires. Oral examination was performed to identify hard or soft tissue injury. For the quantitative approach, athletes were guided to answer the questionnaires that are divided into Part 1: Changes experienced by athletes, and Part 2: Athletes' evaluation of characteristics of their mouthguards. They rated their experience using the Visual Analog Scale (VAS) 100-mm, where 1 means "almost not affected" and 100 means "very affected".

Results: A total of 60 athletes (83.3% male, 16.7% female) participated in this study. Out of 60 athletes, 30.0% experienced sports-related dental injury, the highest was basketball (15.7%), followed by cycling (12.4%). The common self-reported injury was lip laceration (36.7%) and bruised face (25.0%). Less than 15% of the teeth injuries related to sports were observed during the examination. Only 25.0% of the athletes have adequate knowledge and awareness of managing dental injury. Most athletes (90.0%) acknowledged that mouthguards can be used to prevent sports injuries during training and competition, but only 10.0% had used them and the majority were ready-made types.

Conclusion: Knowledge and awareness regarding sports-related dental injury must be clearly delivered and the use of a mouthguard as a preventive appliance is strongly advocated.

Keywords: Awareness, Dental injury, Malaysia, Mouthguard, Paralympic athletes.

Selection of Precision Attachment for Attachment-retained Partial Denture Prosthesis: A Case Series

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Introduction: Attachment-retained partial denture prostheses (ARPDP) has long been considered advantageous in dentistry as it combines fixed and removable prosthodontics in such a way as to enhance aesthetic in removable prostheses. Nonetheless, most dental professionals have largely neglected the option in the past for legitimate reasons, due to its complicated technique and high technical demand especially in treatment planning, designing and fabrication.

Case Description: This case series describes various types of partial edentulism, including Kennedy Class I and Class IV, rehabilitated with precision attachments to address their functional and aesthetic needs. Implant therapy were excluded as the treatment of choice due to several reasons including systemic health condition, alveolar bone quality and quantity, and lengthy treatment time. Precision attachment systems that were incorporated in this case series were OT Cap & OT Strategy from RHEIN 83 attachment system and Root Locator from ZEST

Dental Solutions. The prescribed ARPDPs were able to improve the retention of the previous prosthesis. Furthermore, the patients were pleased with the treatment's aesthetic results.

Discussion: The inclusion of extra-coronal attachment in the construction of ARPDP was deemed a potential treatment modality whenever it is indicated. The success of ARPDP is governed by appropriate treatment planning during pre-prosthetic assessment. Different precision attachment systems were utilized based on the individual clinical parameters such as restorative space availability and edentulous span area. Mechanical factor such as the resiliency and rigidity of the extra-coronal attachment system were also considered. However, presence of precision attachment can complicate oral hygiene care. Hence, meticulous case selection with adequate post-op denture hygiene instructions is essential.

Keywords: Removable partial denture, Extra-coronal attachment, Custom attachments

Maxillary All-on Four VS Six Implants Supported Fixed Prostheses: Case Reports

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Introduction: When planning treatment for edentulous arches, the appropriate number of implants required to support a fixed full-arch prosthesis still seems to be debatable. The aim of these reports was to describe the treatment of two patients with completely edentulous maxilla with two types of fixed-implant supported prostheses on four and on six implants.

Case Description: The use of six implants positioned in a parallel configuration with the appropriate distribution in the edentulous maxilla to support a metal-ceramic fixed prosthesis is described in the first case report. The second report presents the "All-on-four" concept. This treatment option is based on the placement of four implants in the premaxillary region in

the completely edentulous maxilla to support a fixed full-arch prosthesis. Combining two tilted (distal) and two axial (anterior) implants for supporting screw-retained metal-resin fixed prosthesis can be considered a viable treatment modality resulting in a simpler, decreased financial cost and less time consuming procedure.

Discussion: The advantages and disadvantages of these two treatment options were discussed so that the patients may have a realistic perspective of their prosthetic rehabilitation. The number of four to six implants is recommended for both fixed and removable rehabilitation of the maxilla to achieve retention, support and stability for predictable longevity.

Full-mouth Rehabilitation of a Bulimic Patient with All-ceramic Table-tops and Canine Chips

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Introduction: Gastric acid is one of the most corrosive fluids and under specific circumstances it can be found for a restricted period of time in the oral cavity. Dental hard tissues can be progressively dissolved by gastric acid in patients suffering from gastroesophageal reflux disease, eating disorders, such as anorexia nervosa or bulimia nervosa, or pregnant women with alterations in gastrointestinal mobility. The rehabilitation of such worn dentitions is challenging. Aim of the present report is to describe a modern and minimal invasive full-mouth rehabilitation of a bulimic patient with the use of all-ceramic CAD/CAM materials.

Case description: A middle-aged woman proceeded to our clinic with a history of bulimia seeking for functional and aesthetic rehabilitation. The clinical and radiographic examination revealed numerous erosive lesions and a decreased vertical dimension of occlusion. Adaptation to the new vertical dimension was achieved with CAD/CAM table-tops in the posterior area,

while canine guidance was given with canine chips in the anterior area. After a 4-month rehabilitation the provisional restorations were replaced by lithium disilicate table-tops on molars and premolars, whereas anterior teeth were restored with lithium disilicate conventional and sectional veneers.

Discussion: Novel all-ceramic materials require only minimal preparation which makes them an excellent rehabilitative option for situations where the patient does not want to suffer further wear on the teeth. Table-tops covering the occlusal and buccal surface, as well as anterior ceramic chips restoring canine guidance warrant maximal preservation of dental hard tissues. The 10-year follow-up revealed no biologic or technical complications. The use of sectional veneers and table-tops could be a suitable alternative to conventional restorative approaches.

Keywords: bulimia nervosa, sectional veneers, ceramic chips, table-tops, dental wear

Different Palatal Morphologies On Trueness And Accuracy Of Intraoral Digital Impressions: An In Vitro Study

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Objectives of Investigation: Compare the accuracy of intraoral digital impressions for whole upper jaws, to determine the possible effects of different palatal vault height, width and morphologies and the presence or absence of marked palatal wrinkles on the accuracy of intraoral digital impressions, performed by different intraoral scanning systems (IOSs).

Methods Used: Six different typodonts were fabricated for different types of palate, as follows: flat, average and deep palate; each type was designed with and without palatal wrinkles and named as follows: average palate without wrinkles: SAMP average palate with wrinkles: SAMPW flat palate without wrinkles: SAMP-5 flat palate with wrinkles: SAMPW-5 deep palate without wrinkles: SAMP+5 deep palate with wrinkles: SAMPW+5 Each typodont was scanned with a laboratory scanner (control) and different IOS systems (test); test groups were made up of 10 scans each. Scans in STL format were imported into a dedicated software program and trueness and precision were evaluated in μm .

As regards statistical analysis the Kruskal-Wallis and the Dunn tests were performed to analyze differences among groups. Results: Mean values for trueness were: SAMPW = 48.7; SAMPW5 = 85.9; SAMPW-5 = 161.7; SAMP = 48.1; SAMP5 = 349.1; SAMP-5 = 349.9. Significant differences were found for SAMP vs SAMP-5 ($p < .001$); SAMP vs SAMP5 ($P < .001$); SAMPW5 vs SAMP5 ($p = .003$). Mean values for precision were: SAMPW = 46.7; SAMPW5 = 48.9; SAMPW-5 = 46.9; SAMP = 46; SAMP5 = 72.6; SAMP-5 = 105.9. Significant differences were found for SAMPW-5 vs SAMP-5 ($p = .015$).

Conclusions: The best accuracy was found on the average models. Moreover, the trueness and precision of a wrinkled model were better than the smoothed one, respectively on a flat and on a deep palate. Nevertheless, the mean values of trueness and precision are clinically acceptable for each experimental group.

Assessment Occlusal Morphology Zirconia Crowns: Correlation Technique Versus Library Method

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Purpose: The purpose of this clinical trial was to compare the occlusal morphology of monolithic zirconia crowns of molars designed by using correlation technique and library technique.

Material and Methods: 28 molars of 24 participants were included in this trial. For the each tooth one interim crown and two definitive crowns were constructed. The definitive crowns were fabricated by using the correlation technique or the library technique. The interim and definitive crowns were evaluated intraorally for Intercuspal occlusion and lateral interference, while were recorded by using articulating paper 24-micron-thick. The clinical photographs were taken immediately to calculate area of static and dynamic contacts (SDC) using software (ImageJ) and analyzed by the Kruskal-Wallis test.

Results: The average and \pm standard deviation (SD) of area of the occlusal contacts on interim crowns was $32.27 \pm 3.45 \text{ mm}^2$.

The areas of definitive crowns designed by using the correlation technique and library technique respectively were $31.01 \pm 3.73 \text{ mm}^2$ and $36.85 \pm 5.78 \text{ mm}^2$. No statistically significant difference was found ($p = 0.091$) between the occlusal contacts areas of the interim and definitive crowns designed by using the correlation technique. Instead, there were significant differences between the areas of occlusal contacts of the interim and definitive crowns designed by using the library technique, and between the areas of occlusal contacts of definitive crowns designed by using the correlation and library techniques ($p < 0.001$)

Conclusion: The occlusal information of definitive crowns designed by using correlation technique is similar to that one of interim crown. Crowns designed by using the correlation technique produced improved SDC compared to the library method that is less effective.

fMRI Study on Facial Perception After Complex Aesthetic Rehabilitation: Perception of the Self and the Perception of Others' Face

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Introduction: This case was solved using functional magnetic resonance imaging (fMRI). We went to search for the activation of neural patterns involved in the visual processing of photographic images depicting the self (SELF) and similar images depicting other subjects (OTHER). Each of these images portrayed the subjects during the different phases of prosthetic rehabilitation: the pre-treatment phase (PRE), the virtual design phase using the Smile Lynx software (3D Lynx) (VIR) and the post-rehabilitation phase (POST).

Case description: Eighteen volunteers, aged between 22 and 67, have been studied with magnetic resonance imaging. During the acquisition, the subjects were shown the aforementioned photographic images (SELF-PRE, SELF-VIR, SELF-POST, OTHER-PRE, OTHER-VIR, OTHER-POST) in an almost randomized order. Then, a group analysis was conducted on two levels by analyzing the mixed effects using statistical contrasts; these contrasts had as their target, respectively, the Main Effect on Identity (SELF vs

OTHER), the Main Effect on prosthetic rehabilitation (PRE vs VIR - vs POST) and the effects of integration between these two factors. All reported effects exceeded a maximum declared peak $p < 0.05$, using a Family Wise Error (FWE) correction type for multiple comparisons.

Discussion: The results showed bilateral involvement of the dorsolateral and fronto-parietal areas with regard to the Main Effect of Identity, and a Phase-on-Identity interaction concerning the PRE and POST phases at the level of the Supplementary Motor Area (SMA) of the right hemisphere. This interaction became more evident when the subjects were observing a photo portraying the self (SELF) in the post-rehabilitation phase (POST) compared to the various other experimental conditions. These data represent an important starting point for future studies, offering a possible neuro-cognitive measure of how self-perception can vary as a consequence of aesthetic dental rehabilitation.

Evaluation of Two Lithium Disilicate System using a Novel Prosthodontic Functional Index for Teeth (FIT)

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Objectives: The aim of this trial was to evaluate clinical performance of two lithium disilicate systems (LiSi press vs LiSi Block, GC Co., Tokyo, Japan) using a novel prosthodontic Functional Index for Teeth (FIT) after two years of clinical service.

Methods: Partial adhesive crowns on posterior teeth were made on sixty patients. Patients were randomly divided into two groups: Group 1 Initial LiSi press and Group 2 Initial LiSi Block. Fabrication of partial crowns was made with full analog and digital workflows in Group 1 and 2 respectively. The restorations were followed-up for 1 year, and the FIT evaluation was performed at baseline and last recall. The FIT is composed of seven variables: Interproximal, Occlusion, Design, Mucosa, Bone, Biology and Margins. Each of them is evaluated using a 0-1-2 scoring scheme and are investigated using an intraoral radiograph and occlusal and buccal pictures. More specifically, the variables are scored as follows; the presence or not of major, minor or no discrepancy ('Interproximal', 'Occlusion' and 'Design'), presence or not of keratinized and attached gingiva ('Mucosa'), presence of bone loss >1.5 mm, <1.5 mm or not detectable ('Bone'), presence or not of Bleeding on Probing and or

Plaque Index ('Biology'), presence of detectable gap and marginal stain or not ('Margins'). The Mann-Whitney 'U' test was used, and the level of significance was set at $p < 0.05$. Also, "success" of the crowns (restoration in place without any biological or technical complication) and "survival" (restoration still in place with biological or technical complication) were evaluated.

Results: Regarding FIT scores, all evaluated parameters showed a high score, between 1.85 and 2. No statistically significant difference emerged between the two groups in any of the assessed variables ($p > 0.05$). No statistically significant difference was seen between scores recorded at the baseline and the recall. All FIT scores were compatible with the outcome of clinical success and not one restoration was replaced or repaired. The success rate was 100% after 2 year of clinical service. Conclusions: The FIT can be helpful as a standardized evaluation of the quality of prosthodontic therapy. The two lithium disilicate materials showed similar results after 2 years of clinical service. Consequently, no clinical difference between analog and digital procedures was found when LiSi was used. Longer observation times are needed to confirm these preliminary results.

Evaluation of Internal and Marginal Adaptation of the Lithium Disilicate Crowns Fabricated on Different Models

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Objectives of Investigation: The aim of this study is to evaluate the marginal and internal adaptation of monolithic lithium disilicate crown restorations prepared on different models which obtained from digital and conventional impression methods.

Methods: 1st molar tooth prepared for a complete full ceramic crown (2.0 mm occlusal, and 1.5 mm axial reduction, 1 mm shoulder finish line) on a phantom model, then impressions were taken using two different methods (conventional and digital). In conventional method digital STL models (CSTL Group), plaster models with type IV dental stone (CP Group) and 3D printed resin models (C3D Group) were obtained from scannable additional silicone impression material (Hydrorise Implant heavy/light), using putty/wash one-step impression technique. In digital method digital STL (DSTL Group) and 3D printed resin (D3D Group) models were obtained from the digital impressions taken with an intraoral scanner (Medit i500). Lithium disilicate (IPS.e.max CAD) full crowns (N=50) were prepared on the models by using computer-aided design/computer-aided

manufacturing (CAD / CAM) technique. The marginal and internal adaptation of the crowns were evaluated with the silicone replica technique and stereo microscope at x40 magnification. The data were statistically analysed (two-way ANOVA, Tukey's, $p < 0.05$).

Results: There were no interaction with model type and adaptation values of crowns ($p > 0.05$) The lowest marginal and internal adaptation values were obtained in the crowns produced on the Group D3D models, and statistical difference were found between the other groups ($P > 0.05$). The highest marginal and internal opening values were obtained in Group C3D models.

Conclusion: In all 5 different model groups, the best adaptation values were obtained on 3D resin models printed directly from digital impression. Model type was not effect the marginal and internal adaptation. In overall the gap values obtained on different models are below the clinically acceptable maximum gap value ($< 120 \mu\text{m}$).

Study of Trueness in CAD/CAM Complete Dentures

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Objectives of investigation: to compare the trueness of 3D printed versus milled complete denture bases.

Methods used: study used frasaco (Tettng) edentulous model of the upper jaw which was duplicated using silicone duplicating material. Eight casts were poured with type 3 dental stone. Every cast was scanned using laboratory scanner, and on that digitalized cast in appropriate software was modeled denture base with same thickness of 3 mm everywhere. Modeled denture bases were exported as STL files. From the same STL file was denture base 3D printed (IMPRIMO® LC Denture, Scheu Dental) and also milled (IvoBase CAD, Ivoclar Vivadent) according to manufacturer's instructions. The intaglio surface of 3D printed and milled denture bases (16 completely) were scanned with laboratory scanner. The obtained STL file of 3D printed and milled denture base was aligned with reference STL file from which denture bases were made. Deviation values between intaglio surfaces were recorded – highest values of deviation (plus

and minus values) and deviation label sigma (SD of deviation values for all inspected points of mesh). Comparison was made in GOM Inspect software (GOM metrology). Independent samples T test was applied.

Results: Mean value of highest minus deviation values for milled denture bases was $-0,10 \pm 0,01$ and $-0,84 \pm 0,11$ mm for 3D printed. Mean value of highest plus deviation values was $0,23 \pm 0,14$ for milled denture bases and $0,47 \pm 0,10$ mm for 3D printed. Deviation label sigma for milled dentures was $0,04 \pm 0,01$ and $0,14 \pm 0,03$ mm for 3D printed. Independent samples T test showed differences between 3D printed and milled dentures for highest minus values ($p=0,002$) and deviation label sigma ($p=0,010$), while in highest plus values were not proved differences ($p=0,331$).

Conclusions: Milled dentures show better trueness compared to 3D printed. Clinical confirmation of findings is needed.

Keywords: denture base, CAD/CAM

Factors Influencing the Number and Duration of Follow Up Visits after Insertion of Complete Dentures

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Objective of Investigation: It is necessary for most patients who were inserted newly fabricated complete dentures to make several follow-up visits, due to discomfort. There are several factors that can affect the number of follow up visits and total duration of adjustments. The objective of this investigation was to analyze the number and duration of follow-up visits according to various factors.

Methods used: This is a retrospective investigation conducted at the National Health Insurance Service Ilsan Hospital, South Korea. This investigation assessed variables in complete dentures that were delivered to patients who aged 65 or more from 1 July 2012 to June 30 2017. The variables include age, sex, jaw with complete denture, insurance coverage of denture, type of opposite dentition, experience of wearing denture, healing period after extraction, and the type of denture base. Mann-Whitney U test, Kruskal-Wallis H test and Spearman's correlation were used for analysis.

Result: 247 complete dentures were involved in this investigation. The median number of follow-up visits was 3, and the median duration of follow-up was 36 days. In the number of follow up visits, there was no statistically significant difference with variables except jaw with complete denture and type of opposite dentition. In the duration of follow up visits, there was no statistically significant differences with all variables. Comparing upper and lower jaws with complete denture, Mandibular dentures showed significantly higher number of follow up visits than maxillary dentures ($p=0.036$). In type of opposite dentition, complete dentures opposed to a complete denture showed significantly higher number of follow-up visits than complete dentures opposed to a removable partial denture ($p=0.016$).

Conclusion: Within the limitations of present study, mandibular complete dentures and complete dentures opposed to complete denture had an increased number of follow up visits.

Therapy of the Lower Jaw Using Overdenture Retained with Precision Ball and Bar Attachments

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Introduction and Objective: This clinical case demonstrates stability of mandibular overdenture using milled precision bar and two coronally positioned precision attachments.

Case report: 65 yrs. old male patient had two preserved canine roots in lower jaw. Semicircular fused to metal ceramic (PFC) bridge was previously fabricated for upper teeth. The canals of two disparallel roots of mandibular canines were prepared removing 2/3 length of one canal root filling and up to 1/3 of canine root canal filling on the contralateral side. After definite impression of the mandible by A-silicone in custom tray, master cast with prepared canals of roots of canines was provided. Two posts connected with milled precision bar (Bredent, VSP-FS/GS, Germany) were designed. Coronal attachments-patrixs (Bredent VKS-uni 1.7 mm, Germany) were than positioned onto the tip of each coronal part of the construction with axial direction of precision attachments towards roots of canines and root canals. Decision for fabrication of milled bar and metal framework of overdenture was established due to presence

of PFC bridge in the upper jaw. The construction was invested and casted (Remanium, Dentaurum, Germany). Metal framework of overdenture was designed and casted (Co-Cr-Mo alloy) than. After interocclusal record, the artificial anatomic teeth were selected and waxed model of overdenture with matrixs was provided for try-in clinical phase. Finally the overdenture was flaked and polished. Metal construction of two posts and milled bar were cemented simultaneously with overdenture, using self adhesive resin cement (Totalcen, dual-cure, Itena Clinical, France).

Discussion: Milled bar both improve retention and stability of metal framework of overdenture. Coronally positioned patrix of attachment provides redirection of occlusal and other functional forces towards apical root parts. Disparallelities of two remaining roots could be overcame by calculation of allowed angle between posts that allows positioning of metal supporting construction in one manual manipulation.

Post-menopausal Osteoporotic Women's Life Quality with Dental Implant Restorations with or without Hormone Replacement Therapy

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Objectives of Investigation: This multicenter retrospective study examined the relationship, possible interactions, and intermittent effects that dental implants and prostheses can have on menopausal osteoporotic women's quality of life (QoL), concerning the functional and psychological aspects influenced by the role of hormone (estrogen) replacement therapy (HRT).

Methods Used: Questionnaires consisted of selected quality of life (QoL) questions based on specific and additional medical and dental (mainly prosthodontic) questions, were administered to 65 post-menopausal osteoporotic women (Age: Mean Value=63,62y.o. with dental implants and implant restorations, or conventional prosthetic restorations visiting two University Hospitals. Participants were divided in two groups according to estrogen levels (Estradiol>20pg/ml or <20pg/ml) and receiving or not HRT. Pearson Chi-Square, Likelihood and Linear-by-Linear Association tests were used for the statistical analysis.

Results: Post-menopausal women without HRT had more QoL problems (33,3%) comparing to those with HRT (24,6%). The comparison did not reach statistical significance (P=0.253>0.05). Implant problems due to osteoporosis in all groups showed no statistically significant differences.

Conclusions: The post-menopausal estrogen status on QoL in osteoporotic women with implants showed that unsupplemented with HRT post-menopausal women had more "functional and psychological" problems on their quality of life. Although a statistical difference was not revealed, the HRT reduced the problems. These results suggest that estrogen deficiency associated with menopause may influence the QoL in women with dental implants.

Keywords: Dental Implants, Osteoporosis, Quality of Life (QoL), Menopause, Hormone Replacement Therapy (HRT).

A Comparative Study of Accuracy of Implant Surgical Guide Fabricated from Two Different 3D Printers

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Objectives of Investigation: The aim of this study was to evaluate the accuracy of the implants placed using two different digital surgical guides.

Methods Used: A resin model was prepared with missing mandibular 1st molar and an intraoral digital impression was made. A surgical guide was designed on the software (In2guide) based on the preoperative CBCT of the model and the scan image file. After preoperative planning, 15 surgical guides were produced with a stereolithography (SLA) printer and 15 with a digital light processing (DLP) printer. Guided surgeries of 30 dental implants were performed, and digital scans of each implant were made. The implant coronal and apical deviations and the angular deviations between the planned and placed implants

were measured for each implant. The T-test was performed to evaluate the differences between the 3D printers.

Results: The mean coronal, apical and angular deviations for SLA group were 2.93 ± 1.48 mm, 2.87 ± 1.47 mm and $2.79^\circ \pm 1.30^\circ$ respectively, while for DLP group were 3.09 ± 1.30 mm, 3.16 ± 1.30 mm and $2.42^\circ \pm 1.76^\circ$ respectively. No significant differences between SLA and DLP groups were found for any of the measurements.

Conclusions: The implant surgical guide produced with SLA and DLP 3D printers showed similar accuracy in implant placement for position and angle of the implants.

Keywords: Surgical Guides, 3D Printing, Stereolithography, Digital Light Processing.

Is Deep Margin Elevation a Viable Alternative for Extensive Carious Lesions? A Review

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Objective: To review the literature and clarify whether deep margin elevation (DME) is a reliable technique to adopt for the restoration of deep proximal lesions.

Methods: A search in the literature was conducted for evidence-based research articles referring to DME published from January 1998 until November 2021 using MEDLINE (PubMed), Ovid, Scopus, Cochrane Library and Semantic Scholar databases. The following terms were used as key words: "deep margin elevation", "proximal box elevation", "cervical margin relocation", "coronal margin relocation". Supplementary manual research was also performed screening the references from the articles that emerged from the initial selection.

Peer reviewed papers written in English regarding DME and related terms, in human permanent teeth, constituted the inclusion criteria. Papers not written in English, duplicates, critical appraisals and articles not focusing on the aspects of DME were excluded from further evaluation.

Results: DME relocates the cervical margin coronally in a conservative way, thereby facilitating field isolation, impression taking and cementation. Elevation material and adhesive system employed for luting seem to be significant factors concerning the marginal adaptation of the restoration. This technique does not affect bond strength, fatigue behavior, fracture resistance nor failure pattern or reparability. DME and subgingival restorations are compatible with periodontal health given that they are well-polished and refined.

Conclusions: DME is a promising technique. The available literature is limited mainly to in vitro studies. Therefore, randomized clinical trials with extended follow-up periods are necessary to clarify all aspects of the technique and ascertain its validity in clinical practice. However, DME should be applied with caution respecting three criteria: capability of field isolation, the perfect seal of the cervical margin provided by the matrix, no invasion of the connective compartment of biologic width.

Keywords: deep margin elevation, proximal box elevation, cervical margin relocation, coronal margin relocation, deep caries

Evaluation of Microcracks Formed by Grinding in Lithium Silicate Glass-Ceramic Block for CAD/CAM.

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Objectives: In general, when the lithium disilicate (LDS) glass-ceramics is fabricated by machine, microcracks are formed on the prosthesis. In clinical situation, these microcracks are removed by polishing or glazing. However, in case of that microcracks remain on the prosthesis, microcracks become one of factors of fracture. The objective of this study was to evaluate microcracks on surface of LDS glass-ceramic block for CAD/CAM formed by grinding through polishing.

Methods: Three test groups were prepared, 1) LiSi block (GC, LS), 2) e.max CAD (Ivoclar Vivadent, EM), 3) CELTRA DUO (Dentsply-Sirona, CE). Samples of each material were fabricated by CEREC MC XL (Dentsply-Sirona). EM was crystallized after fabrication using EP5000 (Ivoclar Vivadent) following to the manufacturer's instruction. These specimens were polished by following manufacturer's instruction. Specimens were immersed

in 0.2% methylene blue solution to visualize microcracks on the surface using digital microscope (VHX-7000, KEYENCE) (n=12). Number of microcracks were statistically analyzed by Tukey's test ($p < 0.05$). To confirm the microstructure, SEM (SU-70, HITACHI) observation of other fresh specimens immersed in 5N NaOHaq at 60° for 5-days was also carried out, and relative crystalline surface area (RCSA, n=5) was calculated by ImageJ (NIH).

Results: Some microcracks were observed on sample surface after polishing. Table 1 shows the number of microcracks of each sample. Microcracks of LS and EM were significantly less than CE after polishing. LS and EM have higher value of RCSA compared to CE. LS showed less microcracks because it has high RCSA. In contrast, CE had many microcracks because it has low RCSA.

Resin Bonding to CAD/CAM and Pressed Lithium-Disilicate after Surface Decontamination

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Introduction: To evaluate the effect of surface decontamination on the micro-shear bond strength (μ SBS) of CAD/CAM vs pressed lithium-disilicate (LiSi) ceramic to resin cement.

Experimental Methods: Twenty CAD/CAM LiSi specimens (Ips E.max CAD HT A2, Ivoclar) and 20 LiSi ingots (Ips E.max Press HT A2, Ivoclar) were prepared (4x4x4mm). After ultrasonic cleaning in ethanol for 2 min, the specimens were contaminated with fresh human saliva and try-in silicone paste. The following surface cleaning were performed (N=10): 1) water rinsing (control, C) or 2) Monobond Etch&Prime (MEP, Ivoclar) rubbed for 20s. Composite cylinders were luted with a resin cement to the decontaminated surfaces. After storage for 24 h at 37 °C the μ SBS

test was conducted. Two fractured specimens per group were observed under SEM. Data were statistically analyzed ($p < 0.05$).

Results: The type of material significantly influenced the results ($P < 0.001$). The pressed LiSi achieved higher bond strength values than CAD/CAM material ($P < 0.05$), independently the surface was contaminated ($P < 0.031$) or not ($P < 0.012$). In general, SBS values were higher in the non-contaminated groups, even though the differences were not statistically relevant ($P > 0.05$).

Conclusions: The two LiSi ceramics (CAD/CAM vs press) responded differently to surface contamination. Higher bond strength values were obtained with press ceramic. Further studies are warranted to evaluate the effects of surface contamination in the long-term.

A Randomized Controlled Clinical Trial on Two Types of Lithium Disilicate Partial Crowns

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Objectives of Investigation: This randomized controlled clinical trial evaluated the behavior of lithium disilicate partial crowns by means of a novel Functional Index for Teeth (FIT).

Methods Used: 105 subjects in need of at least a single prosthetic restoration in posterior areas were treated with adhesive partial crowns (for a total of 170 restoration) onto natural vital abutment teeth and followed up annually for 5 years. All teeth were vital, at least one cusp was covered, margins were kept mainly in enamel (i.e., more than 50%) and place juxta or supra gingivally and only interproximal boxes had cervical margins below cementum-enamel junction. Subjects were randomly divided into two experimental groups: Group 1, E.max Press and Group 2; Initial LiSi Press. FIT was used for the objective assessment of outcomes including clinical and radiographic examinations. A dropout rate of 4,25% in Group 1 and 3,4% in Group 2

was recorded. FIT is made up of seven variables (interproximal, occlusal, design, mucosa, bone, biology, margins); each of them to be evaluated using 0-1-2 score. The Mann-Whitney U test was applied for statistical analysis and the level of significance was set at $P < 0.05$.

Results: In group 1, five complications were recorded, and four in Group 2, with a failure rate of 6.25% and 6.17% respectively. No statistically significant difference was found between the experimental groups in any of the assessed variables.

Conclusions: The tested lithium disilicate material brands showed comparable clinical performance after 5 years of clinical service.

Keywords: Ceramics, Crowns, Dental Porcelain, Dental Prosthesis Design, Dental Restoration Failure

The Shear Bond Strength Between Milled Denture Base Materials and Artificial Teeth: A Systematic Review

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Objectives of Investigation: The data about shear bond strength between digitally produced denture base materials and artificial teeth are scarce. Several studies investigated shear bond strength values between milled denture base material and different types of artificial teeth. The aim of the present study was to compare and evaluate the available evidence through a systematic review, and to enable the selection of optimal material for a given clinical situation.

Methods Used: A bibliographic search was conducted in PubMed, Scopus, and Web of Science to assess adequate studies published up to June 1st 2022. This review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The studies that determined the shear bond strength values between milled denture base materials and artificial teeth were selected. The search identified 15 studies which were included in PRISMA 2020 flow diagram for new systematic reviews. Studies that scored between 0 and 3 were

categorized as being at low risk of bias, studies with score between 4 and 7 as moderate risk, and scores between 8 and 10 as high risk.

Results: Only 3 studies met inclusion criteria and according to PRISMA 2020 present moderate risk of bias (score 6). The risk of bias is as follows: single operator of the machine, depiction of the sample size calculation, and blinding of the testing machine operator. The scores for these parameters were basically low (score 2) when compared to other risk of bias parameters (score 0).

Conclusions: Shear bond strength values significantly depend on the chosen combination of denture base and denture tooth material ($p < 0.05$). In order to upgrade the quality of future studies, it would be advantageous to use larger number of specimens with standardized dimensions, and blinded testing machine operator to decrease the risk of bias.

Keywords: Dentures; CAD-CAM; Artificial teeth; PRISMA 2020

An in vitro Study of the Accuracy of Dental CAD Programs in Designing a Fixed Partial Denture.

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Purpose: Error testing at each stage of prosthetic manufacturing remains relatively underdeveloped for computer-aided design/computer-aided manufacturing methods, and no experimental studies have validated the computer-aided design programs. This study aimed to test the accuracy and trueness of the computer-aided design of a three-unit fixed prosthesis.

Materials and Methods: Three computer-aided design programs (E, D, and I) were tested on the designs of a three-unit fixed partial denture, and a three-dimensional analysis program was used to calculate the internal clearance error for the computer-aided design prostheses. The Kruskal–Wallis and Dunn’s *post hoc* tests were used to reveal significant differences in trueness between the three computer-aided design programs ($\alpha < 0.05$).

Results: D showed the lowest mean error values for #24 and #26 at the mesial margin (both 0 μm), mesial wall (0.10, 0.12 μm , respectively), occlusal surface (–0.05, 0.10 μm), distal wall (0.23, –0.02 μm), and distal margin (both 0 μm). In sum, except for the mesial margin and distal margin site of tooth #26, the mean error value of D was statistically the lowest, followed by those of E and I ($p < 0.003$).

Conclusions: The accuracy of computer-aided design differed according to the type of computer-aided design program. D achieved the best trueness at the margins, axial walls, and occlusal surface, followed by E and I.

Evaluation of Wear Resistance in Machinable Lithium Disilicate Glass-Ceramics

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Objectives of Investigation: Lithium disilicate (LDS) glass-ceramics are material with high mechanical strength. Therefore, LDS glass-ceramics are expected the long-term durability in oral environment and wear resistance is one of the important properties. The purpose of this study was to evaluate wear resistance of machinable LDS glass-ceramic blocks.

Methods Used: Specimens of three LDS glass-ceramics in the Table were fabricated by CEREC MC XL (Dentsply Sirona). The testing surface was defined as 2.1mm-diameter. Then, specimens were processed by following manufacturer’s instructions (LS: Polishing, EM: Crystalization-Polishing, CT: Firing). These specimens were attached to the wear test machine (Tokyo-Giken) and contacted with hydroxyapatite as the antagonist. The test was performed 300gf load with sliding movement in water

for 10,000 cycles. The wear-height was calculated from the difference between baseline and worn-height ($n=4$). SEM (SU-70, HITACHI) observation was also done and relative crystalline surface area (RCSA, $n=5$) of LDS glass-ceramic block was calculated by ImageJ (NIH).

Results: The results of wear test and RCSA value were shown in the table. Same lowercase in wear-depth indicates no significant difference (Tukey’s test, $p<0.05$). We found LS has the highest wear resistance among 3 machinable glass-ceramics. These glass-ceramics had similar RCSA value. However, the crystal grain size of LS is smaller comparing to EM and CT. The feature is considered to affects to the wear resistance of glass-ceramics.

Conclusions: LS has the highest wear resistance among three glass-ceramics and the durability in mouth are expected.