

Abstracts

A series of abstracts presented at the 2006 British Society for the Study of Prosthetic Dentistry in Edinburgh. Abstracts were selected on the basis of their scientific merit by members of the Editorial Board of the Journal

Effect of curing cycle on the tensile bond strength of heat cured denture base acrylic resin to acrylic resin denture teeth.

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Aims: To determine the effect of three different curing cycles on the tensile bond strength of the join between three brands of heat cured denture base acrylic resin and one brand of cross-linked acrylic resin teeth. **Materials and Methods:** Specimens were prepared following American Dental Association (ADA) specification No.15. Cross-linked acrylic resin denture teeth (Enigma). were sectioned to produce 1.5mm thick discs that were incorporated into acrylic resin dumbbells made from three different heat cured denture base acrylic resins (Trevalon C, Meadway and Pegasus Plus) The specimens were cured following long, medium and short curing cycles. The tensile bond strength of fifteen specimens for each combination was tested using an Instron 1195 Universal testing machine. **Results:** The two-way ANOVA showed a statistically significant difference ($p < 0.05$) between the tensile bond strength of the three heat cured denture base acrylic resins and the three curing cycles used. A one-way ANOVA showed a statistically significant difference ($p = 0.018$) between the three heat cured acrylic resins processed using the medium curing cycle. A post-ANOVA Scheffe comparison test confirmed a difference ($p = 0.031$) between Trevalon C and Pegasus Plus materials processed by the medium curing cycle. Statistically significant differences ($p = 0.035$) were also observed between the three curing cycles used for Pegasus Plus acrylic resin. A post-ANOVA Scheffe comparison test showed a marginal difference ($p = 0.057$) between the Pegasus Plus specimens processed using the short and the medium cycles. **Conclusions:** The short curing cycle produced specimens with the lowest tensile bond strength irrespective of the type of heat cured acrylic resin used. Long and medium curing cycles produced specimens with acceptable tensile bond strength when compared to the ADA specification No.15. Pegasus Plus, produced specimens with the highest tensile bond strength.

Influence of Inter-implant Distance and Type of Attachment on the Retention of Mandibular Overdentures on Two Implants. Initial and Fatigue Retention Values.

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HERAKLION DENTAL PRACTICE, CRETE

Aims: This in vitro study aimed to investigate the influence of (1) the inter-implant distance and (2) the type of attachment on the initial and fatigue retention of mandibular

overdentures. **Materials and Methods:** At distances of 19, 23 and 29mm apart, three different mandibular overdenture attachments were secured onto analogues; Hader bars, ball abutments and NdFeB magnets. 45 groups of paired attachments were tested and again after a simulated 6-month use, at the three inter-implant distances. **Results:** For initial retention values, inter-implant distance played a significant role. When the inter-implant distance was set at 29mm, then the ball abutments showed statistical superiority against all other attachments. Magnets were found to be statistically the least retentive attachment type. **Conclusions:** For the simulated long-term use, inter-implant distance had a significant effect on the retention. Inter-implant distance can affect the initial retention of mandibular overdentures on two implants depending on the type of the attachment used.

Associations between clinical parameters and the prevalence of occlusal interference in unopposed posterior teeth.

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LEEDS DENTAL INSTITUTE

Aims: To examine occlusal changes following posterior tooth loss and investigate their relationship to dynamic tooth contacts in the form of occlusal interferences. **Materials and Methods:** Patients with an unopposed posterior tooth and matched control patients from Leeds Dental Institute were studied. An occlusal examination was carried out, study models were scanned and measurements were made of a number of dental parameters. **Results:** 53% of subjects with unopposed posterior teeth have one or more occlusal interferences associated with the site, compared with 12% of the control group. Each type of contact or interference was modelled using Generalised Linear Modelling. **Conclusions:** Unopposed posterior teeth are more likely to be involved in a functional contact or interference than their matched controls. Many teeth are involved in multiple interferences and there appear to be a number of interrelationships between these.

Effects of processing technique on the surface roughness of denture s with acrylic resin bases.

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Aims: The aim of this trial was to investigate the impression surface roughness of acrylic denture bases processed from two different processing techniques viz. a conventional moulding technique and an injection moulding technique. **Materials and Methods:** A total of forty-five maxillary denture bases were prepared in dental wax. They were

invested and the wax eliminated from the moulds. Fifteen specimens each were assigned in to three groups. Group 1 was conventional moulding technique (Trevalon), Group 2 was injection-moulding technique (PalaXpress) and Group 3 was injection-moulding technique (Paladon 65). A series of surface roughness profile measurements were obtained from each specimen within the group by using a metrological instrument Perthometer S8P, (Feinpruf-perthen GmbH, Gottingen Germany) with contact stylus pickup. The data were analysed by using Wilcoxon Signed Rank test. **Results:** The bases processed via injection moulding technique (Group2 and Group 3) established a smoother surface than those processed via a conventional moulding technique (Group 1). The results of a Wilcoxon Signed Rank Test performed on data obtained for Rmax, Rz and Ra revealed a statistically significant differences between Group 1 and group 2 and Group 1 and Group 3 in terms of surface roughness ($P=0.009$), but there were no statistically significant differences between Group 2 and Group 3 ($P=0.373$). **Conclusions:** The injection moulding technique resulted in a smoother surface than the conventional moulding technique. The study shows that care is needed in the choice of the moulding technique to be used in processing denture bases, as smooth surface is desired.

The impact of Bicon implant stabilised overdentures as measured using a quality of life questionnaire.

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Aims: To assess the impact of Bicon implant stabilised overdentures as using a quality of life questionnaire. **Materials and Methods:** Twenty patients were provided with two Bicon implants to stabilise a mandibular complete denture using a two stage surgical technique. At second stage surgery two abutments with ball attachments were inserted and "O" ring housings were subsequently cured within the lower complete denture. Prior to treatment the patients completed the OHIP (edent) oral health impact profile questionnaire as a baseline. Seventeen patients were recalled and completed the same questionnaire at 3-months and ten patients at 1-year after completion of treatment. **Results:** Analysis of the raw data with the Mann Whitney test demonstrated a significant reduction of the OHIP (edent) scores compared to baseline scores for all questions relating to denture function comfort and disability. However, questions related to social disability were not affected by the provision of the implant-stabilised overdentures.

Culture dependant detection of *Staphylococcus aureus* in denture plaque

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Methicillin-resistant *Staphylococcus aureus* (MRSA) is an important medical and dental pathogen and colonisation with this bacterium can result in potentially fatal localised and systemic infections. Previous work has suggested that prosthetic devices within the oral cavity may encourage MRSA colonisation and act as a potential source for cross-infection. **Aims:** To determine the prevalence of *Staphylococcus aureus* and MRSA in denture plaque and

assess possible sources of transmission in those patients harbouring MRSA. **Materials and Methods:** One-hundred patients attending the Prosthetics Unit at the Eastman Dental Hospital were recruited to the study having satisfied inclusion criteria. Patients completed questionnaires relating to denture hygiene, recent hospitalisation, previous antibiotic therapy and potential sources of MRSA transmission. Sterile swabs were used to sample patient's prostheses and placed into 2ml of sterile Stuart's transport medium. Samples were serially diluted and inoculated onto Blood agar and Mannitol Salt agar and incubated. All *S. aureus* isolates tested for susceptibility to methicillin to identify possible MRSA strains, which was then confirmed with PCR analysis and phage typing. **Results:** Denture plaque from 100 patients was screened. 27% of patient samples were colonised with *S. aureus*, (25% Methicillin sensitive *S. aureus*, and 1% MRSA, identified as EMRSA-15). Total plaque counts and *S. aureus* colonisation correlated with poor denture hygiene regimes and the presence of angular cheilitis. **Conclusions:** 27% of dentures are colonisation with *S. aureus* with a single patient having their dentures colonised with MRSA. The possibility of dentures acting as a potential reservoir for MRSA must be considered.

Attitudes and practice of General Practitioners in the provision of removable partial dentures.

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Aims: To identify the factors shaping the pattern of RPD provision by dentists in England. **Materials and Methods:** Details of current practice and provision, influences, attitudes and demographic details were collected using a self-completion questionnaire mailed to General Dental Practitioners identified through the Dental Practice Board register. **Results:** Three hundred and eighty-five questionnaires were returned by General Dental Practitioners from 62 Health Authorities throughout England. The most important factor reported as influencing both the GDPs decision to provide a partial denture and its subsequent success was patient desire to have a partial denture. Constructing the denture from cobalt chrome, advising the patient on aftercare, making time available to make minor adjustments and being responsible for design were all factors dentists associated with success of an RPD. However, for a number of dentists there was a reported divergence between knowledge and practice. **Conclusions:** Overall it is clear that provision of partial dentures continues to be patient led. However, the decision making process is also influenced by a number of factors including time, cost and the NHS fee structure.

Patient use of removable partial dentures- a national survey

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Aims: To identify the factors shaping the pattern of RPD use by patients in England. **Materials and Methods:** Details of current use, wearing habits, number of teeth being replaced, type of RPD and demographic details were collected using a self-completion questionnaire

mailed to patients in the UK identified through General Dental Practitioners via the Dental Practice Board register.

Results: Two thousand and fifty-two questionnaires were sent to patients. One thousand, one hundred and forty-five questionnaires were returned (response rate 56%) from 50 HAs. Over half of respondents were female (58%) with a mean age of 65 years (range 45 to 94 years). 622 patients currently had an upper denture (54%) and 316 respondents (28%) currently had a lower denture. 94% of upper and 74% of lower dentures were worn regularly. The main single reason for wearing an upper denture was given as appearance (43%) and function (24%). This compared to appearance (30%) and function (37%) for lower denture wearers. **Conclusions:** Overall it is clear that use of partial dentures continues to be influenced by patients desire to look, sound and behave (i.e. eat) in a socially acceptable way.

Helicobacter pylori infection and stomatitis prothetica hyperplastica.

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Aims: To determine of possible relation between chronic inflammations of oral mucosa and the gastric Hp infection.

Materials and Methods: This study was carried out on 215 toothless patients (aged 46 to 89 years) among them 129 females and 86 males. In 30 of patient using complete dentures SPH was found. Another 30 patients from the main group without dentures were used as control group. All examined patients underwent a noninvasive diagnostics of active gastric Hp infections using capsulated ¹³C-UBT (UBT) method that avoid any false positive gastric Hp infection caused by oral urease-producing germs. Moreover, endoscopy of the upper gastrointestinal tract was performed to assess the condition of mucosa of esophagus, stomach and duodenum. **Results:** In all examined patients (100%) with diagnosis of SPH, the gastric Hp infection was found based on UBT. In addition, the endoscopic examination, combined with mucosal biopsy, revealed histologically chronic active gastritis in all patients examined and in some of them also erosions, peptic ulcers, as well as ulcer scars. **Conclusions:** The results presented in this study indicate that SPH etiology is closely related to gastric Hp infection and the treatment of this condition requires consultation with gastroenterologist to confirm this notion and to apply proper eradication therapy.

Tensile bond strength of heat and self cured acrylic denture base resins to the inner and outer layers of multi-layered acrylic resin denture teeth.

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Aims: To investigate the tensile bond strength of both heat cured and self cured acrylic resin to the outer and inner layer of multi-layered acrylic resin teeth. **Materials and Methods:** Specially prepared teeth consisting either entirely of inner or outer layer acrylic resin were obtained from the manufacturers (Myerson). Dumbbell shaped acrylic resin specimens containing slices of teeth (inner and outer layer) were prepared for tensile testing. Forty specimens

were prepared with heat cured resin (20 inner and 20 outer layers). 30 self cure acrylic resin specimens were prepared (15 inner and 15 outer layers). Mean tensile strength was determined by ultimate tensile testing in an Instron 1195 universal testing machine with a cross head speed of 1mm/minute. Representative specimens were then scanned using scanning electron microscopy to study the fractured surfaces. **Results:** The mean bond strength of heat cured acrylic resin was higher than the mean bond strength of the self cured acrylic resin. There was no statistical difference between the bonds of either the heat cured resin or self cure to either the inner or outer layers of teeth. The visual examination and the SEM study showed results that illustrated the majority of the specimens fractured due to adhesive failure. **Conclusions:** Heat cured acrylic resin gave acceptable mean bond strength when bonded to the inner layers of the denture teeth. The mean bond strength (28MPa) of the heat cured acrylic resin to the outer layer was lower than the ADA No. 15 specification (31MPa). Self cured acrylic resin had poor bond strength when bonded to either of the two layers. There was no statistically significant difference in bond strength to the outer and inner layers of either type of resin.

Association between Oral Health Impact Profile and General Health Scores for patients seeking dental implants.

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Aims: To investigate the possible association between the short form, 14-item Oral Health Impact Profile (OHIP-14) and 12-item General Health Questionnaire (GHQ) for patients who required restorative work on Implant Assessment Clinic at GKT. **Materials and Methods:** Treatment need categories were hypodontia, trauma, and unsatisfactory complete and partial denture cases. The OHIP-14, which assesses adverse impact of oral conditions on quality of life and GHQ, a measure of global distress, were completed by the patients. Subsequently, Spearman's correlation and Kendall's Tau analyses were employed to explore the association between OHIP-14 and GHQ scores. **Results:** A total of 221 patients were recruited. Statistical analyses showed that there is a strong association between OHIP-14 and GHQ within all the categories of treatment need ($p < 0.0001$). **Conclusions:** The impact of oral health on the life quality of these patients seeking dental implant treatment was strongly associated with the general health status.

Teaching Dental Technology the Microteaching Way.

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Aims: To determine whether a cognitive learning domain can be used for teaching dental technology. **Materials and Methods:** A comparison of methods for teaching dental technology in removable prosthodontics was undertaken. The traditional method, concentrating on a psychomotor skills domain was compared to a microteaching method using a cognitive skills domain. A case study of a Year 3 BDS clinical dentistry laboratory course over a nine-month

period. The students (N=73) were randomly divided into two teaching groups, one taught by a conventional method and one by a microteaching method. Students in the conventional group had three-hour sessions in the laboratory. Students in the microteaching group spent half their 3-hour period in the laboratory and the other half undertaking directed study from a laboratory teaching-manual. This split in the allocated time enabled smaller group sizes. **Results:** There was no statistical difference between the two teaching methods as determined from practical examination class results. The microteaching students performed as well as the conventional method students with half the time spent in the laboratory. Qualitative data from questionnaires and focus groups showed better engagement from the microteaching group, with self assessment and reflection. A Pearson chi square test confirmed that there was no difference between the methods in terms of examination results (chi square = 0.407, df = 1, p = 0.52). **Conclusions:** Students in the microteaching groups were not disadvantaged in practical or written examinations and had a more positive approach to their learning.

An investigation of the effect on load to failure of different thicknesses of metal retainer resin-bonded to natural teeth.

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Aims: The present study investigated, in-vitro, the differences in the load to failure of different thicknesses of metal beams (retainer) bonded to natural teeth. **Materials and Methods:** Seventy non-carious wisdom teeth were collected and milled on a milling machine to produce preparations of standardised dimension. Seventy wax patterns of dimension 9x18 mm were produced with 7 different thicknesses (0.25mm, 0.45mm, 0.75mm, 0.95mm, 1.25mm, 1.50mm and 1.75mm) and then cast using a Nickel/Chromium base metal alloy. The metal beams (retainers) were cemented on each tooth specimen using the same resin-luting agent and a standard pressure load. The metal beams (retainers) were then loaded in tension to failure using a universal testing machine and the loads to failure were recorded. **Results:** There was strong significant relationship (Spearman's interclass correlation 0.97, P<0.001) between the loads to failure and thickness of the metal beams: the thicker the metal beam, the higher load was required to failure. Specifically, the mean load and Standard Deviation (SD) were as follows:

Beam thickness/mm	Mean load to failure/Newton (SD)
0.25	3.27 (±0.56)
0.5	9.54 (±0.80)
0.75	13.80 (±1.15)
1.00	20.73 (±2.17)
1.25	37.68 (±2.96)
1.50	46.57 (±2.52)
1.75	54.89 (±2.42)

Conclusions: This study using a standardised method concurs with other studies that increased beam thickness may reduce load to failure.

Impact of dietary intervention on antioxidant status in edentulous adults

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There is epidemiological evidence that antioxidants may prevent cardiovascular disease, cancer and some chronic disorders. **Aims:** To determine whether the nature of the prosthetic rehabilitation, i.e. conventional dentures (CD) or implant supported mandibular overdentures (ISMOD), has any demonstrable effect on serum antioxidant status of edentulous adults. To determine the efficacy of individualised dietary advice in achieving beneficial change in serum antioxidant status of both groups. To compare impact of dietary intervention on serum antioxidant status of both group. **Materials and Methods:** The serum antioxidant status of 54 successfully restored edentulous adults was evaluated at baseline. Individualised dietary intervention packages were delivered to subjects by Community Nutrition Assistants in two one to one sessions. A blood sample was taken from each subject before and 3 months after dietary intervention and analysed a. spectrophotometrically for total antioxidant capacity (TAC) by two methods, i.e. Ferric- Reducing Antioxidant Power (FRAP) and Trolox equivalent antioxidant capacity (TEAC), and b. for retinol, α -tocopherol, δ - tocopherol, and β -carotene concentrations using High Performance Liquid Chromatography (HPLC). **Results:** At baseline, the ISMOD group had higher antioxidant status than the CD. Three months after in the total serum antioxidant capacity, retinol, and α -tocopherol concentrations. The ISMOD group showed better improvement in the total serum antioxidant capacity than the CD 3 months after dietary intervention. **Conclusions:** The antioxidant status of edentulous adults wearing ISMOD was better than those with CD. Individualised dietary advice significantly improved the antioxidant status of both groups. This may reflect an increase in fruit and vegetables intake. Improvement of total serum antioxidant capacity with the ISMOD group as a result of dietary intervention was greater than with CD group.

A comparison between three types of implant overdenture attachment system.

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The McGill Consensus (2002) recommends that a two-implant overdenture should be the first choice of treatment for the edentulous mandible. **Aims:** This *in vitro* study set out to measure the retentive forces created by the Southern Implant (SI) ball and clip; Zest Anchor Locator press-stud; and the Magfit magnetic attachment systems. Each of the systems tested offers different strengths of attachment. **Materials and Methods:** A custom built jig was constructed to hold the various components for each attachment system and attach them to a cyclic testing machine. In a simulated oral environment, the forces were measured over a simulated 3,000 cycles of insertion and removal. **Results:** The retentive forces created by the Southern Implants plastic clips and Locator nylon inserts fell exponentially with the number of test cycles, however the forces created by the magnets remained relatively constant throughout the test. After 1000 cycles, the retentive forces created by the clips

of the Southern Implant ranged between 6.6 – 9.0N; for the nylon Locator inserts between 8.1 – 13.0N; and for the Magfit magnets between 4.3 – 2.5N. **Conclusions:** The retentive forces of the Southern Implant clips and Locator inserts are such that they would provide values within the range normally suggested to resist displacement of a complete lower implant retained / tissue supported denture when chewing sticky foods, but the Magfit magnets would need to be used in multiple combinations to achieve a similar effect.

Denture Base Resin: Improvement of Mechanical Properties.

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Previous studies showed that the optimal processing conditions for PMMA is: 1.2.5:1 Powder/ liquid ratio, Plain type of resin, Conventional packing method and water bath curing for 2 hours at 95°C. **Aims:** To improve the fracture resistance of PMMA denture bases by incorporation of filler particles into PMMA. **Materials and Methods:** TiO₂, ZrO₂, Glass Flakes, HDPE, UHMWPE, and PMMA - Silica nanocomposite, were mixed with plain PMMA powder. The mixtures were processed as previously mentioned. Biaxial Flexural Strength (BFS), microindentation Fracture Toughness and Vickers Hardness tests were carried out on the samples. Analysis of data was carried out using ONE-WAY ANOVA and TUKEY'S. **Results:** The addition of TiO₂, ZrO₂ and Glass flakes particles had no significant effect on BFS but did improve fracture toughness and hardness of PMMA. **Conclusions:** TiO₂, ZrO₂ and Glass flake particles can be used to improve mechanical properties of PMMA.

Dimensional stability of four polyvinylsiloxane based dental laboratory duplicating materials.

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Aims: To investigate the dimensional and weight stability of four Polyvinyl siloxane (PVS) dental laboratory duplicating materials (Elite double 8 duplicating silicone, Gemini transparent duplicating silicone, C & J pourable silicone, Z Dupe duplicating silicone) over a 13 week period. **Materials and Methods:** Twenty specimens of four PVS duplicating materials were prepared incorporating standard scales in X, Y and Z axes. Travelling microscope measurements were recorded at baseline, 1, 5, 9 and 13 weeks. Forty PVS partially dentate duplicate moulds were produced and measured using computerised image analysis. Half of the specimens were measured following storage at room temperature ($21 \pm 2^\circ\text{C}$) and half at 37°C . Weight stability was determined using an electronic balance. Prepared specimens were viewed using a scanning electron microscope.

Results: *Travelling microscope measurements:* One-way analysis of variance (ANOVA) for differences between materials in the proportional change in length, breadth and height showed no statistical significance at one week, 5 weeks or 13 weeks. There was a statistically significant difference between Elite double 8 duplicating silicone and Z Dupe duplicating silicone for proportional change in length at nine weeks, but not for breadth or height. *Computerised image analysis measurements:* Factorial ANOVA of the effect of material, time and temperature on the dimensions showed statistically significant differences ($p < 0.05$) due to effects of material and time, but temperature did not show a significant effect ($p > 0.05$). *Weight measurements:* Statistically significant differences ($p < 0.05$) were found due to the effect of material; however temperature and time did not have a significant influence ($p > 0.05$). **Conclusions:** The four polyvinyl siloxane duplicating materials investigated illustrated an excellent capacity for reproduction of details as well as dimensional and weight stability