Restorative Rehabilitation of the Cleft Affected Occlusion - A Service Evaluation

ABSTRACT

Cleft Lip and/or Palate (CLP) is the most common cranio-facial abnormality thought to be caused by a combination of genetic and environmental factors causing challenges with feeding, dental development and speech.[1,2] Cleft affected individuals often present a unique set of challenges with regards to their oro-facial and dental development and require multidisciplinary care. This article aims to describe the role of the restorative dentist in the multidisciplinary management of cleft affected individuals and outlines the various clinical presentations and restorative challenges. This article describes the various treatment modalities provided for cleft affected individuals under the National Health Service (NHS) at Liverpool University Dental Hospital (LUDH) and ranges from minimally invasive techniques to conventional fixed and removable prosthodontics.

INTRODUCTION

In the United Kingdom (UK), about 1 in 700 live born children has a cleft of the lip or palate or both.[3,4] Patients with cleft lip/palate (CLP) often undergo a range of treatments from a young age that require a multidisciplinary approach. This can include surgical management of the cleft, dental treatment to aid with function and aesthetics and speech therapy to improve phonetics.[5,6] Individuals with CLP present with a number of dental anomalies including missing/ abnormal number of teeth, shape and position of the dentition, congenital defects of teeth/bone/soft tissues, speech/functional problems and aesthetic concerns.[7,8] As these individuals progress in age, often these can be complex and difficult cases to treat.[9] The role of the restorative dentist in the multidisciplinary team for individuals with CLP is as vital as any other, as patients commonly require a range of restorative treatments and prosthetic rehabilitations. For many patients, this care continues through adulthood and it is the role of the restorative dentist and/or general practitioner to provide patients with prosthetic or functional replacements to aid with daily life and function. This positively and directly contributes to the psychological aspects of the individual.[10]

Patients with CLP often undergo lip closure at 3 months of age, which is followed by palatal closure at around 9-12 months of age. Patients then normally require alveolar bone grafting and/or orthodontic treatment, and this commences between the ages of 9 and 12 years.[11] The importance of alveolar bone grafting is to provide a continuous alveolus by facilitating the eruption of the unerupted canine and for orthodontics to close the cleft area.[12] In cases that are severe when they cannot be managed solely with bone grafting and orthodontics, prosthetic rehabilitation becomes the most appropriate option. Patients with an aesthetic or functional deficit may also require orthognathic surgery at the age of 16-18 years old, and this decision is frequently considered with a clinical psychologist to ensure an informed decision is made.

Keywords

Multidisciplinary
Cleft
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Rehabilitation in a cleft affected individual can be difficult to achieve. This often depends on the severity of the initial defect, success of the various surgical and orthodontic treatment, the quality of the restorative interventions and the compliance and motivation of the patient.[13] Patients can also succumb to being dentally demotivated due to the numerous interventions that they have had to undergo during their lifetime. The role of the restorative dentist is to treatment plan and be involved in the decision-making process from an early stage. Issues regarding the prognosis of compromised teeth, aesthetic considerations of malformed teeth, as well as the optimal distribution of spacing between and within dental arches, need to be considered prior to orthodontic treatment and surgery to provide the optimal solution to replacing missing hard and soft tissue including teeth. The restorative rehabilitation of cleft affected individuals requires the use of a wide range of restorative techniques and skills to manage the varied and difficult nature of the patient orofacial condition successfully.[14]

The purpose of this paper is to provide an insight into the range of restorative treatments provided under the National Health Service (NHS) for individuals with CLP at the Liverpool University Dental Hospital (LUDH). Treatments were carried out by staff members on the Restorative department at the LUDH which ranged from minimally invasive composite bonding techniques to more complex fixed/removable prostheses. We have tried to include patients of various ages to provide a flavour of the different treatments performed for cleft affected individuals of all ages.

DIRECT RESTORATIONS

Restorative treatment in the younger group may simply consist of composite bonding techniques to mask areas of abnormal tooth size/shape or hypoplastic/hypomineralised enamel. This technique can also be used to camouflage any mild positional discrepancies. There may be minimal discrepancy in this group between the mandible and maxilla in terms of arch-width ratio and vertical relationships, with these patients constituting the optimal outcome of present-day multidisciplinary treatment. Commonly canine teeth are moved orthodontically into the space of the missing lateral incisors. The role of the restorative dentist, with careful assessment, is to ensure that they can be disguised as lateral incisors. This is normally done by reducing the incisal tips and/or adding composite resin to contour the canine tooth as seen in Figure 1. In growing patients, porcelain veneers are generally not recommended as gingival maturation of the patient can lead to the restoration margins being visible, poor aesthetics and replacement restorations which may cause further loss of healthy tooth structure.[15]

FIXED PROSTHESIS - CROWN AND BRIDGEWORK

As cleft affected individuals often present with a multitude of dental anomalies, the provision of indirect restorations can often be challenging. This can be due to arch width/size discrepancy, abnormal tooth structure/anatomy, missing teeth and challenges with occlusion. It is dependent upon numerous factors in the decision-making process on the ideal form of prosthesis for the patient, however basic principles maximising on the conservation of tooth structure and longevity and functionality of the prosthesis remains the same. Resin-bonded bridgework (RBB) is often the treatment of choice in patients with minimal missing units or narrow pontic spaces, eg a missing maxillary lateral incisor *(Figure 2*). This form of prosthesis is useful in treating patients who are poor candidates for dental implants due to continuing growth or in the presence of unfavourable surrounding structures such as adverse positioning or curvature of the adjacent roots into the edentulous space.[13] While treating these patients with adhesive bridgework, the fundamental principles of providing the prosthesis are the same as when treating a non-cleft affected individual. Ideally, the abutment teeth should be minimally restored and of reasonable size in order to provide the maximum surface area of enamel for adhesive bonding. In some cases, it might be beneficial to perform addition procedures eg. electrosurgery or conventional periodontal flap surgery in order to gain a greater surface area for bonding. The non-precious metal wing retainer to be cemented on abutment teeth should be sand-blasted and the casting itself should cover as much enamel as possible, whilst considering aesthetics.[15]

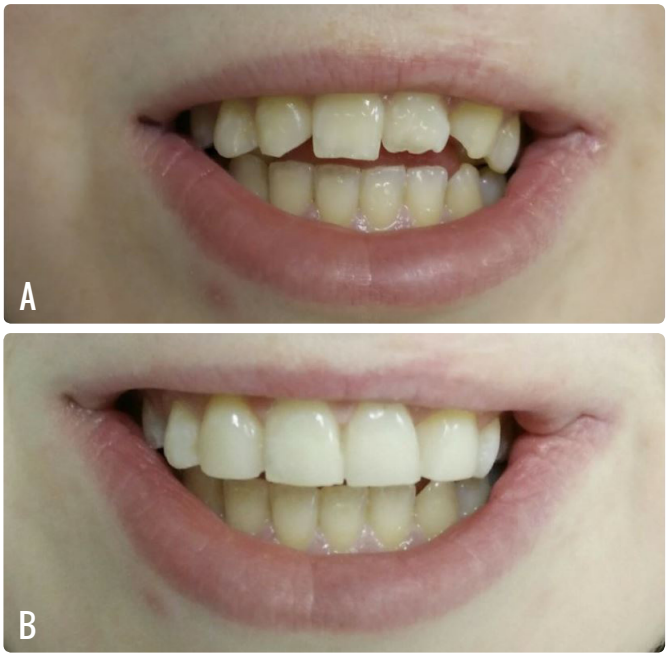

Figure 1: A) Patient with unilateral cleft presenting with malformed 12, 11, 21 and 22. B) Composite bonding placed from 12 to 22 to resemble normal tooth anatomy

Figure 3 illustrates how the authors aimed at restoring function and aesthetics in a cleft affected individual with multiple missing units (13, 14, 15) as well as treating the peg-shaped lateral (12) and heavily restored 16. A "lock-and-key" form of fixed prosthesis was used to restore function while improving retention and stability to aid with occlusal forces in this case.

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Figure 2: A) Anterior view of patient with unilateral cleft presenting with missing 22. B) Provision of adhesive bridge to replace space 22

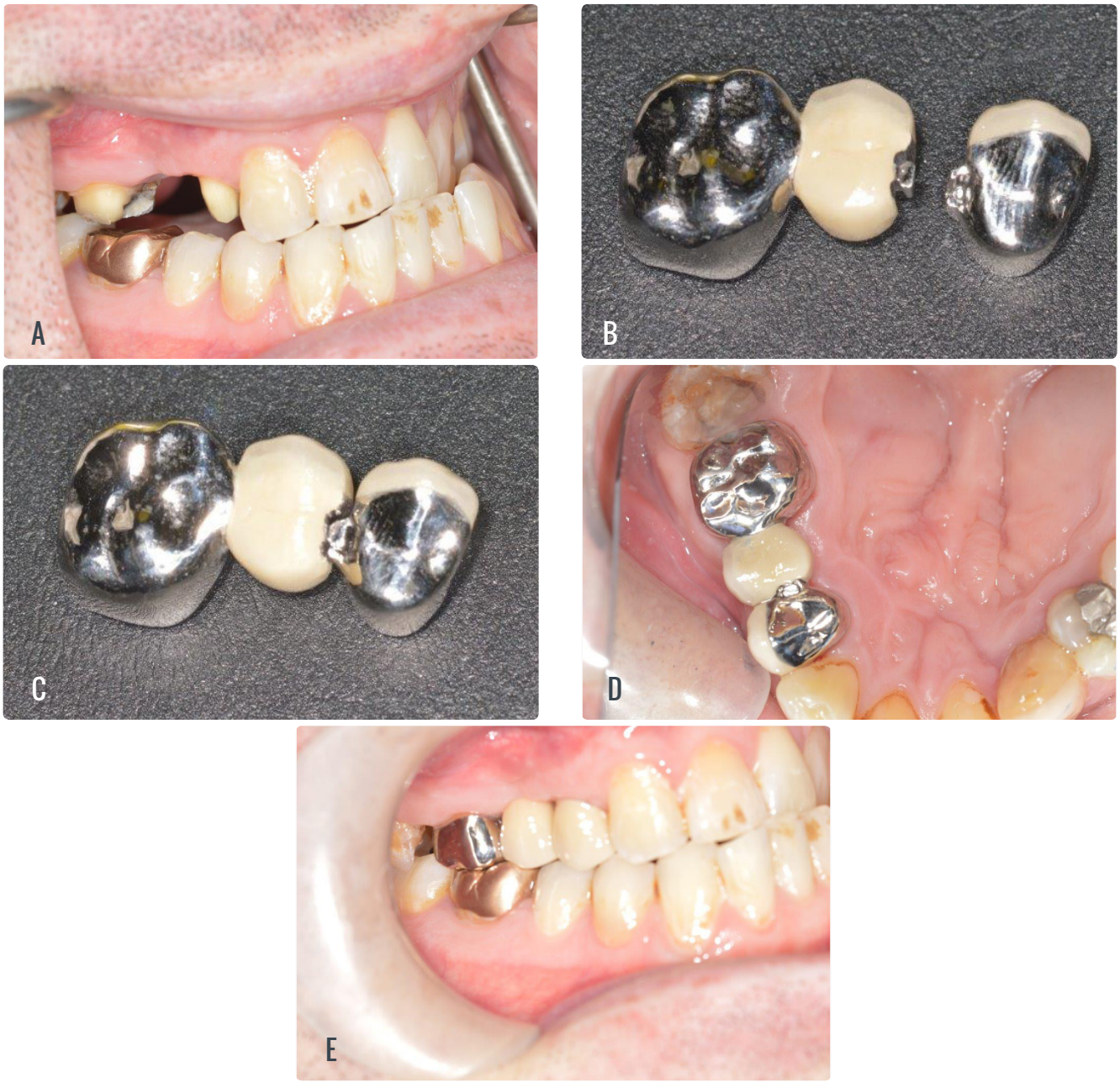

Figure 3: A) Anterior view of patient with repaired bilateral cleft with the 13 and 16 serving as bridge abutments and missing 15. B) Precision-attachment prosthesis, before attached in place. C) Prosthesis when attached in place. D) Occlusal view of prosthesis in situ. E) Anterior view following treatment

REMOVABLE PROSTHESIS - DENTURES

Removable partial dentures (RPDs) have always been a vital treatment option for cleft affected individuals, as often dental and/or soft tissue conditions do not always allow the ideal indication of treatment with fixed or implant-supported dentures. As RPDs are versatile with relative simplicity, they are widely used. The usage of RPDs in combination with abutment teeth (where possible), provides a powerful tool to allow for increased support and retention to improve patient satisfaction and comfort leading to better tolerance towards the prosthesis. However, issues associated with providing dentures for these individuals include partial eruption of teeth, absence of keratinized tissue, presence of frenula, shallow vestibule, difficult oral hygiene and a high prevalence of gingival recession.[16,17] Providing an optimal occlusion is also challenging due to lack of occlusal stability, alterations in the vertical dimension and the absence of anterior guidance.[18] Figure 4 shows the various adaptations made to the RPD in a cleft affected individual with a palatal defect to improve retention and stability of the prosthesis. The authors incorporated the patient's dentition in the design of the removable prosthesis by usage of gold shell crowns (GSCs) to prolong existing dentition and the usage of a cobalt-chrome baseplate to accurately capture the patient's palatal defect with aims to improve stability, retention and comfort of the prosthesis.

REMOVABLE PROSTHESIS - OBTURATORS

An oro-antral communication is present in some patients with palatal defects and this will lead to difficulties with function and altered speech. In cases where the fistula is small, some patients might be able to cope with daily life without any intervention, however most patients will require the provision of a removable obturator appliance to seal the palatal defect successfully and allow feeding without nasal communication. Patients with severe or extensive palatal defects, large edentulous saddles or large alveolar defects may require an obturating removable partial or complete denture, eg in Figure 5. These appliances cover notably more soft and hard tissue than a fixed prosthesis therefore patients are more susceptible to dental infections and disease in the presence of increased plaque accumulation and/or poor plaque control. Therefore, a high standard of oral hygiene is desirable to prevent the deterioration of the existing dentition. The size and location of the palatal defect may pose challenges to the dental operator in achieving an adequate prosthesis in terms of support and retention. These factors are often complicated due to minimal support and the nature of the peripheral tissues pose difficulties in achieving a satisfactory peripheral seal.

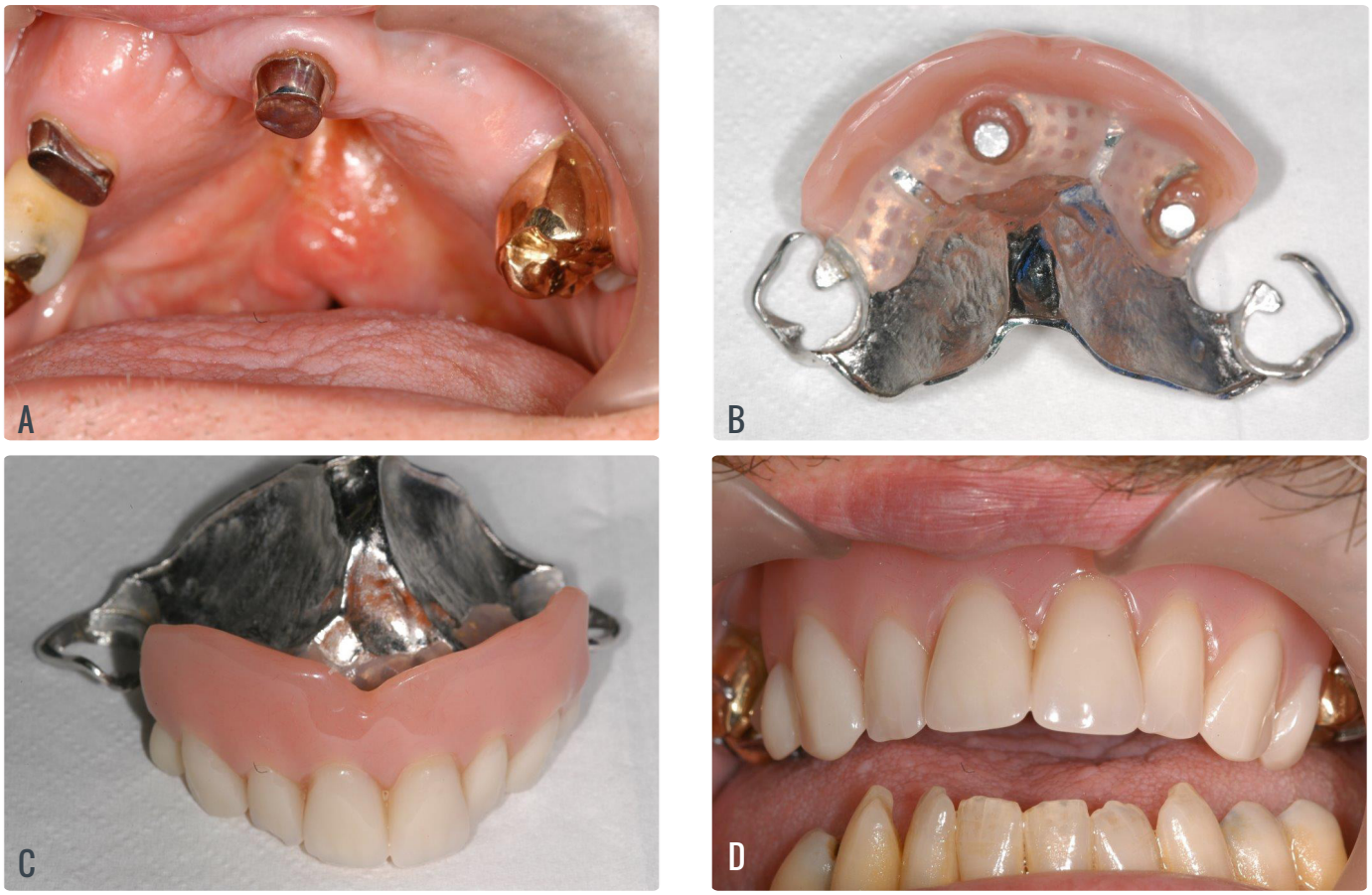

Figure 4: A) Patient with cleft palate with residual anterior and palatal cleft defect and multiple missing anterior teeth. B) Partial CoCr overdenture with tooth abutment fittings. C) Partial CoCr overdenture with palatal groove. D) Anterior view of prosthesis in situ

Figure 5: A) Anterior view of patient with residual palatal cleft defect and multiple missing anterior teeth. B) Occlusal view of residual palatal cleft defect. C) Complete upper acrylic overdenture with tooth abutments and obturator. D) Complete upper acrylic overdenture with tooth abutments and obturator. E) Occlusal view of prosthesis in situ. F) Anterior view of obturating removable complete upper overdenture in occlusion. G) Anterior view of patient's smile line

CONCLUSION

The rehabilitation of cleft affected individuals often requires a multidisciplinary approach comprising of members from various specialities, to allow adequate functional and aesthetic conditions for the individual. Treatment plans can be complex and needs to be tailored to the patient's specific clinical considerations. Careful planning is required while incorporating basic restorative and tooth conservation principles. Continued maintenance is essential and required throughout the patient's life.

CONFLICT OF INTEREST

There were no conflicts of interest noted in this study. No funding was received and no industry affiliations to disclose.

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