The use of overdentures in children with cleft lip and palate: a report of two cases

Zahra Tejani* / Ei Chuen Kok** / Carol Mason*** / Brigitte Griffiths****

The treatment of children with cleft lip and palate is complex. Advances in primary surgery and the advent of alveolar bone grafting have resulted in the reduction of prosthetic intervention. However, in patients where surgery is contraindicated or has been unsuccessful, an alternative treatment is required. Overdentures are a simple, conservative and reversible non-surgical alternative for children with cleft lip and palate. We present two cases with severe complete bilateral cleft lip and palate that were managed in this way.

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INTRODUCTION

The management of children with cleft lip and palate should be undertaken by a specialized multidisciplinary team, who take responsibility for the care of these patients from birth to adulthood.[1,2] It is important that each patient is considered individually, as each patient has different needs and therefore, a standard form of treatment is not available.[3] In general terms, primary management involves lip and palate surgery within the first year of life with the possible combination of pre-operative orthopedics.

Secondary management involves a multidisciplinary team and commonly includes speech therapy, audiology and psychology. Management of both primary and secondary dentitions includes alveolar bone grafting, which may be followed by rhinoplasty and lip revision, and at cessation of growth by orthognathic surgery.[2]

There are numerous complicating factors in these children. Maxillary growth in children with cleft lip and palate is often retarded, probably due to palatal scarring post surgery, resulting in a Class III malocclusion and anterior and posterior crossbites.[2,4] Dental anomalies are commonly encountered in these children, both within and outside the region of the cleft.[5] Such anomalies include hypodontia, supernumerary teeth, dental hypoplasia, delayed or abnormal eruption and teeth of abnormal shape.[6] As a result, a combined orthodontic, pedodontic, restorative approach is usually required to ensure the dentition is managed optimally with the aim of achieving a good functional and aesthetic result. Alveolar bone grafting at age 8-9 years in the cleft-site aids the eruption and correct alignment of the teeth. The aim of this complex surgical and non-surgical management of children with cleft lip and palate is to align the dentition into a position of good function and aesthetics with minimal prosthetic intervention. Since the introduction of alveolar bone grafting in the early 1970s[7], prosthetic treatment in cleft patients has been greatly reduced and is often unnecessary. However, in cases where ideal arch alignment is not achieved or when the alveolar bone graft fails and the congenital defect persists, prosthetic intervention is still sometimes necessary.[3, 8, 9]

This paper reports two such cases where overdenture prostheses were used as an uncommon form of management in two young patients with severe bilateral cleft lip and palate with class III malocclusions. This was an interim treatment prior to the cessation of facial growth and definitive surgery.

The definition for overdentures is 'dentures which are fitted over retained roots and which derive some support from that coverage.[10]

The abutments usually require preparation. The overdentures constructed in the cases reported were a variation of the conventional design as the abutment teeth were not prepared or altered in any way.

* Zahra Tejani, BDS, MFDS, Senior House Officer in Paediatric Dentistry and Orthodontics, Maxillofacial and Dental Department, Great Ormond Street Hospital for Children NHS Trust.

** Ei Chuen Kok, BDS, FDS, Specialist Registrar in Paediatric Dentistry, Maxillofacial and Dental Department, Great Ormond Street Hospital for Children NHS Trust.

*** Carol Mason, BDS, FDS ILT(M), Consultant in Paediatric Dentistry, Maxillofacial and Dental Department,Great Ormond Street Hospital for Children NHS Trust.

**** Brigitte Griffiths, BDS, FDS, PhD, Consultant in Restorative Dentistry, Maxillofacial and Dental Department, Great Ormond Street Hospital for Children NHS Trust.

Send all correspondence to Dr. Zahra Tejani, 4 Tradewinds Court Asher Way, London. E1W 2JB, United Kingdom

Voice: 011 44 7717 33 80 33
Fax: 011 44 207 829 8804
zhrat@gmail.com

Applying overdenture principles in this way has the added advantages of being low cost, simple, completely reversible and highly conservative. Also, progressive changes can be made to the prostheses with ease as the patient grows. In addition, overdentures provide improved masticatory efficiency, speech, swallowing and aesthetics. Since the teeth are retained, there is increased proprioreception, alveolar bone is preserved and there is good support and stability, compared to complete dentures. Also, overdentures very importantly provide psychological support for the child especially at school, improving confidence and self-esteem.[11-13]

Vergo[12] did a long-term follow-up of children, who were provided with overdentures. The study showed that the benefits of overdentures were far greater than the problems. Despite the occluding vertical dimensions being increased, no temporomandibular joint dysfunction was reported. Complications included caries, periodontal problems, chronic soft tissue irritation, denture hyperplasia, gingival recession and denture breakage. It was noted that with good oral hygiene and regular monitoring, these problems were greatly reduced, signifying the importance of regular follow-up appointments. It was also found that the children adapted well to the overdentures and were satisfied with them. It is important that the dentures are modified as the dentition develops, adding material as teeth exfoliate and creating concavities within the alveolar surface of the overdenture as teeth erupt. It is suggested that overdentures be relined every 2 to 4 years or reconstructed every 4 to 6 years.[11,12]

Indications for overdentures in children include congenital abnormalities, which result in severe malocclusions, hypodontia, abnormal tooth structure, color and shape, and defects in oral soft tissue and bone. Overdentures allow teeth to be replaced, malocclusions and misaligned teeth to be corrected, and soft tissue and bone abnormalities to be treated. These include cleft lip and palate, ectodermal dysplasia, dentinogenesis imperfecta and cleidocranial dysplasia.[12] In children with developmental anomalies with associated systemic disorders, surgery is often contraindicated, making the provision of overdentures a non-surgical alternative.[12,13] Overdentures can also be used to treat acquired anomalies, such as extensive tooth surface loss and severe extrinsic staining. Trauma- related loss of teeth and bone, which can result in an altered facial appearance, can also be managed with overdentures.[13]

CASE 1

A 9-year old girl was referred to the Maxillofacial and Dental Department by the cleft lip and palate multidisciplinary clinic at Great Ormond Street Hospital, London. She had a residual palatal fistula resulting in nasal food escape and severe generalized hypodontia. In addition she was experiencing pain in the upper left quadrant and had severely retroclined upper incisors.

Figure 1a. Case 1: Frontal facial view before treatment.
Figure 1b. Case 1: Lateral facial view before treatment.

The patient had a bilateral cleft lip and palate, which was initially repaired at another centre, where she received multidisciplinary care. However after several lip and palate revisions and two alveolar bone grafts, there was a residual fistula (Table 1).

Table 1. Illustrates the surgical History of case 1.

Primary Lip repair	1 month
Primary Palate Repair	8 months
Lip revision	2 years 7 months
Lip revision, nasal correction, columella lengthening and palatal fistula repair	3 years 9 months
Pharyngoplasty	4 years 9 months
Alveolar Bone Graft	7 years 2 months
Alveolar Bone Graft revision	7 years and 7 months

Figure 2a. Case 1: Palatal view of maxilla showing palatal fistula.

Figure 2b. Case 1: Upper standard occlusal radiograph showing palatal fistula.

Figure 3a. Case 1: Intraoral view of patient in occlusion (mirror image of left side).

Figure 3b. Case 1: Intraoral view of patient in occlusion (mirror image of right side).

Figure 4. Case 1: Dental panoramic tomograph.

On extraoral examination, the patient displayed a skeletal class III pattern with a retrusive maxilla, along with a reduced lower facial height and poor upper lip support. There was evidence of scarring in the upper lip and the columella of the nose appeared to have descended (Figures 1a and 1b). On intraoral examination, her dentition was caries-free with good oral hygiene. The teeth present were 17, 55, 54, 13, 11, 21, 22, 63, 64, 65, 27, 75, 74, 73, 31, 41, 83, 85.

The upper incisors were severely retroclined and the residual fistula was visible in the upper central incisor region palatally both clinically and radiographically (Figures 2a and 2b).

The upper left primary second molar was tender to percussion, but there was no associated swelling or sinus. The occlusion was class III with bilateral crossbites and no displacement (Figures 3a and 3b). The patient brushed her teeth twice a day, attended the dentist regularly and was very cooperative in the dental chair.

A Dental Panoramic Tomograph (Figure 4) revealed 15 missing permanent teeth (excluding third molars) both within and outside the regions of the clefts: 16, 15, 14, 12, 24, 25, 26, 37, 36, 35, 32, 42, 45, 46, 47. Resorption of the upper left primary second molar by the erupting upper left first permanent molar was also evident. This extended into the pulp of the upper left second primary molar and hence explained the pain she was experiencing. The upper first primary molars were also resorbing, but the remaining deciduous teeth were firm with no radiographic evidence of resorption.

In summary, the two main concerns for the patient

Figure 5a Case 1. Wax try in; frontal view.

Figure 5b. Case 1. Wax try in; lateral view showing class II div 2 occlusal set-up.

were nasal food escape and the appearance of her upper front teeth. Orthodontic treatment was not possible due to the severe hypodontia leading to difficulty in retaining an appliance and providing suitable anchorage. After a thorough assessment on the multidisciplinary cleft clinic, the following alternative treatment options were discussed with the patient and parents:

a. Repeat surgical fistula closure along with a maxillary overdenture. The patient had already undergone 7 operations and was getting weary of surgery. Also there was no guarantee of success
b. Maxillary overdenture alone. This would cover the fistula and provide prosthodontic rehabilitation from a functional and aesthetic point of view.

The patient and parents chose the non-surgical second option.

The initial management involved pain relief and oral hygiene instruction in preparation for the overdenture. Therefore, extractions of the upper left primary second molar and resorbing upper primary first molars were done under local anaesthetic. An appointment to commence overdenture construction was made two months later to allow time for healing.

It was decided that no tooth preparation would be done prior to the construction of the overdenture, as described by Rogoff and Graser, 1990[13], making this a reversible and non-invasive treatment option.

The denture design included:

1. Full palatal coverage to maximally cover the fistula and prevent nasal regurgitation and to provide maximum retention.
2. Positioning of upper anterior denture teeth labial to the existing teeth in a Class II div 2 relationship to provide improved upper lip support and aesthetics without 'bulging out' the lip markedly.

Figure 6a. Case 1: Frontal facial view with overdenture *in situ*

Figure 6b. Case 1. Intraoral view with overdenture in situ (mirror image of left side).

Figure 6c. Case 1. Intraoral view with overdenture in situ (mirror image of right side).

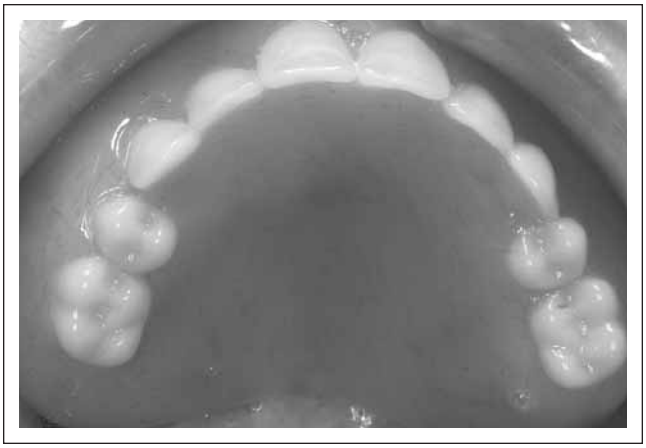

Figure 6d. Case 1. Intraoral palatal view showing overdenture occluding fistula.

3. Jackson's cribs around the upper permanent first molars for maximal retention.
4. A 2mm increase in the occluding vertical dimension to increase lower face height and improve appearance.

The overdenture was constructed in the conventional way: the design was planned on mounted diagnostic casts, which were surveyed to determine the path of insertion, stability and retention of the overdenture; secondary impressions, final jaw registration with tooth selection were followed by a wax try-in (Figures. 5a and 5b). Due to the thin sections required, the denture was processed in high impact acrylic. The opinion of the patient was consulted at each step. The overdenture was fitted. Oral hygiene instruction was reinforced (Figures 6a, 6b, 6c and 6d).

At review, the patient was happy with the overdenture. However, she was experiencing difficulties with speech. She was able to eat without nasal food escape and she was pleased with the appearance. Reassurance was given regarding her speech and likely adaptation. Support in this was provided by Speech and Language Therapy (SALT), as part of the multidisciplinary team.

CASE 2

An 11 year-old Caucasian boy was referred to the Maxillofacial and Dental Department from the cleft lip and palate multidisciplinary clinic at Great Ormond Street Hospital, London for the management of his missing upper incisors. The patient requested for "teeth to smile with" before starting a new school as he had been teased at his previous school.

The patient was born with a bilateral cleft lip and palate, severe eczema and bilateral hydronephrosis with a left urethrocoele and impaired renal function. He also had the typical features of ectodermal dysplasia. He was later diagnosed with Rapp-Hodgkin syndrome (ectodermal dysplasia, anhidrotic, with cleft lip and palate, OMIM 149200). The patient underwent several surgical procedures for the cleft repair that included an alveolar bone graft at the age of 9 years and 10 months.

On examination, the patient had sparse, blond hair and eyebrows, dry skin and dysplastic fingernails. Dental examination showed a skeletal III base with a hypoplastic maxilla and prominent lower lip. Intra-oral examination revealed the following teeth were present: 16, 15, 14, 13, 23, 24, 25, 26, 36, 75, 34, 33, 32, 31, 41, 42, 83, 44, 85, 46 (Figures 7a, 7b, 7c and 7d).

His oral hygiene was good and there were no caries present. The enamel on the permanent dentition was pitted in appearance and a clinical diagnosis of hypoplastic amelogenesis imperfecta had been made. A localized yellow-brown non-carious hypoplastic enamel defect was also noted on the labial surface of the lower right permanent central incisor. The upper permanent canines had erupted through the bone graft at a 45∞ angle. The lower primary second molars were infraoccluded. Radiographic examination showed the absence of 12, 11, 21, 22 and 35. The first permanent molars were taurodonts (Figures 8a and 8b). The first permanent molars had been restored with stainless steel crowns and the lower second primary molars restored with plastic restorations. The premolars were fissure sealed.

The treatment plan was to provide prosthetic replacement for the missing upper incisors and mask the poor appearance of the erupting upper canines in the form of an upper denture to help the patient cope with starting his new school. During the construction of the denture, study casts were mounted on a semi-adjustable articulator to assess the jaw relationships. From this diagnostic procedure, both partial and overdenture wax try-ins were eventually constructed, so that the patient was able to try both designs. Although, the overdenture increased the occluding vertical dimension by 2mm, the patient found it more comfortable than the partial denture.

The patient was therefore provided with a provi-

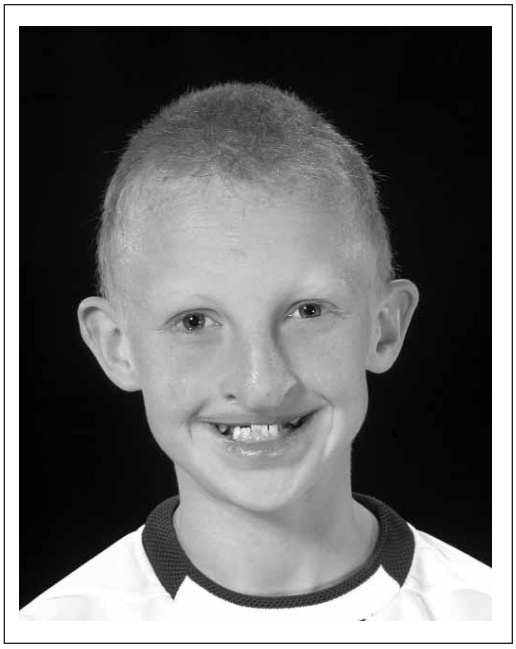

Figure 7a. Case 2. Frontal facial view before treatment; patient shows classic features of ectodermal dysplasia.

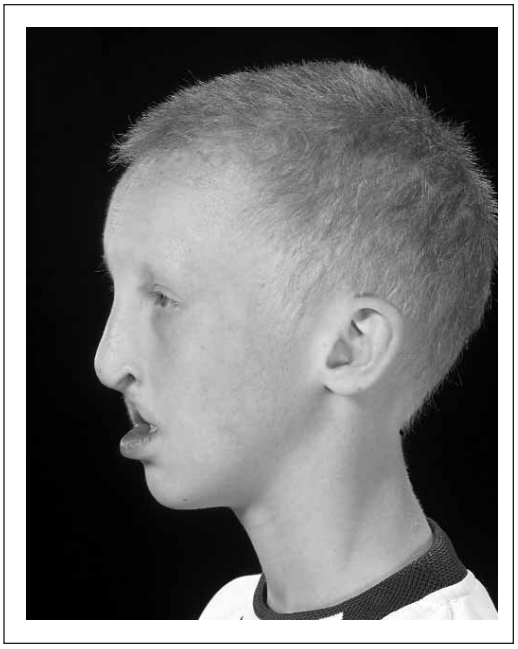

Figure 7b. Case 2. Lateral facial view before treatment.

Figure 7c. Case 2. Intraoral view showing class III occlusion.

Figure 7d. Case 2. Intraoral palatal view.

sional complete upper overdenture to replace the missing upper incisors. A horse-shoe shape design overdenture was chosen to reduce bulk and improve patient comfort. The retention was improved by the use of Jackson clasps on the first permanent molars placed on the fit-surface of the overdenture. In this case, a pleasing result was achieved by the placement of only upper incisors and canines on the denture over the V-shaped maxillary arch at this stage; the remaining teeth were overlayed with acrylic. This provided the patient with a simple transitional prosthesis with minimum bulk and good esthetics, making it easy for the patient to adapt. The patient was instructed on the proper oral and denture hygiene techniques. A daily fluoride mouthrinse was also recommended. An appointment was made for

Figure 8a. Case 2. Dental panoramic tomograph.

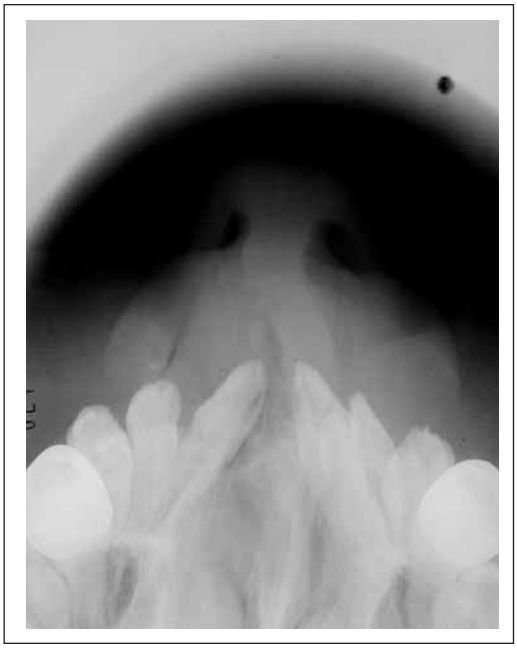

Figure 8b. Case 2. Upper standard occlusal radiograph.

a review in 3 months time (Figures 9a and 9b).

It was decided that the denture would be adjusted every 6 to 9 months to accommodate for the eruption of the other permanent teeth and growth of the patient. Once the patient adapted to his transitional overdenture, a new overdenture with a definitive design including posterior teeth would be made. He would wear this until orthodontic treatment could be done. The long-term management will include orthognathic surgery and implant retained prosthetic replacements.

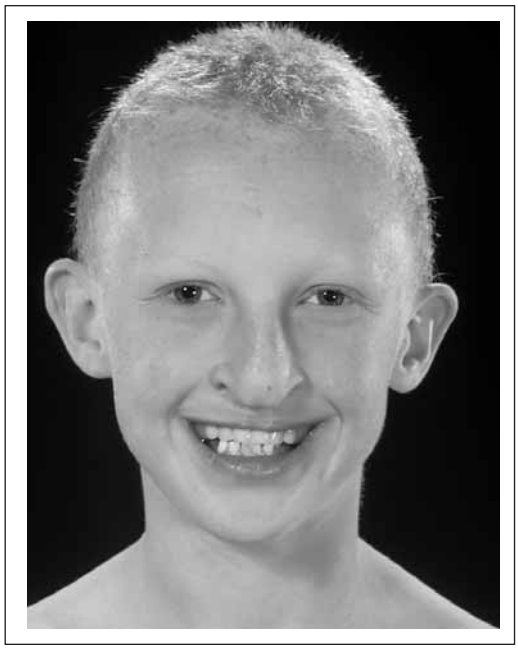

Figure 9a. Case 2. Frontal facial view with overdenture *in situ*.

DISCUSSION

Overdentures in children with cleft lip and palate alone are not a conventional form of treatment. The advances in primary surgery and the advent of alveolar bone grafting has resulted in far fewer children requiring prostheses.[3,8,9] However, in cases where alveolar bone grafting has not resulted in the desired outcome, such as the two cases presented, an alternative in the form of overdentures can be used to improve aesthetics and function in a developing child/adolescent until the patient has fully grown at which time a more definitive form of treatment can be employed, if suitable.[14]

Case 1, a 9-year old girl with bilateral cleft lip and palate, had been exposed to several surgical procedures in an attempt to repair the palatal fistula, which nevertheless persisted and resulted in nasal regurgitation. In addition, she had severe generalized hypodontia with 15 missing permanent teeth. There is an increased incidence of hypodontia in children with cleft lip and palate and Shapira *et al.*[15] reported it as being as high as 77%. Slayton *et al.*[16] found the incidence to be 47.5%. The incidence of hypodontia outside the cleft region found by Slayton *et al.*[16] is 30%. The most commonly missing teeth are maxillary lateral incisors and maxillary and mandibular second premolars.[15,16] However in Case 1, the hypodontia included teeth in addition to these. The overdenture was a non-surgical, reversible option, which adequately occluded the fistula and improved the appearance of the patient. Understandably, the patient had difficulties in speech initially, for which she was provided speech therapy.

Case 2 had an extremely rare form of ectodermal dysplasia called Rapp-Hodgkin syndrome, which presented as ectodermal dysplasia, anhidrosis and bilateral cleft lip and palate. Ectodermal dysplasia syndromes are hereditary and affect ectodermal structures such as sweat glands, hair, nails and teeth, leading to reduction or absent sweat production, sparse, light hair on the scalp and eyebrows, oligodontia and abnormal nails. Overdentures in the treatment of patients with ectodermal dysplasia are well documented.[17,18]

Case 2 presented with missing upper incisors, amel-

Figure 9b. Case 2. Intraoral view with overdenture *in situ*.

ogenesis imperfecta, upper canines erupting at an abnormal angle and a class III malocclusion. These factors were resulting in poor aesthetics, which had resulted in the boy being teased at his old school. He was starting his new school soon and needed a quick solution to the above problems, which was successfully provided in the form of a provisional overdenture. The boy was much happier at his new school. The overdenture design employed was unusual as it only possessed the upper incisors and canines, which improved his appearance markedly. This suggests that each case is individual and modifications in the treatment plan must be made accordingly.

In both patients particular difficulties were encountered when planning overdentures. These included the upper lip contour, suitable crown contour for retention and a developing dentition. The thin short upper lip restricted both anterior tooth position and also the increase in occlusal vertical dimension in the overdenture. This was overcome by using retroclined incisors in Case 1. Retention was maximized by covering the dentition and the use of Jackson clasps within the denture. The use of a provisional design as in Case 2 allows occlusion, function, appearance and patient compliance and comfort to be assessed prior to a more definitive design. Acrylic is an ideal material as it can be easily adjusted as the dentition develops, but conversely performance in thin section is required, hence a high impact acrylic resin was used.

It is essential when planning prosthetic treatment such as overdentures, that the patient has healthy oral hard and soft tissues, good oral hygiene and is motivated and committed to the treatment.[3] Patients are advised to leave dentures out at night, although some may be required to wear night-time orthodontic retainers. Regular review is also essential to maintain dental health and ideal overdenture fit. Poor oral hygiene can result in caries, periodontal problems, chronic soft tissue irritation and gingival recession. In both cases, the children were motivated, had good oral hygiene and no evidence of caries.

Both patients are on long-term follow-up by the multidisciplinary team with a view to providing further treatment when growth has stopped.

CONCLUSION

The provision of overdentures in children with cleft lip and palate is a simple, reversible and conservative alternative non-surgical treatment, which provides good aesthetics, function and improved confidence. The numerous benefits exceed the complications, as long as the patient practices good oral hygiene and is monitored by the clinician regularly.

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REFERENCES

1. Rivkin CJ, Keith O, Crawford PJM, Hathorn IS. Dental care for the patient with a cleft lip and palate. Part 1: From birth to the mixed dentition. Br Dent J 188: 78-83, 2000.
2. Sommerlad BC. Management of cleft lip and palate. Current Paediatrics 4: 189-195, 1994.
3. Moore D, McCord JF. Prosthetic dentistry and the unilateral cleft lip and palate patient. The last 30 years. A review of the prosthodontic literature in respect of treatment options. Eur J Prosthodont Rest Dent 12: 70-74, 2004.
4. Shetye PR. Facial growth of adults with unoperated clefts. Clin Plast Surg 31: 361-7, 2004.
5. Ribeiro LL, das Neves LT, Costa B, Gomide MR. Dental anomalies of the permanent lateral incisors and prevalence of hypodontia outside the cleft area in complete unilateral cleft lip and palate. Cleft Palate Craniofac J 40:172-5, 2003.
6. Thom AR. Modern management of the cleft lip and palate patient. Dent Update 17: 402-8, 1990.
7. Boyne PJ, Sands NR. Secondary bone grafting of residual alveolar and palatal defects. J Oral Maxillofac Surg 30: 87-92, 1972.
8. Ramstad T, Semb G. The effect of alveolar bone grafting on the prosthetic/reconstructive treatment of patients with unilateral complete cleft lip and palate. Int J Prosthodont 10: 156-163, 1997.
9. Semb G, Ramstad T. The influence of alveolar bone grafting on the orthodontic and prosthodontic treatment of patients with cleft lip and palate. Dent Update 26: 60-64, 1999.
10. Basker RM, Davenport JC, Tomlin HR. Prosthetic treatment of the edentulous patient. 3rd ed. London, Macmillan Press ltd. pp. 32-39, 1992.
11. Schneidman E, Wilson S, Spuller RL. Complete overlay dentures for the pediatric patient: case reports. Pediatr Dent 10: 222-225, 1988.
12. Vergo TJ. Prosthodontics for pediatric patients with congenital/developmental orofacial anomalies: a long-term follow-up. J Pros Dent. 86: 342-347, 2001.
13. Rogoff GS, Graser GN. Overdentures for acquired and congenital anomalies: part 1. Complete dentures. Int J Prosthodont 3: 229-237, 1990.
14. Yenisey M, Guler A, Unal U. Orthodontic and prosthodontic treatment of ectodermal dysplasia- a case report. Br Dent J 196: 677-9, 2004.
15. Shapira Y, Lubit E, Kuftinec MM. Hypodontia in children with various types of clefts. Angle Orth 70: 16-21, 2000.
16. Slayton RL, Williams L, Wheeler JJ, Lidral AC, Nishimura CJ. Genetic association studies of cleft lip and/or palate with hypodontia outside the cleft region. Cleft Palate Craniofac J 40: 274-279, 2003.
17. Cetiner D, Engel U, Tüter G, Yalim M. Clinical management of ectodermal dysplasia with long term follow up: two case reports. J Clin Pediatr Dent 25: 187-190, 2001.
18. Bonilla ED, Guerra L, Luna O. Overdenture prosthesis for oral rehabilitation of hypohidrotic ectodermal dysplasia: a case report. Quint Int 28: 657-665, 1997.