

# Prosthodontic Rehabilitation of Cleft Lip and Palate Patients using Conventional Methods: A Case Series

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## ABSTRACT

This case series describes prosthodontic management of seven cleft-lip-and-palate patients with different cleft deformities, gender and age. Patients were rehabilitated using conventional prosthesis. Five patients in whose maxillary arch was orthodontically expanded were treated with a combination of fixed and removable partial dentures with precision attachments. Two patients, who did not maxillary collapse were treated with metal-ceramic fixed-partial-dentures. All patients were followed up to two years. When there are limitations for secondary bone-grafting and implants, conventional approaches provide good physiologic, functional and esthetic outcomes with care taken to prevent maxillary relapse in treating these patients.

**Keywords:** Cleft lip and palate, Deformities, Fixed and removable prosthodontics, Orthodontics.

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## INTRODUCTION

Clefts of the lip and palate (CLP) are commonly encountered congenital anomalies, affecting one in seven hundred live births<sup>1</sup> and often result in severe functional deficiency on the patient's chewing abilities, appearance and ability to speak.<sup>2</sup> Generally, they are classified into four major types: cleft lip, cleft palate, unilateral cleft lip and cleft palate (UCLP), and finally bilateral cleft lip and palate (BCLP). A combination of cleft lip and palate is the most common clefting deformity seen. The prevalence of dental anomalies associated with cleft lip and palate is remarkable.<sup>2</sup> Abnormalities of tooth number, size, morphology, calcification and eruption have been described.<sup>2</sup> Paranaiba et al<sup>3</sup> demonstrated that patients with unilateral CLP were frequently more affected by dental anomalies than bilateral CLP. The incidence of congenitally missing teeth, especially lateral incisors adjacent to the alveolar cleft is high.<sup>2,4</sup> If not missing, these teeth may be malformed and malposed.<sup>4</sup>

It is clear that multidisciplinary treatment planning by surgeons, orthodontists and restorative dentists is required for the long-term benefit of this small but challenging group of patients.<sup>5</sup> Today, knowledge of craniofacial growth has increased, there with the success of surgical and orthodontic treatment has improved. This requires less prosthetic intervention. Nonetheless, if the edentulous cleft side is not

closed orthodontically or surgically some types of prosthetic treatment is required and still, the prosthodontist remains an integral member of the cleft and craniofacial rehabilitation team.<sup>4</sup>

Maxillofacial prosthetic treatments offer improvement in function, appearance, and health of patients with congenital and craniofacial defects. When planning a prosthetic rehabilitation for a patient with congenital abnormalities; lack of teeth, intraoral anatomic deformities, inadequate arc development, and inspection of appropriate occlusal vertical dimension must be taken into consideration.<sup>6</sup> There are various treatment modalities of definitive prosthesis for unilateral and bilateral cleft lip and palate patients after completion of orthodontic treatment such as; conventional multi-unit fixed partial denture (FPD), resin composite veneered multi-unit FPD, fiber-reinforced composite resin-bonded FPD, conventional removable partial denture (RPD), RPD with extracoronal attachment and combination of fixed and removable partial dentures.<sup>7-10</sup> Herein, prosthodontist should make a decision whether to use fixed (conventional or implant supported) or removable partial denture.<sup>7</sup>

RPDs are particularly indicated in patients with tissue deficiency, several fistulae, soft palate dysfunction, or uncoordinated nasopharyngeal sphincter action that can cause hypernasal speech.<sup>7</sup> Moreover, in the circumstances of vertical bone loss at edentulous anterior region, RPDs can hinder severe hygiene problems and deficiencies of labial support contrary to FPDs<sup>11</sup> and can provide good esthetics.<sup>4</sup> In addition it is possible to ensure permanent retention of maxillary arc while hindering arc collapse with RPDs.<sup>12</sup> Despite these advantages, patient satisfaction with RPDs significantly reduces with age.<sup>13</sup> The common objection is that its removable structure accentuates its artificial character.<sup>4</sup> Alternatively osseointegrated implants after secondary bone grafting have provided an invasive treatment approach for cleft lip and palate patients.<sup>14-16</sup> The use of endosseous implants for CLP patients with grafted alveolar clefts have lots of advantages, especially preservation of tooth structure in healthy adjacent teeth<sup>17</sup> and the prevention of resorption of grafted bone.<sup>18</sup> Secondary bone grafting at the early stage of the mixed dentition poses many benefits, however there is a conflict on timing of bone grafting.<sup>19</sup>

Despite the advantages of surgical intervention in CLPs, conventional prosthetic rehabilitation may be preferred especially in young patients whom bone grafting followed

by endosseous implants is not a treatment option. In the presented case series, 7 patients were presented describing the conventional prosthetic management of patients showing different patterns of cleft lip and palate.

### CASE SERIES

Seven patients, who were treated orthodontically and received a number of different lip and palate surgeries, were referred to Baskent University, Faculty of Dentistry, Department of Prosthodontics. Of these 7 patients, 5 were female (aged 17-21 years) and 2 were male (aged 15-29 years) with a mean age of 20 years. Three patients had BCLP and 4 patients had UCLP. Two of the BCLP patients and one of the UCLP patients had triangular alveolar defect extending to the palate in which food impacted during mastication, and caused speech alteration. Rest of the patients had only alveolar defects. All of the patients had missing maxillary lateral teeth, and 3 of the patients had additional missing teeth; bilaterally maxillary central and opposite lateral incisors. Only 2 patients had morphologically abnormal teeth; as maxillary left central incisors. Maxillary arch was orthodontically expanded in 5 of the 7 patients.

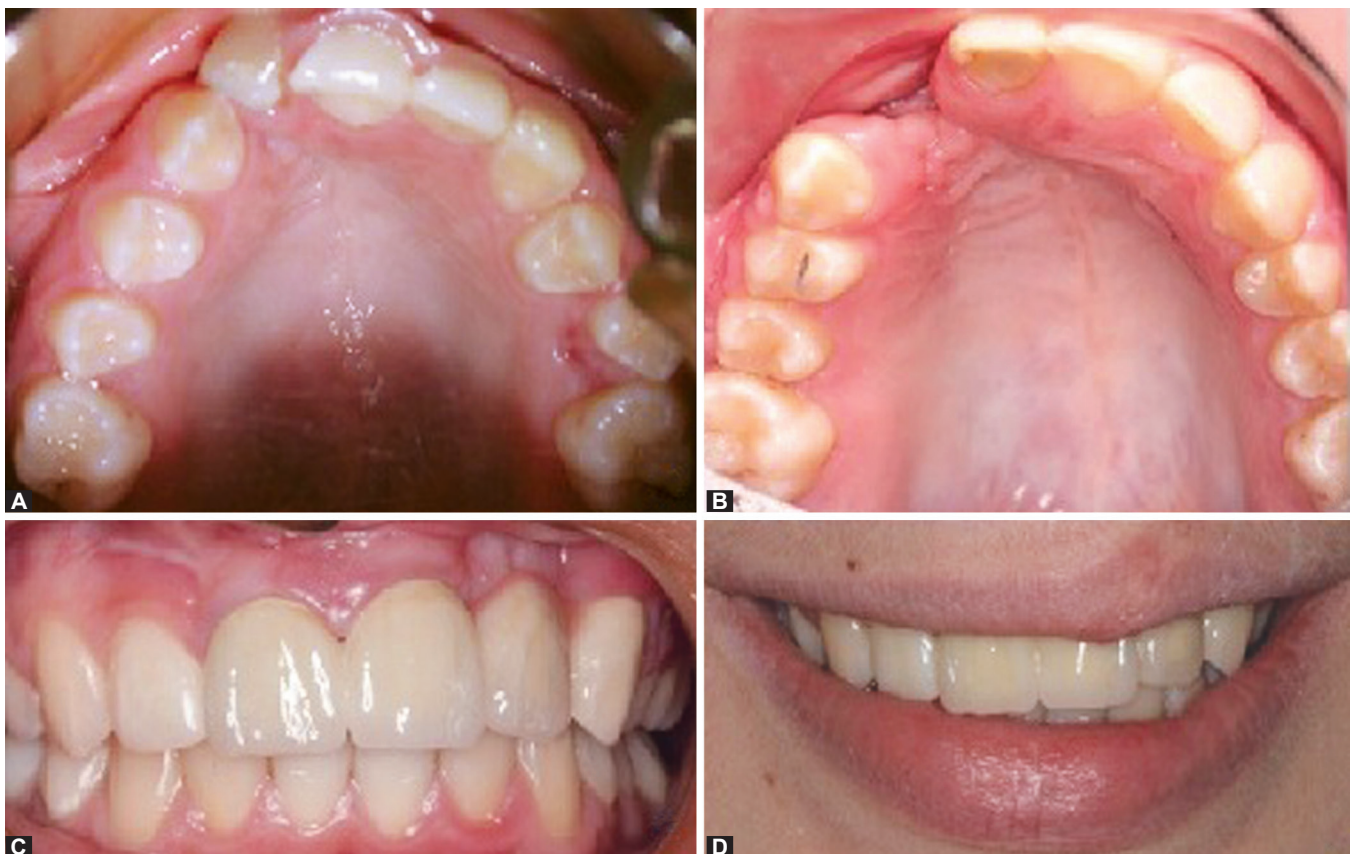
Prosthetic rehabilitation was commenced with an oral hygiene protocol which is a prior condition for this form of treatment. Two types of prosthesis, based on conservative

and economically feasible principals were designed. Five patients whose maxillary arch was orthodontically expanded were treated with a combination of fixed and removable partial dentures. The other 2 patients, who did not have maxillary collapse prior to orthodontic treatment, were treated either with three or four unit metal-ceramic FPDs.

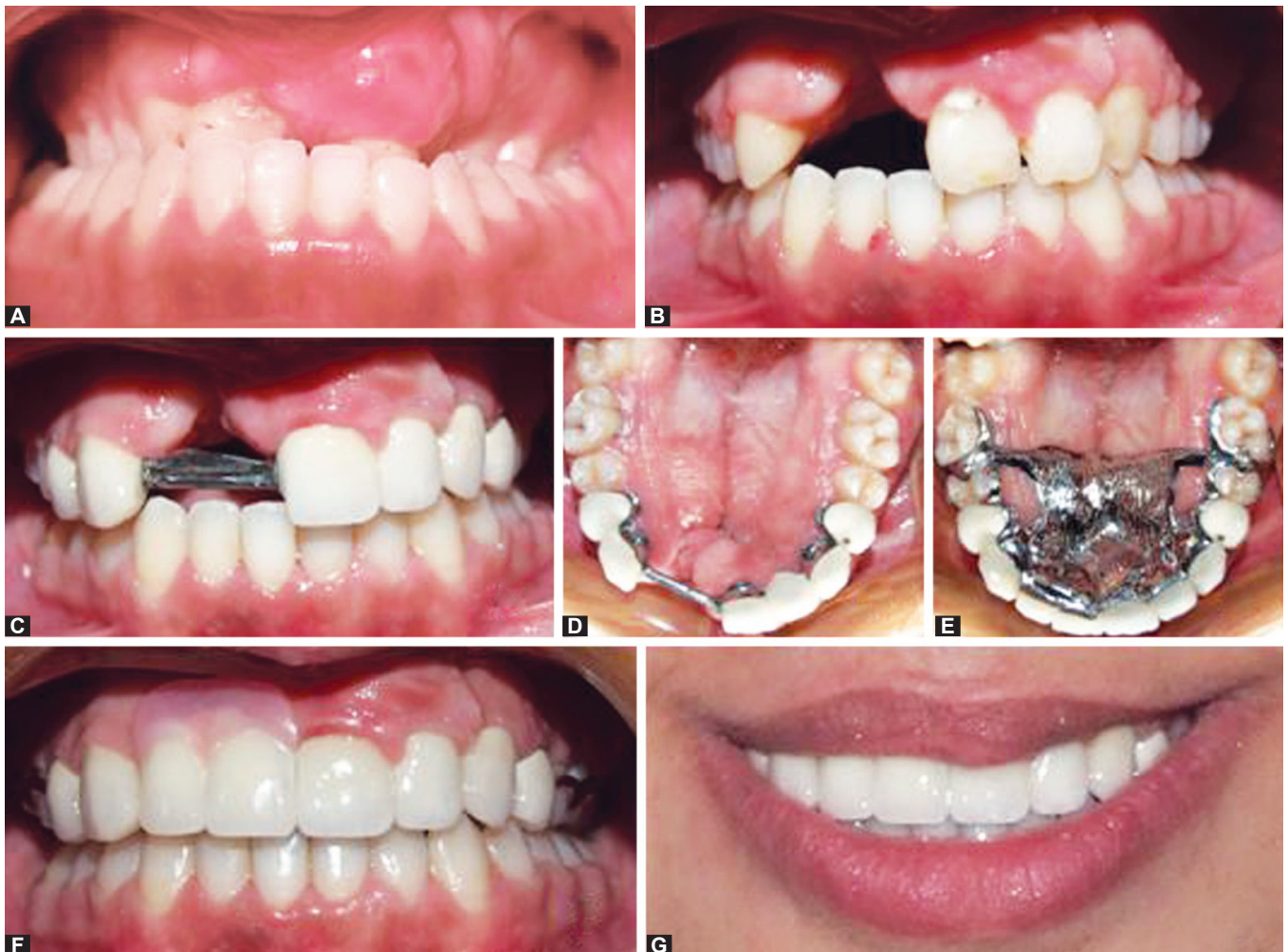
For FPDs, an abutment tooth on each end of the edentulous space was used to restore missing maxillary lateral. Metal-ceramic FPDs were constructed with routine clinical and laboratory process. (Figs 1A to D) For combination of fixed and RPDs, the numbers of prepared abutment teeth were determined according to biomechanical considerations.<sup>20</sup> Bar attachments on a bar spanning an edentulous area joining teeth were used. Multi-unit metal-ceramic FPDs with bar attachment were constructed. Prosthetic treatment was completed with combined bar and clasp retention RPDs. Aker's clasp or double Aker's clasps were used on posterior teeth. Special care was shown to cover the palatal defect area with the RPD framework for enhancing speech (Figs 2A to G). All patients were followed for up to minimum of 1 year and maximum of 2 years.

### DISCUSSION

Patients with congenital and craniofacial defect are unique, and oral problems must be evaluated individually to the



**Figs 1A to D:** Patient rehabilitated with FPDs. (A) Preorthodontic view, (B) preprosthetic palatal view, (C) frontal view of FPDs, (D) esthetic view of final restoration



**Figs 2A to G:** Patient rehabilitated with RPD and FPDs. (A) Preorthodontic view, (B) postorthodontic view, (C) frontal view of bar attachment between FPDs, (D) palatal view of FPDs and palatal defect side, (E) coverage of palatal defect with RPD, (F) intraoral view with the RPD in place, (G) esthetic view of final restoration

most ideal treatments.<sup>6</sup> In the presented case series, all of the patients were treated with conventional fixed or removable prosthetic dentures with precision attachments. When making a decision whether to use fixed or removable partial dentures; defect form, speech and swallowing difficulties, dental abnormalities, cosmetic deformities, maxillary collapse<sup>7</sup> age,<sup>13</sup> and financial status are the factors that form the prosthetic treatment plan.

In this case series, 3 of the patients showed a defect located in the palate, alveolar ridge and labial vestibule. Although the defects do not cause serious feeding problems, speech had been clearly affected in these patients. It was not easy to understand the patients' speech when the RPD was taken out. It is emphasized that, palatal cover of the framework assists speech therapy for correction of compensatory articulations and contributes to normal speech production.<sup>4,7</sup>

Prosthetic rehabilitation of missing maxillary anterior teeth requires special consideration to restore esthetics. The importance of oral health and hygiene cannot be ignored.

Besides, following surgical repair of the lip and palate, a defect in the alveolar ridge at the edentulous area adjacent to the abutment teeth may remain.<sup>21</sup> Destruction type will play an important role in selecting the pontic design. Ridge deformities have been classified into three categories. Class I; loss of faciolingual ridge width with normal apicocoronal height, class II; loss of ridge height with normal width, and class III, loss of both ridge width and height.<sup>22</sup> One of the alternative solutions used in the restoration of large ridge defect, particularly in the anterior segment, is the Andrews bridge system.<sup>23</sup> It utilizes fixed retainers that are connected by a rectangular bar which follows the curve of the ridge under it. Although the removable flange may cause plaque accumulation if not cleaned appropriately, it still may be the best way of handling large ridge defects<sup>23</sup> as far as esthetics, phonetics and function is concerned. In the present study, patients strongly requested to restore their missing teeth with fixed restorations. Unfortunately, clinic examination showed that making a FPD including anterior missing incisors may have caused food impaction

on the class II and III buccal defect side.<sup>22</sup> Additionally the amount of periodontal destruction is more pronounced in the cleft lip and palate patients compared with noncleft patients.<sup>24</sup> Bacterial plaque accumulation is enhanced due to the irregularly positioned teeth or displaced teeth, difficulty in closing lips, mouth breathing, and inadequate personal oral hygiene care.<sup>25</sup> Therefore, the patient was rehabilitated with metal ceramic FPD with a bar attachment passing throughout the defect side.

When a missing tooth is to be replaced, a conventional FPD<sup>20</sup> or implant supported FPD<sup>17</sup> is preferred by the majority of the patients. However, there is an important prerequisite for FPDs, that there should be no gross soft tissue deficiency in the alveolar ridge. If there is, it may be possible to augment the ridge with grafts.<sup>20</sup> Particularly in the CLP patients, secondary bone grafting at the early stage of the mixed dentition offers several benefits, such as bone support for unerupted teeth adjacent to the cleft, closure of oronasal fistulae, support and elevation of alar base on the cleft side, construction of a continuous arch form and alveolar ridge and stabilization of premaxilla in patients with a bilateral cleft. However, there are strong controversies concerning alveolar bone grafting related to the timing of the grafting, sequencing of orthodontic treatment to correct transverse discrepancy and type of bone for the graft. Ideally the permanent canine root must be formed half to two thirds at the time of grafting, which is generally between the ages 8 and 11. Occasionally the graft may be placed at an earlier age to improve the periodontal support of a lateral incisor. It is important to note that once teeth have erupted into the cleft side, bone grafting will not improve their periodontal support or the height of the alveolar bone crest.<sup>19</sup> All the patients presented in this case series were those who did not want to take the potential failure risk of bone grafting related to advanced age, and additionally those who resisted secondary alveolar bone grafting due to poor economic conditions unlikely to cover the additional graft.

It is well known that the scar tissue and deficiency of palatal and alveolar bone structure cause relapse of orthodontic treatment in CLP patients. No matter how ideal the occlusion obtained or the teeth positioned, relapse is inevitable even after 10 years use of retention appliances following orthodontic treatment. It was also shown that late secondary bone grafting which was expected to increase stability of the treatment could not stabilize the maxillary transverse dimension obtained by expansion. Therefore, permanent retention with an appropriate type of prosthetic restoration is strongly recommended for these patient.<sup>12,26,27</sup> It requires either a removable palatal prosthesis or a fixed bridge spanning the cleft.<sup>12</sup> According to Kantorowicz,<sup>28</sup> FPDs should be extended as far as second premolar or the

first molar to ensure stability. In this case series maxillary arch was orthodontically expanded in 5 of the 7 patients. Fixed partial denture combined with removable partial dentures attached on the crowns stabilized the premaxilla, thereby preventing relapse of the palatal expansion.<sup>7</sup> The patients were advised to wear the RPD continuously throughout the day and night in order to maintain arc width because maxillary dental arc segments may have contracted after surgical repair of the palate.<sup>12</sup>

## CONCLUSION

Despite recent advances in bone grafting and dental implants for CLPs, conventional prosthetic rehabilitation remains to be an important aspect in treatment of these patients. The presented cases had been followed up for up to 2 years and none of them revealed bone loss around abutment teeth or any complications related to maxillary relapse. Masticatory and speech functions had markedly improved in all patients following treatment as well their psychological state. Longer follow-up periods must be made for further evaluation of these patients in terms of prosthetic complications which may come up in the future.

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