

Clinical outcome of tooth-supported fixed partial dentures in unilateral cleft lip and palate patients: A case series

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Abstract

Introduction: Cleft lip and palate (CLP) is the most frequent congenital facial abnormality and multidisciplinary treatment extending over many years is necessary to rehabilitate the affected individuals to normal function and esthetics.

Objective: To evaluate the clinical treatment outcome for missing teeth with tooth supported fixed partial dentures in unilateral cleft lip and palate patients.

Patients and Methods: Tooth supported fixed partial denture (T-FPD) was utilized for restoration of missing teeth in the cleft area for 9 non syndromic, unilateral cleft lip and palate patients (U-CLP). The mean age of the patients was 25 ± 4 years. The edentulous sites were prepared to receive ovate pontic for best possible esthetic results. Survival and complications were recorded following various biologic, technical and esthetic parameters up to 10 years of follow up. A clinical comparison was also made with respect to the periodontal status and development of new carious lesion between the restored cleft side teeth and corresponding teeth of the normal side with in the same patient.

Results: Three failures experienced with fixed partial dentures were a result of ceramic chipping after 10 years, functional fracture after 3 years, and fracture due to external trauma after 2 years.

Discussion: CLP patients undergo a lot of treatment; therefore understanding their opinions, expectations, and perspectives towards the prosthodontic intervention was given due importance. The provisional phase was utilized to educate the patients on the achievable treatment outcome and its limitation. In the present case series, out of three failed FPDs, only one restoration failed relatively early due to functional factors. Re-treatment was successfully achieved without change in the original material and extent of the FPDs.

Conclusion: The outcome accomplished endorses the integral role of T-FPDs in the overall cleft care and it will remain a viable treatment alternative in select few patients in meeting their esthetic and functional desires.

Key Words: Cleft lip and palate, complications, fixed partial dentures

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INTRODUCTION

Cleft lip and palate (CLP) is the most frequent congenital facial abnormality, and its occurrence is linked to both hereditary and environmental factors.^[1,2] A multidisciplinary treatment extending over many years is necessary to rehabilitate the affected individuals to normal function and esthetics. For optimal outcome, the intervention commences early in infancy and continues in adulthood with various treatments being performed to harmonize with the growth of the child.

The desirable oral treatment goal in CLP patients is to achieve a complete dental arch without the need of a prosthesis.^[3] The complete closure of the dental arch can be accomplished by autogenous bone grafting in combination with orthodontic tooth movement to facilitate the eruption of either lateral incisor or canine in the grafted site.^[4-6] In comparison to the further need of prosthetic restoration, orthodontic space closure precludes the need for a prosthesis, is relatively less costly, does not have to be postponed till the completion of growth, and preserves primary healthy abutments from preparation. This therapeutic end point results in a significantly healthier periodontium and greater patient satisfaction in comparison to prosthodontic restoration.^[7]

However, prosthodontic intervention may become a necessity when edentulous span remains after completion of orthodontic treatment and is usually considered a final link to complete oral rehabilitation in CLP patients. The treatment modality chosen to restore the edentulous site in CLP patients is dictated by patency and extent of the defect, presence of unrepaired cleft lip and/or palate, maxillomandibular relationship, and status of the remaining teeth. Edentulous space with bone grafted cleft site may be predictably restored with dental implants.^[8] In clinical situations with shorter edentulous span, where implant supported restoration is not feasible due to anatomical and/or patient-related limitations, a tooth supported fixed partial denture (T-FPD) is a preferable treatment option.^[9] In patients, where primary abutments are not grossly malformed and are not indicated for any further prosthetic intervention, resin bonded FPD may serve well as a restorative option without compromising on esthetics and function.

A removable prosthesis is indicated in patients with an excessive span of edentulism, presence of inter-arch discrepancies, and when the edentulous space is associated with a patent cleft in the lip and/or palate. Accordingly, treatment may be planned for a conventional cast partial removable denture, telescopic denture, or hybrid prosthesis in a combination defect.^[10,11]

This case series reports the outcome of the treatment performed for the restoration of edentulous space in

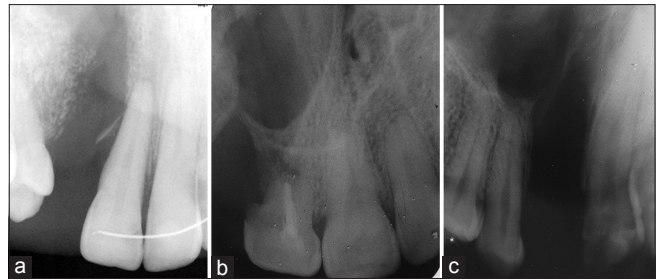


Figure 1: (a-c) Intraoral radiographic pictures showing compromised alveolar bone support of teeth adjacent to the alveolar cleft

Table 1: Details of prostheses characteristics, region of the cleft and associated missing teeth, reason for failure, response to their own aesthetic perception on Visual analogue score on a scale of 10, fixed partial denture span and follow up in years

Core material	Missing tooth	Age/Sex	Reason for failure	VAS	FPD _n /Ab _n /FU _Y
Co-Cr	Left LI, Canine	32/M*	Ceramic chipping	9	5/3/10
	Left LI, Canine	28/F		10	6/4/3.5
Li-DiS	Right LI	26/F*	Fracture	10	3/2/3
	Right LI	20/M		10	3/2/1
Zi	Left LI	20/F*	RSA	10	4/3/2
	Left LI	23/M		10	3/2/5
	Left LI	25/M		9	4/3/2
	Left LI	27/M		9	3/2/3
	Right LI	22/F		10	3/2/1

Co-Cr: Cobalt-Chrome alloy; Li-DiS: Lithium Disilicate, Zi: Zirconia, LI: Lateral Incisor, RSA: Road side accident, VAS: Visual analogue Score, FPD_n: Number of units of Fixed Dental Prosthesis, Ab_n: Number of Abutments, FU_Y: Follow up in years, *Failed Prosthesis

unilateral CLP (U-CLP) patients with T-FPD, where bone grafting and dental implant supported restorations were not feasible.

PATIENTS AND METHODS

Nine nonsyndromic, U-CLP patients (four females and five males) with mean age of 25 ± 4 years and high esthetic expectations were treated with T-FPD for their missing teeth in the left region [Table I]. Except for two patients, primary bone grafting in the cleft area was never attempted. The teeth immediately adjacent to the cleft were malformed, Grade II mobile, and with guarded prognosis due to compromised alveolar bone support [Figure I a-c]. None of the patients gave consent for extraction of the mobile teeth.

Inclusion criteria

- Nonsyndromic U-CLP patients with no remaining patent cleft in lip and/or palate
- Class I malocclusion
- Patients and parents inclined toward retaining the prospective abutments
- Consent for treatment with tooth supported fixed prosthesis
- Refusal for another surgical intervention like late bone grafting and/or implant placement in the cleft area

- Stable, well maintained periodontal status and motivation to further maintain it
- Adequate manual dexterity to use oral hygiene aids
- Agreeing for regular follow-ups.

Exclusion criteria

- Patient's younger than 16 years
- Three or more missing teeth in the cleft segment
- Presence of deep bite and traumatic occlusion
- Patient requiring comprehensive orthodontic treatment.

Preprosthetic phase

The complete treatment process with its timeline and limitations was explained to each patient. In addition, clinical models and pictures of other patients who underwent similar treatment were used as an aid to make them fully aware of the treatment they will be undergoing. Periodontal supportive therapy was performed in all patients before the onset of prosthodontic intervention.

After teeth preparation, provisional FPDs were fabricated using an indirect-direct technique and were cemented under active pressure.^[12] The soft tissue in the edentulous space was contoured during the provisional phase of treatment to receive an ovate pontic for better emergence profile and soft tissue integration.^[13,14] The tissue contacting surface of all the pontics were highly polished and were modified every month for 3 months. The provisional phase of treatment was utilized to garner adequate feedback on their esthetic expectations, to communicate the achievable esthetic potential of the prosthesis, educating them on the drawbacks of the treatment being rendered, and evaluating the level periodontal maintenance and suggest modifications accordingly.

Prosthesis considerations

Depending on the span of edentulism, at least one abutment on each side of the cleft was involved in the FPD. Cantilever pontic was not deliberated upon. At the final impression stage, the exact contour of the pontic was communicated to the laboratory following the technique described by Dylina TJ.^[15] Decision on the material of the prosthesis was based on patient's esthetic desires, number of missing teeth, and the economic concerns. Adhesive bonded FPD (E-max, Ivoclar Vivadent, Schaan Leichenstein) and metal ceramic FPD was chosen for two patients each and in the remaining five patients zirconia-based prosthesis (Procera, Nobel Biocare, Sweden) was selected as the material of choice [Table I]. Gingival colored ceramic was used to compensate for the prevailing tissue deficiencies [Figure 2a-c].

Final cementation

The respective FPDs were acceptable to the patients without any major modification in the morphology and/or color. Initial cementation of FPD in the patient with 10 years

follow-up was done using glass ionomer cement (GC Fuji, Japan). Repeat prosthesis in this particular patient and cementation for all other FPDs was done using self-etch and bond resin cement (U200, 3M ESPE). Patients were motivated to report for the first follow-up at 1 month and subsequently visit for annual evaluations or when some concern arose with respect to the treatment rendered, which-ever was earlier [Figure 3a and b].

Parameters evaluated

The prostheses were examined with respect to any biologic, technical, and esthetic issues. A fully functional restoration with no complications reported or detected during the observation period was considered successful. Concerns warranting removal of the original FPD was considered as failure.

Assessment of biologic complications included the presence or absence of secondary caries at crowned teeth, periapical pathology, vitality and mobility of abutments, crown-root fracture, and periodontal disease. Assessment of technical complications included loss of retention and material fracture (ceramic chipping and/or fracture of the framework). Esthetic evaluation was based on the feedback from patient's own perception with respect to the prosthesis at follow-up appointments. Any significant change in perception with time warranting removal of the FPD was to be taken into account. A clinical comparison evaluating status of the periodontal health and development of new caries was made between the restored cleft segment and corresponding teeth on the opposite side with in the same patient.

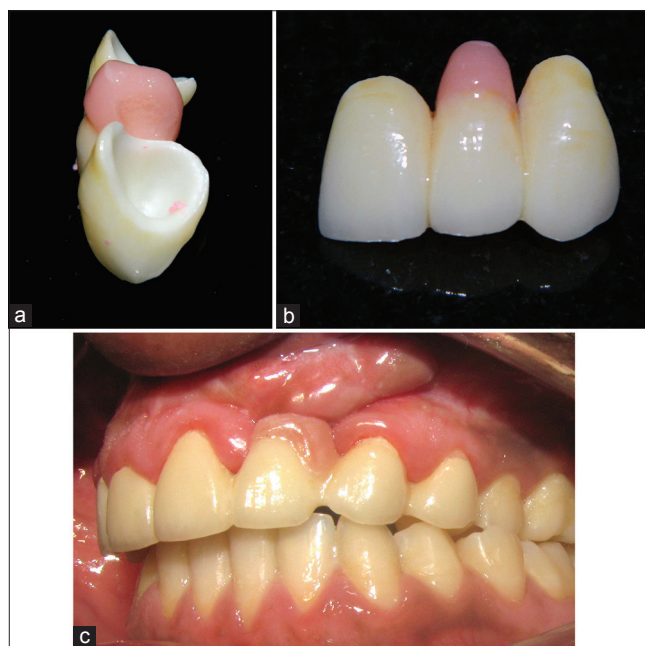


Figure 2: (a-c) Gingival colored ceramic used to mask the soft tissue deficiencies for an overall pleasant appearance



Figure 3: (a and b) Restoration of missing left lateral incisor. (a) Tissue contacting surface of the pontic made convex. (b) Optimal soft tissue integration and emergence profile achieved with an ovate pontic in a fixed dental prosthesis at 4 years follow-up

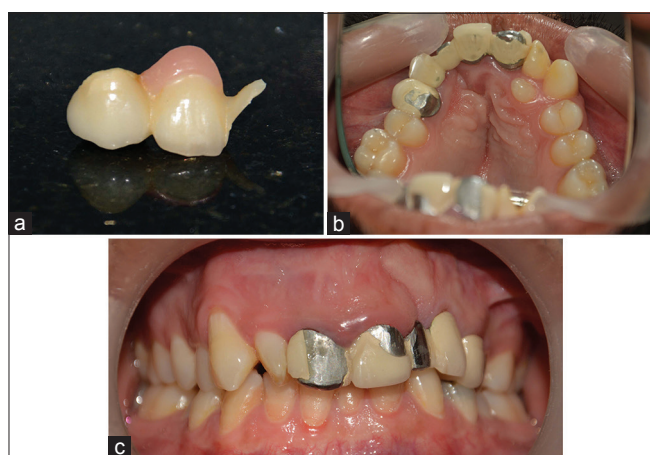


Figure 4: (a-c) Failed prostheses. (a) *In situ* fracture. (b and c) Ceramic chipping in multiple retainers after 10 years

Outcome

Nine T-FPDs were delivered utilizing 23 abutments; out of which twenty teeth were vital. All patients were satisfied with the esthetic outcome achieved and their own perception did not change at the subsequent follow ups. Three failures experienced with FPDs were a result of ceramic chipping after 10 years, functional fracture after 3 years, and fracture due to external trauma after 2 years [Figure 4 a-c]. One abutment each turned nonvital below the fractured prostheses, due to secondary caries and trauma.

During the entire follow-up period, periodontal health of all the abutments remained stable and none showed clinical mobility to be concerned of. Furthermore, the periodontal status of the restored cleft segment was satisfactory and was not different from the normal side. Only one out of 23 abutments was affected with secondary caries in the restored side.

DISCUSSION

The optimal oral treatment outcome in CLP patients is to achieve a unified maxillary arch using patient's own teeth. However, all patients of CLP are not treated in the same way and we may not always achieve the anticipated outcome; thus, resulting in an edentulous span. The next desirable treatment alternative would be to graft the alveolar cleft site followed by implant supported prosthesis.^[7,8] However, this treatment modality is influenced by the fear of another surgery for bone grafting and osteotomy, donor site morbidity, unpredictable outcome of late grafting, extent of alveolar defect (larger defects may not be conducive for grafting), and higher treatment cost and time involved.^[16,17]

In comparison to the implant related treatment in CLP patients, T-FPD has a distinct advantage of eliminating visible spaces, correction of malformed teeth adjacent to the cleft and splinting the mobile abutments. Preparation of the vital teeth, lack of osseous stimulation in the pontic area, and need for revision treatment are the potential shortcomings of this conventional treatment. Nevertheless, this time saving and economically viable modality does serve the patients functional needs with excellent esthetic outcome and further prolongs the longevity of weaker abutments.

Patients affected with CLP live through a lot of treatments commencing as early as within 1 month of the birth.^[18] Therefore, their opinions, expectations, and perspectives toward the intervention should always be given due significance.^[19,20] Decision to retain the teeth adjacent to the cleft as prospective abutments was made judiciously considering that the lack of supporting bone was present only on the cleft side of the

abutments, absence of active periodontal pathology, and patient and parents refusal for extraction of the primary abutments. In addition, lesser cost and time involved, simplistic treatment planning, and execution, and predictable outcome favored for the treatment rendered in comparison to extractions of weaker abutments and a longer span of tooth or implant supported FPD. It would be prudent to work conservatively in these patients and more importantly, the proposed treatment options after extracting the weak abutments still remain valid in future, in the unfortunate event of abutment loss.

Literature is sparse, when comparing the performance of T-FPD on cleft side with the normal side in the same patient. The systematic reviews on the survival and complications of T-FPD in noncleft population have revealed low incidence of failure up to 5 years of function, which increases afterwards and reaches a significant levels at 10 years.^[21-25] In the present case series, only one bonded restoration failed relatively early due to an *in situ* fracture after 3 years. The distal abutment in this FPD was affected with secondary caries, requiring endodontic treatment and fiber postsupported composite core. An external trauma after 2 years was responsible for the retreatment of the Zirconia-based prosthesis. The fractured abutment was root canal treated. The metal ceramic prosthesis was removed due to ceramic chipping at multiple places after 10 years of satisfactory function. All three failed restorations were replaced with new FPDs without change in the original material and extent of the framework.

The completion of prosthodontic treatment may be presumed as the culmination of a very long cleft care. Although the frequency of review appointments will decrease, it is imperative to educate both the parents and the patients regarding the inevitable need for revision treatments, considering the limitations of the T-FPD.^[26]

Research in the field of visual difference has revealed that self-awareness and own perception of noticeability play a significant role in the psychological well-being of the patient rather than the objective evaluation of asymmetry.^[27-31] Therefore, understanding the patients' expectations from the prosthodontic intervention was given due importance before beginning the treatment. Provisional phase of the treatment was utilized to sensitize the patients toward the achievable final outcome, limitations involved with respect to T-FPD, and to reinforce importance of periodontal health in the ultimate success of the treatment being rendered. The patients were involved in the entire treatment process and were encouraged to provide feedback and suggestions on the potential modifications desired in the final prosthesis. The foremost concern in these patients was the presence of unaesthetic edentulous space; therefore, the pontic site was developed to receive an ovate

tooth with which it integrates esthetically, phonetically, and functionally. The T-FPDs met the expectations of all the patients and they responded favorably even to the failures.

It is understandable, that the need for such prosthodontic intervention in U-CLP patients is decreasing and fewer numbers of patients will be treated in this manner. The outcome achieved does emphasize the importance of self-perception and patient education in creating positive approach to several important aspects of the prosthodontic treatment experience.

CONCLUSION

Due to the limited need of prosthodontic intervention in the current treatment protocols for cleft lip and palate patients, only few patients were treated in this manner. The outcome accomplished endorses the integral role of tooth supported fixed dental prostheses in the overall cleft care and that, it will remain a viable treatment alternative in select few patients in meeting their esthetic and functional desires.

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Conflicts of interest

There are no conflicts of interest.

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Bhandari: Tooth-supported fixed partial dentures in unilateral cleft lip and palate

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