

CASE REPORT

Using loop connectors as an interim mode of treatment: An interdisciplinary approach

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ABSTRACT

To tackle a large midline diastema and generalized spacing existing before extraction often poses a challenge to the treating prosthodontist. The situation becomes even more complicated if the patient is a teenager, with multiple missing teeth, associated deep bite and where the jaw bone growth has not yet been completed. Possible treatment options would include a removable prosthesis, a fixed partial denture or an implant supported prosthesis. Treating such cases with a simple removable prosthesis cannot be justified if a deep bite existed which would result in posterior disocclusion. Also a conventional fixed partial denture or closure of the diastema with light cure composite (LCC), would result in a seemingly large tooth, which would be unaesthetic in appearance. Implant supported prosthesis is a possibility, if the patient's jaw bone growth has been completed. Another simple non-invasive solution to this problem would be to fabricate a non-rigid connector using loops. This presentation describes the procedure for fabrication of an interim loop connector for a 16 year old female patient who had lost one of her maxillary central incisors as a result of trauma. Patient also had multiple spacing in the maxillary anterior teeth and an associated deep bite. Her cephalogram revealed that she had a Class III skeletal pattern. A permanent treatment at this stage was not possible due to onward mandibular growth pattern as revealed on the cephalogram. Hence to dodge all these problems, a simple and non-invasive treatment using loop connectors was chosen till the growth period was completed.

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A simple smile increases the confidence of an individual manifold. However, the loss of tooth, especially at an early age can have deleterious effects on the psychological makeup of an individual. The situation is worsened if such victims fall in the teenage category, who are generally known to be notoriously self-conscious.

Fracture of a maxillary central incisor in a young individual is not an uncommon finding. The fractured teeth are either extracted or restored according to the grade of fracture involvement. A missing tooth is then prosthetically rehabilitated with a conventional bridge or endodontically

treated and replaced with a crown if the line of fracture is not extensive. The field of prosthodontics has taken a giant leap, when once upon a time; shells and exfoliated teeth were somehow wired onto the adjacent teeth for support to the presently booming era of dental implants, where a partially edentulous or a completely edentulous patient can be completely restored functionally and esthetically to normal occlusion.

As each individual is a unique creation, and no two individuals appear the same in form or character, their problems are also different. Hence, there cannot be one permanent solution for all. This principle is applicable while treating our patients too, where each patient presents with a different case scenario. Treating such patients always

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with a single mode of treatment would be considered as an underestimation of the individual's problem.

This case report describes a different treatment solution for a young female patient who had to undergo extraction of her front tooth due to severe external resorption. The missing tooth was subsequently replaced by a spring cantilever bridge (Loop Connector) to tackle a large midline diastema and associated deep bite. A permanent solution such as conventional three-unit bridge or a dental implant treatment could not be advised immediately as the patient exhibited a Class III skeletal tendency, which could eventually result in lower anterior crowding and subsequent failure of prosthesis.

CASE REPORT

A 16-year-old female reported to the Department of Prosthodontics and Crown and Bridges, Pushpagiri College of Dental Sciences, with a chief complaint of repeated dislodgement of the artificial crown in relation to the upper left front tooth region. The past dental history revealed that the patient had experienced a fall 4 years back due to which 21 was avulsed and immediately reimplanted by a local dentist, followed by endodontic treatment which was done in the following week.

On clinical examination, the patient revealed a straight profile, with an apparently symmetrical facial form. A fenestration of size (1.5 mm × 1.5 mm) was present in relation to the mucogingival junction of 21 extending into the attached gingiva. The patient presented a Class I molar relation bilaterally and on protrusive and laterotrusive movements, a mutually protected and group function occlusion existed, respectively. A large midline diastema of almost 5 mm was noticed associated with an aberrant maxillary labial frenum attachment. Spacing was noticed between the maxillary anterior teeth bilaterally, mesial to the canine teeth. 12 was missing, and 22 was a peg lateral [Figure 1].

Intraoral periapical view of 21 revealed radiopaque mass in the pulpal space suggestive of an endodontic filling material [Figure 2]. The periodontal ligament space in relation to the mesial aspect appeared to be obliterated. The radicular margins appear to be irregularly defined indicative of an ongoing external resorption. A multidisciplinary approach was carried out, and opinion was taken from the Department of Conservative and Endodontics, Periodontics and Orthodontics. As the extent of the resorption was extensive, it was decided to extract the 21 and replace the tooth with an immediate removable partial denture (RPD). The aberrant frenum had to be surgically removed; however, it was decided to carry out the procedure during the termination of the orthodontic procedure. The patient exhibited a Class III skeletal pattern on the cephalogram, [Figure 3a and b] and it was decided to evaluate the patient after 2 years, as a possibility of late mandibular growth was expected and so any immediate

treatment to correct the spacing was delayed. It was decided to fabricate a spring cantilever bridge replacing missing 21 using the palatal surface of 14 as an abutment. The prosthesis acted as an interim treatment until a more definitive treatment such as a conventional three-unit bridge, or a dental implant could be given, after completion of any residual growth of the jaw bones.



Figure 1: Pretreatment intraoral photograph; a fenestration of size 1.5 mm × 1.5 mm near the mucogingival junction approaching the attached gingiva in relation to 21



Figure 2: Intraoral periapical view of 21. Replacement resorption noticed with obliteration of the periodontal ligament space

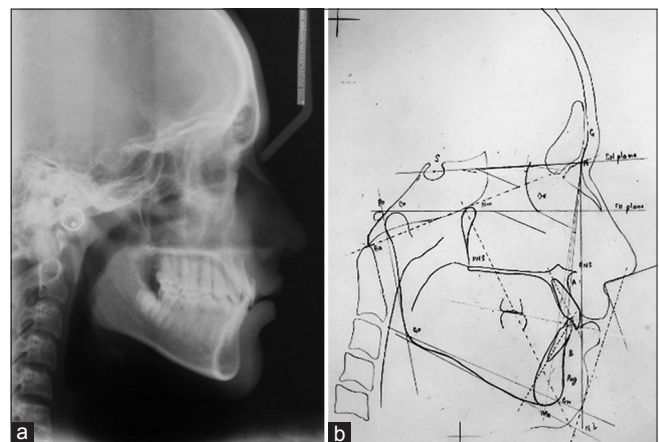


Figure 3: (a) Pretreatment lateral head cephalogram, (b) superimposition of tracing showing skeletal and dental

Procedure

Mock preparation

A diagnostic impression was made, and the maxillary and mandibular casts were articulated on a three-point articulator. A mock wax pattern was fabricated involving the palatal aspect of 14 as the abutment which simulated the design of the final prosthesis.

Extraction and immediate removable partial denture fabrication

21 was extracted and an immediate RPD [Figure 4] was delivered made of self-cure acrylic (Orthoplast, Uttar Pradesh, India).

Tooth preparation

A sleeve type of preparation similar to the type of preparation for a Maryland bridge was performed using a tapered chamfer bur. The preparation was confined to the palatal half of the tooth with proximal extensions limited just beyond the contact point made with the adjacent teeth. A supragingival finish line was prepared, and occlusally the preparation extended up to the central development groove. An overall reduction of 0.5 mm was done and the entire preparation was confined within the enamel layer [Figure 5]. An interocclusal clearance of 1 mm in relation to the palatal cusp of 14 was established to provide adequate thickness for the metal wing. The final preparation was confirmed, and an elastomeric impression (Aquasil soft putty and Aquasil LV, Dentsply, Noida, India) was made and was poured using die stone (Asian Chemicals, Gujrat, India).

Laboratory phase

A die cut procedure could not be carried out as this would result in the loss of soft tissue anatomy adjacent to the proximal preparation. Wax pattern was fabricated as proposed earlier during the mock design. The palatal loop connecting the pontic and the retainer on the right first premolar were made with round gauge wax. The framework was casted, and the metal thickness at the wing region was about 0.5–0.8 mm and at the loop was 1.5–2 mm in diameter.

Metal try in

A metal trial was checked for proper fit and any impingement of the palatal tissue. Any interference during anterior and lateral guidance was checked for and eliminated before porcelain build up. After the trial procedure, porcelain fused to metal was baked at the recommended temperature.

Cementation of the prosthesis

The final prosthesis [Figure 6] was checked for proper shade and the patient was asked to perform anterior and lateral movements to check for any interference. The prosthesis was cemented using Rely XU 200 (3M ESPE, St. Paul, MN, USA).

Composite build up

An esthetic build up with light cure composite was done to recontour the peg lateral in relation to 22 [Figure 7a and b].

The patient was satisfied with the treatment. The patient's spacing was maintained among the anterior teeth for a natural appearance and also considering future growth possibilities.

Follow up

She was recalled after 1 week and assessed for any occlusal interference or irritation. A follow up was made after 4 months and the patient was satisfied with the treatment and had no complaints while chewing. Special instructions were given not to chew any hard foods with the anterior teeth.



Figure 4: Tooth extracted and immediate removable partial denture inserted



Figure 5: Sleeve preparation done using tapered chamfer bur



Figure 6: Final prosthesis; the luting surface of the wing was sandblasted to enhance the retention of the prosthesis

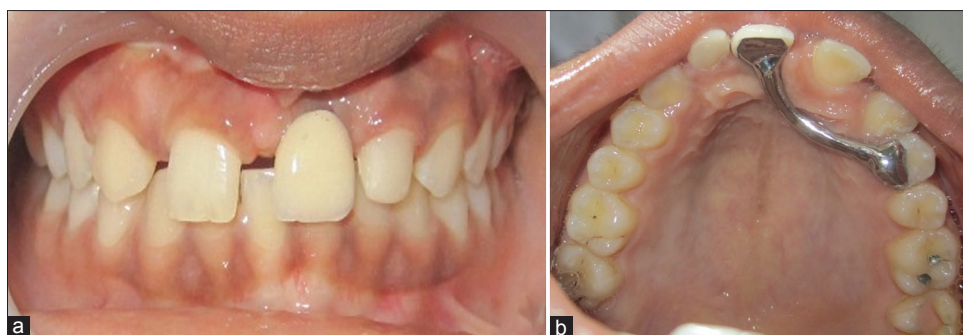


Figure 7: Post treatment intra oral photograph (a) frontal (b) occlusal

as this would result in the dislodgement of the prosthesis. The patient was also informed about the possibility of recementing the prosthesis in case of dislodgment and was asked to maintain oral hygiene regularly. The patient was asked to report to the Department of Orthodontics after 2 years to assess growth phase and initiation of orthodontic treatment.

DISCUSSION

The article described above sheds light on the additive benefits of using a spring cantilever as an interim mode of treatment in a patient whose maxillary left central incisor had to be extracted due to external resorption. Restoring a missing tooth with a preexisting diastema poses significant challenges before the general dentist or the prosthodontist. The need for an interdisciplinary approach in treating such patients would ultimately benefit the patient, and also would help the dental team comprising of different specialties to see the problem from a wider perspective.

One of the main complications of a tooth that has avulsed as a result of trauma which is later replanted is external root resorption. This is because of the destruction of the periodontal ligament associated with loss of precementum, cementoblasts and epithelial rests of Malassez which makes the tooth susceptible to hard tissue resorbing cells.^[1] Treatment of a tooth that is affected by resorption is dependent on the stimulation factors that resulted in the resorption.

The external resorption of the patient suggested in this case report of the replacement type which is characterized by an obliterated periodontal ligament space with irregularly defined root margins and inward bone growth. However, in replacement resorption or an ankylotic resorptive process, the stimulation factor is unknown and therefore a predictable success cannot be assured.^[1,2] Replacement resorption occurs when there has been extensive destruction of the periodontal ligament. Here, a competitive healing takes place where the healing occurs from the socket wall (i.e., from the bone marrow-derived cells) and also from the adjacent periodontal ligament. (Cementum and

Sharpey's fibers), and this process occurs simultaneously. The decision to extract the tooth was completely justified due to the extensive destruction that had taken place. If the tooth would have been retained, the resorptive process would have progressed, making it difficult for the retrieval of the gutta-percha cone at a later stage.

An orthodontic treatment was not advisable at the present stage as the clinical, and cephalometric evaluation revealed a Class III skeletal growth pattern with compensated dentition (proclined maxillary anteriors and upright mandibular anterior teeth. ANB value of -2° , increased mandibular length Condylion–Gnathion is 122 mm. In Wits appraisal, B point was found to be ahead of A by 5 mm. According to Bassetti's classification on cervical vertebral maturation for the assessment of optimal treatment timing in dentofacial orthopedics, the patient was assigned a cervical stage 5, where the peak mandibular growth was completed a year back, and some residual growth could be expected.^[3] These findings are consistent with earlier studies conducted by Foley and Mamandras and Brown and Daugaard-Jensen which suggests the potential for the jaws to exhibit signs of growth beyond the expected limits.^[4-6]

Replacing the missing tooth with a permanent treatment such as a conventional three-unit bridge or placing a single implant may either hamper the growth of the jaw or result in an unaesthetic appearance of the final restoration. Furthermore, the possibility of future crowding of the mandibular anteriors as discussed before may exert undue pressure on the final restoration resulting in failure of the prosthesis.

Op Heij *et al.* in 2003 has done an excellent review on the various complications that could arise if dental implants are placed before growth completion. He stated that the anterior maxilla is a crucial site for premature implant placement because of the amount, direction and unpredictability of growth in this area especially when adjacent teeth are present.^[7] Iseri highlighted that, like a natural tooth, the implant cannot have a symbiotic relationship with alveolar bone during the growth of the jaw bones as the implant is ankylosed to the bone. The growth of the bone in the vicinity of the implant is halted while continued growth

takes place near the adjacent teeth usually resulting in infra-occlusion of the artificial teeth.^[8]

Even though the patient had a thick and aberrant maxillary labial frenum attachment, a frenectomy procedure was not done immediately, as the resultant scar tissue formed postsurgery would hinder the orthodontic movement near the midline. The benefit of postponing the frenectomy procedure during tooth movement or at its culmination stage is that the resultant scar tissue would act as a cuff preventing relapse.^[9]

A loop connector also known as the spring cantilever bridge is a simple prosthesis which is indicated when an existing diastema is maintained in a planned fixed prosthesis. The loop exists on the lingual aspect of the prosthesis which connects the retainer and the pontic.^[10] The prosthesis is not an ideal permanent solution for a missing tooth as the loop permanently covers the areas of mucosa which may result in irritation or compression of the underlying soft tissue.^[11,12] The speech of the patient may get affected if the connector design is bulky, in turn affecting the linguopalatal sounds.^[13] Therefore, it must be used only as an interim mode of treatment in cases where skeletal growth is not completed, or during the osseointegration phase before implant loading, or during the healing of the periodontium until a permanent prosthesis can be given. Furthermore, strict oral hygiene instructions must be given to prevent plaque accumulation around the loops.

An added advantage of using the loop connector is its ability to flex to a little extent, the property which could be utilized during the orthodontic tooth movement where the prosthesis may be debonded and slightly adjusted to maintain the midline. It would also be appropriate to mention that the flexible nature of the cantilever should also be considered a disadvantage if the prosthesis is used as a permanent mode of treatment. A full coverage crown was not given, although it would improve the retention of the prosthesis as the patient's requirement was only for a short period. Hence minimal preparation of the tooth restricting it within the enamel layer was done which could be later veneered with a composite restoration.

Also, the resin cement (Rely XU 200) used showed promising results of superior bond strength with the enamel ensuring longevity of the prosthesis.^[14] It is always better to take an abutment on the ipsilateral side to decrease the lever arm, however, in this case, the palatal surface of maxillary right first premolar was selected as the abutment because of its greater surface area for bonding compared to its counterpart.

CONCLUSION

The main purpose of this article was not to highlight the indication of a loop connector as that is already an established fact, but rather to bring to light the need of treating such cases with an interdisciplinary approach. Patients who are in their

late teens are believed to have completed the active growth phase and are generally considered for any permanent dental rehabilitation. The exclusivity of the case mentioned above lies in the fact that the patient's dental and skeletal findings did not correlate with her chronological age. An immediate permanent treatment may have consequences on the growing dental and skeletal structures. Treating the patient with an interim loop connector avoided the present esthetic deficiency and also provided space for any continuing growth to occur. At the end of 2 years, any possibilities for residual growth would have completed, and an orthodontic treatment including deep bite correction and teeth alignment could be initiated. The missing teeth would then later be replaced by dental implant treatment. The main issues regarding the retention of a tooth undergoing external resorption, and premature placement of a permanent prosthesis in a patient exhibiting features of a late mandibular growth pattern are discussed in detail.

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Conflicts of interest

There are no conflicts of interest.

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