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Combined orthodontic and prosthetic management of missing maxillary incisor and mandibular crowding: A case report

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Missing teeth is one of the common problems seen in clinical dental practice. Orthodontists may contribute to the overall management of missing teeth by closing, opening or redistributing spaces. Other aspects of malocclusion such as crowding and arch discrepancies may be managed at the same time. This article reports treatment of a 14 year old boy with missing maxillary left central incisor and mandibular anterior segment crowding.

Introduction

The loss of a maxillary central incisor may be the result of trauma or extraction necessitated by a number of conditions including periodontal disease, caries, root fracture, resorption and tooth malformation.[1]
Most traumatic dental injuries occur in childhood and adolescence. Researches have estimated that 70 to 90 percent of all traumatic dental injuries sustained in a lifetime take place before the age of 19 years.[2]
Avulsion of teeth affects mostly the maxillary central incisors at the time of their eruption and generally occurs in children from 7 to 9 years of age. At this age, loosely structured periodontal ligament and low mineralized bone that surround erupting teeth provide only minimal resistance to an extrusive force. Most frequently avulsion involves a single tooth, but multiple avulsions also occur.[3]
A number of patients do not seek professional help for some time resulting in space loss caused by mesial drift of the lateral incisor. In such cases the long term management rests on choosing between one of the two approaches i.e. either re-opening the space followed by prosthetic replacement or maintaining the closed space together with modification of the lateral incisor to mimic the missing central incisor.[4]
The problem of restoring esthetics and function varies significantly according to the age of the patient, facial morphology, assessment of available space, width of the lateral incisor and length of its root, size and shape of other teeth, colour and morphology of the canine, nature of any malocclusion and cuspal interdigitation, risk of future trauma and finally the patient's willingness to undergo complex, expensive treatment.[1]
This paper discusses the management of avulsed maxillary left incisor space and mandibular crowding by an orthodontist. To produce an optimal treatment result, it frequently is necessary to use the combined efforts of an interdisciplinary team of experts namely orthodontist, restorative dentist and prosthodontist.

Diagnosis and Etiology

A 14 year old male was referred to the orthodontic clinic by a private dentist for an integrated orthodontic and restorative treatment. The patient complained of upper and lower front teeth not being straight and missing upper front tooth. Patient presented with lower anterior crowding on a class I skeletal base. Maxillary left central incisor was missing. Both upper right central and left lateral incisors had tipped towards missing tooth space. There was less than 5mm crowding in mandibular anterior segment. Lower right central incisor was labially tipped with gingival recession but attached gingiva appeared normal (Figure 1).

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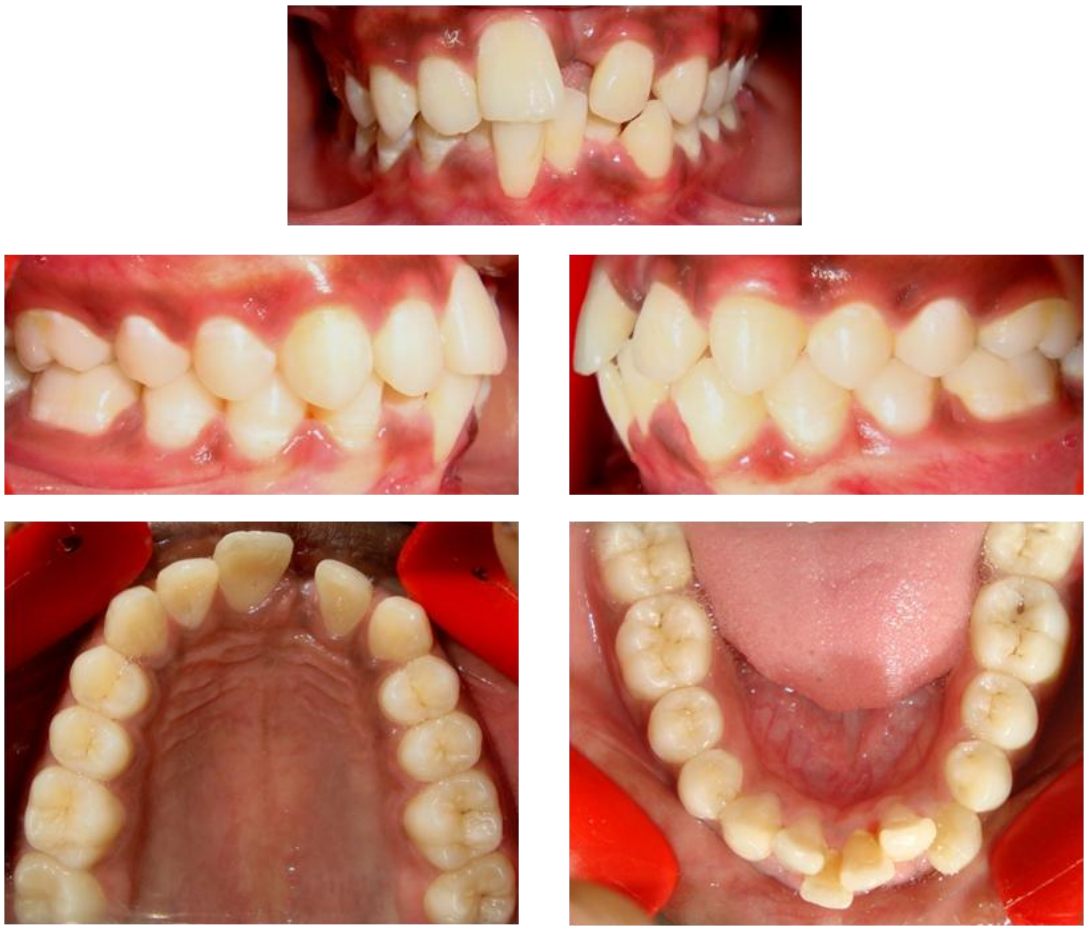

Figure 1. Pre-treatment intra oral photographs

Figure 2. Space opening

Figure 3. Retention with acrylic tooth

Figure 4. Fixed retention

The dental panoramic radiograph confirmed the presence of all permanent teeth except the maxillary left central incisor. Carey's analysis showed 4.5mm excess tooth material in lower arch.

Treatment Objectives

The treatment objectives included resolution of crowding, up-righting the mesially tilted incisors in the space of the missing tooth, proper space reopening and eventual referral for proper tooth replacement.

Treatment Alternatives

The alternative treatment plan would have been to mesialize the lateral incisor in the space of the missing central incisor, lateralize the cuspid and cuspidize the bicuspid. This plan would involve build ups and selective reshaping of teeth. The patient agreed with the space reopening and replacement plan.

Treatment Progress

The severity of crowding in the mandibular labial segment indicated the necessity to extract the mandibular right central incisor. The patient was treated using a fixed appliance with 0.18 slot McLaughlin, Bennett and Trevisi (MBT) prescription. Initially 0.014 Nickel Titanium wire was used to align and level upper and lower teeth. Progressively 0.016, 0.016×0.022, 0.017×0.025 Nickel Titanium and Stainless Steel wires were used. To close extraction space in lower arch, elastomeric chain was used from #36 to #46. The space available for #21 was not enough when compared to the width of the contra lateral tooth #11. Thus space was created using the active Nickel Titanium coil spring. Space created was satisfactory (Figure 2). Upper removable Hawley's retainer with acrylic tooth #21 attached to base plate was used to maintain the correction (Figure 3). Fixed permanent retainer from canine to canine was given in lower arch (Figure 4).

Results and Discussion

Missing teeth is one of the common problems seen in clinical dental practice. Orthodontists may contribute to the overall management of missing teeth by closing, opening or redistributing spaces. Other aspects of malocclusion such as crowding and arch discrepancies may be managed at the same time. As regards to treatment alternatives for missing teeth, orthodontic space closure is to be preferred if good aesthetics are to be obtained. In some cases, however such a result is difficult to obtain due to tooth anatomy, emergence profile, gingival height and asymmetry of midline. Space maintenance and redistribution of space to accept a prosthesis may be preferred if poor aesthetics is related to unsuitable colour, position or anatomy of adjacent teeth.[2] Various treatment methods used for missing incisors are maintenance of the space by means of a removable denture with single tooth prosthesis, resin bonded bridges or fixed partial denture, use of a single tooth implant prosthesis, orthodontic closure of the space, replacement of the lost incisor via auto-transplantation of a developing premolar (or another suitable donor tooth) and after loss of multiple maxillary anterior teeth, treatment with a combination of transplantation and orthodontic space closure.[3]

We chose first treatment option to treat our case, because he had a wide pulp chamber, growth was present and root apexes were closed. Asymmetric extraction of lower incisor was performed to relieve crowding in lower anterior segment. In general, removal of a lower incisor should be avoided since inter-canine width tends to decrease which can result in development of crowding in the upper labial segment and/or increase in over jet.

However a number of situations do exist in which a lower incisor extraction may be considered as part of an orthodontic treatment plan and fixed appliances are generally required in these cases. These

include situations where a lower incisor is grossly displaced from the arch, is ectopic, space is required to align the teeth, buccal segments are in a class I relation, profile considerations, Bolton discrepancy and the amount of crowding corroborating with the width of a single incisor tooth. This is best considered in adults and especially those who have had previous loss of premolar units in each quadrant and present with late lower labial segment crowding. Class III cases at the limit of their growth can be camouflaged with extraction of a lower incisor, to allow the lower labial segment to be tipped lingually correcting the incisor relationship. This also tends to increase the overbite, which is helpful in these cases.

An increase in over-jet or a slightly class III buccal segment relation may be an undesirable side effect in single incisor extraction cases. More over using a removable denture with a tooth to replace lost maxillary incisor can lead to progressive increase of alveolar bone resorption.

Where a tooth size discrepancy exists due to upper peg shaped laterals or missing upper lateral incisors, extraction of a lower incisor is a viable treatment option. A Bolton analysis may be used to analyze the extent of the disproportion. A Kesling set up with the anterior teeth sectioned from plaster model, repositioned in wax as a trial set up with lower incisor removed may be helpful in predicting the final outcome.[5,6]

Conclusions

Space problem and crowding were managed successfully in this patient due to preference of having a replacement rather than space closure orthodontically. Albeit the ease of such a treatment plan, orthodontic space closure is a viable option and has the benefit of giving a natural replacement.

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