REVIEW ARTICLE

Orthodontic Treatment Planning In Case Of Congenitally Missing Lateral Incisors – A Literature Review.

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ABSTRACT

INTRODUCTION: *The maxillary lateral incisor is the second most common congenitally missing tooth and can be expressed as unilateral or bilateral agenesis. The treatment plan can include either orthodontic space closure, implant supported or tooth-supported dental prostheses and endodontic tooth recontouring. Because of its high prevalence rate in routine orthodontic practice, it is crucial to understand the different biomechanical considerations of substituting a canine as a lateral incisor and further to make first premolar as canine. This approach is called canine substitution and results in improved micro aesthetics.*

OBJECTIVE: *The objective of this literature review was to discuss the different treatment planning in case of congenitally missing lateral incisors.*

DESCRIPTION: *This literature review evaluated the best treatment alternative for patients with maxillary lateral incisor agenesis by comparing orthodontic space closure, implant supported or tooth-supported dental prostheses and endodontic tooth recontouring. The review evaluated the aesthetic, occlusal, and periodontal results of the different alternatives for patients with unilateral or bilateral maxillary lateral incisor agenesis in the permanent dentition.*

CONCLUSION: *Within the limits of the review literature, a long and difficult interdisciplinary treatment is required, the challenge is to obtain predictably satisfactory results with long-term stability, regardless of the alternative treatment plan.*

Keywords- canine substitution, agenesis of lateral incisors.

1. Introduction

Hypodontia is the absence of five or fewer teeth excluding the third molars and is likely to occur on the most distal tooth of each tooth type.[1] The maxillary lateral incisor is the second most common congenitally absent tooth after the mandibular second premolars. The prevalence of unilateral agenesis of maxillary lateral incisors was more prevalent than bilateral agenesis and is higher in females than males.[2] Genetic transmission of hypodontia has demonstrated variable penetrance, mainly including the heterozygous mutations in AXIN2, PAX9, and/or MSX1 (mesenchymal transcription factors).[2]

There are three treatment options to replace missing lateral incisors: canine substitution, a single-tooth implant, or a tooth supported prosthesis and endodontic tooth recontouring. All three treatment approaches mandate an orthodontic treatment first, either in space reopening for restorative procedure or space closing as an advent to canine substitution. In recent years a trend towards orthodontic space closure was observed than space opening and prosthetic replacement in management strategies for patients with congenitally missing lateral incisors.[3]

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This literature review aimed to determine the different treatment planning in case of congenitally missing lateral incisors

2. Orthodontic canine substitution

Orthodontic space closure by canine substitution has a number of advantages, including less cost and time when compared to tooth-supported prosthesis or implant replacements, avoidance of the need for tooth extractions in cases of severe crowding, favourable periodontal and TMJ health compared with a restoration. Another major advantage of space closure is that adolescents do not have to wait for dental maturity to initiate treatment. It has also been shown to demonstrate and it has no reported. [4]

2.1 Orthodontic biomechanical considerations

When replacing a canine as a lateral incisor and further to make first premolar as a canine certain adjustments are required during the initial bonding phase. For achieving proper gingival zenith and the ideal frontal exposure, the levelling of the upper six front teeth to achieve natural "high-low-high" gingival margins must be included. The new canines (i.e., the first premolars) are at the same level as the central incisors and the new lateral incisors (i.e., the canines) are at a lower level. Such adjustments can be made using arch wire bends or, more easily, by bonding the canine brackets occlusally than normal and the first premolar brackets in an incisal direction.[5]

The extrusion of the canine might cause occlusal interferences thus incisal grinding of the canine after levelling and alignment phase is indicated.[6] This will give more time for secondary dentin formation at the incisal

region and thus cause less tooth sensitivity when final recontouring of the tooth is done at the end of treatment.
Canine being the corner stone of the mouth has a long and bulky prominent root, it has -7 degree torque, while lateral incisors have a more palatally placed root and buccally placed crown with +10 degree torque. Now to substitute the canine as a lateral incisor increased palatal root torque is required, however as already the roots of canine are bucally placed, the palatal root torques value need to be further increased.

To achieve this, either 0 torque brackets should be used or while using MBT bracket system, the brackets of lower premolars can be inverted and placed, making the -20 degree to +20 degree palatal root torque. Application of lingual root torque results in less enamel grinding near the labial CEJ, where the enamel layer is sometimes thin.[7]
In regards to premolar, buccal root torque should be added so that root prominence of canine can be duplicated. In this way the palatal cusp gets intruded compared to the buccal cusp and later requires less grinding and can be easily be re-contoured as the new canine. But care should be taken as not to add excessive buccal root torque of the intruded first premolar crowns as it may result in excessive overjet in the canine area. The tip value of lateral incisor and canine is same. While placing inverted lower premolar bracket, contralateral premolar bracket is used to adjust the tip value.[8,9]

The mesial movement of the first premolar may be complicated in the presence of two divergent roots. It may be indicated to slightly rotate such premolars to prevent the buccal root from moving into the cortical plate, which would slow down the movement and potentially produce a risk for periodontal tissue breakdown.[10] Bonding should be done according to the criteria described earlier (Figure 1, Figure 2).

In bilaterally missing lateral incisors if patient presents with a convex profile and acute nasolabial angle, the space present can be closed by retraction of anterior teeth (Figure 3). Unilateral space closure can also create problems and is often a dilemma for the orthodontist. The upper midline is often asymmetrical and deflected relative to the midline of the face and necessitates extraction of one tooth on the contralateral side. [10] A generally safe decision is to extract the other lateral incisor, particularly if it is narrow or peg-shaped, which is not applicable here. The main indication for unilateral space closure is a Class II subdivision case on the agenesis side, with a symmetrical upper midline in a patient who does not show the gingival margins when smiling. [1] Contraindications of space closure includes, elderly patients who have no gingival exposure when smiling, patients who have low aesthetic expectations and patients who indicate lack of cooperation and motivation. In such instances the alternative is space reopening or patient-oriented, limited treatment, followed by prosthetic replacement.

3. Prosthodontic replacement of missing lateral incisors

The most commonly used treatment alternative is the single tooth implant porcelain crown. This solution is the most conservative since the adjacent teeth may remain untouched. Patients with external root resorption, periodontal problems, high caries activity are not ideal for orthodontic treatment and thus prosthodontic treatment plan is indicated. [12] The cases with a shallow overbite and no mobility of the adjacent teeth can be restored with a tooth-supported restoration eg. zirconia resin-bonded FPD. Prosthodontic treatment is not a compromise. It is a precise treatment option with clear and predictable goals. When only a few teeth have to be moved, it is sometimes difficult to prevent undesired movements of the anchor teeth and temporary anchorage devices may be needed.[13]

4. Endodontic tooth recontouring

The goal sometimes be achieved with direct composite restorations but a short orthodontic treatment is usually necessary first to reduce spaces and correct incisor angulations. The endodontic recontouring should follow the ideal crown to root ratios and not create black spaces, diastemas, and evident asymmetries. The restorations should be whiter than the yellowish enamel of the canines and the colour must be chosen accordingly. This approach addresses the patient complaint at the quickest and easiest.[14]

5. Discussion

The available scientific evidence concludes that, in the long term, any type of restoration is less favourable and less predictable in terms of periodontal health and patient satisfaction. Thus canine substitution is a viable option.
Evidence indicates that proper orthodontic space closure is well accepted by patients, does not produce a major risk for temporomandibular joint disorder (TMD) problems, and from a periodontal standpoint is safer than prosthetic replacements.[8-9]

Although a single-tooth implant crown may appear preferable, recent studies have demonstrated that frequent biological complications may occur in the long-term. Such problems may include blue colouring of the marginal gingiva following labial bone resorption, peri-implantitis, bone loss around neighbouring teeth, abutment exposure due to retraction of the labial gingiva, and progressive infraocclusion. Infraposition of the clinical crown may occur even when the implant has been placed in a mature adult, due to continuous eruption of the adjacent teeth. The cessation and degree of vertical growth is unpredictable.[11]
Orthodontic space reopening is then followed by implant placement procedure and several years are elapsed between these two procedures. In contrast, the canine substitution option has the indisputable advantage that the entire treatment is accomplished in one phase.

In the canine substitution orthodontic treatment procedure, the result is permanent and independent of residual maxillary growth.

6. Conclusion

Within the limits of the literature review, it may be concluded that different orthodontic consideration does improve micro-aesthetics in congenitally missing lateral incisors and will facilitate endodontic reconstruction after treatment completion. The main problem in treating patients with missing maxillary lateral incisors and any coexisting malocclusion is not closing or opening spaces, but to achieve overall aesthetics. Since a long and difficult interdisciplinary treatment is required, the challenge is to obtain predictably satisfactory results with long-term stability, regardless of the alternative treatment plan.

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Figure 1 : Pre-treatment photos of a patient with missing lateral incisors

Figure 2 : Bonding done for upper arch

Figure 3 - Canine substitution in bilateral missing lateral incisors.