Implants for orthodontic patients with missing anterior teeth: Placement in growing patients—Immediate loading

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There is a marked increase in the importance of facial esthetics. This means that interdisciplinary treatment plans are an important strategy for achieving pleasing facial appearance with dental treatment. Over the decades, missing anterior teeth have been a challenge for clinicians and replacing them with an implant in children and adolescents was questionable. One concern was that an implant might influence the growth of the alveolar ridge, which could compromise facial esthetics in the long run since the positioning of the implant within the alveolar ridge plays a key role in the esthetic outcome. Another concern was the long-term effects of immediate loading of orthodontic force on implants. The short-term effects have been evaluated but not the long-term implications. This article summarizes a discussion about the effects of implants to restore missing anterior teeth in growing patients and the effect of the immediate application of orthodontic forces on newly placed implants. (Semin Orthod 2016; 22:64–74.)

Introduction

How a person looks can be an important factor in whether or not they are successful in life and appearance affects self-esteem and social acceptance. Facial esthetics are a big part of appearance, and since teeth are a prominent facial feature, dental appearance is a key part of facial esthetics, especially if there are missing anterior teeth. In addition, they have a significantly higher impact on the oral health-related quality of life than missing posteriors.[1–4]

There has always been a question whether missing teeth should be replaced with an implant or fixed prosthesis, or whether the space should be closed orthodontically. The decision depends on several factors including age, profile, space availability, condition of adjacent teeth, gingival display on smiling, type of malocclusion, overjet, and overbite.[5,6] Another study showed that it also depends on the skill of the orthodontist and his/her work environment.[7] Andrade et al.[8] reported the lack of scientific evidence for any type of treatment for agenesis of the maxillary lateral incisors.

Dental implants have been one of the treatments of choice for missing anterior teeth. Their success rate has been reported extensively and depends on age, gender, which side, and which jaw, among other factors. On average, implants have a survival rate better than 97% and are expected to last for decades.[9] However, most of the literature focuses just on adult patients.

Interestingly, children and adolescent suffer from the same conditions requiring placement of dental implants, even though the frequency is lower than that of adults. The prevalence of

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traumatic dental injury to anterior teeth in children ranges from 9% to 35% depending on the population.[10–13] These injuries resulted in missing teeth in 10.9% of the cases.[13] In addition, congenitally missing teeth occurs in 1.6–15.7% of various modern societies.[14–18] However, clinicians have been reluctant to install implants in growing patients. Nevertheless, untreated dental problems have some negative impact on the quality of life of children.[19]

This article aims to demonstrate some orthodontic applications where implant placement can serve as an adjunctive treatment placement, especially in younger patient populations.

Adjunctive orthodontic treatment prior to implantation

When an edentulous area is left unrestored over an extended period of time, a more challenging clinical situation arises when there is an extrusion of the opposing teeth, tilting of neighboring teeth, and a vertically and horizontally resorbed ridge. Often, such deteriorated conditions will require orthodontic treatment prior to the start of any definitive restorative work.

In the anterior region, adjunctive orthodontic therapy may be necessary to address misalignment and tooth size discrepancy for better function and esthetics. Proper alignment of anterior teeth and creation of appropriate space enhances purely esthetic restorations not only by preserving restoration space but also by maintaining the desired interproximal alveolar contour and gingival embrasure form. In order to establish normal overjet and overbite, it might be necessary to position the implant labiolingually a bit beyond than the optimal position, which might in turn compromise the esthetic relationship between the gingiva and the crown by altering the ideal space required around the implant. The adjacent teeth may need to be increased in width with adhesive restoration or reduced by interproximal reduction.

Generally, there should be enough bone around an implant to prevent bone loss. When placed between two natural teeth, at least 1.0 mm of interdental space is essential. For an implant restoration, there should be 1.5 mm of bone between the implant and adjacent roots, or 3.0 mm of bone between adjacent implants to prevent marginal bone loss and the presence of unesthetic papilla.[20–22] Since the standard implant diameter ranges between 3.5 and 4.2 mm, the narrowest edentulous space required is about 6.5 mm. However, when a narrow dental implant is used, the space required can be as small as 5 mm.

The proximity and inclination of adjacent teeth is important for the mesiodistal tooth position. The proximity of adjacent teeth is necessary to provide proximal support and volume of the interdental papilla. A mesially inclined tooth usually creates a more incisally located contact point and a much larger gingival embrasure, which requires more volume in order to achieve the same vertical height. However, this mesial inclination has an advantage in the case of implantation due to the thicker interproximal bone and lower risk of resorption. Hopeless teeth with diastemas have similar advantages.[23]

Case 1

A 27-year-old female was referred by a general dentist for orthodontic tooth movement before final restoration. The upper dental midline had been shifted to the left side and a missing maxillary lateral incisor caused spacing. Her peg-shaped, right lateral incisor had been previously restored as revealed in a panoramic radiograph. A bracket was bonded to the acrylic pontic in the left lateral incisor area and an arch wire was inserted to regain space to restore esthetic balance between the maxillary lateral incisors. The maxillary and mandibular dental midline coincided and adequate space was regained for the restoration. After debonding, an implant was placed in the maxillary lateral incisor area. A crown lengthening procedure was performed on the maxillary right lateral incisor to correct the gingival height (Figs. 1–4).

Temporary anchorage devices as temporary crown restoration

There are several treatment options for a missing maxillary anterior tooth in adolescent patients including substitution, autotransplantation, and dental restoration. However, these methods each have limitations. An orthodontic miniscrew system (C-implant) may serve as an excellent treatment option to maintain edentulous space upon completion of active orthodontic