Orthodontic and Esthetic Consideration for Anterior Single Tooth Implant

Manoj Varma, Mukesh Kumar Singh, Abhay Lamba, Anil Sharma

ABSTRACT

Implant restorations have become a primary treatment option for permanent replacement of compromised or missing teeth. The tooth which has undergone structural damage is usually an endodontic failure and frequently associated with multiple episodes of reinfection. The adjacent teeth may be tipped with or without unesthetic rotations. In such situations, a preprosthetic orthodontic treatment is frequently required. Derotation of the central incisor and/or premolars correction of the tipped canine, space closure and correction of root proximities may be required to create appropriate space in which the implant has to be placed to achieve an esthetic restoration. This paper discusses aspects of preprosthetic orthodontic diagnosis and treatment that need to be considered with implant restorations.

Keywords: Preprosthetic orthodontics, Corrective orthodontics, Single tooth implant, Multidisciplinary orthodontics.

INTRODUCTION

We often treat patients with missing or malformed teeth. Treatment alternatives for missing teeth include removable partial dentures, conventional fixed bridges, resin-bonded bridges, autotransplantation and dental implants. A number of criteria are evaluated before a choice of the type of restoration/treatment rendered is made. Over the years, with improved predictability and success in the use of dental implants, it is increasingly advocated that prosthetic replacement of such missing teeth, especially the missing anterior teeth, be done with single tooth implants. Such a treatment modality provides a fixed prosthetic rehabilitation to the patient without involving the adjacent teeth. In addition, implants also help maintain the alveolar ridge, enhance occlusal function and provide optimal esthetics. However, for a successful replacement of such teeth with an implant, preprosthetic orthodontic intervention may be necessary in order to create adequate space and alignment of the adjacent teeth. This is in addition to other elements of anterior design esthetics involving single-tooth replacement, which include shade mapping, length/width ratio, golden proportion, incisal edge position, arch form, gingival symmetry, lip line, papilla height, contact gradient, emergence profile, and occlusal relationships, such as centric, anterior guidance, overjet and overbite.

Therefore, a full set of orthodontic records, including radiographs, models and clinical photographs are recommended to plan the preprosthetic orthodontic alignment. A diagnostic wax set-up is also beneficial for planning treatment and esthetics. Participating clinicians—the orthodontist, endodontist and prosthodontist should determine the patient’s treatment plan collaboratively and communicate throughout the course of treatment to ensure all aspects of treatment are considered and the overall treatment objectives are achieved. The following case study involves all the restorative challenges described, and demonstrates a multidisciplinary approach to the treatment of an endodontically failed maxillary lateral incisor with anterior restorative principles for esthetics.

CASE REPORT

A 25-year-old female patient reported to the department with a chief complaint of pus discharge from the labial aspect of the upper front tooth. The patient gave a history of multiple episodes of the same complaint for the past 12 months for which she had undertaken treatment elsewhere, without permanent relief. She had undergone multiple root canal procedures with the associated maxillary left lateral incisor (Fig. 1). The IOPA revealed a well-defined radiolucency in periapical region. The fact that the tooth was still infected along with the patient’s desire that she wanted to be cured, it was decided to extract the offending tooth and subsequently prepare for a prosthetic rehabilitation. A CT scan of the region (Fig. 2) showed periapical radiolucency suggestive of chronic infection in relation to 22. Since her adjacent canine was palatally placed...
and in cross bite, an orthodontic intervention was sought. Fixed orthodontic treatment was undertaken to correct the alignment of adjacent individual teeth as well as create an ideal space for the extracted lateral incisor (Fig. 3). After regaining space for the lateral incisor (Fig. 4), the dimensions of alveolar bone were buccoplatally 5.8 mm and occlusoginglyvally 17 mm. Therefore, 3.8 mm diameter and 13 mm long dental implant was placed into the alveolar bone after the osteotomy. The correction was
maintained using a Hawley’s retainer with an acrylic tooth in place of the missing lateral incisor (Fig. 5) Provisional restoration with an ovate pontic placement was given to create ideal bed for the final prosthesis. A final impression was taken after 10 weeks and a cement-retained prosthesis given (Figs 6 and 7).

DISCUSSION

Preprosthetic orthodontic treatment plan usually deals with the alignment of adjacent crowns and roots before implant restoration.4-6 Along with the orthodontic considerations, it is important to predefine the goals of the orthodontic treatment in consultation with the prosthodontist and/or other concerned specialists. The principles for maintaining a healthy biological width around natural teeth and implants need to be considered.8-10 In the present scenario, sufficient space between the roots of the central incisor and canine had to be created with additional orthodontic treatment to allow placement of the implant fixture. During the course of the orthodontic treatment, a rider pontic was given to maintain space and improve aesthetics. Following removal of the fixed appliances, orthodontic retention was necessary to maintain this space and the position of the teeth,11-13 so long as the implant-retained final prosthesis is delivered. For this purpose a Hawley’s retainer with the tooth (lateral incisor) was used.4

To accommodate a standard implant there should be a minimum of 10 mm of incisogingival bone and a minimum of 6 mm of facial-lingual bone.12,13 In the presented case, there was sufficient alveolar bone for implant placement, therefore, ridge augmentation was not necessary. A minimum of 6 mm of space mesiodistally is required to replace a lateral incisor crown. The roots of the central incisor and canine should be almost parallel or slightly divergent so as to avoid complications resulting from root proximity during implant placement. Usually, the tip of the central incisor is approximately 5° while that of the canine is 13°, which means that the roots are slightly divergent. Additional mechanotherapy, like the use of a “V” bend to orthodontically position the roots of the adjacent teeth might be made use of for the purpose. The use of a nickel-titanium open coil spring is usually sufficient to create space. Once created, an acrylic crown with a bonded bracket is ideal to maintain the space. Additionally, a closed coil spring can be used for the same purpose. Other considerations from an orthodontic perspective include—an ideal placement of brackets to achieve the correct root and crown positions; bending the archwire to accentuate root divergence and bonding a contralateral bracket on the central incisor (such as placing the maxillary right central incisor bracket on the maxillary left central incisor) to accentuate root divergence in the implant area.5 Once the edentulous space has been created and the tissues have stabilized following orthodontic treatment, the quantity and quality of alveolar bone needs to be assessed before implant placement. Considerations of occlusal factors, such as bruxism, parafunctional activity, muscular dynamics, as well as tooth mobility need to taken into account.4 A radiopaque guide stent can be used with a CT scan to define tooth position better.

The correct surgical placement of a dental implant is mandatory to obtain the ideal esthetic result. During preparation of the osteotomy, care should be taken not to create excessive heat, which can lead to necrosis of bone. A bur speed of 800 rpm (35-50 Ncm² torque) sharp osteotomy burs, copious irrigation, and sequential preparation of the osteotomy site is required.

A mucoperiosteal flap is raised for osteotomy preparation which assures maintenance of adequate blood supply. Papilla-sparing incisions with broad-base, full-thickness flaps are useful in minimizing esthetic problems.14 It is important to evaluate the bone buccal to the dental implant placement site, and place the implant with a slight lingual direction so that adequate bone is present buccal to the implant (Figs 8 and 9). This aids in implant stability and soft-tissue coverage and provides ideal emergence profile (Fig. 10). Restoration is the last stage in the
CONCLUSION

Single-tooth implants are the treatment of choice for most patients with missing or grossly damaged anterior teeth. Successful restorative treatment involving implants depends on interdisciplinary treatment planning, especially when preprosthetic orthodontic tooth alignment is required. This article has illustrated the steps needed to create ideal esthetics in the maxillary anterior region, to replace a maxillary lateral incisor with an implant-supported prosthesis.

REFERENCES