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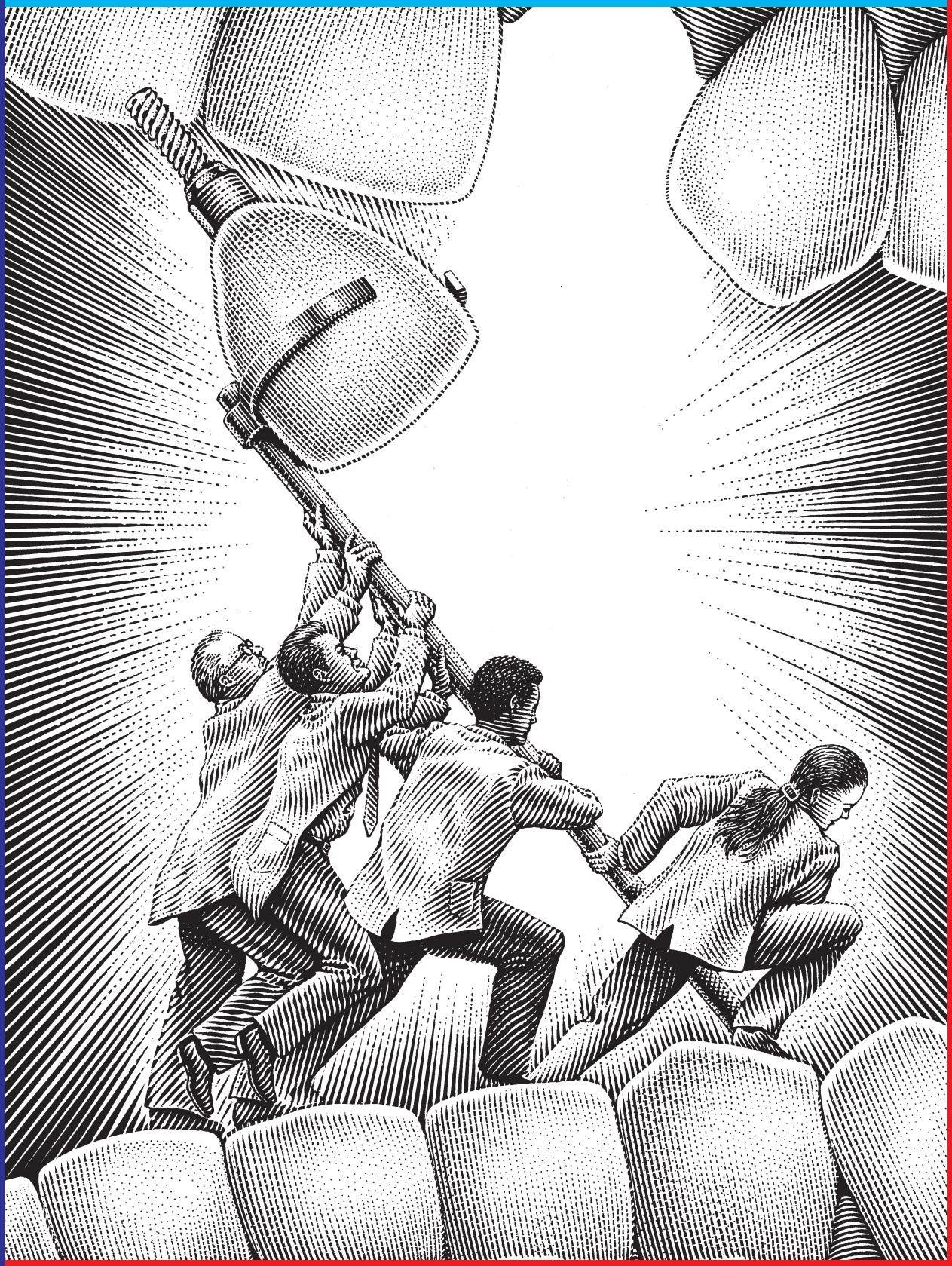


THE ROLE OF THE ORTHODONTIST ON THE MAXILLARY ANTERIOR IMPLANT TEAM

ORTHODONTIC DIALOGUE

The Role of the Orthodontist on the Maxillary Anterior Implant Team

"Leave it to Beaver," "My Little Margie," "Happy Days" ... "Those were the days my friend, we thought they'd never end ..." Well, they have!!! In the past, replacement choices for a missing anterior tooth were simple and limited. The selection included the "flipper" removable appliance, conventional fixed bridgework, and the ever popular Maryland bridge.[1,2] Preprosthetic preparation was usually limited to simple coronal space consolidation into the area of the eventual prosthetic unit. The relatively recent advent of the anterior implant has considerably improved the restorative options while simultaneously complicating the therapeutic considerations. The successful placement and restoration of an anterior implant is dependent upon meticulous treatment planning coordinated among the orthodontist, surgeon, prosthodontist and general dentist.

Periodontal disease, caries, trauma, congenital absence are prominent in the list of etiological factors that can result in the loss of one or more anterior teeth. In the orthodontic practice, congenitally missing teeth or traumatic loss are the most frequently encountered situations. Quite often, there is a superimposed malocclusion that requires comprehensive orthodontic correction prior to implant placement. In some particular Class II cases with considerable overjet, it may be possible to consider the orthodontic repositioning of the canines as missing lateral incisors while simultaneously reducing the overjet. However, this therapeutic option is often complicated or restricted by crown esthetics, inadequate overjet or protraction anchorage, and difficulty in dental midline control in unilateral cases.[3] In some particular extraction cases characterized by lower arch crowding and missing upper lateral incisors, consideration can be given to repositioning the maxillary canines as lateral incisors in order to obviate the need for removal of upper teeth and simultaneously balance the lower arch extractions. Anterior esthetic requirements, invasive involvement of adjacent teeth, and appliance breakage are just some of the complications to be considered when choosing conventional fixed or removable prosthetic replacements for anterior teeth. Consequently, the success of the single tooth implant replacement has become a warmly welcomed option for the treatment of this potentially complex problem.

Orthodontic treatment planning for the single tooth anterior implant involves the consolidation of an ideal amount of coronal space for the missing tooth while simultaneously creating an adequate mesio-distal interradicular space for the safe placement of the eventual implant. Ideal coronal space can be created by utilizing a compressed coil between the brackets on the teeth adjacent to the edentulous area (Fig. 1).

Fig. 1
Compressed coil to create adequate coronal space for replacement

Obviously, inadequate space between adjacent roots could lead to surgical contact with root structure, resulting in serious potential complications. The orthodontist must attempt to create at least 6mm of root separation in order to accommodate a reasonably small implant safely (providing at least 1mm of clearance per side). The procedure becomes complicated by the necessity to maintain sufficient coronal replacement space, contact of adjacent crowns, and ideal anterior alignment while the roots are being diverged. Further complexity arises from the conical anatomy of the maxilla, which produces a narrower apical arc relative to the coronal arc resulting in a natural "lampshade" convergence of the roots (Fig. 2A,B).

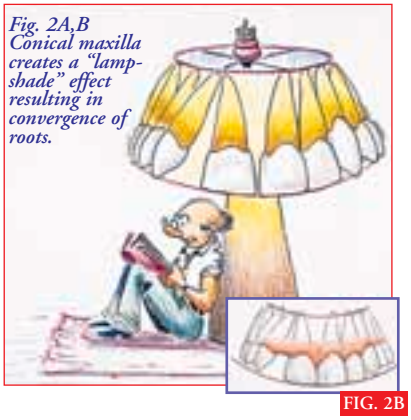


Fig. 2A,B
Conical maxilla creates a "lampshade" effect resulting in convergence of roots.

FIG. 2B

The orthodontic creation of adequate interradicular space involves altering the normal bracket angulation, thereby producing the required root divergence. In the absence of a maxillary lateral incisor, the adjacent central incisor bracket is angulated mesio-gingivally while the adjacent canine bracket is overangulated disto-gingivally. Another option involves using the same canine compensation noted while placing a preangulated bracket from the opposite central incisor on the central incisor approximating the implant side (e.g. placing a right central incisor bracket on a left central incisor adjacent to a missing left lateral incisor). These alterations in bracket placement will create adequate root separation to permit the safe surgical placement of the implant (Fig. 3A,B,C,D,E).

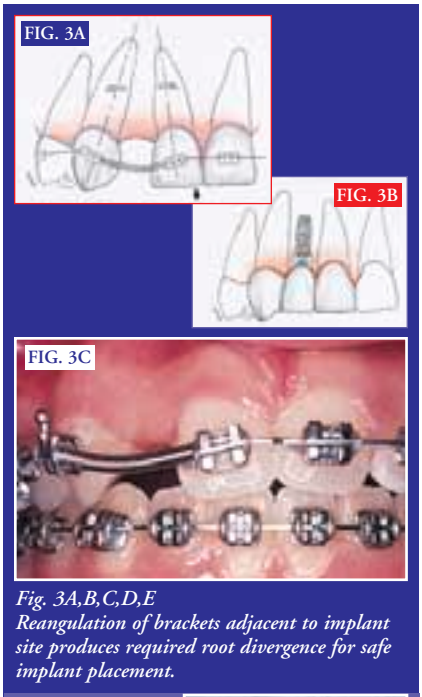


Fig. 3A,B,C,D,E
Reangulation of brackets adjacent to implant site produces required root divergence for safe implant placement.

However, the change in the central incisor angulation results in a separation of the central incisor crowns at their incisal edges as the contact point between the teeth migrates apically. Consequently, it may be necessary to perform a small amount of gingival interproximal stripping between the central incisors in order to achieve adequate closure at their incisal edges. During root reangulation, the central incisor brackets can be gently ligated together in order to prevent any severe space formation between the crowns. A closed coil between the brackets abutting the implant site will serve to maintain adequate coronal space for the eventual restoration. The reangulation of the central incisor also precipitates a downward movement of the mesio-incisal edge of this compensated tooth. Incisal equilibration is often necessary in order to achieve a pleasing esthetic realignment of the incisal edges (Fig. 4A,B).

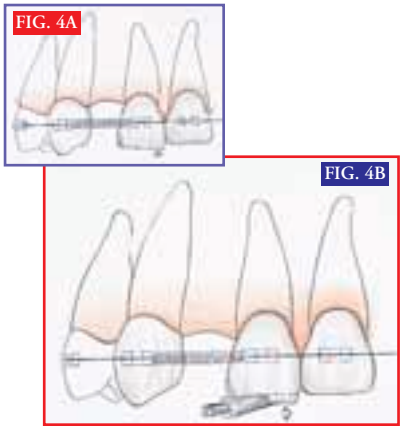
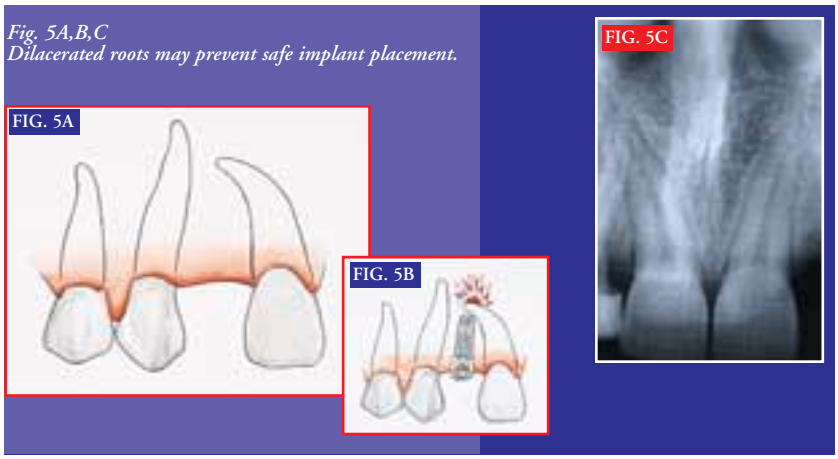


Fig. 4A,B
Reangulation of brackets results in extrusion of mesio-incisal edge. Esthetic incisal equilibration becomes necessary.

Occasionally, aberrant root morphologies, such as dilaceration or excessive width, may preclude the possibility of implant placement altogether (Fig. 5A,B,C).

There are osseous constraints that may complicate the successful surgical placement of an implant. The surgeon must carefully calculate the dimensions of the bony housing that will eventually encase the implant. A failure in properly placing the implant can be the result if adequate measurements are not made bucco-lingually, inciso-gingivally and mesio-distally. An ideal inciso-gingival vertical distance of 2mm from the osseous crest of the edentulous area

Fig. 5A,B,C
Dilacerated roots may prevent safe implant placement.



to a line connecting the proximal cemento-enamel junctions of the teeth adjacent to this site will serve to produce the best gingival esthetics and stability.[4] Frequently, the bone in the edentulous site has undergone atrophy resulting in inadequate bucco-lingual bone to accommodate an implant (Fig. 6A,B).

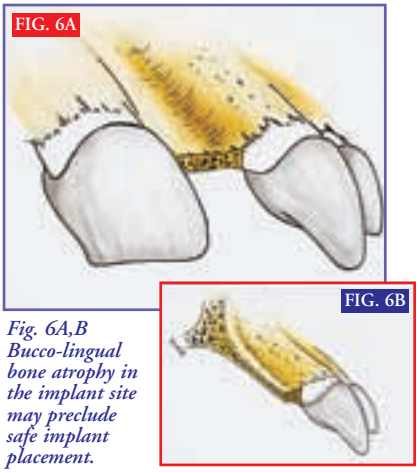


Fig. 6A,B
Bucco-lingual bone atrophy in the implant site may preclude safe implant placement.

Careful examination of this area through a CT scan radiograph provides the critical information that is essential in determining the necessity for bone augmentation/regeneration procedures prior to implant placement (Fig. 7).

Obviously, every effort should be made to try to preserve all available bone in the edentulous areas whenever implants are anticipated. Between the surgical phases of implant placement, temporary esthetics can be established by utilizing a removable retention appliance modified with an acrylic replacement tooth hollowed out palatally to accommodate the implant and the surgical site (Fig. 8).

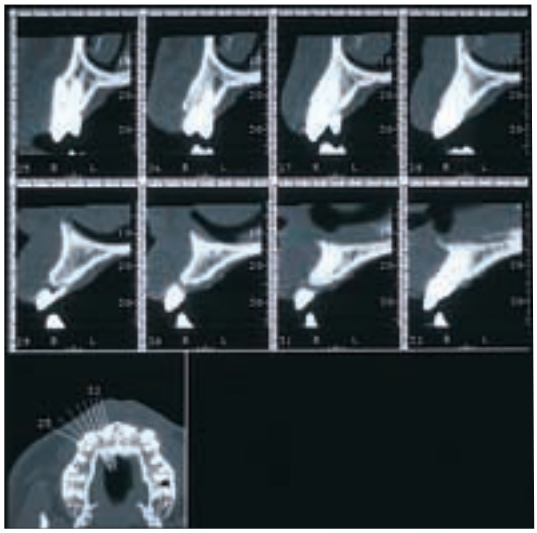


Fig. 7
CT scan radiograph provides critical evaluation of bone in implant site.

The final restoration of the single tooth anterior implant is no easy task. The restorative dentist also faces numerous possible complications that may affect the form and angulation of the crown, the gingival margin and the single anterior crown esthetics. Proper orthodontic preparation of the adjacent roots combined with sound surgical intervention will greatly assist the restorative phase of treatment and help minimize some of these potential pitfalls.[5] The coordinated interdisciplinary cooperation between the orthodontist, surgeon, prosthodontist and general dentist can be the critical determining factor essential for the placement of a predictable, functional and esthetic implant (Fig. 9A,B).

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The American Association of Orthodontists is a national dental specialty organization that was founded in 1900. The AAO comprises more than 13,000 members. Among its primary goals are the advancement of the art and the science of orthodontics; the encouragement and sponsorship of research; and the achievement of high standards of excellence in orthodontic instruction, practice and continuing education.

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The AAO recommends that every child should have an orthodontic screening no later than age seven.

Fig. 8
During surgical implant phase of treatment, temporary esthetics can be established by a removable appliance with an acrylic replacement tooth.

Fig. 9A
Final anterior implant restoration by implant team (pre-treatment)

Fig. 9B
Final anterior implant restoration by implant team (post-treatment) (Courtesy of Dr. Ken Malament)

It must be remembered that patients are generally uncompromising in their determination to obtain the highest quality and most esthetic anterior restoration possible … meticulous treatment planning will facilitate the achievement of these goals.

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