

Soft Tissue Management Around Implants in the Esthetic Zone



David P. Mathews, DDS*

The concept of overbuilding the implant site in the esthetic zone is paramount in creating the inconspicuous implant restoration. If teeth are congenitally missing, the site may be underdeveloped. Tooth extraction and trauma may lead to ridge deformities. The goal is to create an enhanced site for the restorative clinician. This site can then be molded to an ideal gingival framework. Cases are used to illustrate surgical and orthodontic techniques for preserving and overbuilding the implant site in the esthetic zone. (Int J Periodontics Restorative Dent 2000;20:141-149.)

*Private Practice, Specialist in Periodontics, Tacoma, Washington.

Reprint requests: Dr David Mathews, 4050 South 19th Street, Tacoma, Washington 98405.

Creation of the inconspicuous restoration in the esthetic zone is a goal of implant therapy today.¹ It is now possible to fulfill this goal with innovations in the use of orthodontics,²⁻⁴ bone grafting,^{5,6} soft tissue augmentation,⁷⁻¹⁰ and diligent prosthetic management.^{4,11-13}

However, we still fall short in creating an ideal gingival framework when treating sites with significant hard and soft tissue deformities. Now, our most sophisticated treatment strategies allow us to come closer to achieving the inconspicuous restoration. This requires site enhancement and ideal implant placement. Meticulous and creative management of the overbuilt site during the prosthetic phase is paramount in the final finishing of the ideal esthetic restoration.

Improved results can be achieved when the surgeon, orthodontist, and restorative clinician work closely in a well-thought out and well-sequenced treatment plan. This article will discuss the importance of ridge preservation and site "overdevelopment" using various treatment modalities. If the implant site can be

enhanced, then the restorative clinician will have the opportunity to create a beautiful, natural, inconspicuous restoration. Treatment strategies in ridge preservation, hard and soft tissue augmentation, and most importantly, stage 2 uncovering techniques, will be elucidated.

Case reports

Case 1—Treatment of a gingival defect using guided soft tissue augmentation

A 41-year-old woman presented with a Class II malocclusion. She was congenitally missing the maxillary right lateral incisor. The midline had shifted completely to the right side, closing the space. Correction of the malocclusion entailed reestablishing the midline by moving the central incisors back to their proper location. When this type of tooth movement is accomplished in an adult, a gingival defect will be created on the distal aspect of the right central incisor (Fig 1a). The missing tooth was to be replaced with an implant. However, the significant black space had to be rectified to achieve an esthetic result.

The gingival deformity was resolved by using the principles of "submerged" guided soft tissue augmentation.⁸ A full-thickness flap was initiated from the palate with vertical incisions on the mesiolabial aspect of the right canine and central incisor. A 3.25-mm implant (3i) was placed, and a 2-mm healing abutment was seated. The flap was

released periosteally so that complete closure over the abutment was possible without tension on the flap.

Reformation of the papilla was substantial (Fig 1b). At 8 months after placement, the implant was uncovered. A flap was contraindicated since no further tissue augmentation was required. The implant was placed in a prosthetically favorable location (angled through the incisal edge), so a punch uncovering was possible.⁴ The punch was initiated palatal to the crest of the ridge to maintain the thickness of the labial gingiva. The 2-mm healing abutment was removed, and a 4-mm-long healing abutment was placed. A temporary crown was placed to progressively mold the tissue during the next 3 months.^{12,13}

An esthetic gingival framework that mimicked the contralateral site was achieved. The final crown was placed after the desired gingival framework had been created (Fig 1c). Figure 1d shows a radiographic view of the restoration after 2 years in function.

Fig 1a (left) Case 1. Patient is congenitally missing the maxillary right lateral incisor. Midline had shifted to the right, closing the space. After orthodontics, space is opened for the lateral incisor. Note gingival defect distal of the central incisor.



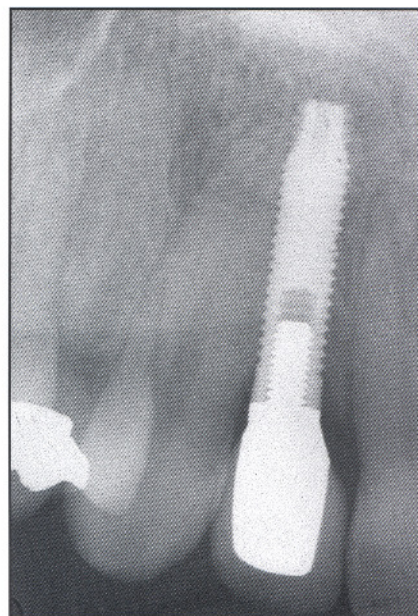
Fig 1b (right) Clinical view 8 months after implant and healing abutment placement, prior to punch uncovering.



Fig 1c (left) Clinical view of the final crown 2 years after cementation. (Restoration by Dr Frank Spear; orthodontics by Dr Vincent Kokich.)



Fig 1d (right) Radiograph taken after 2 years in function.



Case 2—Orthodontic extrusion for site development

A 30-year-old woman presented with a vertical fracture of the maxillary right central incisor (Fig 2a). Periodontal probing on the labial aspect extended to the apex, indicating loss of the labial plate of bone. The tooth was hopeless and needed to be extracted. A decision was made to orthodontically erupt the tooth to "overdevelop" the site prior to placement of an implant.²

Coronal movement of the hard and soft tissue complex would greatly enhance the site. To achieve this goal, the broken segments were bonded together with pins and composite resin and a provisional restoration was placed. The tooth was orthodontically erupted approximately 6 mm and retained in that position for 3 months prior to extraction and implant placement (Fig 2b).

The tooth was extracted, and a 3.75-mm implant (3i) was placed.^{14,15} To preserve the vertical

augmentation achieved by the eruption, "flapless" surgery was employed.^{16,17} The implant was seated approximately 3 mm apical to the desired gingival margin.⁴ The bone was "profiled" to allow for proper seating of the index and temporary abutment. The implant was indexed so that a temporary crown could be placed at the time of uncovering.¹⁸ A 4-mm temporary healing abutment was placed on the implant, and a gingival graft was placed over the site to further support the



Fig 2a Case 2. Maxillary right central incisor with a vertical fracture and loss of the labial plate of bone.

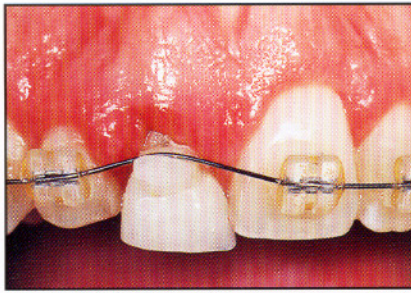


Fig 2b Right central incisor is erupted 6 mm and stabilized for 3 months prior to extraction.



Fig 2c At 8 months after implant placement, punch uncovering is done and a temporary crown is seated. Note preservation and molding of tissue.



Fig 2d (left) One year after cementation of the final crown. (Restoration by Dr Frank Spear.)

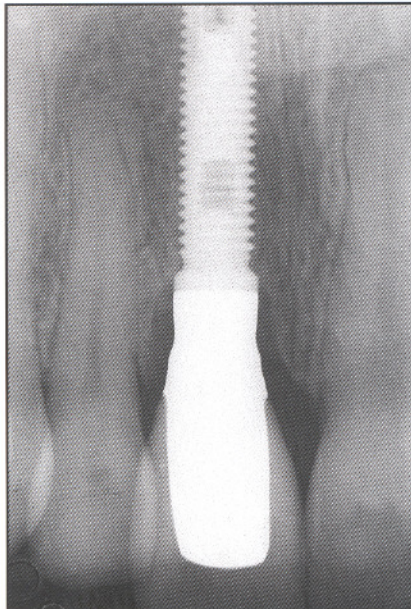


Fig 2e (right) Radiograph taken after 1 year in function.

proximal and labial tissue.^{19,20} The coronal aspect of the extracted tooth was bonded in place at the completion of the surgery.²¹

The implant was uncovered 8 months later. To preserve the soft tissue that was developed, a punch uncovering procedure was planned.⁴ The tissue punch was placed toward

the palatal aspect of the crest to preserve the thickness of the labial tissue. Because the implant was indexed, it was possible to prefabricate a temporary abutment and crown to be placed at the time of the uncovering. The provisional restoration was contoured to mold the tissue and was screwed into place (Fig

2c). A small composite resin restoration was placed at the incisal edge to restore the screw access hole. The final crown was cemented 4 months later (Fig 2d). Figure 2e shows a radiographic view of the restoration after 1 year in function.



Fig 3a Case 3. Maxillary right central incisor with advanced cervical root resorption. Extraction, delayed implant placement, and flap uncovering at stage 2 are planned.



Fig 3b Four-year result. Note ideal gingival margin level and maintenance of height of the papillae. (Restoration by Dr Frank Spear.)

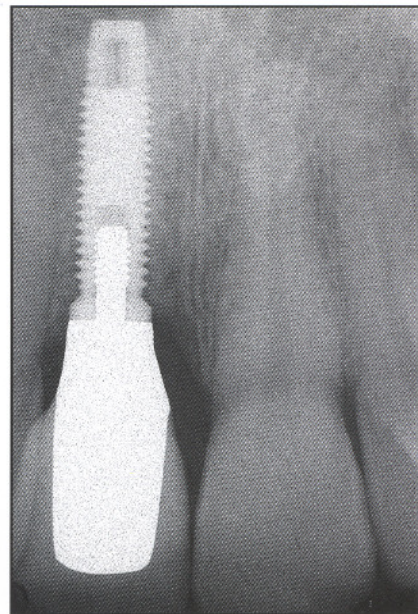


Fig 3c (right) Radiograph taken after 4 years in function.

Case 3—Soft tissue strategies in delayed implant placement

A 34-year-old man presented with advanced root resorption and partial ankylosis of the maxillary right central incisor (Fig 3a). The tooth was unrestorable and extraction and implant placement were planned. A delayed approach was considered²² because of the possible traumatic nature of removing the ankylosed segments and a concern that stabilization of an immediately placed implant could be tenuous.

The crown was removed and the ankylosed segments were ground out with a surgical round bur. Since reentry was planned in 3 months, no bone replacement was

used to fill the socket. A large, plug-shaped gingival graft was placed over the socket to maintain the ideal gingival framework.^{19,20} A removable appliance was placed and adjusted to further support the papillae.

A flap was reflected 3 months later and a 3.75-mm implant (3i) was ideally placed. Stage 2 uncovering surgery was undertaken 8 months later. The goal of stage 2 surgery should be to maintain an overbuilt site or to augment the site where gingival deficiency exists. Further soft tissue augmentation was desired, so a palatal approach was employed.⁴ If papillae need further coronal augmentation, they are included in the flap. A 4-mm

temporary healing abutment (3i) was placed and the flap was coronally advanced over the top of the healing abutment.⁴

In 4 weeks, tissue molding can be initiated with either a temporary or final restoration. Occasionally, the final restoration can be seated at this time without using a provisional restoration to premold the tissue. If this is considered, precise contouring of the restoration by the laboratory technician is imperative.^{12,23,24} If the site is overdeveloped and the final crown contours are ideal, the crown can be seated and it will mold the tissue to an ideal gingival framework (Fig 3b). Figure 3c shows a radiographic view of case 3 after 4 years in function.

Case 4—Creating a papilla between adjacent implants

A 24-year-old woman was congenitally missing the maxillary left lateral incisor and canine. The edentulous ridge was significantly underdeveloped in the labial and crestal areas (Fig 4a). The patient preferred an implant treatment plan to replace the missing teeth. Considerable augmentation would be necessary in an attempt to overbuild the deficient edentulous area. The patient had a moderately high smile line, making it imperative that the gingival level be consistent with that of the adjacent natural teeth. Creation of a papilla between the adjacent implants would be necessary to achieve the esthetic goals.

The following treatment sequence was planned. First, the site would require bone grafting. After maturation of the graft, implants with healing abutments would be placed. The abutments would be covered with a connective tissue graft. Third, after integration, the implants would be uncovered with a punch technique and temporary restorations would be placed. After tissue molding, the final restorations would be cemented.

The bone graft was accomplished with a combination of freeze-dried cortical bone (LifeNet) and resorbable hydroxyapatite (CeraMed). A titanium-reinforced membrane (3i) was placed over the site and stabilized with Memfix screws (Straumann).^{5,6,25} The temporary removable appliance was relieved to avoid pressure over the

augmented ridge. The graft was allowed to mature for 11 months. At that time, the site was reentered and the titanium membrane was removed. Approximately 4 mm of buccal augmentation and 2 mm of crestal augmentation were achieved.

The implants were placed to maximize the interimplant distance. A 2.9-mm implant (3i) was used for the lateral incisor and a 3.25-mm implant (3i) was used for the canine. The implants were indexed, and 2-mm healing abutments were seated (Fig 4b). A large connective tissue graft was placed around the healing abutments and sutured with resorbable suture. The flap was released to allow for tension-free primary closure over the abutments.⁸ The removable appliance was relieved further to avoid transmucosal loading. Figure 4c shows the clinical result 1 year after implant placement.

To preserve all of the connective tissue created by submerging the temporary abutments, a punch technique was used. A guide was fabricated from the indexed analogues, and a narrow-diameter punch (3i) was used to uncover the submerged abutments.⁴ The 2-mm abutments were removed, and 4-mm-long healing abutments were placed while final contouring and polishing of the temporary crowns were accomplished. The temporary crowns were seated and adjusted (Fig 4d). After 8 months of temporization, the final crowns were cemented (Fig 4e). Figure 4f shows a radiographic view of the restoration after 2½ years in function.

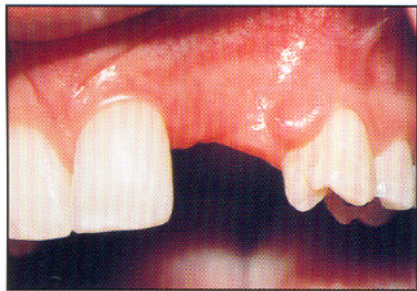


Fig 4a Case 4. Underdeveloped ridge. The patient is congenitally missing the maxillary left lateral incisor and canine.

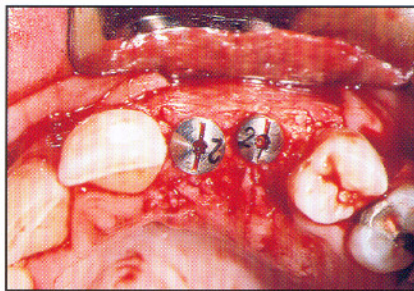


Fig 4b Membrane is removed and implants are placed 11 months after bone graft; 2-mm healing abutments are seated. A connective tissue graft will be placed over the healing abutments. The flap will be released for primary closure over the abutments.

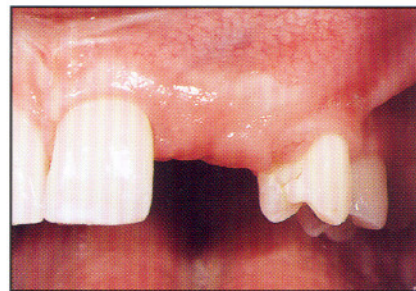


Fig 4c Prior to punch uncovering, 1 year after implant placement.

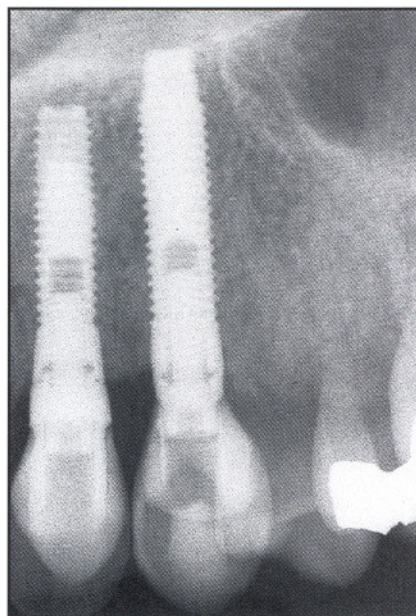


Fig 4d Day of punch uncovering, temporary crowns are seated.



Fig 4e Final crowns are seated 8 months after temporization. Result at 2½ years. (Restoration by Dr Frank Spear.)

Fig 4f (right) Radiograph taken after 2½ years in function.



Discussion

This article illustrates the importance of preserving and overbuilding the implant site to establish an enhanced gingival framework. Site enhancement can be accomplished through orthodontic eruption, bone grafting, connective tissue grafting, guided soft tissue regeneration, and creative uncovering techniques. The goal of the surgeon should be to overbuild the site in all dimensions. This enhanced site can then be molded to an ideal form by the restorative clinician.

To accomplish this goal, the surgeon needs to visualize the site and decide which aspects may need enhancement.¹³ When the single-tooth site is properly enhanced, the crest of the ridge should be coronal to the desired gingival margin, and the papillae should be close in height to those of the contralateral site (Fig 1b).

For sites with adjacent implants in the esthetic zone, the midcrest of the ridge should be at the level of the tips of the papillae on the adjacent teeth (Fig 4c). Any deficiencies will need augmentation prior to prosthetic restoration (Figs 1a and 4a).^{1,24,26}

In this author's experience, it is rare that more than 2 surgeries are needed to overbuild a site; one at the time of implant placement and one at the time of stage 2 uncovering are sufficient.

The punch uncovering procedure is reserved for those cases with ideal or enhanced sites. If further augmentation procedures are

needed at the uncovering stage, the punch technique should not be employed and a temporary restoration should not be placed.⁴ The implants should have ideal placement. If placement is labial to the incisal edge, a punch technique will leave the labial tissue too thin and can lead to apical migration of the gingival margin. If the tissue is too thin, there may be a gray cast to the labial gingival tissue.

The key in attempting to create a papilla between adjacent implants is to overbuild the site and to avoid a flap uncovering procedure at stage 2. If the ridge is overbuilt and a punch uncovering procedure is accomplished, this may help achieve the most ideal papilla between adjacent implants in the esthetic zone. It is a challenge to create an esthetic papilla between adjacent implants, especially when there is minimal distance between the implants. The most difficult areas in which to achieve this are between a maxillary lateral and central incisor or between a maxillary lateral incisor and canine because of the limited embrasure. Creating an esthetic papilla between maxillary central incisors, albeit a challenge, is facilitated by the increased embrasure and the natural occurrence of the anterior palatal papilla.

Proper contouring of the temporary restorations in the tissue molding phase is paramount in meeting the goals of an ideal gingival framework. The development of the site through ideal placement and surgical finesse can all be lost at this stage if the restorative phase is not

handled patiently and creatively.¹³ If a flap procedure is used at stage 2, the restorative clinician should wait 4 to 5 weeks before provisionalization. Placement of large-diameter healing abutments or temporary restorations at the time of flap uncovering will diminish any augmentation attempts.⁴ This may lead to unwanted recession at the site.

If the site is adequately enhanced, the tissue will act like a water bottle. It can be pushed and molded when it is full.^{4,27} If the ridge has not been developed adequately, it compromises the restorative clinician's ability to create an ideal gingival framework.^{1,26} Papillae or gingival margins will end up apical to their desired levels. This is especially true in the patient with a thin periodontium.²⁸ These cases require the utmost care and skill by the surgeon and restorative clinician to achieve a good esthetic outcome.²⁹

Creating the esthetic implant restoration is a multifaceted puzzle requiring ingenious treatment strategies. Further development in surgical techniques, microsurgery, tissue engineering, growth factors, and implant and dental materials will assist us in achieving more predictable results in the future.

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