

# Bone and Crescent Shaped Free Gingival Grafting for Anterior Immediate Implant Placement: Technique and Case Report

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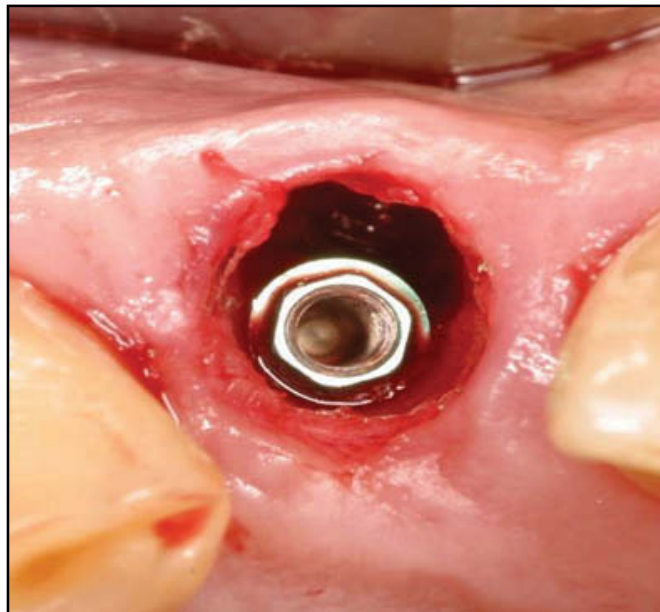
## Abstract

Immediate implant placement in a single staged approach, with or without provisionalization, can be advantageous in preserving gingival anatomy around dental implants. However, placing implants immediately in the changing alveolar bone of an extraction socket may result in progressive recession of the gingival labial margin over the implant restoration. This negative outcome may be overcome with enhanced labial thickness. Thicker labial gingiva and bone of the

peri-implant tissue have shown to promote long-term stable gingival margins.

This article presents a simple surgical technique utilizing crescent shaped free gingival tissue and bone grafting to promote thicker labial bone and biotype. The surgical procedure as well as the biologic and clinical rationale is described. One-year post-restoration results

are evaluated and show a stable, favorably positioned labial gingival margin at the implant site.



**KEY WORDS:** Immediate dental implant, connective tissue graft, bone graft

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## INTRODUCTION

Alveolar ridge resorption following the loss of anterior teeth often creates challenging esthetic problems in implant dentistry. Horizontal and vertical bone change surrounding the extraction socket may create papilla loss, labial tissue recession, and poor unstable gingival foundations for an esthetic final restoration. If a harmonious gingival form exists around the tooth proposed for extraction, immediate implant placement and provisionalization may effectively preserve the vertical height of the interdental papilla.<sup>1</sup> However, with this approach, the propensity for labial gingival recession over time can alter the appearance of the final restoration.<sup>2,3</sup> While proper implant placement and correct fabrication of the restoration are important for esthetics in implant dentistry,<sup>4,5</sup> it appears that for long term stable esthetics around dental implants, favorable peri-implant soft and hard tissues are also necessary.<sup>6</sup> Studies support that grafting the extraction socket decreases the amount of horizontal resorption and can enhance the bone thickness.<sup>6</sup> A modified ridge preservation technique called “socket seal surgery” which combines bone and soft tissue grafting to preserve/enhance hard and soft tissue profiles has been used with immediate implant placement.<sup>7</sup> While this technique provides a thick biotype, stable labial gingiva, negligible loss of interdental papillary height, and preservation of bone graft material by sealing the socket with a gingival graft, it requires a second-stage surgery and immediate provisionalization is not possible. A different technique attempting to preserve/enhance hard and soft tissue profiles involves a bilaminar subepithelial connective tissue graft used in conjunction with provisionalized immediate implant placement and bone grafting in the esthetic zone.<sup>8</sup>

While this technique shows enhanced labial biotype over the implants, it requires a large piece of connective tissue (approximately 9mm long and 1.5mm thick) which may increase the surgical morbidity of the donor site. Additionally, this technique does not adequately address situations where there are initially unfavorable gingival margins and/or underlying bony architectures.

This article describes a relatively simple gingival tissue augmentation technique used with immediate implant placement in a single stage approach, either with or without provisionalization, to convert unfavorable initial labial gingival level and thin biotype to a more stable biotype with a favorable gingival margin for better long term final esthetics. One year follow-up of the implant restoration showing stability of the peri-implant gingival tissue is included.

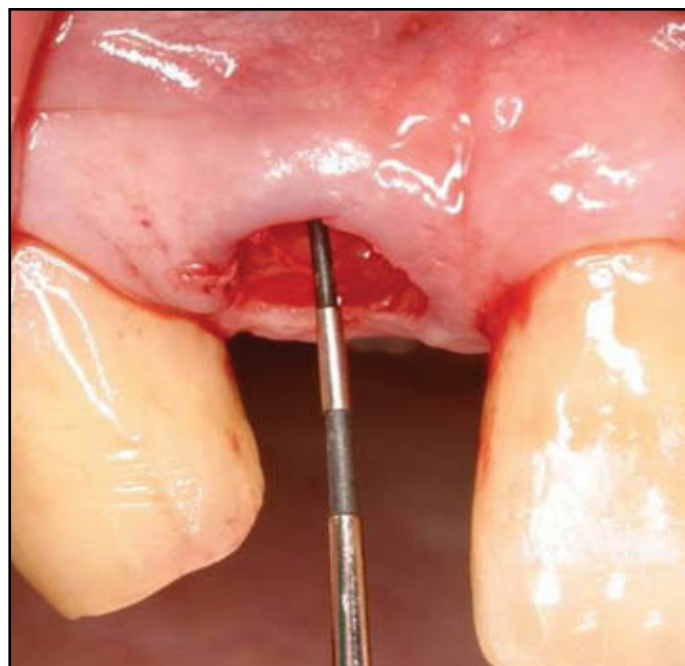
## MATERIALS AND METHODS

### Soft and Hard Tissue Assessment

The advantage of single stage immediate implant placement is more predictable preservation of the periimplant gingival tissue with less patient discomfort and less treatment time. Nonetheless, if mere preservation of the existing tissue is insufficient to provide an adequate peri-implant gingival foundation for esthetic restoration, other surgical approaches better suited to augmenting the deficient tissue should be utilized. The criteria and techniques for proper immediate implant placement have previously been established and reported with successful long-term outcomes.<sup>5,7,9</sup> One of the more difficult aspects of immediate implant placement is positioning the implant with sufficient primary stability in an extraction socket, often without elevating a flap. The



**Figure 1:** Gingival fracture of the maxillary right lateral incisor.



**Figure 1a:** Probing of extraction socket.

alveolar architecture in relation to the angle of the implant, the presence or absence of bone concavity apical to the extracted tooth, the amount of existing bone apical and palatal to the extraction socket, as well as the quality of the bone and soft tissues of the ridge should all be thoroughly evaluated clinically and radiographically prior to surgery. Many clinicians perform successful immediate implant placement without the aid of a computerized tomographic (CT) scan, but if any questions exist regarding the proposed delivery site, use of a CT scan is advised.

In this case, the patient was 54-year-old male with a fractured right lateral incisor at the dentogingival junction. There were no medical contraindications for dental implant treatment. The fractured root was in a slightly labial position, with the labial gingival margin already at the tangent line join-

ing the labial margins of the adjacent canine and the central incisor (figure 1). The labial biotype was considered to be slightly thin. Placing an implant immediately after the removal of the root in this situation would most likely result in a less than ideal labial gingival margin without surgically compensating for the post treatment recession at the time of implant placement. Interproximal papilla height was within normal range and the underlying bone levels were within 3mm from the margin based on probing (figures 1, 1a, 2).

### Socket Preparation

Atraumatic extraction results in minimal damage to the surrounding alveolar bone. If the root needs to be elevated, the elevator should be placed at mesio-palatal or disto-palatal line angles to minimize damage to labial, mesial, and distal interproximal bone. Use of a periotome to initiate the



**Figure 2:** Preoperative periapical radiograph.

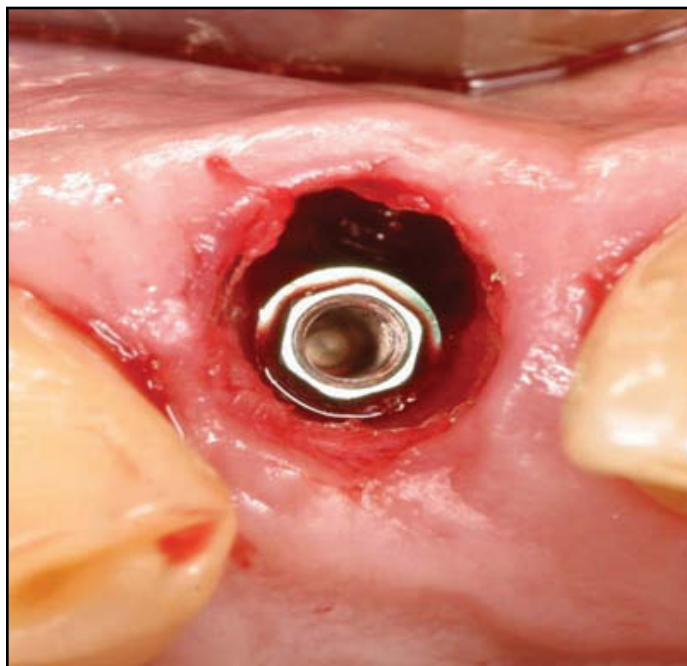
separation of the tooth from the alveolar periodontal ligament (PDL) junction can decrease the chance of labial bone fracture during the extraction. The fresh extraction socket should be thoroughly degranulated and all walls palpated with hand instruments to assess osseous integrity. The gingival walls of the socket orifice are de-epithelialized with the use of a 15C blade, or gently with a high-speed diamond bur. The exposed, bleeding lamina propria will enhance the revascularization of the connective tissue graft which will be placed after implant placement.

### Implant Placement

Implant placement starts with determining the final desired labial gingival margin for the implant res-

toration. This may be different from the existing gingival margin. Once this is decided, the proper apical position for implant placement can then be determined with the implant platform 2-4mm apical to the anticipated gingival margin. An implant with sufficient length should be used to engage the bone 3-5mm beyond the apex of the extraction socket to provide initial primary stability; this is the single most important factor for its success.

The angulations of the implant should avoid adjacent roots and be no more than 15 degrees off, bucco-lingually, from the long axis of the ideal position. One common mistake is to angle the implant too labially to accommodate the existing bone for primary stabilization. This will not only cause restorative difficulties, but increase labial recession problems as well. In addition, bucco-lingual positioning of the implant must be within the outline of the crown, with 1-2mm of space present between the inner surface of the labial osseous wall and the labial surface of the implant (figure 3). This also helps engage the palatal wall for primary stabilization. The mesio-distal position must ensure that there is sufficient room for the interdental papilla. Placing the implant in this manner will ensure both proper implant restoration emergence profile and hygiene. After placing the implant in a proper position, a bone profiler is used to profile the interproximal bone so that a slightly flared healing abutment or a provisional restoration fits passively. A healing abutment of 2-4mm in length, an appropriate abutment for a cement or screw-retained provisional is placed with appropriate torque. If a healing abutment is used, a removable denture or a tooth attached to an adjacent tooth can be placed over the abutment for the healing period. For a cement-on type of



**Figure 3:** Extraction Socket with implant immediately placed in palatal position.



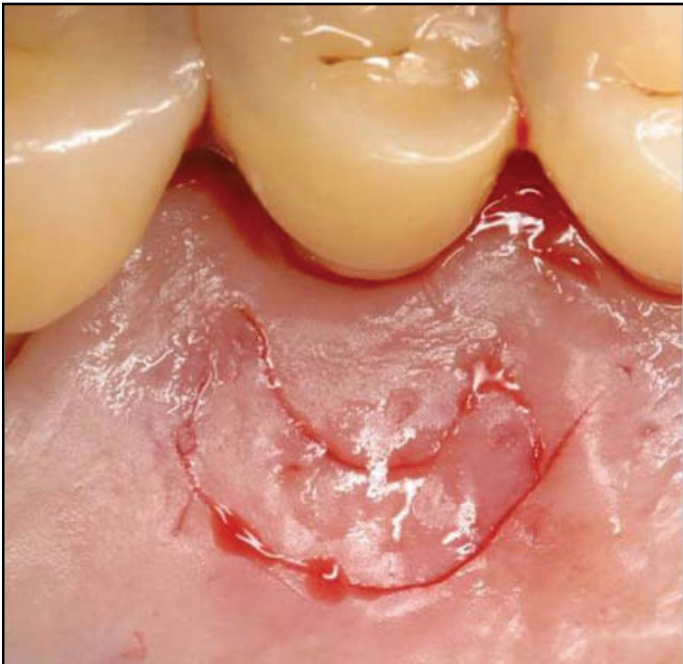
**Figure 4:** Bone graft material packed in the gap between the implant and facial bone.

abutment, the margin of the provisional should stay supragingival at this stage for minimal disruption of the grafted site. Chemical irritation from the monomer should be avoided during the fabrication and polymerization of the cement-on provisional. There should be at least 1.5-2mm of space labial to the abutment or provisional restoration to accommodate a connective graft without excessive horizontal and vertical pressure. The provisional restoration emergence profile should be under-contoured and out of occlusion.

### Bone Grafting

The space between the inner surface of the labial bony wall and the labial surface of the implant is filled with either mineralized freeze-dried particulate bone allograft (FDBA) or particulate xenograft. There is evidence that the space fills without grafting,<sup>10-12</sup> but filling the socket

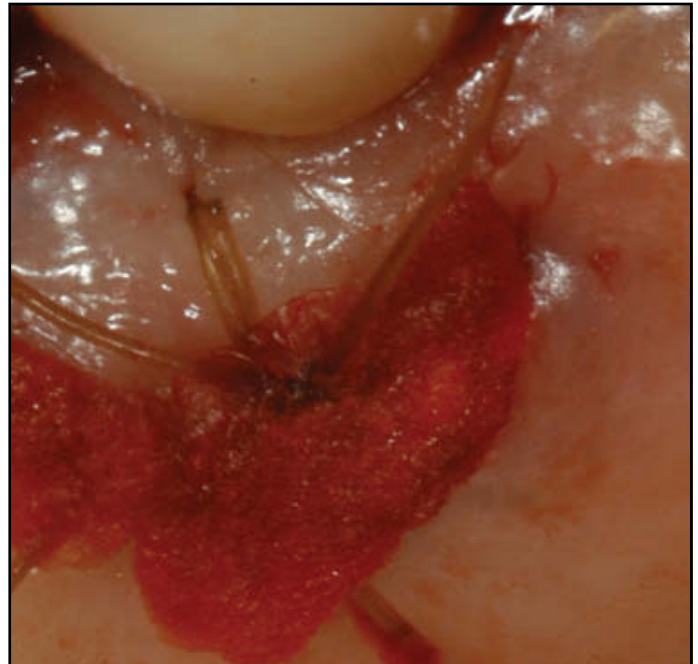
with graft material minimizes both vertical and horizontal resorption of the labial bone.<sup>13</sup> Many clinicians prefer the use of xenograft because there seems to be less shrinkage over time, but the choice of grafting material does not appear to influence the survival of the connective tissue graft. The use of autograft is not recommended due to greater horizontal shrinkage of the ridge. The bone graft is lightly packed to 3mm below the height of labial gingival margin. If the graft is packed too shallow or too deep, it can affect the final result. At this point there should be a crescent-shaped depression, about 3mm deep, around the mesio-labial-distal aspect of the stable implant abutment or provisional, lined by the inner lining of the labial gingiva with sulcular epithelium removed at the socket preparation stage (figure 4). This is the space that will receive the crescent shaped free gingival graft.



**Figure 5:** Crescent shaped free gingival graft is harvested from the ipsilateral palate.

### Crescent Free Gingival Tissue Harvesting

A crescent shaped free gingival graft with epithelium intact is usually harvested from the ipsilateral palate, approximately 5mm below the palatal gingival margin of the canine or premolars. The crescent shape follows the palatal gingival outline of the adjacent dentition (figure 5). This will ensure the proper fitting of the graft in the recipient site. A 15C blade is ideal for this procedure. The blade is penetrated perpendicular to the palatal surface of the underlying alveolar bone, following the shape of a crescent as much as possible. The length and width of the graft are determined by the mesio-distal dimension of the socket, with the bucco-lingual dimension approximately 3mm. Due to the flexibility of the gingival wall, this dimension does not need to be exact. The resulting graft is usually about 3mm in thickness, which will fit snugly into to the recipient site.



**Figure 6:** Collacote is placed into the donor site and sutured.

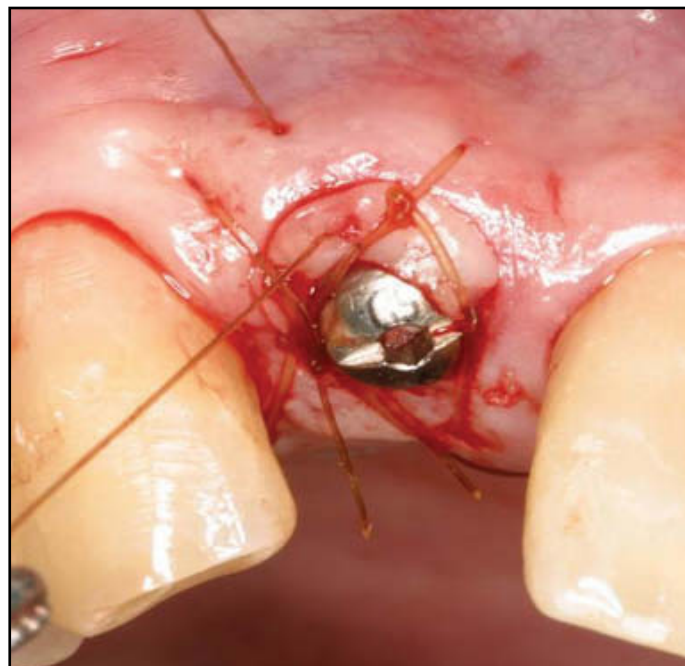
The graft tissue is either immediately placed into the recipient site or maintained in a moist environment to prevent desiccation. A small piece collagen dressing material (Collacote or Gelfoam) is placed into the donor site and an interrupted suture is placed at the middle part of the donor site. Most of the time this is sufficient for the closure, but one or two more interrupted sutures may be necessary if hemorrhaging continues (figure 6).

### Securing the Free Gingival Graft

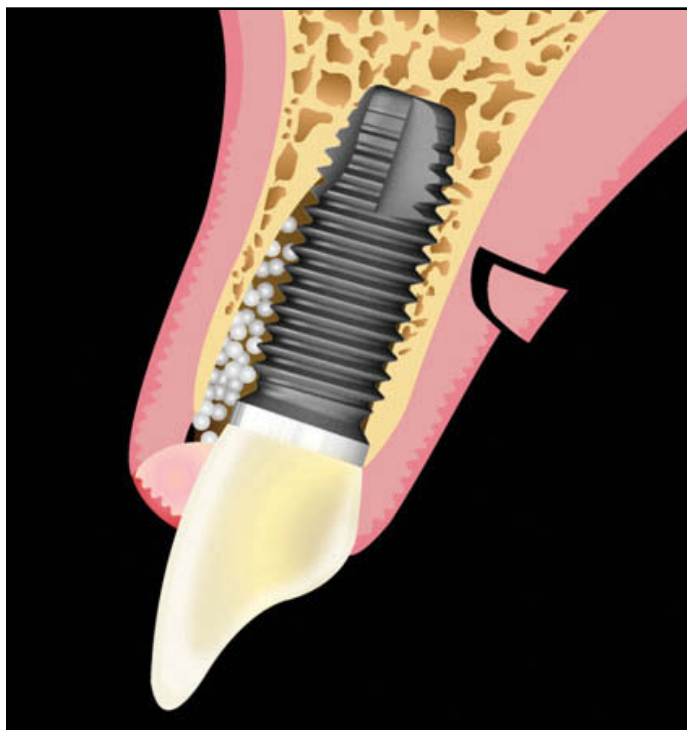
In order to maintain the blood supply and nutrients to the donor tissue, it is important that the outer surface of the crescent graft has intimate contact with the bleeding lamina propria of the labial gingiva with the graft should pushing against the gingival wall. The donor tissue will fit into the recipient site with the inner side of the graft in snug contact with the implant abutment



**Figure 7a:** Crescent shaped free gingival graft lightly pushes against gingival wall.



**Figure 8:** Suture entering from the graft to labial tissue.



**Figure 7b:** Diagram of crescent shaped free gingival graft in place.

or provisional restoration (figure 7a). The graft-implant margin will usually be approximately 1mm coronal to the existing gingival margin. With the epithelium of the graft to the oral cavity side, the bone graft and the exposed socket environment are essentially sealed from the oral cavity (figure 7b). Since the bucco-lingual thickness of the graft is slightly thicker than the recipient space, it may have a tendency to displace. It is kept in the site using gentle pressure with a blunt instrument while initiating suturing. Placing a crescent graft that is too thick can create excessive pressure and hinder blood and nutrient flow to the graft. In such a situation, the graft should be trimmed as needed. The suture recommended is P-3 5-0 chromic gut or Vicryl™ suture. The first suture is started at the mid-labial area with the needle entering through the epithelium of the graft at the mid bucco-lingual



**Figure 9:** Free gingival graft secured with three sutures.

thickness level. It penetrates through the graft and the labial gingiva approximately 2-3mm apical to the gingival margin (figure 8). Without cutting, the suture is wrapped around the provisional or slung over the abutment and tied to the palatal tissue. This ensures that the labial side of the graft is in good stable contact with the labial gingival inner bleeding surface and prevents the graft from being displaced coronally out of the recipient site. The same type of suture is placed in the mesial and distal aspects of the graft. Most of the time, three sutures are sufficient, but one or two more may be necessary in larger grafts. The site should exhibit a socket completely sealed with the epithelium of the crescent connective tissue graft and a healing abutment or a provisional restoration (figure 9). It is also very important that the resulting gingival margin at this point is usually 0.5-1mm



**Figure 10:** 1 week postsurgical visit.

coronal to the final desired gingival margin to compensate for possible future shrinkage.

### Postoperative Instructions

The patient is instructed not to brush the area of the surgery, but to apply chlorhexidine gluconate (0.12%) twice daily and stay on a soft diet. Direct functioning on the implant provisional is not advised for a period of at least 2-3 months. Antibiotics and analgesics should be prescribed appropriately and the patient should be seen for a 1-2 week post-operative visit. A pinkish graft with some sloughing epithelium indicates live tissue (fig. 10). Yellowish or white tissue appearance indicates unsuccessful grafting. If the latter occurs, remove the necrotic portion of the tissue with a sharp scissors. The patient can return to normal light brushing in 2 weeks and is advised to apply chlorhexidine to the area twice a day after brushing.





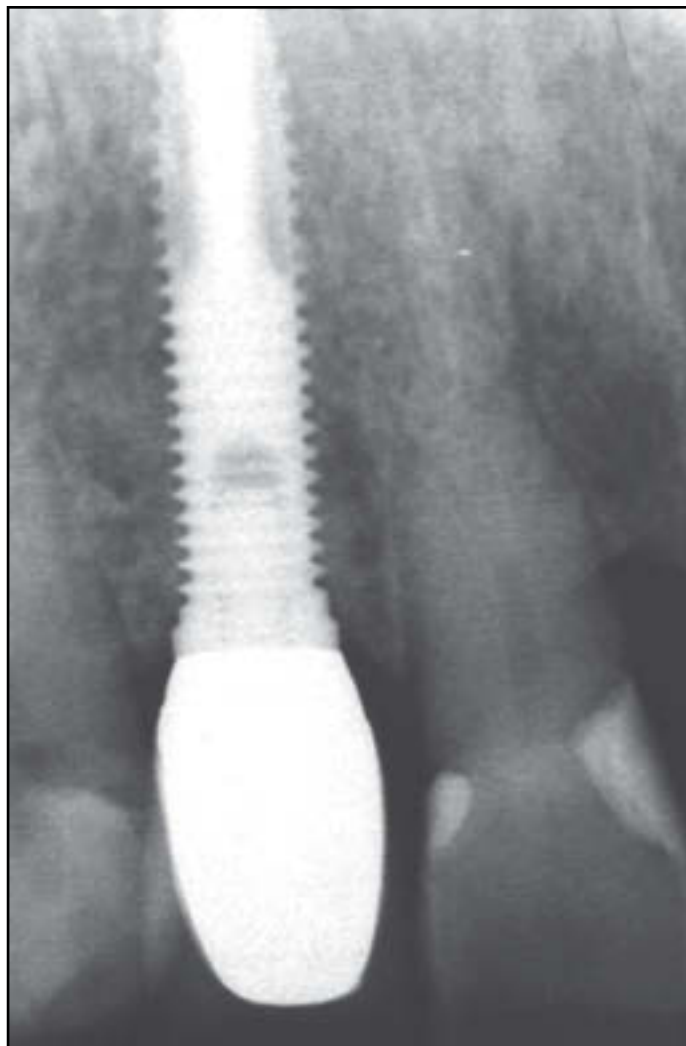
**Figure 11:** Facial view of final restoration after 1 year in function.

## RESULTS

The labial gingival margin one year after the final implant restoration is stable at 1mm coronal to the original gingival margin. There is a thick biotype without gingival discoloration (figure 11). The periapical radiograph indicates stable alveolar bone surrounding the implant at a normal level (figure 12).

## DISCUSSION

Immediate implant placement in a single staged approach with or without provisionalization after extraction, has been shown to preserve the vertical height of the existing interdental papilla.<sup>5</sup> There is, however, a propensity for labial gingival recession over time. The difficulty in immediately placing an implant in the changing environment of an extraction socket lies in predicting which socket will result in an unstable labial gingival margin and which will remain stable over time.<sup>14</sup>



**Figure 12:** Periapical radiograph 1 year after restoration.

Factors which seem to matter most in determining labial marginal stability are not clear, hence there is some controversy. Most would agree that thickness and position of the underlying bone and the biotype of the labial gingival are important factors. However, determining the adequate thickness of bone and biotype in relation to the patient's physiology and function after implant placement is difficult. If there exists in the extraction socket a 2-3mm thickness of labial bone within a 3mm distance from the final desired

facial margin, additional bone or gingival grafting may not have additional benefit on the gingival stability.<sup>13</sup> Placing implants with a distance of 2mm(+) between the implant and the labial socket wall will most likely result in 2-3mm of labial bone thickness with minimal gingival recession. This concept seems to be supported by a recently published retrospective study by Chen.<sup>14</sup>

Other anatomical factors which may affect the stability of the labial margin have been difficult to document. The results of studies which examine the esthetics and stability of the labial gingival margin can vary depending on the type of implants used and which combinations of surgical and restorative approaches were employed. Without a controlled study that examines each single factor and its significance, it would be premature to dismiss any of the factors as being most important for the stability of gingival margin. Therefore, when placing an immediate implant with a single staged approach in the esthetic zone, a prudent strategy would be to overcompensate for both soft and hard tissues to improve the quality and quantity of labial gingival tissue.

Bone grafting of the socket gap up to 3mm of the facial gingival margin and enclosing with crescent graft as described in this technique can create a surgical healing environment that promotes bone formation and maintenance of thicker gingival tissue. The crescent free gingival graft may result in retardation of epithelial growth into the socket and enhance healing of the surgical site.<sup>16</sup> Additionally, thickening of the biotype at the implant site with the crescent graft may inhibit the facial gingival recession associated with immediately placed dental implants in thin biotypes.<sup>17-20</sup> This concept is supported by several

other studies which utilized different surgical approaches to enhance the labial biotype and reported stable gingival margins over time.<sup>21-23</sup>

## SUMMARY

Optimal esthetics for implant therapy in the esthetic zone depends on a synergistic relationship between the underlying osseous architecture, gingival anatomy, implant position, and implant restoration. The bone and crescent shaped free gingival augmentation technique described in this article can help to preserve/enhance the labial soft and hard tissues involved with immediately-placed implants in a single staged approach. The epithelial barrier provided by the crescent graft maintains the labial socket space and keeps bone graft isolated from the insults of the oral environment. The free gingival graft can enhance the labial biotype and improve the labial gingival marginal height. One year post-restoration results showed stable improved labial gingival margins over the implants immediately placed in a one-stage approach. ●

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**Disclosure**

The authors report no conflicts of interest with anything mentioned in this article.

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