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Soft tissue enhancement around dental implants

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Peri-implant plastic surgery aims at improving the esthetic aspects of smile appearance and masticatory function. Enhancement of the esthetic appearance can lend significant support to patients wishing to experience more effective and successful interactions with others in personal, social and workplace situations. This article reviews pre-implant anatomic features that influence the outcome of dental implant therapy and presents a range of surgical modalities aimed at enhancing the appearance of peri-implant soft tissue.

Peri-implant plastic surgery

Definition

Peri-implant plastic surgery focuses on harmonizing peri-implant structures by means of hard tissue engineering and soft tissue engineering, and includes: bone structure enhancement; soft tissue enhancement; precision in implant placement; and quality of the prosthetic restoration.

The rationale for the peri-implant plastic surgery approach goes well beyond pure esthetics to address issues of quality-of-life and the psychosocial wellbeing of patients. Peri-implant plastic surgery is also important for creating peri-implant keratinized mucosa and interimplant soft tissue height in order to avoid food impaction, interimplant airflow and speech problems.

Limitations

Psychological factors

Implant dentistry contributes to the restoration of oral function and beauty, but may occasionally fail to meet very high patient expectations. Much of what comprises a beautiful and appealing smile is influenced by emotion and personality (28, 48). Patients in a modern, affluent society often demonstrate an obsessive interest in achieving unrealistic beauty forms (12, 14, 43). It is essential to understand that dental implants do not provide a perfect treatment outcome for all patients. Replacement of anterior teeth with conventional fixed partial dentures or with resin-bonded restorations may sometimes accomplish equal or even better esthetic results. Appropriate dentist–patient communication and documentation is necessary in order to prevent unrealistic expectations and misunderstandings (39, 47).

Health vs. esthetics

While dental implants can improve a poor esthetic appearance (28, 48), which may handicap individuals and negatively interfere with function, livelihood and social interactions (43), the most important goal of peri-implant interventions is to alleviate and prevent morbidity, such as mucosal inflammation and peri-implantitis. The interaction between potential pathogenic agents and the host immune response determines the health status around teeth as well as dental implants (35). Virulence factors of periodontopathic bacteria trigger the release of pro-inflammatory cytokines from oral mucosal cells and the release of collagenase and other matrix metalloproteinases from gingival fibroblasts. The design and the composition of dental implants are thought to affect local host–parasite interactions (8, 29, 34–36). However, the features of implant design that affect the height of bone and soft tissue around implants have still not been fully identified (20).

Interimplant anterior scalloped papilla

Peri-implant mucosal height essentially follows the crest of the alveolar bone; however, the determining factors in interimplant papilla development are complex and may not be fully controlled by implant design features or surgical interventions (7, 9, 34, 36). Although bone height and thickness are major determinants of soft tissue height, factors such as tooth morphology, location of the interdental contact point, and arrangement and quality of soft tissue fibers can also influence soft tissue appearance. Lack of dento–gingivo–alveolar circular, semicircular, transeptal, interpapillary and intergingival fibers around implants constitutes a major obstacle in soft tissue appearance and management around implants (34, 36). The absence of interimplant papillae causing an interimplant 'black triangle' continues to be a significant problem in dental implant esthetics.

Provisional phase

The type of provisional prosthesis used during the healing period is critical for optimal healing. The design of the provisional restoration should be based on thorough diagnostic information and provide minimal post-surgical irritation and pressure on soft tissues (11). A proper interim prosthesis can provide valuable suggestions about the esthetic appearance of the definitive restoration (20).

Presurgical medical history

The patient's medical history must be known in order to avoid complications during implant surgery (2). Uncontrolled diabetes, or long-term therapy with corticosteroids, may alter a patient's healing potential and jeopardize the surgical outcome (31). Smoking is another factor that affects soft tissue healing (16, 23, 30).

Presurgical oral examination

A thorough pre-surgical oral examination should include the following.

Information on bone quality and quantity

The thickness, height and contour of the facial alveolar plate can significantly affect the labial position, the facial expression and the smile (27). There is a wide range of variation in the morphology of the alveolar plate (5). A dynamic balance between functional forces and existing alveolar bone shape sculpts the alveolar bone morphology.

The housing of a standard 3.75–4-mm-diameter implant requires 6 mm of bone in the bucco–lingual dimension and 5–6 mm of bone in the mesio–distal dimension. Both thickness and height of the facial alveolar plate are influenced by implant angulation (5). A lingual implant inclination is associated with a thick and flat facial alveolar bone that provides soft tissue support in a more coronal position than normal. A labial implant inclination is associated with a thin and scalloped facial alveolar bone that often is located in an apical position. Lingually inclined anterior implants provide a thicker coronal portion of the facial alveolar plate and counteract a tendency to peri-implant bone resorption. Vertical and horizontal enlargements of the facial alveolar plate prior to implant placement can be critical for the long-term maintenance of soft tissue height (6, 15, 17).

Limitations in bone quantity in the mesio–distal dimension may be caused by root position of adjacent teeth. Orthodontic movement used to change the root position can provide the necessary space for implant insertion. A reduced horizontal distance between a tooth and a neighboring implant may adversely affect the bone level at the tooth side (15).

Dental morphology

Tooth morphology is related to the periodontal biotype, and this phenomenon is most evident in the anterior esthetic zone of the mouth. The triangular-shaped tooth is linked to a thin, scalloped periodontium (Biotype I) (37). In this biotype, the interproximal contact area is located in the coronal one-third of the crown and is associated with a long, thin papilla. The square-shaped tooth is connected to a thick, flat periodontium (Biotype II) (37). The interproximal contact area is located at the middle one-third of the crown and supports a short, wide papilla (37, 38).

Occlusion and occlusal forces

The direction, intensity and duration of masticatory forces on implants are reflected in the associated bone density and thickness. Nonaxial implant forces may cause bone stress and subsequent bone loss (32). A negative correlation seems to exist between angular implant forces and the thickness and height of the facial alveolar plate. To achieve a favorable prognosis, occlusal adjustment may be needed to direct the masticatory forces as much as possible towards the long axis of an implant (32). Prosthodontic treatment planning is often required to ascertain whether an implant restoration would satisfy the requirements for proper occlusion and phonetics.

Adjacent periodontium

The crown–abutment junction largely coincides with the cemento–enamel junction of neighboring periodontally healthy teeth (7, 21, 25). In the event of a markedly reduced periodontium around teeth adjacent to an implant, the results will be (i) a longer clinical implant crown and (ii) a reduced size, or absence, of papillae.

The maxillary central incisor measures, in general, 7–8 mm mesio–distally and 6 mm facio–lingually at the emergence from the soft tissue (50). A standard 3.75- or 4-mm-diameter implant should be placed 3–4 mm apical to the buccal soft tissue level of the adjacent teeth to allow the restoration to merge with a natural profile. A vertical distance of 3–4 mm is needed to allow for a gradual transition from the 4-mm diameter of the implant platform to the 7–8-mm dimension of the crown at the gingival margin. In the event of replacing a maxillary lateral incisor, the implant can be positioned more coronally because the average diameter of the crown at the gingival level is about 5 mm and would therefore require less room for transition (Figs 1–6).

Smile line, lip position and lip mobility

The Vermilion border of the lips, or the redness surrounding the mouth, is the primary anatomic feature of the lips. The Vermilion–skin junction is most highly defined centrally, and the vertical groove on the center upper lip is known as the philtrum. A well-defined upper-lip Vermilion tubercle provides fullness to the central Vermilion beneath the philtrum. The tonus and the shape of the Vermilion, the Vermilion tubercle and the philtrum are significantly influenced by the maxillary bone anatomy, the position of implants, the peri-implant anatomy and the dental morphology (13). In the mandible, the need for an esthetic outcome is not as high as in the maxilla and the practitioner can focus more on the long-term implant health vs. esthetics. (Figs 7–11).

Fig. 1. Lack of maxillary lateral incisors adjacent to intact periodontium.

Fig. 2. Palatal view.

Fig. 3. Note the optimal position of implants that were restored using nonangled screw-retained abutments. (Prosthodontics by Dr Arman Torbati.)

Fig. 4. Clinical view of the finished maxillary right lateral incisor.

Soft tissue quality, quantity, color, texture and shape

The oral mucosa typically comprises a shiny red alveolar mucosa and a coral pink masticatory mucosa (26). The movable alveolar mucosa is loosely composed of collagen fibers, and the epithelium is thin,

Fig. 5. Clinical view of the finished maxillary left lateral incisor.

Fig. 6. Frontal view of the final result.

Fig. 7. Pre-operative view. Note the dento–gingival disharmony.

nonkeratinized and contains no rete pegs. In contrast, the epithelium of masticatory mucosa is nonmoveable, thick, keratinized and composed of well-organized dense, collagen fibers. Being firm, stippled and tightly attached to the periosteum, the masticatory mucosa can resist physical, thermal or chemical trauma (10, 46, 49).

The gingival margin of the maxillary teeth usually runs parallel with the contour of the upper lip. The

Fig. 8. Note the fractured maxillary right central incisor.

Fig. 9. The maxillary central incisor was extruded and extracted followed by bone and soft tissue augmentation.

Fig. 10. Clinical view of the finished case.

mucosal margins of the maxillary central incisors and canines are at the same height. The mucosal margin of the maxillary lateral incisor is 0.5–1.0 mm more coronal than that of the canine and central incisor. With an average smile, the labial tonus and position cause a display of 75–100% of the maxillary anterior teeth and the associated soft tissue (13).

Fig. 11. Note the restoration of dento–gingival harmony. (Prosthodontics by Dr Arman Torbati.)

Periodontal biotypes

Gingival thickness, the morphology of the gingiva and the interdental papilla, and the osseous architecture are all determining factors in periodontal biotyping and can influence surgical approaches and healing (25, 46, 49). Ochsenbein & Ross (37) described healthy periodontal tissues by the biotype categories of 'thin scalloped' (thin gingival tissue, long papillae, and thin, scalloped bone) and 'thick flat' (thick gingival tissue, short and wide papillae, and thick, flat bone). Olsson & Lindhe (38) further categorized the periodontium based on the associated tooth form and susceptibility to gingival recession. The triangular tooth form is associated with a scalloped and thin periodontium. The contact area for the triangular tooth shape is at the coronal third of the crown, supporting a long and thin papilla. The squared tooth combines with a thick and flat periodontium. The contact area for the square tooth shape is at the middle third of the crown, supporting a short and wide papilla.

Periodontal biotyping affects practically all periodontal surgical procedures, including crown lengthening (44), implant placement (40, 42) and tissue grafting (45). A thin periodontal biotype is the more technique-sensitive and can, post-treatment, give rise to gingival recession or black triangle formation (6). An implant placed in a site with a thin periodontal biotype may develop mucosal recession or bluish color changes.

Classification of the alveolar ridge in the anterior maxilla

To help practitioners deal with the complexity of implant treatment, visualize the end result and understand the limitations, Palacci & Ericsson (41) published, in 2001, a classification system based on the loss of hard and soft tissues (Fig 12–20). An assessment of the pre-implant anatomical site provides a helpful guide in choosing proper treatment options for reaching a desirable functional and esthetic outcome.

The Palacci-Ericsson classification system divides implant sites into four classes according to the vertical and horizontal dimensions of tissue loss, respectively.

Vertical loss

Class I, intact or slightly reduced papillae; class II, limited loss of papillae (less than 50%); class III, severe loss of papillae; and class IV, absence of papillae (edentulous ridge).

Horizontal loss

Class A, intact or slightly reduced buccal tissues; class B, limited loss of buccal tissues; class C, severe loss of buccal tissues; and class D, extreme loss of buccal tissue, often in combination with a limited amount of attached mucosa.

Combinations of the different classes can exist, as shown in Table 1.

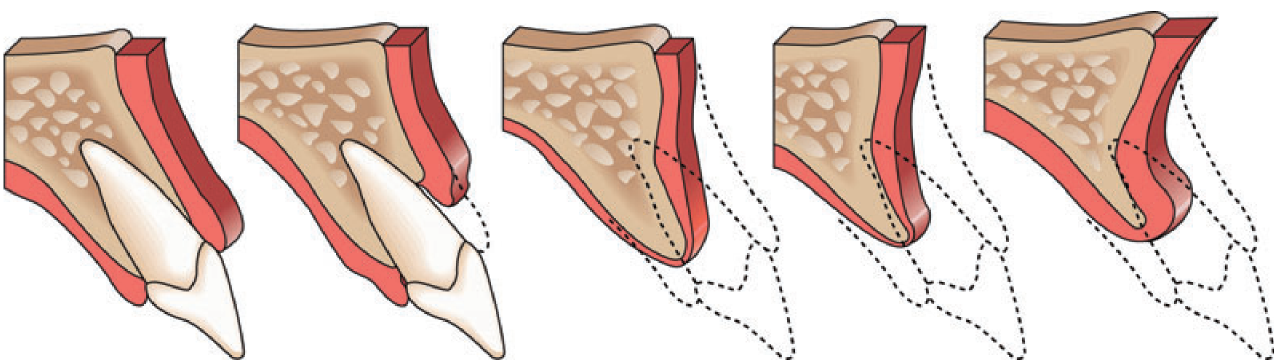


Fig. 12. Vertical and horizontal ridge loss. While the treatment of the left-side case was relatively simple and 'restitution ad integrum' could be achieved, treatment of the right-side case was challenging. The objectives and treatment options were not the same for the two cases presented here. An implant-supported fixed restoration was more likely to be a better solution for the right-side case.

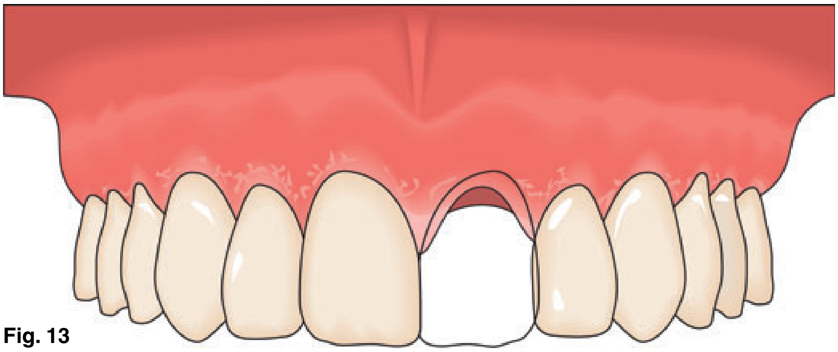


Fig. 13

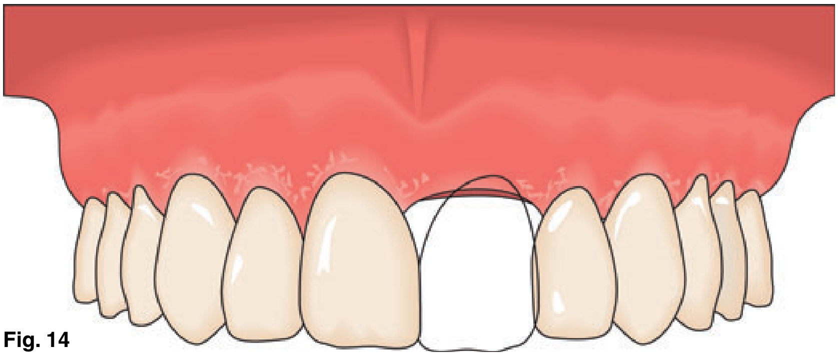


Fig. 14

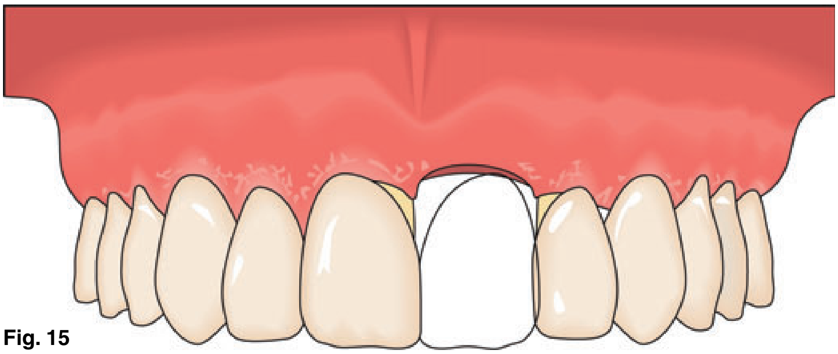


Fig. 15

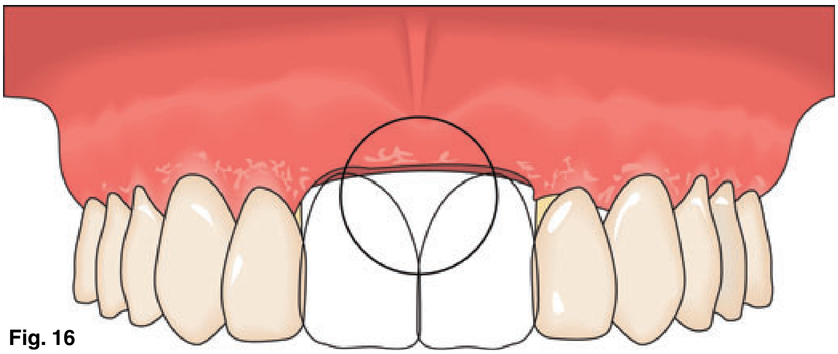


Fig. 16

Figs 13–20. The Palacci-Ericsson classification.

The dental practitioner cannot expect to go directly from class IV to class II or from class III to class I in one surgical procedure. However, a class IV case may convert to a class II case in a series of treatment procedures.

A total of 4–5 mm of gain in soft tissue height may be obtained in a series of surgical steps. Bone-augmentation procedures can provide a gain in height of 2–3 mm. An additional 2 mm can be gained using soft tissue augmentation, and 1–2 mm further gain can be obtained by surgical crown-lengthening. The 5–6 mm of gain in soft tissue height obtained by a staged surgical approach can make the difference between a successful and an unacceptable implant treatment outcome (Figs 13–22).

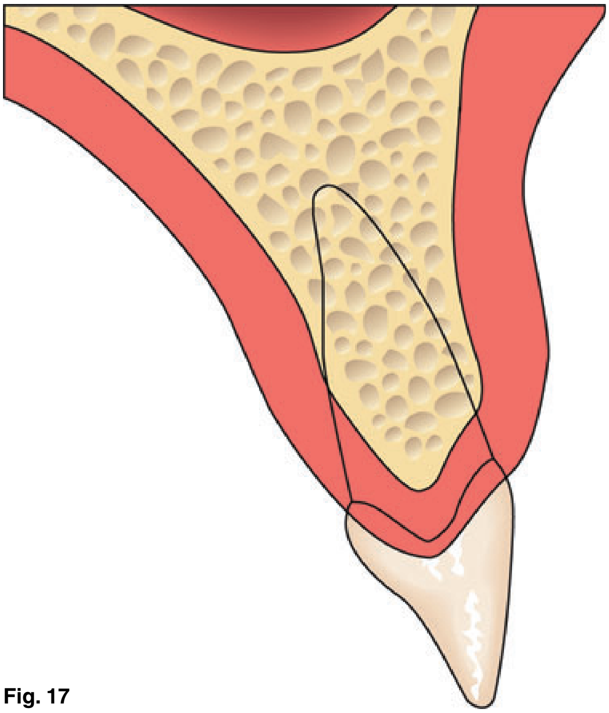


Fig. 17

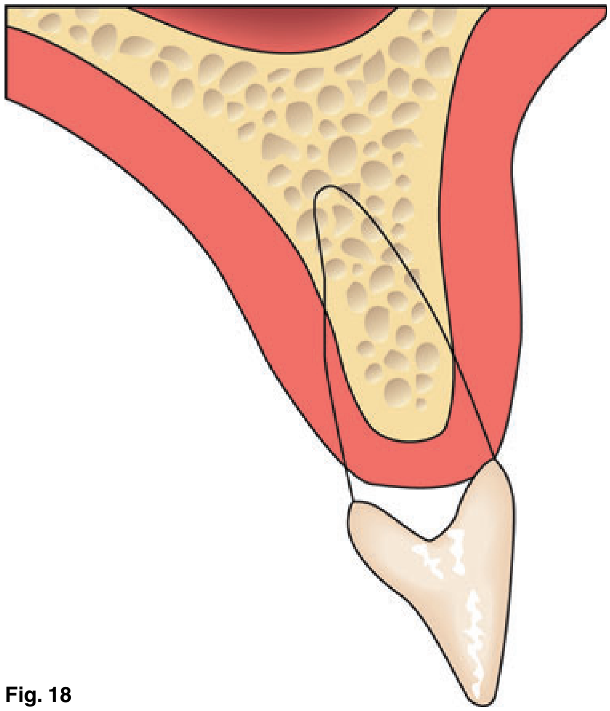


Fig. 18

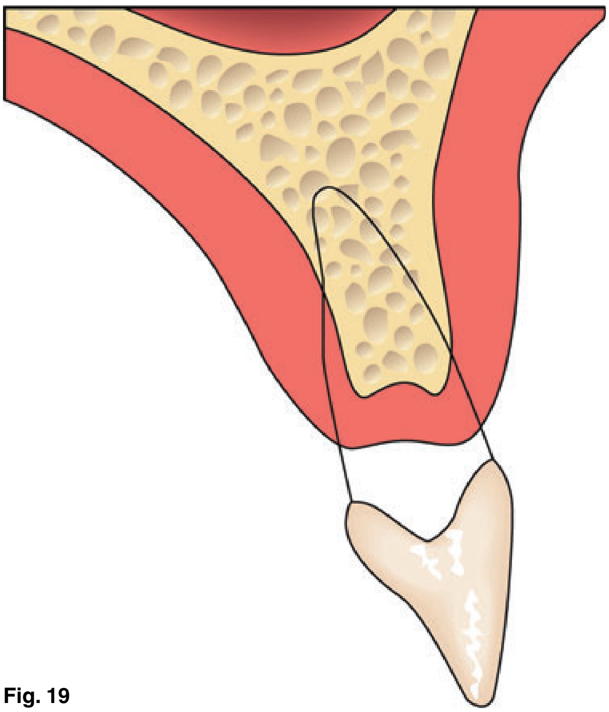


Fig. 19

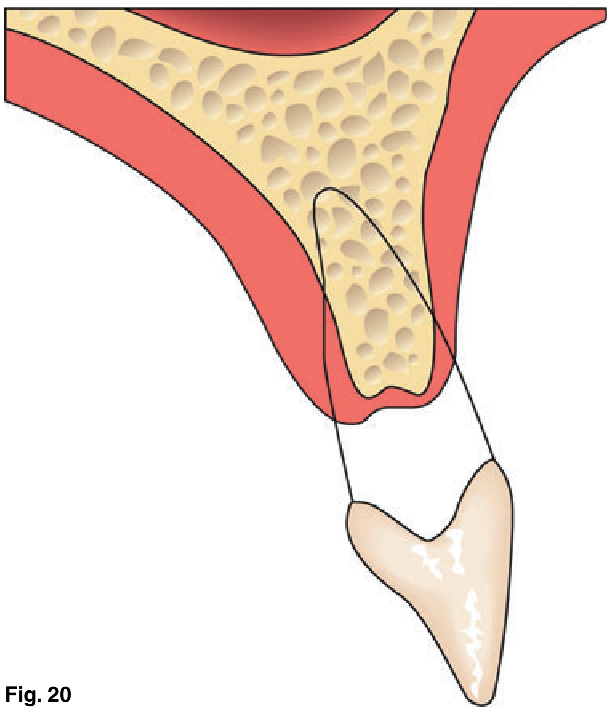


Fig. 20

Figs 13–20. Continued.

Suggested treatment options for different classes

Class I-A

In class I-A cases, there is no need to increase the alveolar ridge contour in vertical or horizontal dimensions. Often, a tissue punch technique or a horizontal crestal incision within keratinized masticatory mucosa is sufficient to provide an adequate soft tissue anatomy around an implant.

Immediate implant placement following tooth extraction can be attempted to reduce treatment time. However, peri-implant bone maintenance and soft tissue stabilization may be affected (3, 4, 22). If an immediate implant placement compromises implant positioning and angulation, a delayed implant

Table 1. Combinations of the different classes of vertical and horizontal dimensions of tissue loss

Vertical loss	Horizontal loss
Class I	Class A
Class II	Class B
Class III	Class C
Class IV	Class D

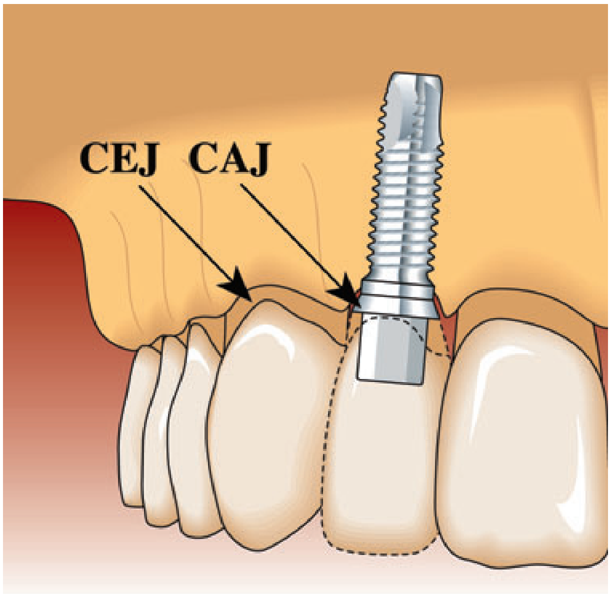


Fig. 21. Proper implant positioning adjacent to an intact periodontium. The crown–abutment junction (CAJ) more or less coincides with the most apical extension of the cemento–enamel junction (CEJ) of the neighboring teeth.

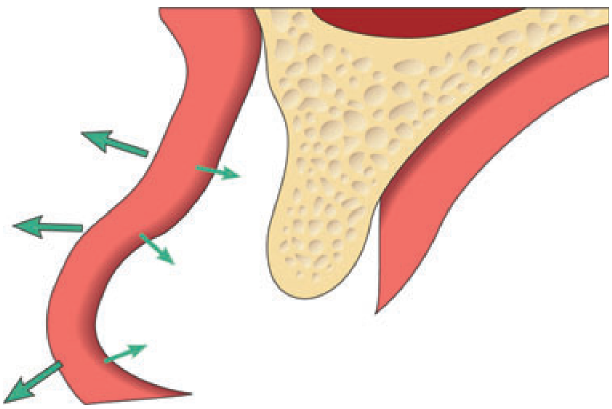


Fig. 22. The ridge can be augmented in vertical and horizontal directions. The combination of bone and soft tissue additive surgeries provided optimal alveolar ridge support for optimal implant placement and esthetics. The arrows illustrate the directions of bone and ⁄ or soft tissue augmentation.

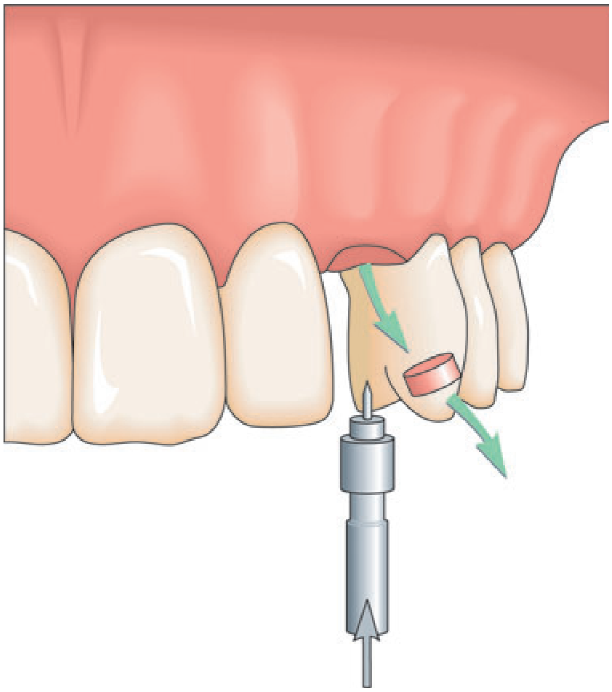


Fig. 23. Illustration of the tissue-punch technique.

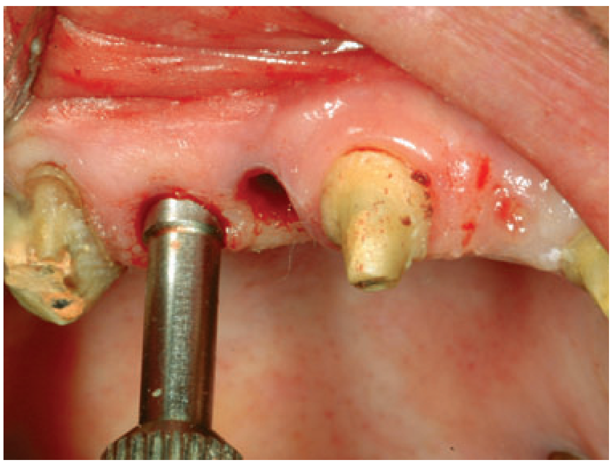


Fig. 24. Thick soft tissue ridge. Two implants were placed in the pre-molar area. The soft tissue was punched to expose the implants, cover screws were removed and prosthetic abutments were selected.

placement approach should be considered (Figs 23–34).

Buccal implant inclination is usually associated with a thin alveolar bone that tends to experience more resorption than normal after tooth extraction and implant placement (17). The most extensive bone resorption takes place during the first year, especially during the first 6 months, following extraction of a tooth. Resorption is particularly pronounced in the saggital plane in the mandible, and is directed more buccal and horizontally in the maxilla (27). A lingual implant inclination is associated with a thick facial alveolar bone that tends to remain in a coronal position with little or no tendency of bone resorption.

Fig. 25. The abutments were placed and covered by protection caps. The maxillary first molar was extracted and replaced by a cantilever pre-molar.

Fig. 26. An onlay block graft was placed to restore the alveolar ridge.

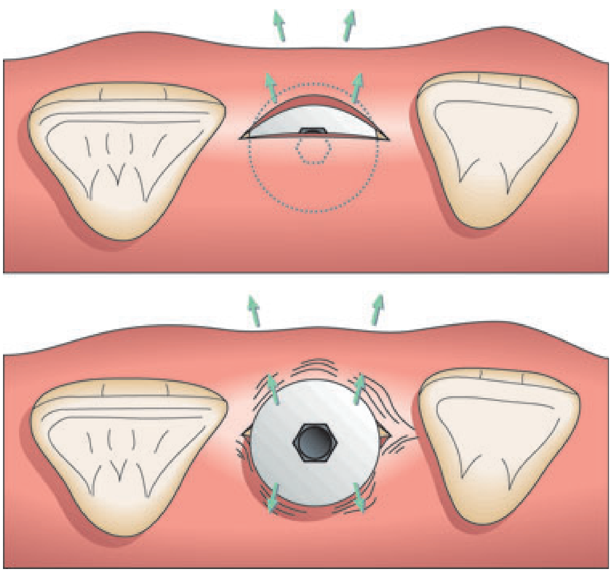


Fig. 27. A crestal incision allowed a buccal positioning of the peri-implant mucosa.

Class II-B

A proper soft tissue augmentation technique can be of utmost importance in class II-B cases (Figs 35–40).

Fig. 28. The abutment provided soft tissue support.

Fig. 29. Definitive prosthesis.

Fig. 30. At 1 year of follow-up.

Fig. 31. Maxillary teeth have to be extracted as a result of severe periodontitis. Following extractions, implants were inserted, allowing the immediate positioning of a fixed partial denture.

Fig. 32. Clinical views at 1 day.

Fig. 33. One week after surgery. The acrylic papillae will progressively be removed, allowing the growth of the newly formed soft tissue.

Fig. 34. Clinical view at 1 year of follow-up.

Fig. 35. Improper implant dentistry. Implant at maxillary left and right incisors were placed too buccally and grafted with bovine bone, resulting in soft tissue fenestration adjacent to an intact neighboring periodontium.

Fig. 36. Note the change in soft tissue color and texture associated with encapsulated bovine bone.

Fig. 37. After new abutment placement and new temporary crown, bovine bone was removed and connective tissue grafts were inserted.

Fig. 38. Clinical view of the finished case. (Prosthodontics by Dr Arman Torbati.)

The degree and type of soft tissue contouring may vary according to the needs of the patients, as mentioned earlier, and can be performed during implant or abutment installation, depending on the employment of either a one-stage or a two-stage implant placement procedure.

Fig. 39. Note the volumetric improvement of the soft tissue.

Fig. 40. Smile view. Compare with Fig. 36.

Historically, abutment installation has been performed using the tissue-punch technique. The tissue punch technique is indicated in the following:

- in cases with no specific need to increase connective tissue and keratinized mucosa around abutments.
- in cases of excessive soft tissue at the implant level.
- in single-stage implant placement and abutment installation procedures, when adequate bone and keratinized soft tissue are present.

Notably, partial-thickness flap, apically repositioned flap and roll surgical techniques may compromise interimplant or implant-dental papillae (18, 19).

A surgical technique to restore a papilla-like tissue between implants

Manipulation of the soft tissue adjacent to implants enables proper peri-implant tissue healing and can result in a soft tissue architecture similar to the healthy gingival anatomy around teeth (18). A surgical technique has been developed to restore a papilla-like tissue at the time of the second-stage implant surgery. The attached masticatory mucosa is displaced buccally, thereby increasing the tissue volume at the buccal side of the implant(s). The

Fig. 41. Implants have been placed distal to the canine. Palatal and distal incisions release the tissue to the buccal aspect of the alveolar ridge.

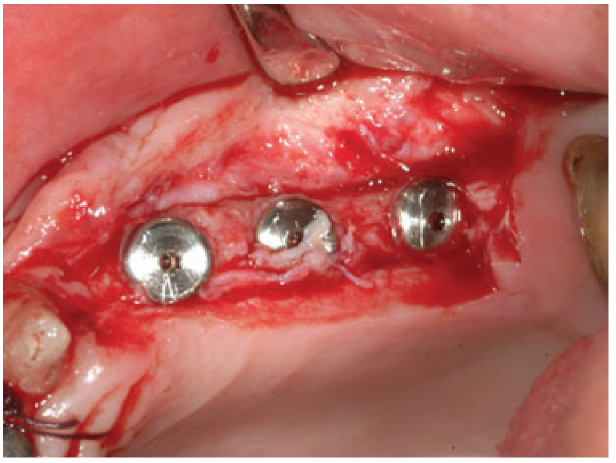


Fig. 42. Implant exposure.

Fig. 43. Healing abutments were connected. Note the volumetric improvement of the alveolar ridge.

Fig. 44

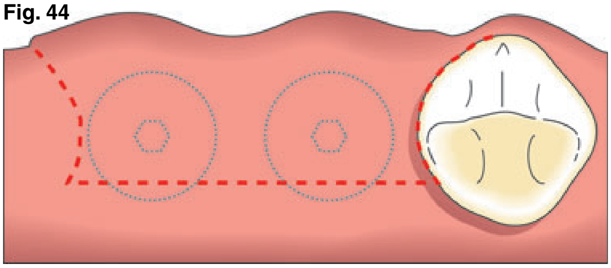


Fig. 45

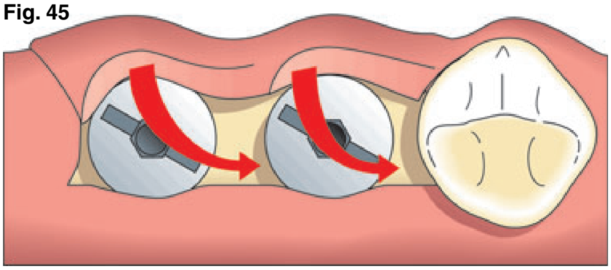
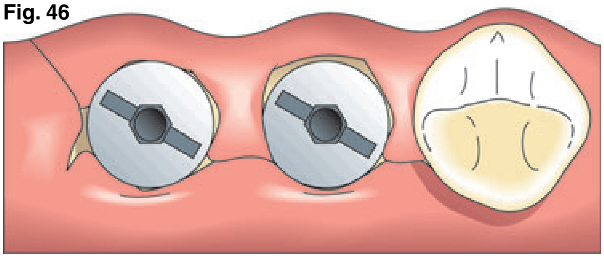


Fig. 46



Figs 44–46. Occlusal view of horizontal and vertical incisions.

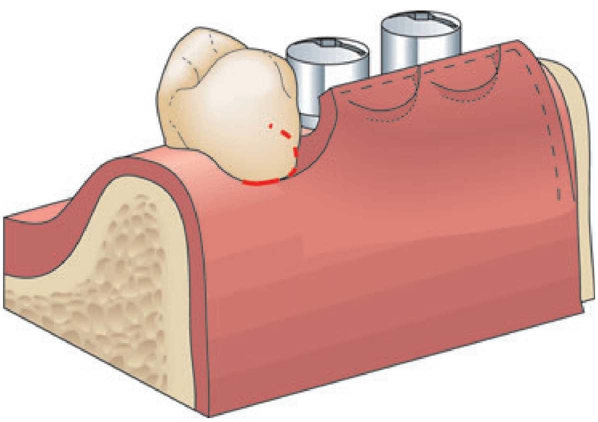


Fig. 47. Placement of the healing abutments and rotation of the pedicles. Pedicles fill the space between abutments.

reposition buccal tissue is stabilized by the connected abutment(s). The excess buccal tissue allows for a dissection and rotation of pedicles with the purpose of filling the interimplant space with a papilla-like soft tissue (Figs 41–54).

Variations of the above technique include the inclusion of the edentulous area, a large interimplant distance and the use of cylindrical abutments. The

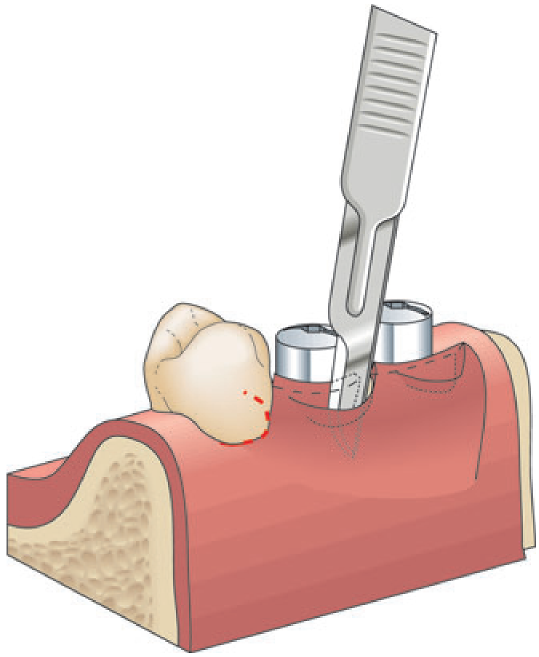


Fig. 48. Views from the side. The full-thickness flap was elevated and reflected labially. The healing abutments emerge from the tissues and hold them in place. Semilunar bevel incisions were made, recreating a scalloped shape similar to that of tissues around natural teeth.

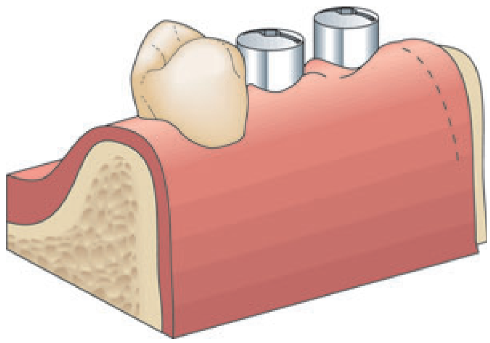


Fig. 49. The pedicles were rotated to fill the interabutment and abutment–tooth spaces.

Fig. 50. Semilunar incisions were made in the flap at each implant. The first one started distal to the most mesial implant.

Fig. 51. The tissue was then rotated towards the palate to create a papilla between the implant and the tooth. Semilunar incisions were also made more distally around each abutment.

Fig. 52. The rotation of the pedicles made it possible to close the space between the abutments.

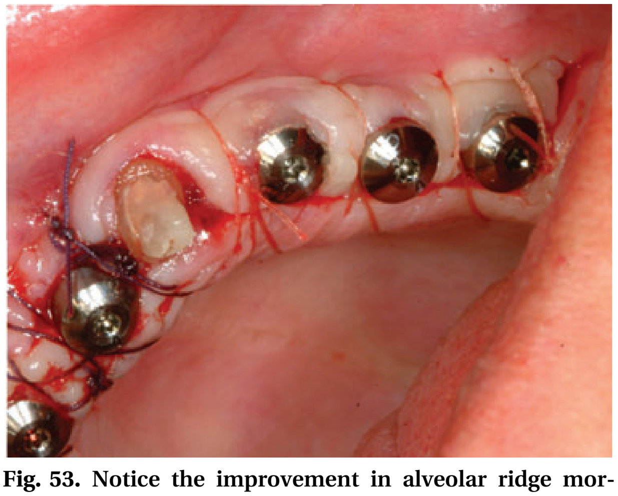


Fig. 53. Notice the improvement in alveolar ridge morphology. Pedicles fill the interimplant space.

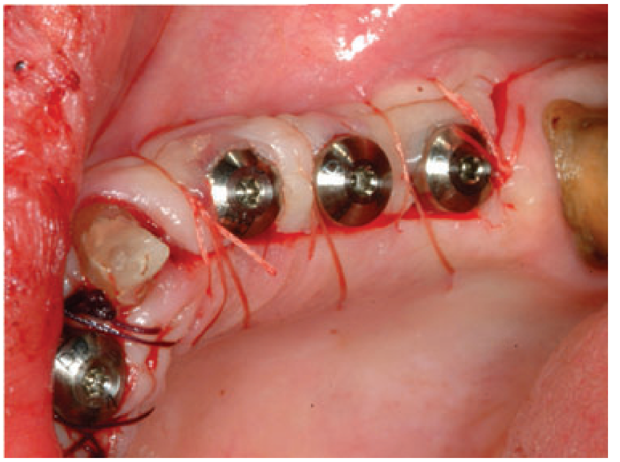


Fig. 54. Mattress sutures hold the tissues in place.

Fig. 55. Anterior region: note the flat shape of the alveolar ridge and the loss of papillae. A horizontal palatal incision is made.

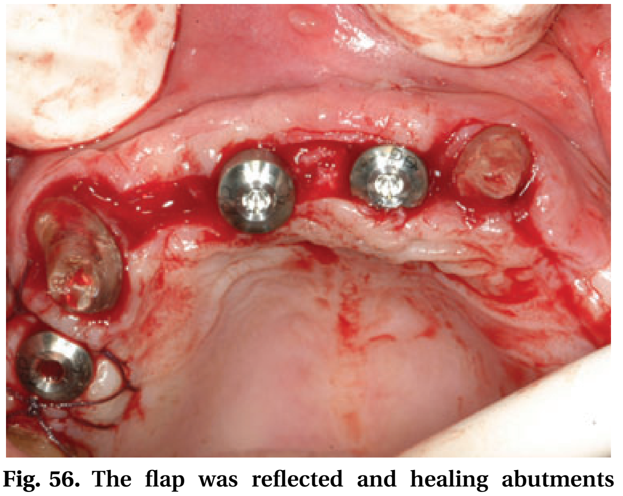


Fig. 56. The flap was reflected and healing abutments inserted. Note the change in the alveolar ridge morphology.

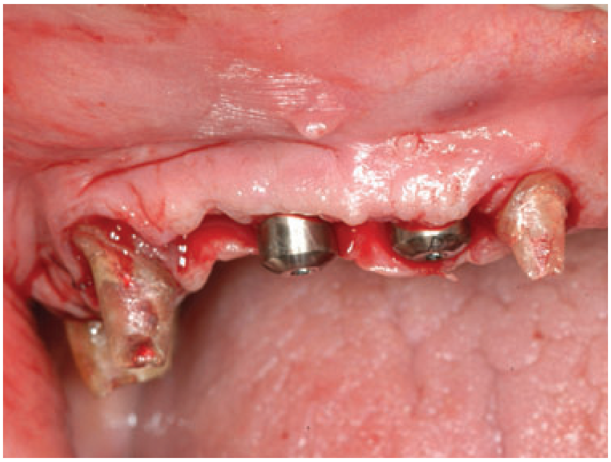


Fig. 57. Buccal view: there is a straight horizontal line between adjacent teeth. There will be a lack of tissue at the site of lateral incisor. Soft tissue augmentation is required to restore the alveolar ridge harmony.

Fig. 58. Palatal connective tissue was harvested from the adjacent implant site.

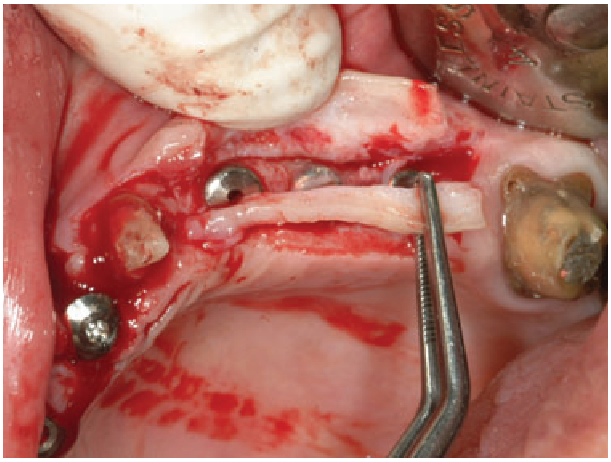


Fig. 59. Graft in place.

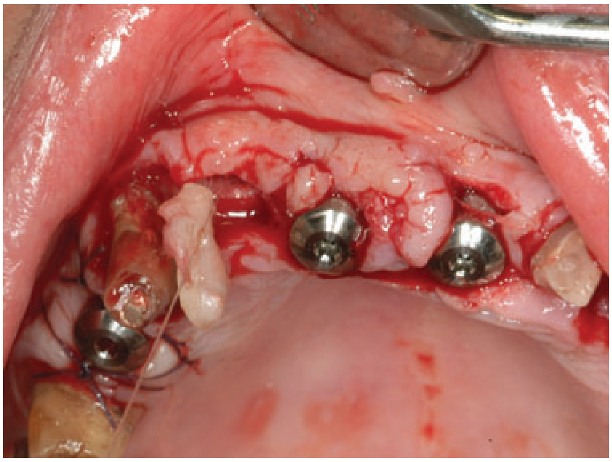


Fig. 60. A double pedicle was placed between the implants to increase the interimplant height of the tissue. The connective tissue graft slides along the suturing material.

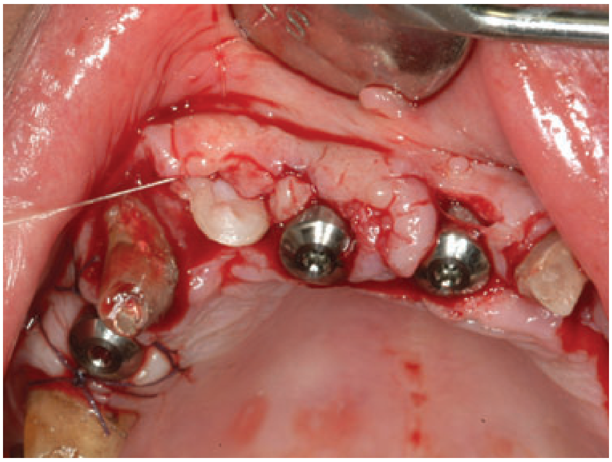


Fig. 61. The papillae remain in position without tension and the graft was sutured into the desired position.

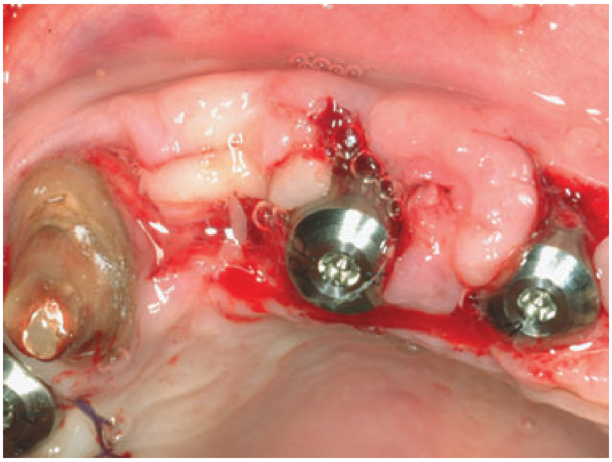


Fig. 62. Higher magnification.

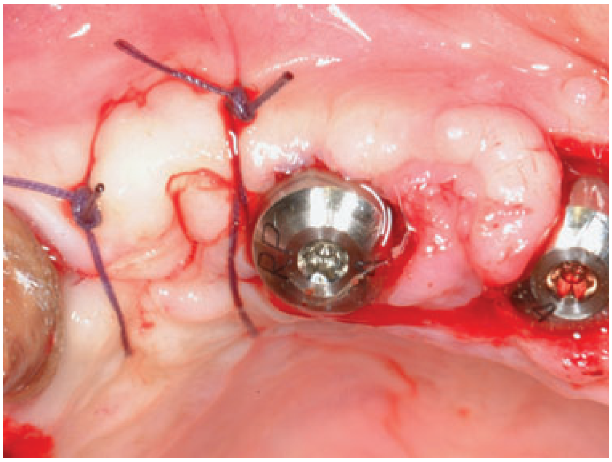


Fig. 63. Sutures on the top of the alveolar ridge.

Fig. 64. The mattress sutures hold the tissues in position. Note the tissue adaptation around titanium abutments. At 2 weeks, the prosthetic abutments were selected and the impression taken.

Fig. 65. Clinical views of the finished case.

Fig. 66. Note the recreation of the papillae and compare the result with the initial condition.

Fig. 67. Papillae have been created in a class IV case.

Fig. 68. Similar situation to that described above (Figs 57–67). Four implants replaced the canine, pre-molars and first molar. A connective tissue graft was placed at the lateral incisor site.

Fig. 69. Occlusal view of the prosthesis illustrated the importance of implant positions. The emergence of the screw holes at the central fossa and separated by 7–9 mm.

Fig. 70. Adequate interimplant space is essential to preserve blood supply for soft tissue stability.

Fig. 71. Loss of maxillary lateral incisor resulted in loss of papillae and alveolar ridge deficiency. Note the changes in soft tissue color and texture. The patient wears a removable denture.

recommended surgical technique to restore interimplant papillae involves the following:

- careful handling of tissues in order to minimize trauma and maximize vascularization.

Fig. 72. Note the alveolar ridge loss.

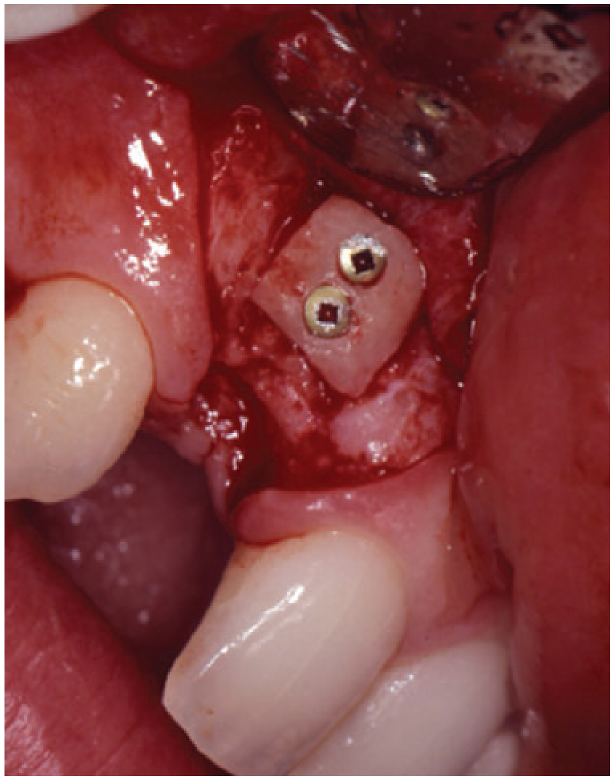


Fig. 73. Mandibular symphysis graft was used to restore the alveolar ridge.

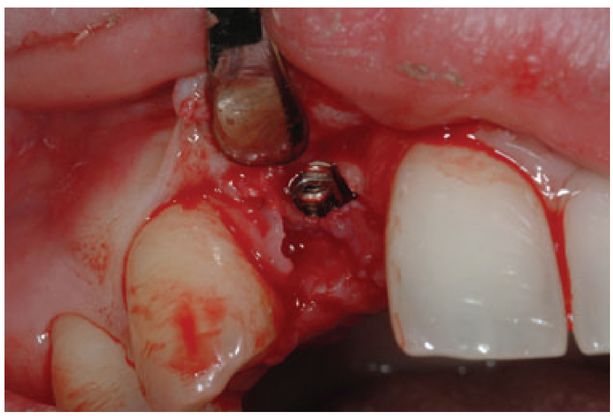


Fig. 74. At 4 months post-grafting. Note the optimal position of implant in horizontal and vertical directions.

Fig. 75. After the insertion of healing abutment, horizontal palatal incision resulted in a significant gain of tissue buccally.

Fig. 76. A semilunar beveled incision and the rotation of dissected pedicle form the mesial papilla. Periosteal mattress sutures held the tissue in the desired position.

Fig. 77. After a 2-week healing time, a papilla-like tissue was formed between the implant and the central incisor. The alveolar ridge was repaired.

- bevel incisions in the mobile flap should be delicate and vary according to needs (thickness, height, or both).
- the rotated pedicles should be tension-free.
- the suturing technique should provide a tight and firm connection of the pedicles to the supporting bone and abutments.

Additional connective tissue grafting prior to bone grafting, during implant placement, or at the time of second-stage surgery can help to produce a favorable

Fig. 78. Loss of maxillary lateral incisor resulted in the loss of papillae and alveolar ridge deficiency. Note the changes in soft tissue color and texture.

Fig. 79. Note the changes in soft tissue color and texture.

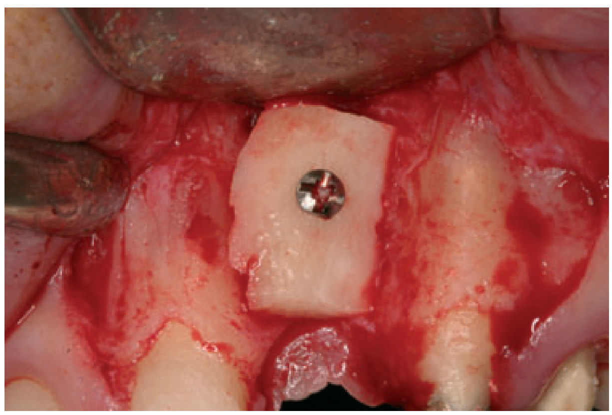


Fig. 80. Mandibular ramus graft was used to restore the alveolar ridge.

implant situation. These treatment options should be carefully considered, knowing that the papilla-regeneration technique in many cases will provide enough tissue in the buccal dimension. Soft tissue surgeries to add buccal or crestal tissues can be performed as illustrated in Figs 55–70.

Fig. 81. Note the optimal position of implant in horizontal and vertical directions.

Fig. 82. Clinical view of the finished case. (Prosthodontics by Dr Aria Davodi.)

Class III-C

In Class III-C, bone grafting aims at restoring adequate support for the implant and soft tissue. The subsequent clinical situation should approach class II-B and then class I-A after performing soft tissue augmentation.

Intramembranous autogenous bone grafting and implant placement at 4 months represents a reliable treatment option in class III-C cases (1, 33). After a healing period of 3–6 months, at second-stage surgery the soft tissue contour, texture and shape can be relatively easily improved. A temporary prosthesis can optimize soft tissue anatomy and help to finalize esthetics and occlusion, after which a definitive restoration is made. Figs 25–30 illustrate different surgical treatment modalities that are able to convert a case from class III-C to class II-B and to end up finally in class I-A (Figs 71–77).

Class IV-D

In Class IV-D, the vertical dimension of the future implant site has been markedly altered, and the bone resorption and soft tissue collapse require major surgical reconstruction prior to implant placement. A staged surgical approach is necessary, but not always sufficient, to achieve a complete ridge reconstruction. Several treatment modalities have been used to obtain an acceptable clinical outcome (24):

- bone grafting (Figs 78–82).
- orthodontic eruption of the ridge (Figs 7–11).
- segmental osteotomy.
- distraction osteogenesis.
- porcelain ⁄ acrylic gingival imitation included in the prosthetic restoration.

It is important that a class IV-D patient accepts a compromised clinical outcome prior to the start of treatment.

Conclusions

In the maxillary anterior region, the replacement of missing teeth is only one part of the treatment. Another important aspect of therapy consists of replacing the lost portion of the alveolar process and the associated soft tissue. The re-establishment of a normal alveolar contour is a critical step in esthetic success.

It is essential to understand that implant dentistry is not without complications and difficulties. However, the long-term prognosis of the function and the esthetics of dental implants can be improved by correctly classifying alveolar ridge defects, by adhering to proper techniques for alveolar ridge and soft tissue augmentation, and by ensuring the most appropriate mode of implant placement in individual patients.

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