CHAPTER 30

# Management of Complications of Soft Tissue Grafting in Implant Dentistry

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## Introduction

This section will discuss the management of soft tissue complications surrounding restored implants. Complications surrounding restored implants can be either inflammatory or esthetic in nature, with inflammatory pathologies often causing esthetic issues. Inflammatory problems include peri-implant mucositis and peri-implantitis; diagnosis and treatment of these pathologies must be addressed before attempting to correct the esthetic defects caused by the disease process. Purely esthetic complications are those present with no signs of inflammation and can often be the result of implant positioning, restoration, or inadequate soft and hard tissue. While it is best to ensure correct positioning and adequate hard and soft tissue prior to implant placement and restoration circumstances still arise where this is not always possible. While one may be tempted to remove a healthy osseointegrated implant for the sake of achieving better positioning or building a site prior to placement, rather than attempting to surgically mask or correct a hard or soft tissue problem restarting the case from the beginning is not always the best treatment option. One important thing to consider when choosing a course of action, implant removal and replacement with multiple surgeries can be time consuming and traumatic for patients, tissue that has healed from multiple procedures is often fibrous and difficult to handle and has a reduced blood supply, and a decrease in the success rate often follows multiple surgical procedures. It is important for surgeons to have alternative options other than restarting cases from scratch in their repertoire. The following chapter will include case presentations and management of soft tissue problems at implant sites. It will also review how to distinguish inflammatory and non-inflammatory complications as well as management of both types of complications. The most complicated failures are those that are inflammatory in nature. Diagnosis and treatment of these as well as repair of the destruction they cause will be discussed through three case reports in this section.

### Diagnosis/treatment of inflammatory complications

Peri-implantitis and peri-implant mucositis are diagnostic terms to describe an inflammatory pathology surrounding implants. Peri-implant mucositis involves inflammation of the soft tissue surrounding implants and peri-implantitis is inflammation of both the hard and soft tissues surrounding implants and is distinguished from peri-implant mucositis by the crestal bone loss that accompanies the soft tissue inflammation [1]. The diagnosis of peri-implantitis is based on clinical observations of bleeding or suppuration on palpation or probing and radiographic analysis of crestal bone levels [1]. The diagnosis of peri-implantitis cannot be made with the same set of objective assessments used to diagnose periodontal disease surrounding teeth. Probing to assess attachment loss around implants is not a valid diagnostic tool. The validity of probing around implants is questionable as the fibrous arrangement and insertion surrounding implants varies from that around natural teeth [2,3]. Probe penetration is highly dependent on force and in the case of implants probe penetration has been shown to penetrate up to 0.2 mm from the crest of bone [4]. Diagnosis of peri-implantitis and peri-implant mucositis is mostly made by clinical observation of tissue and radiographic examination. If a clinician determines that there is an inflammatory aspect to the soft tissue complications surrounding an implant it is necessary to first address and treat the inflammatory disease before addressing repair of the aesthetic aberrations.

The 6th European Workshop in Periodontology put forth a consensus statement that successful treatment of peri-implantitis must be surgical in nature [5]. The primary objectives of surgical treatment of peri-implantitis should include resolution of inflammation and preservation of the supporting bone as well as surface decontamination and debridement. In the following cases decontamination and debridement by implantoplasty was selected due to the survival rates of implants treated with implantoplasty. Another reason implantoplasty is used as a treatment of peri-implantitis prior to correction of defects is that GBR and re-osseointegration is successful around adequately disinfected previously infected implants [6,7]. The decision to surgically treat rather than remove and replace an implant should be made on a case by case basis by the clinician. The following protocol is not advised for mobile or failed implants [8]. The surgical protocol followed when peri-implantitis was an element of the diagnosis in the following cases was presented in a poster presentation at the 100th meeting of the American Academy of Periodontology and is as follows [9]:

*Horizontal Alveolar Ridge Augmentation in Implant Dentistry: A Surgical Manual*, First Edition. Edited by Len Tolstunov.

1 Debridement
2 Defect assessment
3 Implantoplasty
4 Decontamination with phosphoric acid
5 Grafting of amenable defects with puros cancellous graft and pericardium membrane; osteoplasty if necessary.

Soft tissue grafting and adaptation of the techniques presented in the previous chapters can be used concurrently with this protocol or in a separate surgical procedure following the resolution of peri-implantitis.

## Case reports

### Case 1

A 59-year-old female, presented with purulent exudate on the buccal of an implant in position 27–28. Intraoral examination revealed a lack of keratinized tissue and gingival margin recession (Figure 30.1). In this case one option was to remove the dental implant, prepare the site, and replace the implant in a more amenable position. This option would require removal and replacement of the entire round-house prosthetic bridge as well as a large economic and time commitment from the patient. A more conservative option, and the one that was chosen for this case, was surgical treatment of the inflammatory pathology and grafting to correct the resulting defects. The procedure was performed in one sitting and there was no need to remove the patient's existing prosthesis.

A full-thickness mucoperiosteal flap was elevated and it was visually confirmed that the implant was partly placed outside of the buccal boney housing. Two intrabony defects, classified as three wall periodontal defects, were also noted on the mesial and distal (Figures 30.2 and 30.3).

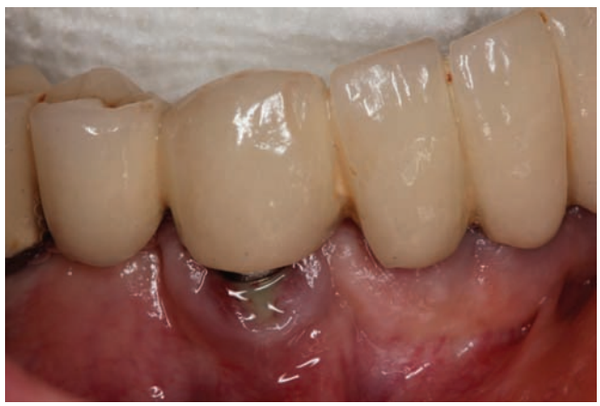

**Figure 30.1** Purulent exudate and a lack of keratined tissue with recession on the buccal of implant in position 27–28 to be treated with implant decontamination and connective tissue graft.

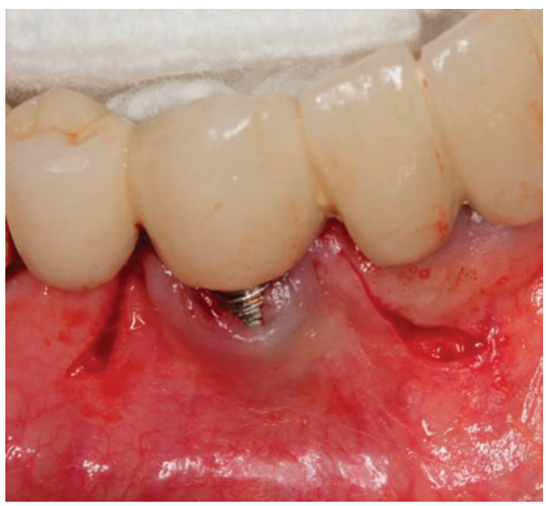

**Figure 30.2** The procedure began with debridement and elevation of a full-thickness flap.

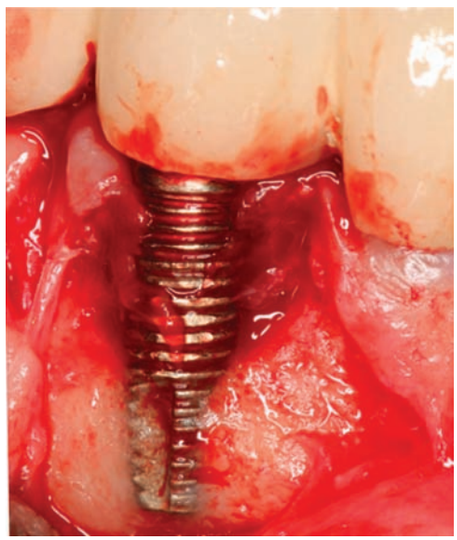

**Figure 30.3** Once the flap was elevated it was confirmed that the implant was placed outside of the boney housing. Note the infraboney defects present on both the mesial and lingual of the implant. The area was debrided and prepped for implantoplasty.

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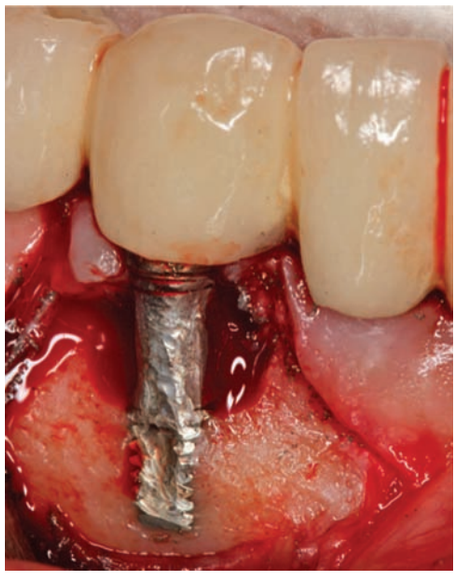

**Figure 30.4** High-speed handpiece and irrigation was used to preform implantoplasty on all exposed areas of the implant.

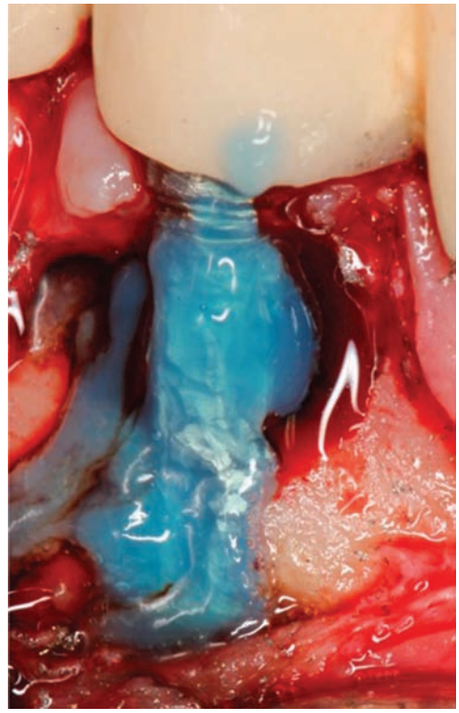

**Figure 30.5** Following implantoplasty, the implant surface was treated with phosphoric etch solution and then thoroughly irrigated with saline.

The dental implant had a roughened surface and was deemed contaminated due to the presence of purulence. In cases such as this the first step is to perform a disinfection of the dental implant surface. In this procedure it was done via implantoplasty and surface treatment with phosphoric acid followed by a saline rinse. The implantoplasty physically removes surface contamination while creating a smooth surface. The phosphoric re-etches the implant surface, creating minor roughness. This treatment of the contaminated implant surface will help create an amenable environment for the regenerative aspects of this procedure (Figures 30.4 and 30.5).

A cancellous mineralized allograft bone graft was placed in the intrabony defect on the mesial and distal (Figure 30.6). The photograph in the Figure 30.6 clearly shows blood filling the spaces between the cancellous graft material. This blood graft mix will form the clot and scaffold necessary for wound healing and tissue regeneration.

Following bone grafting, a connective tissue autograft was collected from the palate of 20 mm × 10 mm in length and width (Figure 30.7) and laid over the treated area. This soft tissue graft was secured by interrupted resorbable Vicryl 5.0 sutures on the interproximal papilla areas of the recipient site. The mucoperiosteal flap was stretched and coronally repositioned achieving a complete coverage. Post-operative instructions were reviewed and antibiotic therapy coverage was given along with pain control medications (Figure 30.8).

This treatment led to a successful complete coverage with the formation of a thick keratinized tissue of a keloid nature around the dental implant, as shown in the figure of three years follow-up (Figure 30.9). The patient was placed on a rigorous periodontal maintenance of three months recall two months after the surgical procedure was done.

A review of how treatment planning and surgical decisions made during this case influenced and led to a successful outcome will be presented prior to discussing further cases. Successful treatment is dependent on proper diagnosis, treatment planning, and laying out of surgical goals. In this case both inflammatory and esthetic complications were observed. Proper investigation and diagnosis revealed the cause of the inflammation and the esthetic complications were the result of both the positioning of the implant and the lack of keratinized tissue. The treatment goals were resolution of the existing inflammation and soft tissue enhancements to both prevent recurrence of inflammation and correct damage caused by the existing pathology. The chosen surgical treatment was a direct reflection of these goals.

A full thickness flap was elevated giving access to debride and decontaminate the area achieving the first surgical goal, resolution of inflammation. Following debridement and decontamination the area needs to be assessed and choices need to be made regarding achievement of the next surgical goal, rebuilding of the soft tissue. In this case two periodontal intrabony defects on either side of the implant were present and a decision to regenerate and augment the hard tissue along with the soft tissue was made. The two wall boney defects have the potential to contain and provide blood supply to the graft [10]. When placing the bone graft a mineralized cancellous allograft graft was intentionally chosen. The clinician in this case chose mineralized cancellous allograft over mineralized cortical allograft because of its density as well as its ability to wick more blood in between the graft particles, allowing for better healing [11]. Blood supply to the grafts also drove the clinician's choice not to use a resorbable barrier over the bone graft. In bone regeneration therapy, the use of a resorbable barrier is recommended to contain the bone graft and inhibit the soft tissue in growth. In this case, placing a barrier over the bone and below the connective tissue graft (CTG) would interfere with the healing CTG by inhibiting the blood being supplied to it from the supporting bone [12,13]. All of the choices made during the execution of treatment for this case were based on diagnosis, surgical goals, blood supply, and wound healing, which helped lead to a successful treatment outcome.

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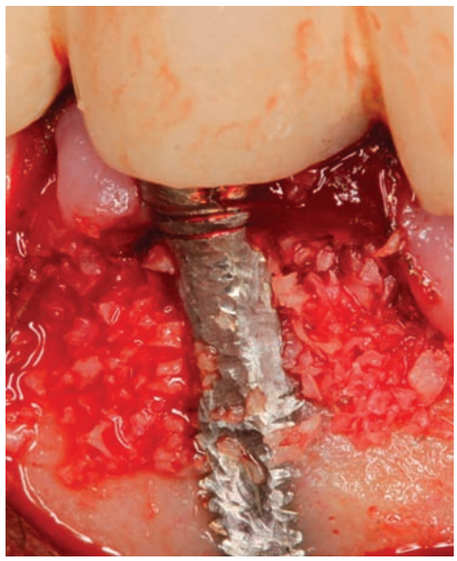

**Figure 30.6** A cancellous mineralized allograft bone graft was placed in the intrabony defect on the mesial and distal. Note the wicking of the blood into the area between the bone particles and the creation of an overall red tone to the otherwise white graft material.

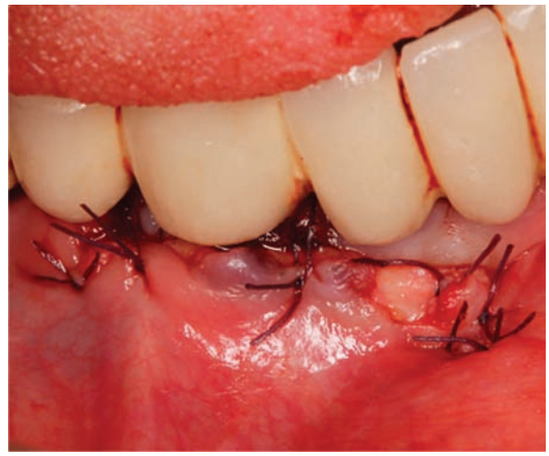

**Figure 30.8** The flap is elevated over the donor tissue and both the flap and graft are sutured into place.

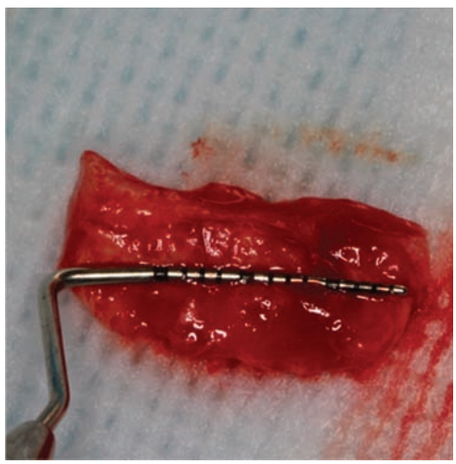

**Figure 30.7** A thick connective tissue graft was harvested from the palate for placement over the defect.

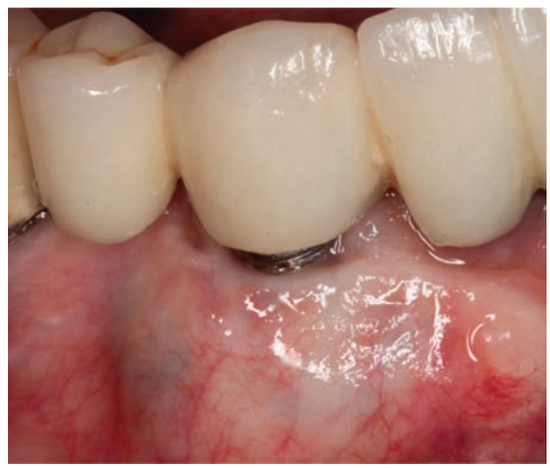

**Figure 30.9** A three-year follow-up shows thick firm pink healthy tissue surrounding the implant.

**Case 2**

A 49-year-old female presented with mucositis on the implant in position 5 (Figure 30.10). Clinically the area exhibited a lack of keratinized tissue with metal translucency and the patient exhibited pain upon passing a periodontal probe over the area. Clinically, it appeared that the implant was placed buccally with the possibility of having it outside the bony housing after the restorative dentist removed the crown and placed a cover screw for implant 5 (Figure 30.11). Two treatment options were presented to the patient, one to remove the implant, rebuild the site, and replace the dental implant and the other to increase the connective tissue in the buccal area. The patient opted for the latter and it was decided to increase the amount of keratinized tissue by using our modified rolled technique, discussed in Chapter 29.

Trapezoidal measurements needed to perform the modified rolled technique were made on the buccal and palatal incisions were made replicating the desired shape (Figure 30.12). The pedicle was elevated to full thickness and was de-epithelialized using a new 15C blade. The buccal pouch was prepared exposing an implant surface devoid of buccal bone. At this point implantoplasty was performed to disinfect that surface as thoroughly as possible and a phosphoric acid etch was applied for 40 seconds and washed out with saline (Figure 30.13).

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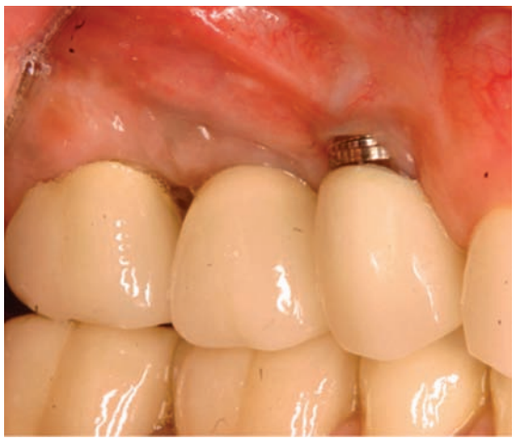

**Figure 30.10** There is a lack of keratinized tissue, pain upon probing, as well as metal translucency in the area of implant 5. Clinically the implant appears buccally placed and outside the alveolar housing. This area was treated by using the modified roll technique.

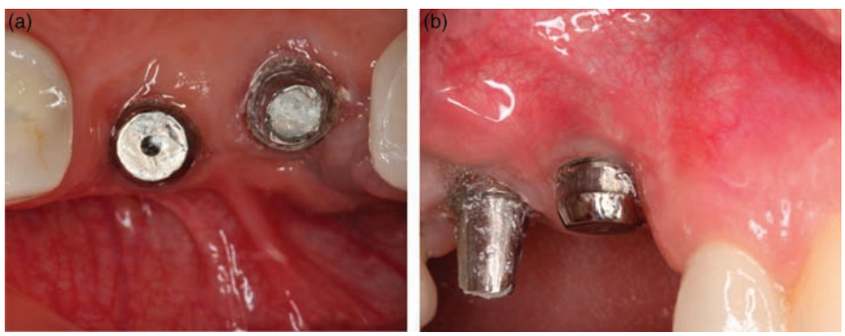


**Figure 30.11** The restorative dentist removed the prosthetic and replaced the healing abutments in areas 4 and 5.

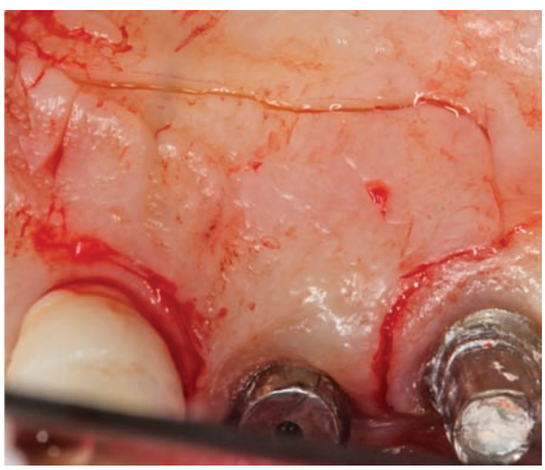

**Figure 30.12** Trapezoidal measurements needed to perform the modified rolled technique were made on the buccal and palatal incisions were made replicating the desired shape.

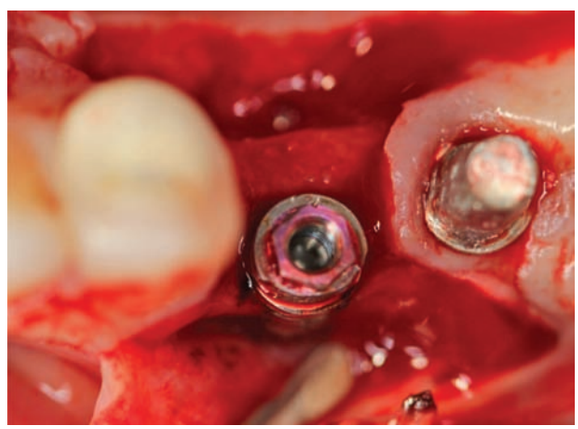

**Figure 30.13** The pedicle was elevated to full thickness and was de-epithelized using a new 15C blade. The buccal pouch was prepared, exposing an implant surface devoid of buccal bone. At this point implantoplasty was performed to disinfect that surface as thoroughly as possible and a phosphoric acid etch was applied for 40 seconds and washed out with saline.

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Following cleaning of the exposed implant surface, the trapezoidal pedicle was rolled under the buccal flap. The pedicle was sutured apically mesially and distally and next on the coronal level (Figure 30.14). The donor site was covered with a resorbable collagen matrix and stabilized using a methylacrylate-based glue that was applied all around the edge (Figure 30.15). Immediately after the surgery, a temporary crown was placed over the implant (Figure 30.16).

The modified rolled technique led to a substantial increase in soft tissue thickness and in the amount of keratinization (Figure 30.17). In 8 weeks time, the tissue had settled and the final restoration was redone, as shown in the five years post-restorative images depicting the clinical state of that site both buccally and lingually (Figure 30.18).

In analyzing the treatment rendered and explaining the reasoning behind the success achieved, one can notice that the inflammatory complications around this dental implant were due to the erroneous positioning of the implant as well as the lack of keratinized tissue. In this case resolution of the inflammation and esthetic correction of the thin soft tissue can be conceptualized as two treatment goals, disinfection and soft tissue enhancement. The first goal of reduction of inflammation was achieved by following the previously discussed protocol for treatment of infected implant surfaces. The second goal of soft tissue augmentation was achieved through use of a pediculated graft. A connective tissue graft receives a blood supply from the underlying bone but in this case the CTG is being placed over both vascularized bone and a non-vascularized implant surface [14]. In order to increase the success of this graft and compensate for a reduced blood supply caused by the presence of the implant surface a pediculated style graft was chosen [15]. Note that the graft was dissected to full thickness to prevent disturbing the blood supply within the pediculated flap. Also the full-thickness pouch was created to allow direct contact between the CTG and the underlying bone as well as maintaining the supraperiosteal capillary bed within the flap as a third source of blood supply to the pedicle graft [13,16]. The three sources of blood supply to this graft were the overlying flap, the base of the pedicle, and the underlying bone; it was the attention to the blood supply and its role in successful wound healing and surgical outcome that allowed an effective outcome in these cases. Lastly, the trapezoidal design of the pedicle was chosen because it allows a vast coverage of the defect area, allowing the grafted tissue to blend into the surrounding area without the obvious demarcated bump, which occurs in the original rolled technique promoted by Scharf and Tarnow [17].

### Case 3

In this case, the patient presented with a dental implant in position 9. Examination revealed a thin biotype with a mid-buccal soft tissue dehiscence about 4 mm apical to the gingival margin (Figure 30.19). There was no mobility and the patient expressed no discomfort in the area. Radiographically there was a pronounced radiolucency around the dental implant (Figure 30.20). The patient expressed financial difficulties and requested to save the implant and the restoration costs. The surgical goals in this case were to increase the soft tissue over the buccal in the area of implant 9 to correct and prevent further soft tissue complications and elimination of any inflammation that could be causing bone loss, which presented as radiolucency around the implant. In this scenario it was decided to use a tunnel technique and sandwich an autogenous connective tissue graft (CTG) harvested from the palate under the buccal flap following surgical decontamination of the exposed implant surfaces.

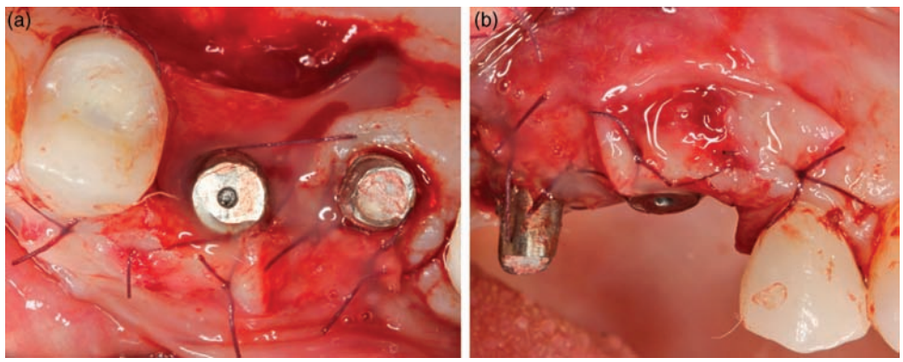


**Figure 30.14** Following cleaning of the exposed implant surface, the trapezoidal pedicle was rolled under the buccal flap. The pedicle was sutured apically mesially and distally and next on the coronal level.

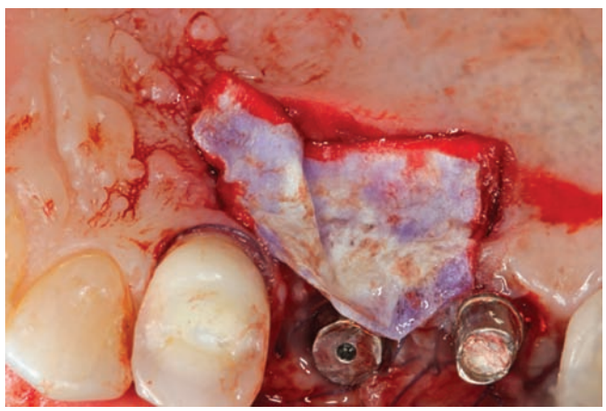

**Figure 30.15** The donor site was covered with a resorbable collagen matrix and stabilized using a methyl acrylate based glue that was applied all around the edge.

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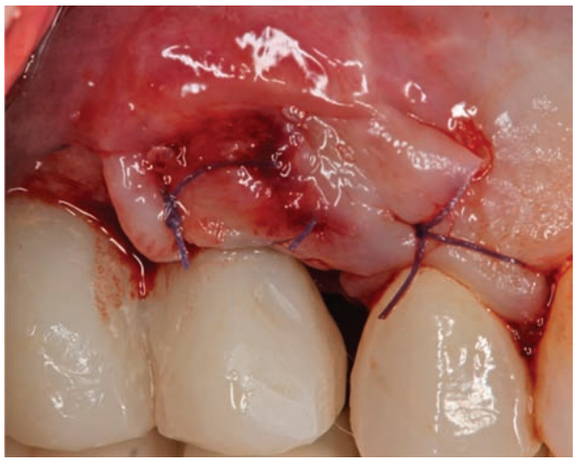

**Figure 30.16** A temporary crown was placed over the implant.

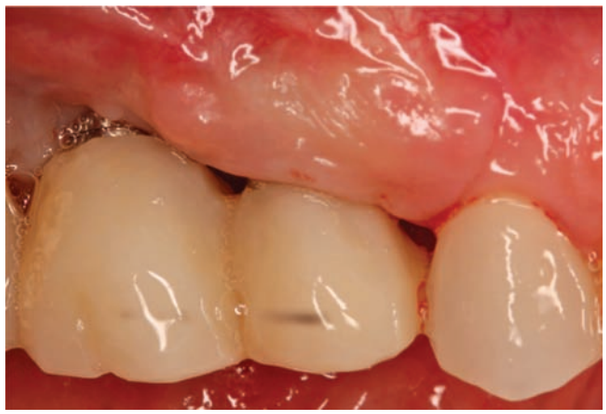

**Figure 30.17** An 8-week surgical follow-up.

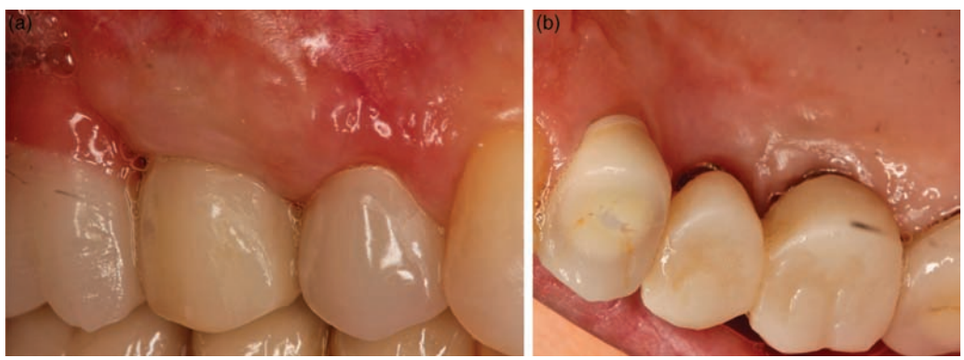


**Figure 30.18** A five-year post-restorative follow-up. Note the firm pink thick healthy tissue in the area of implant 5 as compared to the pre-operative figure.

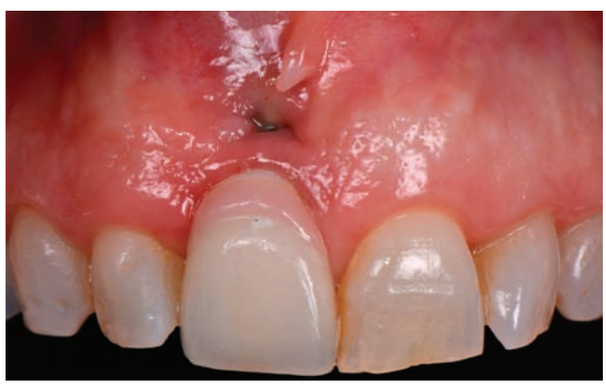

**Figure 30.19** There is a buccal dehiscence present in the area of implant 9 as well as a thin biotype. In this scenario it was decided to use a tunnel technique and sandwich an autogenous connective tissue graft (CTG) harvested from the palate under the buccal flap following surgical decontamination of the exposed implant surfaces.

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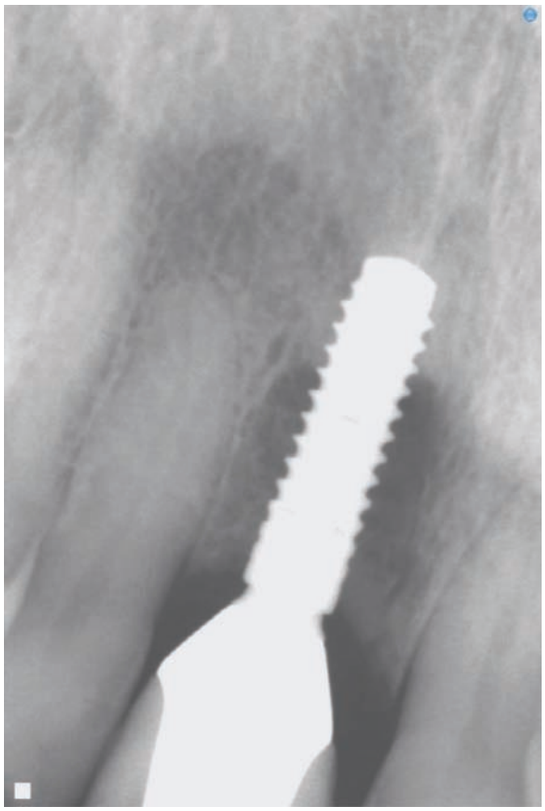

**Figure 30.20** The radiographic exam depicts a pronounced radiolucency around the dental implant 9.

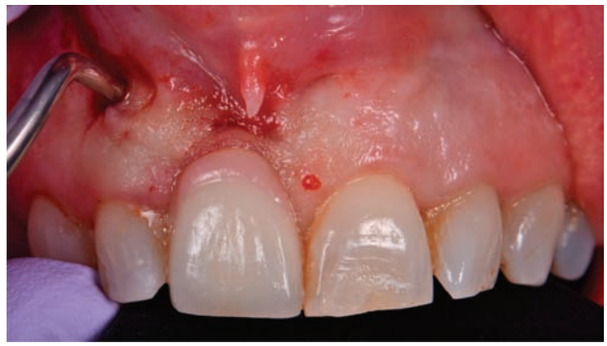

**Figure 30.21** The 5-mm vertical incision was made interdental 5 mm from the papilla on the mesial side of the implant one tooth over. The area was elevated to full thickness and dissected past the mucogingival junction and extended laterally to allow adequate mobility for passage of the CTG.

As discussed earlier, this technique was introduced in the mid-1990s and has been very successful around natural teeth [18–20]. The difficulty with this approach lies in creating a pouch large enough to pass a thick CTG through without perforating the flap or ripping the interdental papilla. Many modifications have been described in the literature and recently it is mostly employed with a dermis allograft, but it can also be used with an autogenic CTG [21]. With either alloplast or autogenous grafts this technique is indicated for satisfactory correction of Miller Class I and II gingival recession around natural teeth [21]. In this scenario there is not gingival recession around natural teeth but rather a dehiscence type of gingival aberration in the area of an implant adjacent to natural teeth with a well-maintained periodontium. The challenge in performing the tunnel technique in this case resides in avoiding creation of a gingival recession on the adjacent teeth while creating a large enough pouch for graft access to the implant.

One 5-mm vertical incision was made interdentally 5 mm from the papilla on the mesial side of the implant one tooth over. A fine surgical periosteal elevator was used to elevate a full-thickness pouch flap. The pouch was dissected past the mucogingival junction and extended laterally to allow adequate mobility for passage of the CTG (Figure 30.21).

The area over the implant was examined and a very careful implantoplasty was performed, accessing the surface through the vertical incisions as well as the mid-buccal perforation. Phosphoric acid was placed over the polished implant surface and rubbed for 40 seconds and rinsed out with saline (Figures 30.22 to 30.24).

Next the needed size of CTG was measured. Here it was decided to harvest the CTG from the left palatal side, which was partially edentulous distal to tooth 12. A sizeable CTG was harvested and passed through the right vertical incision by threading a 5.0 Vicryl suture that was affixed to one end of the CTG through the tunnel flap. Once the CTG was in place it was stabilized with interrupted sutures. The mid-buccal dehiscence was closed using a peri-acryl glue (Figures 30.25 to 30.28).

At eight weeks, the tissue finished its maturation and can be seen in the included photograph (Figure 30.29). At six months post-operative, a radiograph was taken and showed gain in bone re-cortication and resolution of the radiolucency (Figure 30.30). Clinically, the perforation was closed but the tissue in the area of the dehiscence remained thinner than the adjacent tissue (Figure 30.31). This is attributed to the buccal tilt of the implant. At this time the patient was placed on a rigorous three months recall to prevent recurrence of inflammation.

Discussion of the justification for decisions made during this case and how they are related to the outcome are as follows. Once again clinicians must diagnose the underlying cause of the soft tissue aberration surrounding the implant in order to set surgical goals that both eliminate the cause and correct the existing defect. The cause of the inflammation surrounding this implant was due to the erroneous positioning of the implant and the lack of keratinized tissue. The surgical goals in this case were to eliminate the existing inflammation using the presented protocol for implant decontamination and enhancement of the soft tissue using a CTG.

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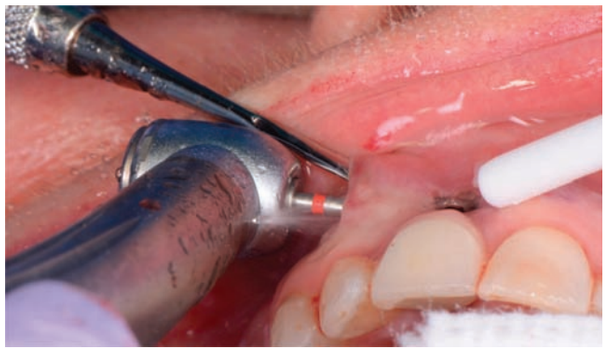

**Figure 30.22** Implantoplasty was carefully preformed through the incisions made for the tunnel flap using diamond burs with irrigation and a high-speed handpiece.

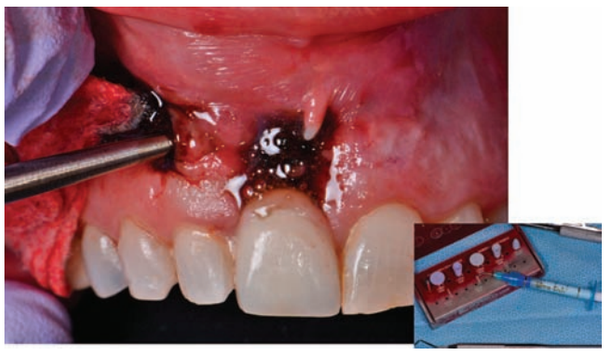

**Figure 30.23** Next the surface was treated with phosphoric etch and thoroughly rinsed with saline.

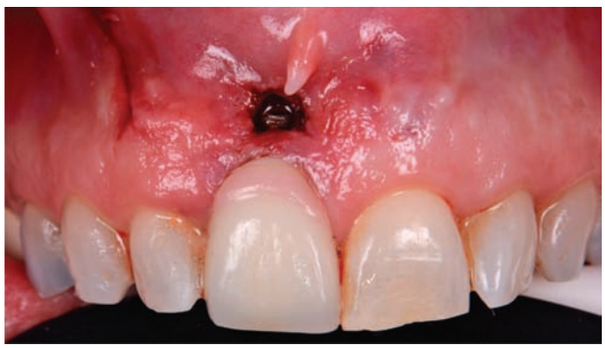

**Figure 30.24** This figure depicts the flap and implant following decontamination.

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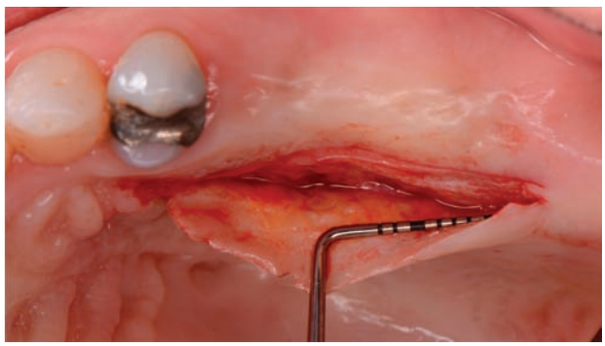

**Figure 30.25** A single palatal incision in the premolar region for the harvesting of a connective tissue graft.

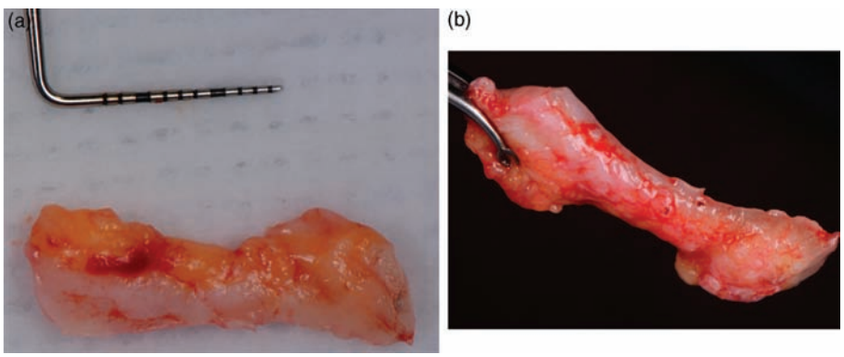


**Figure 30.26** A thick connective tissue graft was harvested from the palate.

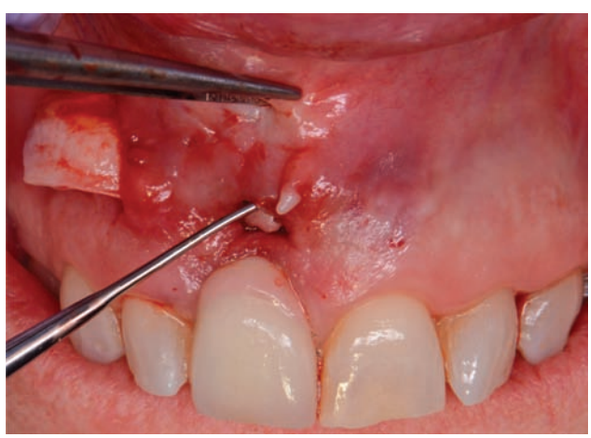

**Figure 30.27** The graft was carefully put into place through both the vertical incision and the existing dehiscence with the help of a 5.0 Vicryl suture affixed to one end of the graft.

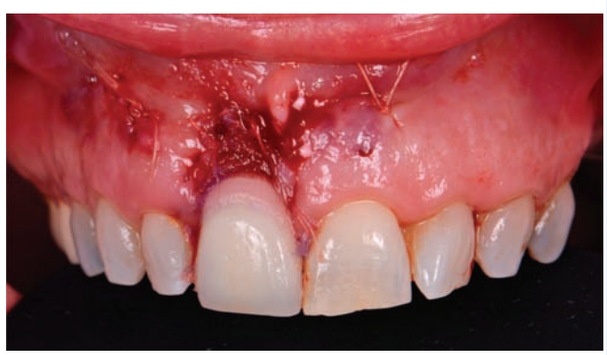

**Figure 30.28** The graft was sutured in place and the vertical incision was closed. The mid-buccal dehiscence was closed using a peri-acryl glue.

The existing inflammation was removed using the established implant decontamination protocol and soft tissue enhancement was achieved using a CTG along with the tunnel technique. A full-thickness tunnel flap was used because of its ability to stabilize the CTG as well as provide enhanced blood supply. The CTG received its blood supply from the underlying exposed bone of the adjacent teeth and the areas surrounding the exposed implant surface as well as the overlaying flap. The full thickness design of the tunnel flap and the choice to extend it to the adjacent teeth increased the contact area between the CTG and

(*continued*)

(*continued*)

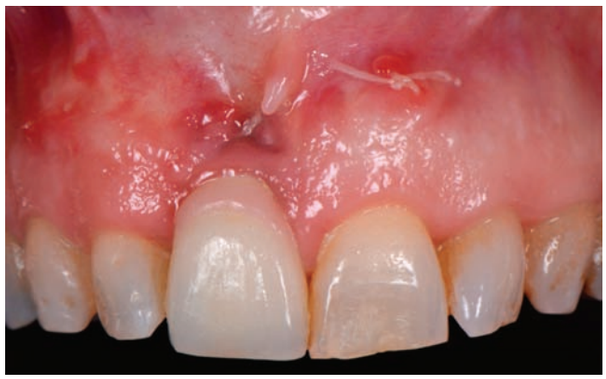

**Figure 30.29** Eight weeks post-operative clinical photograph.

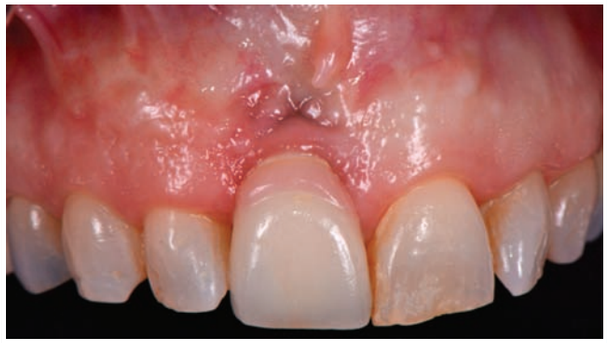

**Figure 30.31** A six-month post-operative clinical photograph. Note that the dehiscence is closed and the surrounding tissue is thicker but there is still a dip in the tissue topography in the area of the previous dehiscence.

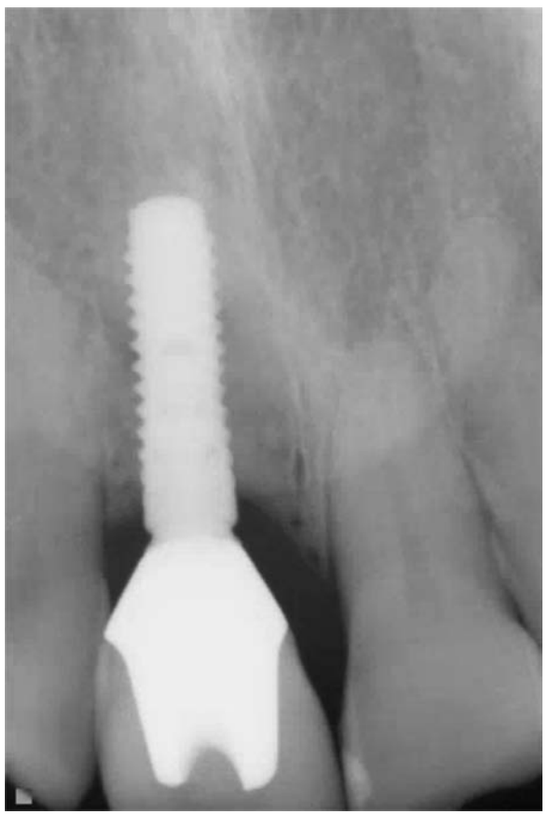

**Figure 30.30** Six months post-operative radiograph showing gain in bone recortication and resolution of the radiolucency.

underlying bone. The area of the exposed implant is unable to provide vascularization to the graft and in order to increase the percentage of the graft that is in direct contact with a blood supply the graft size was increased and the recipient bed was extended to include the adjacent teeth. In this case the graft is placed directly over the cortical buccal bone. The cortical bone contains Haversian canals that link directly to the blood-rich cancellous bone underneath, but it takes about 2–4 days for the Haversian canals to internally resorb and increase to a diameter that is large enough to allow blood to flow from the marrow out to the graft [22]. During these initial days of compromised blood supply to the graft from the underlying bone the CTG is more dependent on the blood supply from the overlaying flap. To help increase the blood supply from the flap a tunnel flap was chosen rather than an open flap due to the pedicle nature of the tunnel flap. Despite the challenges of the lack of vascularity in the area of the exposed implant as well as the dehiscence of the overlaying flap, the CTG survived and will continue to thrive in the area as long as further inflammation of the implant area is prevented through proper maintenance.

## Conclusion

The three presented cases share common themes: one was misplacement of the dental implants and another was inflammatory pathology as a repercussion of inadequate soft tissue and bony support. The soft and hard tissue complications in all of these cases could have been avoided had the fundamentals of implant placement, described in the previous chapter, been respected and followed. It is understood that errors occur. Proper management of these errors needs to be addressed. In the management of existing complications, the pros and cons of correction verses implant removal and replacement need to be weighed on case-by-case bases. There is a great deal of risk, time commitment, and cost in redoing an unsuccessful implant case but it should be noted that surgical correction is also highly technique sensitive, requiring both surgical skill and a deep understanding of inflammation and wound healing. Proper diagnosis and elimination of inflammatory pathology should always be eliminated prior to correction of the damages it caused in order to prevent a recurrence. It is suggested that any operator should only embark on the above-described techniques after mastery of soft tissue management and an understanding of wound healing and vascularization. The details of soft tissue grafting around implants has been thoroughly covered in the previous three chapters and stands as an excellent starting point to the incorporation of the covered techniques into any clinician's repertoire.

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