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Chapter 13

A Conservative Approach to Implant Surgery

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Introduction

Many patients are busy, fearful of dental visits and cost conscious. Large complex bone grafting during stage one implant surgery can lead to increased incidence of post-operative swelling and pain.

Implant surgery complexity, morbidity and cost may be minimized if:

1. Bone is preserved as far as possible at the time of tooth extraction.
2. Ridge expansion techniques are used instead of only drilling during osteotomy of the implant site.
3. Narrower diameter implants are used.

Ridge preservation

Tooth extractions should be done in an atraumatic fashion. When the buccal plate is intact, a good conservative option is to immediately replace the extracted tooth with a dental implant, or to wait four to six weeks for soft tissue healing for an early placement of the implant.

Sclar (1999) presented a conservative flapless socket preservation procedure which he termed the Bio-Col technique. For this procedure the extraction socket is filled with an anorganic bovine bone substitute and then covered with a collagen plug. This procedure can be effectively used when the buccal plate is intact after tooth extraction. Implant stage one surgery can be carried out 6 months later. However, as stated earlier, when the buccal plate is intact, it is more rational to leave the socket to heal by itself. Performing socket preservation surgery when the buccal plate is intact lengthens rather than shortens the treatment. The practicality of Sclar's Bio-Col procedure however, is that it is performed flapless with very little patient morbidity.

Elian *et al* (2007) presented a simplified approach to socket preservation. This is a technique that can be used when there is buccal bone dehiscence, but soft tissue is still present. A collagen membrane is trimmed into an ice-cream cone shape, round at the coronal and a long triangle shape at the apical. After the socket has been thoroughly but gently curetted, this trimmed membrane is placed inside the socket to separate the buccal soft tissue from the bone graft (Figure 2). The bone graft will press against the membrane to hold it in place (Figure 2). The membrane should extend over the opening of the socket and then underneath the palatal flap by 2 to 3 mm (Figure 3). The membrane can be held down by suturing it to the palatal tissue or tucking beneath the palatal flap and held by a cross mattress suture (Figure 4). Like Sclar's procedure, the membrane is left exposed, and the whole procedure done in a flapless fashion.

In a study population of 35 patients, using the ice-cream cone technique, and where the buccal dehiscence did not exceed 50% of the

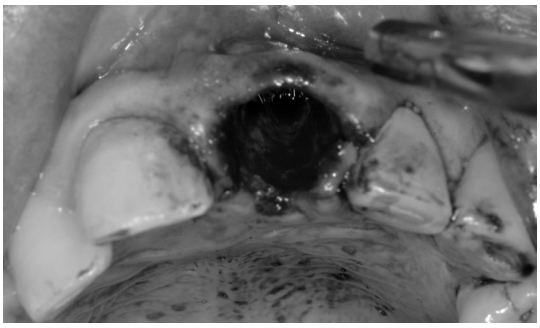

Figure 1. After extraction, 50% buccal dehiscence was noted.

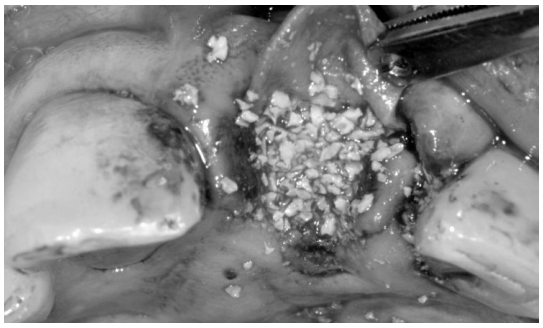

Figure 2. An ice-cream cone shaped membrane was placed within the socket to keep the bone graft separate from the buccal mucosa.

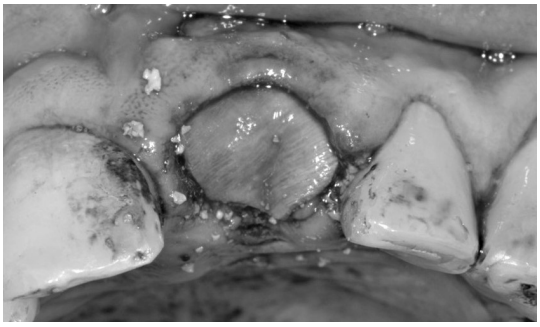

Figure 3. The membrane extends over the opening of the socket and then underneath the palatal flap by 2 to 3 mm.

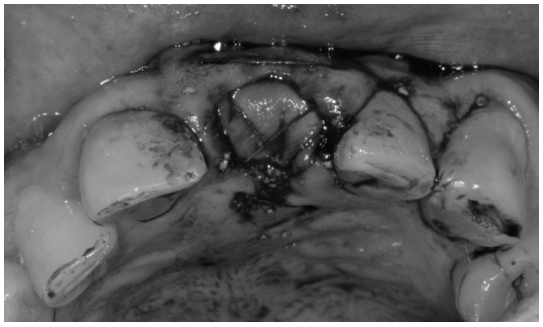

Figure 4. The membrane is held down by mattress sutures.

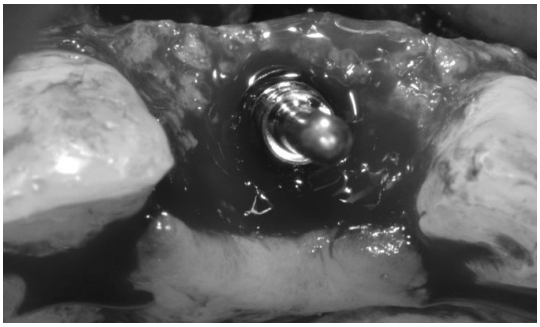

Figure 5. Ridge at stage 1 surgery six months later was sufficient for placement of a dental implant.

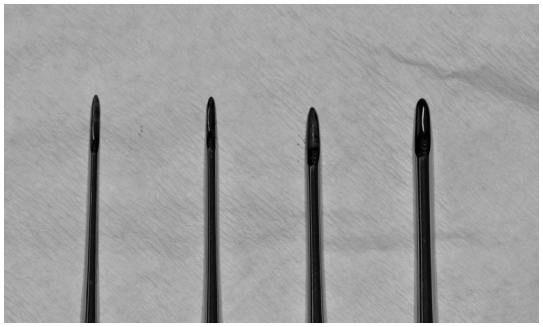

Figure 6. The Nentwig bone spreaders are flat spear shaped instruments that comes in widths of 2.2 mm, 2.8 mm, 3.4 mm and 4.0 mm.

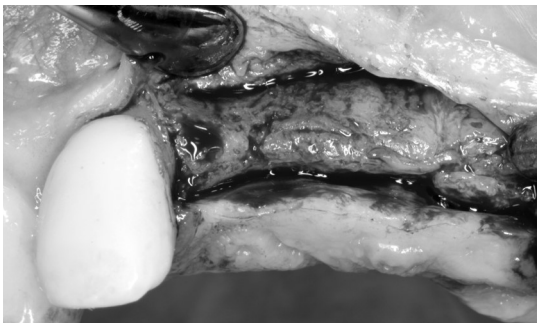

Figure 7. This 4 mm wide ridge width was deemed too narrow for a 4.3 mm implant and patient was advised that a GBR may be necessary.

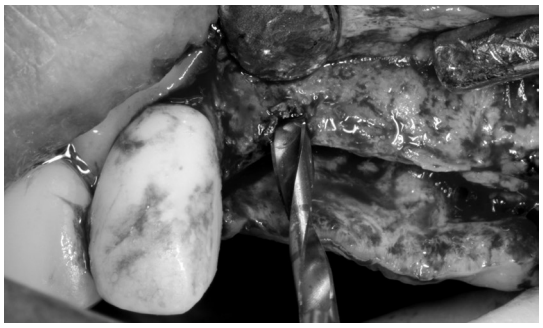

Figure 8. Osteotomy initiated with 2 mm pilot drill.

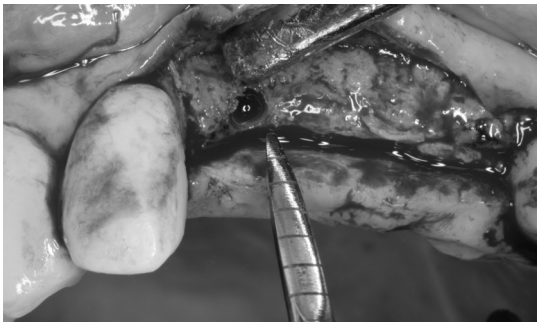

Figure 9. Osteotomy was continued with the Nentwig bone spreaders.

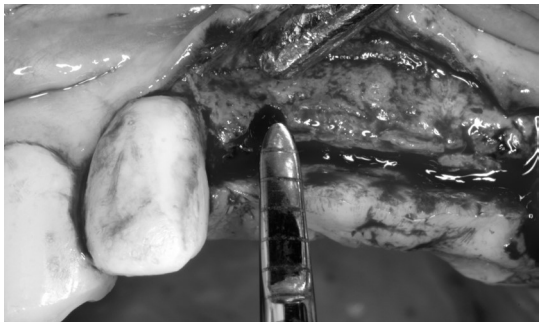

Figure 10. Bone spreader was inserted with the flat part facing buccally.

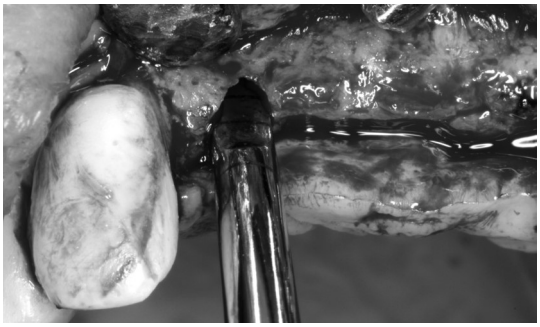

Figure 11. Bone spreader rotated 90° clockwise, back to original position and then 90° anti-clockwise.

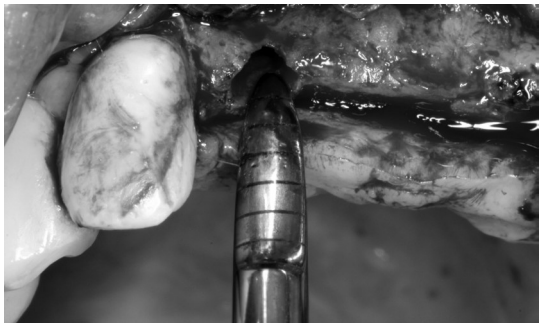

Figure 12. Round osteotomy was pre-formed.

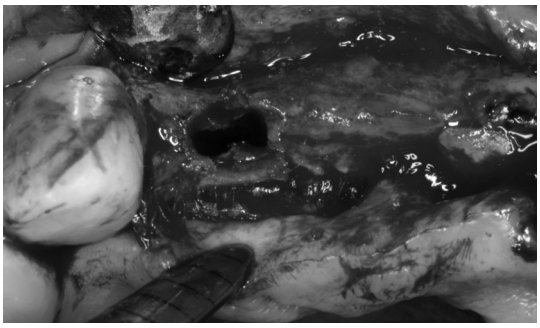

Figure 13. Ridge width widened before using the 4.3 mm diameter tapered drill to reduce the amount of bone the drill will cut away.

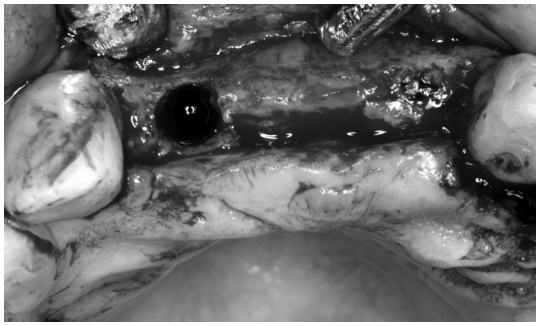

Figure 15. Buccal bone dehiscence was avoided by bone spreaders in conjunction with implant drills.

socket, Eskow and Mealey (2014) found that 33 out of 35 sites allowed for the placement of implants in the correct restorative positions. Two out of 35 sites (5.7%) did not have sufficient bone to place an implant. Of the 33 sites that allowed implants to be placed, nine sites (27%) require further guided bone regeneration procedure.

Ridge expansion during stage 1 implant surgery

Bone spreaders and expanders expand and compress bone in alveolar ridges. This technique can be used in both the maxilla and the mandible, although the maxillary bone tends to be softer and more malleable. Cancellous bone should be present and alveolar ridge width should be at least 3 mm.

Figure 14. Osteotomy with 4.3 mm tapered drill.

In this technique, bone spreaders are used after the initial pilot (1.3 to 2 mm) osteotomy preparation is done, before proceeding on with the wider twist drills. The Nentwig bone spreader (Ustomed Instrumente) is a flat-spear shaped instrument. It comes in a set of four instruments with widths of 2.2 mm, 2.8 mm, 3.4 mm and 4.0 mm (Figure 6). After inserting the bone spreader into the pilot osteotomy, it is rotated on its axis 90° clockwise, back to its original position and then 90° anti-clockwise, thereby forming a circular shaped osteotomy (Figures 8 to 12). Select the bone spreader up to one size smaller than the final twist drill for the implant diameter one plans to use, and finish the osteotomy with the final twist drill (Figures 13 to 15). Up to 3 mm of ridge expansion can usually be achieved.

If a 4 to 4.3 mm implant is planned on a 4 mm ridge, it is likely that a bone graft procedure is necessary. With the use of bone spreaders, the ridge could be expanded to 6.5 mm, thereby removing the need for a bone graft.

Narrower diameter implants

Conventionally, standard diameter implants (3.75 to 4.1 mm) have been recommended to restore central incisors, canines, and premolars; and wide diameter implants for molars; especially when the patient presents with heavy occlusal wear patterns (Klein *et*

al 2014).

Narrow diameter implants (3.0 to 3.5 mm) have been recommended to restore mandibular incisors and maxillary lateral incisors. There are concerns that should they be used in load bearing areas, implant fixtures may fracture and there may also be failure of osseointegration due to reduction in the implant-bone contact surface area (Quek *et al* 2006). Prosthetically, restoring a narrow diameter implant into a molar restoration without proper considerations may result in an over-contoured emergence profile, and be challenging to maintain oral hygiene (Graves *et al* 1994).

Renouard and Nisand (2006), examined the impact of implant length and diameter on implant survival rates. They defined short implants as those between 6 to 8 mm in length, narrow implants as those between 3 to 3.4 mm in diameter, and wide implants as those 4.5 mm or more in diameter. In this review of data taken from Medline of 53 papers that fit his criteria, he found that the survival rate of 6 to 8 mm length implants was comparable to longer implants, and also that implant diameter and survival rates have no relationship.

A recent retrospective clinical study reported that Branemark Mark II, Mark III and NobelSpeedy 3.3 mm diameter implants had a 95.1% survival rate in edentulous and deficient posterior ridges, comparable to that of wide diameter implants (Malo *et al* 2011). The mean peri-implant bone loss was 1.16 mm, 1.53 mm, and 1.74 mm at one, five and ten years follow up. Another study on 12,737 Ankylos (Dentsply) implants showed that there was no significant difference in the cumulative survival rate (CSR) of 3.5 mm diameter implants and 4.5 mm diameter implants after an average of 60.7 months (Krebs *et al* 2015)

Papadimitriou *et al* (2014) undertook virtual surgical planning of 1760 implants using the existing CT scans of 200 patients and found that the use of 3.3 mm diameter implants increased the odds ratio for ridge augmentation being unnecessary by 2.2 (95% confidence interval) relative to the 4.1 mm diameter implants. This will significantly reduce costs for patients as well as post-surgical morbidity. The clinician also benefits from less chair time and because the surgery is straightforward, chances of surgical complications occurring are reduced.

With improvements in the strength of the implant body materials and improvements in abutment designs, it can be expected that there will be a move towards using narrower diameter implants.

Conclusion

This paper describes a simple strategy to reduce the need for complicated implant stage 1 surgery with use of a flapless socket preservation surgical design, ridge expansion technique and the use of narrower diameter implants.

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