Socket preservation in the daily practice: A clinical case report

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Abstract

Soft tissue contour depends on the underlying bone anatomy. Following tooth extraction, the socket undergoes a remodeling process that influences the implant rehabilitation treatment of the edentulous area.

Socket preservation procedures following tooth extraction will reduce the need for further ridge augmentation techniques prior to implant placement and will conserve the existing bone. The aim is to preserve the original bone dimensional contours by limiting the normal post extraction resorptive process.[8]

The overall goal of this article is to provide the dental professional with valid tools in order to help them make a conscious decision in considering the indications of this therapy, dependent on each clinical case.

Key words: Extraction, socket preservation, implant, resorption process.

The outcome of implant surgery is now measured by long-term esthetic and functional success, rather than survival rate. A correlation exists between the hard and soft tissues in order to assure esthetic outcomes in implant surgery.

Significant changes in bone volume and morphology following tooth extraction can complicate implant rehabilitation, as the period between extraction and implant placement increases.

Bone substitute in alveolar ridge preservation and prevention of additional bone grafting is highly supported and has a wide range of advantages. The socket preservation technique allows implant placement in sites that were previously considered compromised.

Following conservative extraction (Figures 1, 2), a bone filler is placed in the empty socket with a cross or non-cross linked membrane (Figure 3) and closed, either partially (Figure 4) or totally, by a flap by adding stitches. Note that a provisional preparation is sometimes necessary in order to facilitate the healing process of the surrounding tissues (Figures 5 - 7).

It has been demonstrated that, following tooth extraction, the buccal bone plate will undergo some modification due to bone remodeling,[1] with several surgical techniques having been proposed to reduce bone loss. .

It is still possible to minimize osseous deformities problems by carrying out ridge preservation techniques in extraction sockets and using bone fillers materials with barrier membranes.[13] The advanced wide range of bone grafting materials and collagen membranes currently available

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Figure 1: Preoperative situation, note the unaligned incisive edge of tooth 21 with the grey cervical lining.

Figure 2: Clinical view showing a complete horizontal fracture of the crown of tooth 21.

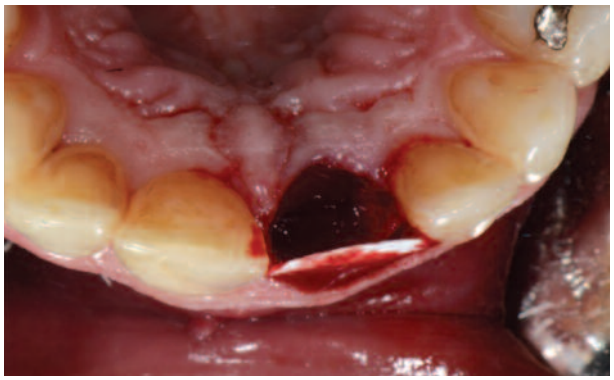


Figure 3: After conservative extraction of tooth 21, collagen membrane is placed inside the bony envelope. Note the intact socket bone walls.

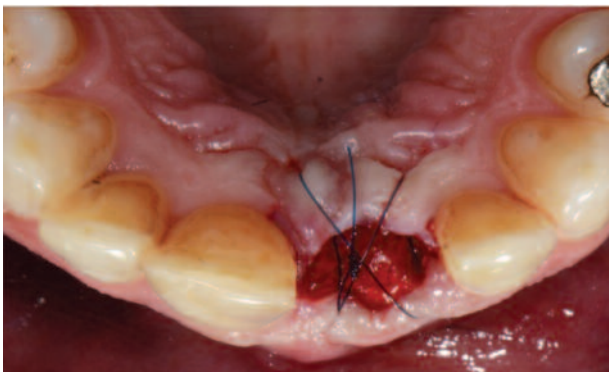


Figure 4: Xenograft (Bio Oss®) is placed inside the socket, covered by a collagen membrane sutured to the palatal flap and intentionally left exposed so as not to create a mucosal defect from flap advancement.

Figure 5: A temporary Maryland bridge is prepared in order to facilitate the healing of soft tissues and enhance the esthetics in anterior maxillary region.

Figure 6: Temporary Maryland Bridge in place to facilitate the healing process of socket 21.

Figure 7: Three weeks postoperative

enables the clinician to manage many compromised cases.

It was noted that since resorption of bone ridge is faster during the first six months following extraction,[5] a conservative approach remains necessary.

Many measures should be taken into consideration when conducting socket preservation surgery, including reducing extraction trauma and limiting flap elevation.[6] It has been found histologically that bone formation occurs over the surface of the implanted osteoconductive graft fillers.[7]

This article outlines the technical basis for the socket preservation procedure and demonstrates its importance as an available treatment to prevent ridge atrophy and optimize esthetics in the anterior maxillary area.

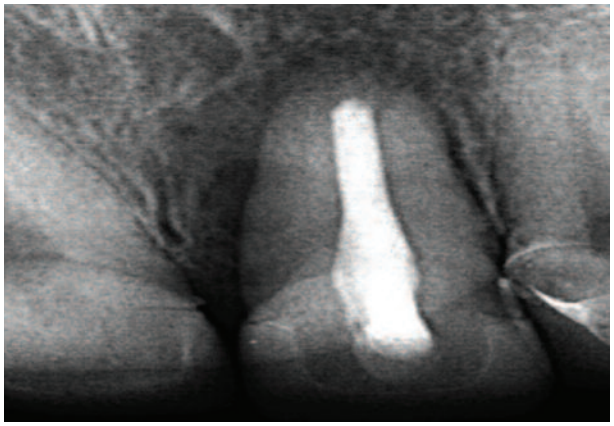


Figure 8: Periapical radiograph showing the resorbed apex of tooth 21.

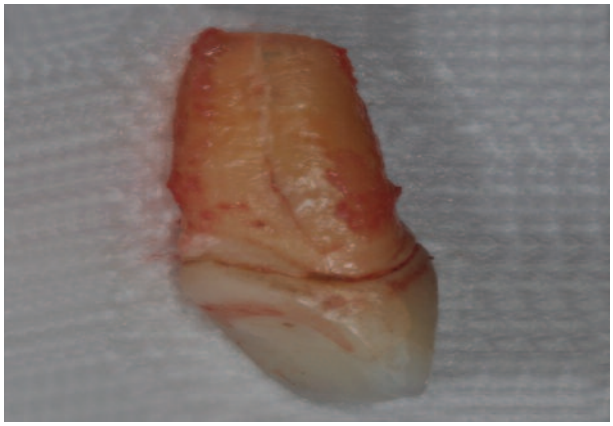


Figure 9: Clinical view after extraction of tooth 21, note the resorbed apex

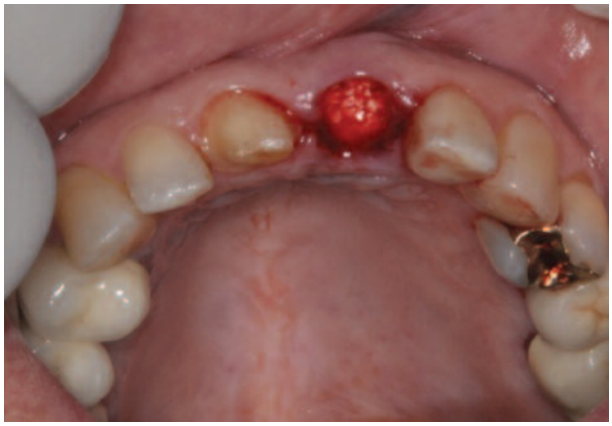


Figure 10: Intraoral view of the socket of tooth 21 after been filled with porous bovine bone minerals.

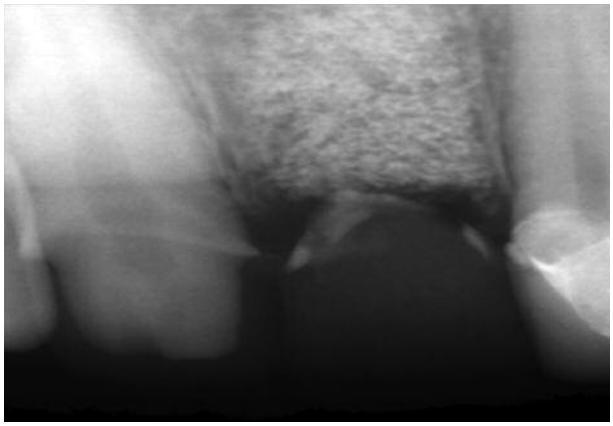


Figure 11: Periapical radiograph showing the xenograft in place in socket of tooth 21.

Clinical Case

A 49-year-old female with a non-contributory medical history, presented to our clinic with a mobile tooth 21 and an apical resorption. The chief complaint was pressure in the upper anterior left area of the central incisor. Clinical examination showed that tooth 21 was mobile with grey discolouration.

A periapical radiograph examination revealed an apical resorption with an incomplete endodontic treatment (Figure 8). The tooth was deemed hopeless and referred for extraction with socket preservation for future dental implant placement.

After the tooth was carefully removed with forceps (Figure 9), the extraction site was grafted with an osteoconductive bone graft (Figures 10, 11). A resorbable collagen membrane was placed on the buccal aspect of the extraction socket and sutured to the palatal flap as a primary closure, with an exposed membrane remaining at the occlusal aspect of the extraction socket.

A temporary bridge was placed to facilitate the healing process and conserve the esthetic in the anterior region (Figure 12). After six months, surgical re-entry during implant placement showed good bony healing, allowing the placement of a regular platform implant within the bony envelope (Figure 13). A good primary stability which allowed the placement of a single piece, direct-to-fixture provisional screw-retained restoration on site 21 was achieved in order to facilitate the healing process (Figures 14 - 16).

After a three month period to facilitate osseointegration, the patient presented for the final impression (Figures 17,18). It was noted that the long axis of the implant correlated to the central fossa of the expected final restoration (Figure 19). The final restoration showed an ideal esthetic restoration with healthy surrounding soft tissues.

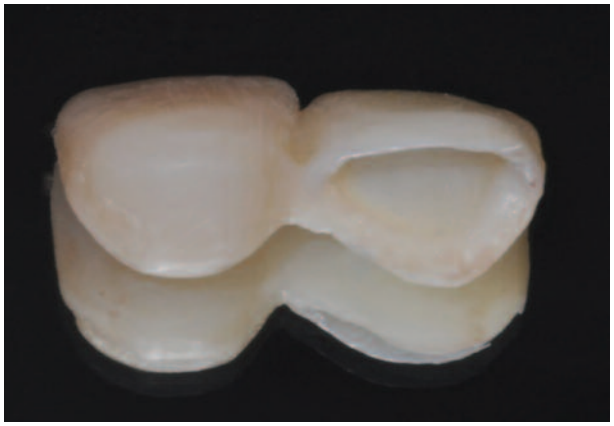


Figure 12: Temporary crowns prepared in order to facilitate the healing of the surrounding tissues.

Figure 13: Implant in place six months after the healing, showing successful preservation of the ridge and placement of a regular-platform implant.

Figure 14: Temporary crowns placed on tooth 11 and a single piece, direct-to-fixture provisional screw-retained restoration on site 21 to facilitate the healing process.

Figure 15: Clinical view showing the healthy soft tissue surrounding the temporary crowns.

Figure 16: Ideal biotype of the surrounding soft tissue ready for impression.

Discussion

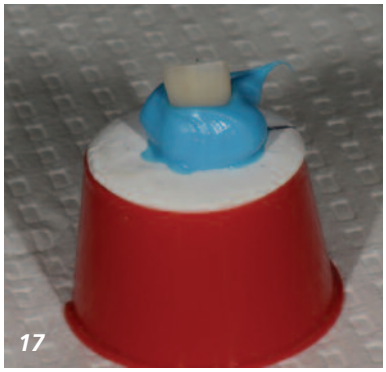
The failure to preserve the anatomy of hard and soft tissues will result in esthetic failure and compromise the final results. In a paper published in 2009, Araujo mentioned that the use of xenograft in socket preservation techniques will delay socket healing, but at the same time, help to conserve the anatomy.[2]

Xenografts are considered the most frequently used bone fillers in socket preservation procedures due to their osteoconductive matrix framework, which enhances the growth of new bone around it .[2]

Following tooth extraction, the buccal plate formed, in particular, by bundle bone will experience more resorption than lingual/palatal plates,[3,10] and is considered the first to be absorbed.[4] Loss of vertical ridge height will also occur less than horizontal width, reducing the buccal bone aspect of the bony ridge.[19] The rate of residual ridge resorption is related to the time elapsed from when the tooth was removed.[11]

Factors such as trauma can cause loss of alveolar bone, since a number extractions are performed with no consideration of maintaining alveolar bone volume.[12] In the first year following extraction, bone resorption can result in up to 2mm vertical and 4mm horizontal loss.[18]

A study published by Araujo in 2006, showed that implants placed directly after extraction will not preserve the dimension of the ridge, resulting in marginal bone loss.[21]



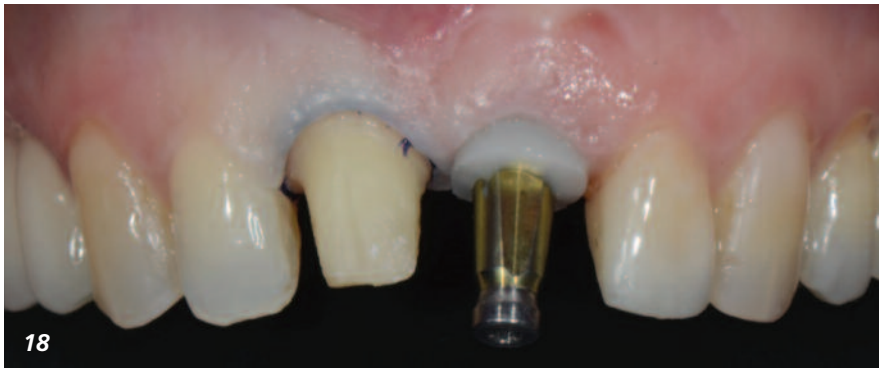


Figure 17, 18: Impression on the head of the implant simulating the surrounding soft tissues.

It has been demonstrated that flap elevation will disturb the thin cellular layer of cells in the periosteum causing more resorption than the conservative flapless technique.[6] It is therefore recommended, in socket preservation surgery, to enhance healing and to lower or stabilize bone resorption. Conversely, hand bone filler may interfere with the early stages of alveolar bone healing and while it may need several years to be absorbed,[8] it can still lack resorption.[9]

It has been found that implants placed into grafted sockets revealed a clinical performance similar to implants placed into non-grafted sites in terms of survival and marginal bone loss. On the other hand, grafted sites facilitated the placement of larger implants and did not require augmentation procedures, compared with naturally healed sites.[17]

A further study published by Araujo in 2009, demonstrated that the placement of biomaterial in an extraction socket will enhance bone modeling and compensate marginal ridge contraction.[20]

As shown in the clinical case, the socket preservation technique led to esthetic success, including the absence of the grey hue in the free gingiva, with the preservation of the interproximal bone between tooth 11 and the implant.[21] Note the dimension of the preserved bone allowed the placement of a narrow neck implant in an optimal position, while the resulting occlusal forces did not cause any overload and maintained an excellent prognosis.

It has been observed that ridge resorption occurs more in the mandible than in the maxilla,[14] with many studies investigating BIC (Bone implant contact) of natural bone compared to regenerated bone. Trisi found that BIC in rough surfaced implants is enhanced by up to 72% over time.[15]

A study published by Valentini revealed that the BIC at sites grafted with bovine bone fillers is greater than in the nongrafted sites.[16]

The aim of this article is to focus on the healing patterns of bone after socket preservation techniques with emphasis on the rationale for the preservation of the dimensions of the extraction sockets.

Conclusion

Since tooth loss due to caries or trauma often results in hard and soft tissue collapse, the preservation of bone volume is of major importance to ensure proper implant and esthetic rehabilitation. In order to insure the success of implant therapy, a sufficient volume of healthy bone at the recipient site at the time of implant placement is imperative.

Currently, the most commonly used method for ridge preservation procedure is the placement of bone graft material in the extraction socket, covered by a cross or non-cross linked membrane and followed by complete or partial flap closure.

The decision to use the socket preservation technique should depend on eaxch individual. Surgeons should be familiar with the wide array of techniques and materials used in order to optimize and preserve the anatomy of bone and soft tissues.

This article offers information that can be of benefit to clinicians when implementing the socket preservation technique in their daily practice. In conclusion, the socket preservation technique appears to produce important results concerning bone volume conservation and favorable architecture of the alveolar ridge in order to obtain ideal functional and esthetic prosthesis after implant rehabilitation.[12]

Figure 19: Clinical presentation of the final esthetic result with the healthy surrounding soft tissues. The clinical crowns conserved the gingival architecture and met the patient's esthetic demands.

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