Osteotome Sinus Floor Elevation and Implant Placement in Grafted Sockets After Extraction

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ABSTRACT

Immediate bone grafting procedures were proposed to preserve bone volume in residual damaged alveolar walls and to prevent the expansion of the sinus floor in the maxillary molar region. The use of an osteotome allows vertical bone augmentation and localized sinus elevation with minimal surgical trauma. The aim of this study is to evaluate the clinical outcome of implant placed in previously grafted alveoli that were expanded at a second-stage surgery by an osteotome technique. At the 6-month follow-up, the use of the osteotome technique for vertical expansion of the grafted tissue was considered a predictable procedure in the implant surgery. Although these are promising clinical results, further studies are needed to better understand the healing process of grafted biomaterials in relationship with dental implants.

Keywords: sinus elevation, grafting, implants, socket preservation.

INTRODUCTION

Posterior maxillary tooth extraction causes an inferior expansion of the maxillary sinus in relation to fixed anatomic structures, thus proving the pneumatization phenomenon after tooth loss. The expansion of the sinus is larger after the extraction of teeth enveloped by a superiorly curving sinus floor, extraction of several adjacent posterior teeth, and extraction of second molars compared to first molars1. Furthermore, roots that protrude into the sinus have a thin cortical bone lining, and during the extraction procedure, this thin bone may break and dislocate, allowing the sinus to expand toward the empty socket2. Molar extraction induces greater pneumatization than premolar extraction, probably due to a larger defect left in the alveolar cavity that allows the sinus to pneumatize.

To prevent the expansion of the sinus floor and to preserve the bone volume of fresh sockets after tooth extraction, immediate dental implant placement3 and/or immediate bone grafting procedures are advocated. In an effort to increase the apical occlusal dimension of available bone for implant placement, the use of an osteotome allows for vertical bone augmentation and localized sinus elevation with minimal surgical trauma. The crestal bone is displaced toward the sinus floor, and the apical portion of the implant is placed in the augmented space. In a study by Fugazzotto and De Paoli4, a modified trephine and osteotome procedure was performed at the time of a maxillary molar extraction to implode the interradicular bone after maxillary molar extraction.

The present case-report considered fresh extraction sockets unable to support immediate implant placements and/or vertical expansions. At a first stage surgery, the sites were filled with Osseograft. At a second-stage surgery, 3 months later, implants were placed using an osteotome technique for vertical expansion of osseografted sites. This technique was different from previous studies in which osteotomes were used for native bone expansion. The aim of the study is to evaluate the clinical outcome of implants6-7 placed in previously grafted alveoli that were expanded at a second-stage surgery by the SUMMERS6-7 osteotome technique.

A CASE REPORT

A systemically healthy 33-year old male patient

reported with the chief complaint pain on his tooth in relation to his right upper first molar. On further investigation , fracture of his tooth was detected. On clinical examination , patient had entrance filling with composite restoration in 16 which was fractured in the mid- region and the crown was clinically split into two and the fracture extended upto the CEJ (Figure 1). The radiographic examination showed presence of fracture seen in relation to 16 with no periapical pathology (Figure 2) and the following treatment plan was formulated :

Full mouth scaling and root surface debridement.

Extraction of 16 followed by socket preservation with CollaPlug

The patient to be reviewed 6 month after preservation of socket

Socket preserved for 6 months after extraction

Internal sinus lift in relation to 16

Replacement of missing 16 with an implant.

Fig 1. Clinical finding-fractured tooth 16

Fig 2. Radiographic examination

SURGICAL MANAGEMENT OF EXTRACTION AND SOCKET PRESERVATION

Under LA 2% lignocaine with 1:80,000 adrenaline bone exposure was done with piezo surgery to remove the fractured crown and the socket was completely debrided and socket was preserved using CollaPlug (Zimmer) which was placed till apical end and osseograf and biogiude membrane (Figure 3,Figure 4&Figure 5) was used to fill the socket and sutured with 4-0 vicryl to attain primary closure and socket was preserved for 6 months after extraction (Figure 6) .

Fig 3 . extracted socket of fractured tooth

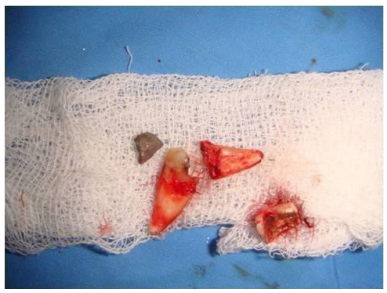


Fig 4. Fragments of extracted tooth

Fig 5. Placement of collaplug

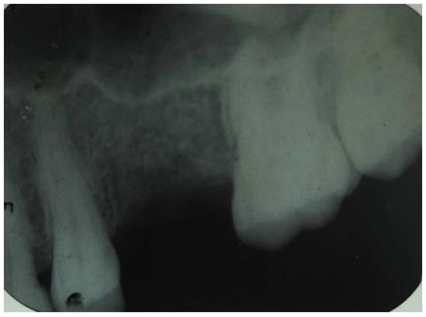


Fig 6. Post-op radiograph after 6months

SURGICAL MANAGEMENT – SINUS LIFT & IMPLANT PLACEMENT:

Under LA 2% lignocaine with 1:80,000 adrenaline beveled crestal incision with full thickness

mucoperiosteal flap reflected and the proposed implant site was first clearly marked with 2.0 round drill , followed by 2mm twist drill to a depth of 6-7mm and then a 2mm giuded pin to verify implant positioning was done.2 mm twist drill taken to a depth of 0.5 to 1.5 mm from sinus floor .After radiographical confirmation, osteotomy was widened to 3mm diameter.

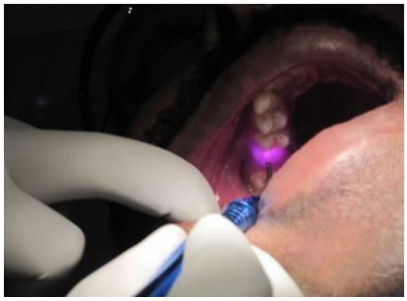
Exapansion of osteotomy was carried out with combination of drills and concave tipped osteotomes based on residual bone density. Using SUMMERS technique , localised sinus elevation (Figure 7) was done upto 3 to 4 mm and implant placement (Figure 8) was done..flap approximated with 4-0 vicryl .

Fig.7 sinus lift procedure

Fig 8. Implant placement

Implant second stage& final crown:

Under LA 2% lignocaine with 1:80,000 adrenaline second stage implant was exposed using soft tissue laser (Figure 9) . Abutment placed and final prosthesis was delivered (Figure 10).



ig 9. Second stage implant

Fig 10. Prosthetic crown

FOLLOW-UP EVALUATION

The following clinical parameters were checked: pain, occlusion, and prosthesis mobility. The success criteria for implant survival were accepted as the presence of implant stability, absence of radiolucent zone around the implants, no mucosal suppuration, and no pain8. Probing depths (PDs) were determined on the mesial, distal, buccal, and palatal surfaces of the implants with a periodontal probe9.Follow-up examinations were performed at baseline and 3, 6 months after implant placement.

RESULTS

Surgical and Prosthetic Procedures After 6 months of follow-up, a survival rate of 100% was seen the implant. No sinus membrane perforation was found. No pain or final prosthesis mobility was recorded. There was suitable woun dhealing around temporary abutments with a fine adaptation to the final crown. Minor swelling of the gingival mucosa was present in the first days after surgical procedures, but no mucositis or flap dehiscence with suppuration was found.

DISCUSSION

Osteotome-mediated sinus floor elevation was associated with an implant survival rate directly related to the height of the remaining subsinus bone because the initial stability of implants was only provided by the residual alveolar ridge10. This justifies the use of a biomaterial graft to avoid bone collapse after tooth extraction by providing a residual bone height to allow a vertical bone expansion. In clinical studies5,11, after tooth extraction in a one-stage surgery, the implant site was immediately prepared using standardized sequence of osteotomes for vertical expansion of native bone, and immediately, a mixture of collagen gel and cortico cancellous porcine bone particles was introduced into the receptor site and pressed into the fractured sinus floor area; subsequently, the implant was placed into the bone site to the planned depth.

In another clinical study4, after molar extraction, the osteotome imploded both the interradicular native bone and the underlying sinus membrane; then, the prepared alveolus was filled with anorganic bovine bonematerial and covered by membranes. At the

second- stage surgery, after 4 months , the implants were placed using a traditional surgical procedure. A total of 97.8% of the implants were functioning successfully for up to 3 years. In all reported cases, the osteotome procedure was used for the expansion of native bone to create a vertical and horizontal space for implant placement.

In the present study, alveolar walls of the fresh sockets prevented both immediate implantplacement and the use of osteotomes; consequently, the alveoli were filled with ossegraft without expansion procedures. From the previous article12 and the present study, the same defects of fresh sockets were filled by the same graft material, and after 3 months, implant sites were prepared by different surgical procedures, one using traditional drilling12 and the other using an osteotome, and a survival rate of 100% was reported for all implants. It is probable that, within the grafted area, increasing amounts of bone might grow during the osseointegration process, providing drilling or expansion procedures for implant site preparation and allowing appropriate functional loading periods.

CONCLUSION

Although these are promising clinical results, further studies are needed to better understand the healing process of grafted biomaterials in relationship with dental implants.

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