



Radiographic bone formation after indirect sinus lift using transcrestal osteotomy with simultaneous implant placement

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ABSTRACT

Dental implants really have transformed the reconstruction and strategic planning of fixed prosthodontics in the edentulous posterior maxilla. Increased bone volume via elevation of sinus membrane enables dental implants to be positioned in dysplastic maxillary ridges. The purpose of the research was to determine retrospectively the volume of hard tissue height acquired through a transcrestal method to sinus lifting utilizing osteotomes, together with the concurrent positioning of implants. Documents from the previous 2-year span of partially edentulous cases checked at Saveetha Dental Hospital were searched for patients undergoing implantation to substitute teeth missing in a posterior edentulous maxillary area with inadequate vertical osseous height. The inclusion criterion, sinus lift operation, was performed without bone grafts. A maximum of 42 people was selected. Among these patients, 35 were classified as cases recommended for indirect sinus lift while 45 were given implants. The implants being used are 3.5 mm or 4.5 mm diameter and 10.5, 11 or 13 mm length. The average survival rate for implants was 97.78 per cent. The mean bone height estimated from alveolar crest to the base of the implant just at the time of implantation was 6.79 mm \pm 1.35 mm. Measured mean bone height at the six-month follow-up period was 11.4 mm \pm 0.88 mm, which was significant ($p < 0.05$). Transcrestal osteotomy with implants tenting sinus membrane without extra graft material might show a substantial mean osseous height increase of 4.6 mm.



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INTRODUCTION

The posterior edentulous maxilla is most usually complemented by reduced bone density and height.

The configuration of dental implants has improved the recovery of the edentate posterior maxilla with a fixed prosthesis. A significant need for insert location is the proximity of a substantial bone and the quality of the residual bone (Bernardello *et al.*, 2011). The treatment of insufficient maxillary alveolar ridge is attempted due to pneumatization of the maxillary sinus in the posterior maxillary area with impaired alveolar bone height.

Bone volume can also be increased by extension while growing vertical bone calculation is a delicate process. The growth of sinus layer is also an option for expanding vertical bone height (Bernardello *et al.*, 2015). Any extensive knowledge of modern expansion systems assisted by good patient choice will lead to convincing long-haul strategies for the management of deficient posterior maxilla. There

are different methods for enlarging maxillary sinus. They can indeed be comprehensively divided into two separate methods for sinus floor height: a) Lateral antrostomy as a step-by-step approach as either an immediate technique. (b) a technique for osteotomy with a crestal approach mostly as a roundabout tool (Cosci and Luccioli, 2000).

Transcrestal approach is seen as the most traditionalist method and has a few desirable circumstances in comparison to horizontal osteotomy. The osteotome method involves the establishment of implant bed without osteotomy to allow longer and larger inserts to occur, especially in posterior maxillary jaw (Spinato *et al.*, 2017). In endosseous implant therapy, the sinus grows. This technique helps to increase the thickness as well as the volume of spongy bone in apico-coronal and buccal-lingual dimensions by pressure conceivable from its viscoelastic properties. The use of osteotomes comprehends for bone compaction, cortical sinus floor elevation and edge expansion described in various clinical studies (Cosci and Luccioli, 2000; Fairbairn and Leventis, 2015).

Minimum alveolar bone height suggested for osteotome method for transcrestal sinus lift being 5 mm, although implant placement is advised when the preliminary alveolar bone height is at minimum 5 to 7 mm. An average increase of 3 to 3.25 mm in alveolar height through osteotome combined both with bone add-on technique has been recorded (Rapani and Rapani, 2012). The purpose of our research was, therefore, to assess retrospectively the amount of bone height acquired through a transcrestal approach to sinus elevation using osteotomes.

MATERIALS AND METHODS

A total of 42 partially edentulous patients in the posterior maxilla were short-listed. Of these patients, 35 patients were identified as cases indicated for indirect sinus lift and the remaining 7 cases were indicated to undergo direct sinus lift. 45 implants were placed in these 35 patients. The average follow-up time was 6-12 months. The patients were primarily evaluated with a CBCT prior to implant placement to gauge the bone dimensions. The implants placed were placed in the first, second molar position and in second premolar position accordingly with the values recorded in Table 1. After six months follow up, a CBCT was again taken to evaluate the bone height gained.

RESULTS

The preoperative and postoperative values of the bone height were noted in the region of the implant placement. All the implants used were 4.3 mm in diameter and 10.5, 11 or 13mm in length. The cumulative survival rate of the implants was 97.78 Of 45 implants in operation, 1 was lost after loading due to acute infection over 24 days. Almost no adverse effects were observed. The mean bone height estimated from the alveolar crest to the base of the implant at the period of implant placement was 6.79 mm \pm 1.35 mm. The mean estimated bone height at the six-month follow-up time was 11.4 mm \pm 0.88 mm, which was very significant ($p < 0.05$) Table 1.

DISCUSSION

The sinus increase treatment has been shown to be an effective and often necessary technique for rehabilitating maxillary atrophic ridge with pneumatic sinuses. The lateral approach suggested by Boyne and James since 1980 permitted a dramatic improvement in bone > 10 mm, in atrophic ridges, but resulted in significantly higher post-surgery morbidity and a higher likelihood for membrane perforation (Cha *et al.*, 2014; Rapani and Rapani, 2012).

In 1986, Tatum Jr. suggested a transcrestal, rather traditional conservative approach, later modified by Summers, which originally portrayed the use of osteotomes to raise the film and eliminate the banging, making the technique more relaxed. Nowadays, the crestal approach is a strong technique that allows for appropriate incorporation with high endurance levels. Crestal method, osteotome interfered sinus lift surgical technique, can be done with a variety of bone junction material, e.g. allograft, autogenous bone or heterologous materials, and platelet derivatives themselves or in conjunction with unifying materials, in order to combine the properties of the production factor to just the mechanical proximity of the delicate platelet derivatives that enables super-plasticity (Mazor *et al.*, 2004). The key containment of this technique was, however, the considerable stature of > 5 mm of remaining bone height due to the danger of layer perforation and low embed solidity. In the latest evaluation report, 45 inserts inserted in a standard 6.79 mm peak showed superb durability levels (97.78 per cent) in the corresponding duration.

The negligible height of the maxillary sinus membrane and the synchronous configuration of the implants give rise to bone growth and osseointegration. Measurement of bone growth does not con-

Table 1: Bone levels in implant placement

Bone regeneration time	Bone levels	P value
Bone height at the time of implant positioning	6.79mm \pm 1.35 mm	P<0.05
Bone height after 6 months of implant positioning	11.4 mm \pm 0.88 mm	

continue to differ when performing sinus film heights with or without bone grafts (Soardi *et al.*, 2014). Success has also been defined by various authors and in case of a combination of osteotome sinus upsurge and joint material was shown to be effective. Postoperative CT images showed tent-like bone formation all around implants. This indicates that a tent-like image is stretched from the apical implant surface by sinus membrane, and also that bone tissue formation is acquired in the space produced by sinus membrane tent.

Consequently, in order to accomplish bone formation only at the top of both the implant, it is necessary to find techniques that allow the membrane to remain elevated in its new role using membrane elevation technique. The implant inserted during the sinus lift may also serve as an object to keep the sinus membrane at an elevated location, as in this research, where no graft material has been used. Rather, the implant has only been used to stimulate the sinus membrane.

Nedir *et al.* registered sinus floor elevation without grafting materials to demonstrate a bone deficiency in the implant extremity after 1 year with 2.5 mm bone benefit (Nedir *et al.*, 2006). Nevertheless, avoiding the use of graft material not only removes the need for secondary surgery but also decreases the risk of infection, the possibility of overfilling maxillary sinus or membranes necrosis and sinusitis (Nedir *et al.*, 2012) is also avoided. No graft material inserted in the newly developed region below the Schneider membrane has been reported by numerous authors (Lai *et al.*, 2008). However, studies documenting the use of osteotomes for indirect sinus lifts with no graft material in place are uncommon sites. The results of the study verified the use of implants as tenting screws to hold the sinus membrane at the desired position. Radiographically, peri implant radiopacity confirmed bone formation around the implant surface and apex (He *et al.*, 2013).

CONCLUSION

This research concluded the promising results of transcrestal osteotomy with implants utilized for

tenting the sinus membrane, in obtaining a substantial average bone height increase of 4.6 mm. This will enable the clinicians to implement this procedure in surgical reconstruction and rehabilitation of patients with implants in those regions with insufficient bone due to excessive pneumatization of the maxillary sinus.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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