

Rehabilitation of Maxillary Posterior Edentulism with Direct Antroplasty and Dental Implants: A comparative analysis of two different types of bone grafts

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Abstract:

Aims - To determine the difference in the amount of bone generated from two different sites for bilateral maxillary sinus augmentation.

Introduction- Rehabilitation of the edentulous posterior maxilla with an implant supported prosthesis is a commonly occurring challenge in dental practice. Objectives - Achieving adequate height of alveolar bone for placing dental implants requires uplifting of the sinus lining in many such cases. This is generally done by harvesting bone grafts from various sites and placing it in the defect created after raising the sinus lining thus restoring the height and width of residual alveolar bone.

Objectives - To determine if regional sites of bone graft harvest are equally effective when compared with distant site.

Material & Methods - In this series, out of 3 of our patients, two received autologous chin grafts and one patient received PCBM graft from the iliac crest. In all 3 patients, implants were placed in the second stage.

Results - A comparative analysis of the feasibility of the two techniques which involves bone grafts from two sites which have different quality of bone available over the end outcome was done and it was found that the quality of bone available for implant placement was almost the same irrespective of the graft harvest site.

Conclusion - It can be safely concluded chin graft is a viable alternative to cortico-cancellous bone graft in cases of direct sinus lift procedures with minimal issues of donor site morbidity.

Keywords - Implants, Sinus lift, Bone grafts, Cortico-cancellous, Maxillary sinus, Edentulism

Introduction:

Low quality of bone, resorption after tooth loss & pneumatization of maxillary sinus usually result in paucity of residual ridge for implant rehabilitation. Besides, the posterior maxilla is the least dense area of jaw bones, also bone density decreases really fast after the extraction of multiple teeth.⁽¹⁾ To overcome this difficulty Tatum⁽²⁾ in 1970's elaborated a technique for increasing the posterior maxillary bone volume that was first published by Boyne⁽³⁾.

The original protocol as described by Boyne, and subsequently used by many other clinicians for this procedure utilized 100% autogenous bone harvested from the ilium as a grafting material. Iliac autografts were utilized both in block form and in particulate form with simultaneous or delayed placement, depending upon the ability to achieve primary implant stability in the residual crestal bone.

Other sources for autogenous bone include, extraorally, the tibia and cranium, and intraorally, the ramus, symphysis, and maxillary tuberosity.

In this series, out of 3 of our patients, two received autologous chin grafts and one patient received PCBM graft from the iliac crest. In all 3 patients, implants were placed in the second stage.

Case 1:

A 40 year old female patient was referred to our department for posterior maxillary augmentation for implant placement as the residual alveolar bone was not suitable to receive the fixed prosthesis. All co-morbid conditions were ruled out. Her Orthopantomogram (OPG) showed residual bone height at the right and left posterior maxilla to be 2.4 mm and 3.0 mm respectively (Figure 4). Patient was taken under general anesthesia (GA) and a standard lateral window technique was

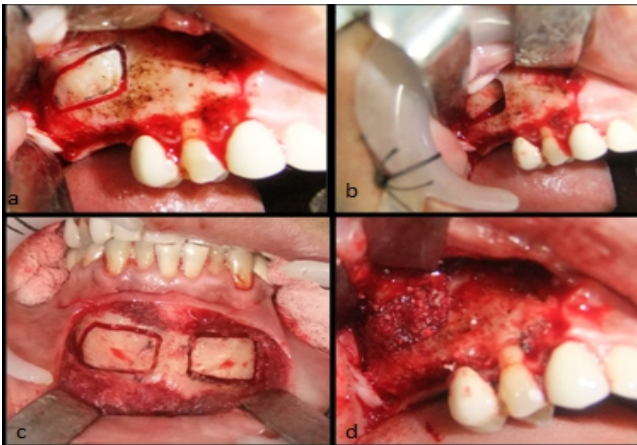


Figure - 1 - (a) Marking of Direct Sinus Lift, (b) Trapdoor type Sinus Lift, (c) Marking of Chin Graft, (d) Harvested and packed Chin graft in the floor of the sinus.

used to lift the sinus membrane bilaterally then PCBM graft of approximately 50cc was retrieved from the right anterior iliac crest and was used to fill in the space between the uplifted sinus membrane, lateral cortical bone and the antral floor bilaterally (Figure 2). Before placing the graft material a Guided tissue regenerative membrane(GTR) was placed superiorly and the same sheet continued on the medial side of the defect. The graft material was then used to fill the defect in toto and was covered with another GTR membrane, the surgical site was now sutured primarily. Simultaneously patient's lower arch implants were placed. After six months maxillary implants were placed bilaterally under local anaesthesia. Patient had an augmentation of 12mm which was evident in the post operative Orthopantomogram.

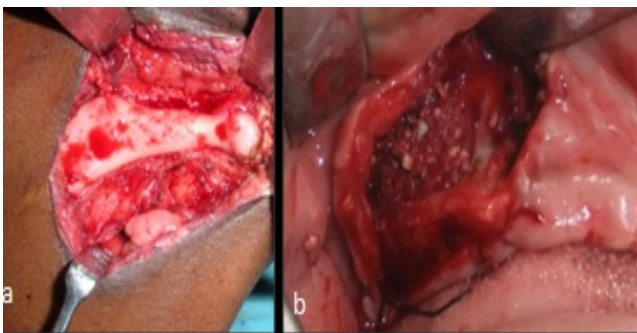


Figure - 2 - (a) exposed Iliac Crest donor site, (b) Cortico-cancellous iliac crest bone graft packed in the sinus floor.

Case2:

A 43 year old male patient was referred to our department with the same complaint as the previous patient. Patient had undergone extraction of only upper right posterior teeth with a resultant atrophied residual ridge. An autologous chin graft was used for augmentation (Figure 1). After a period of six months the patient received his implants.

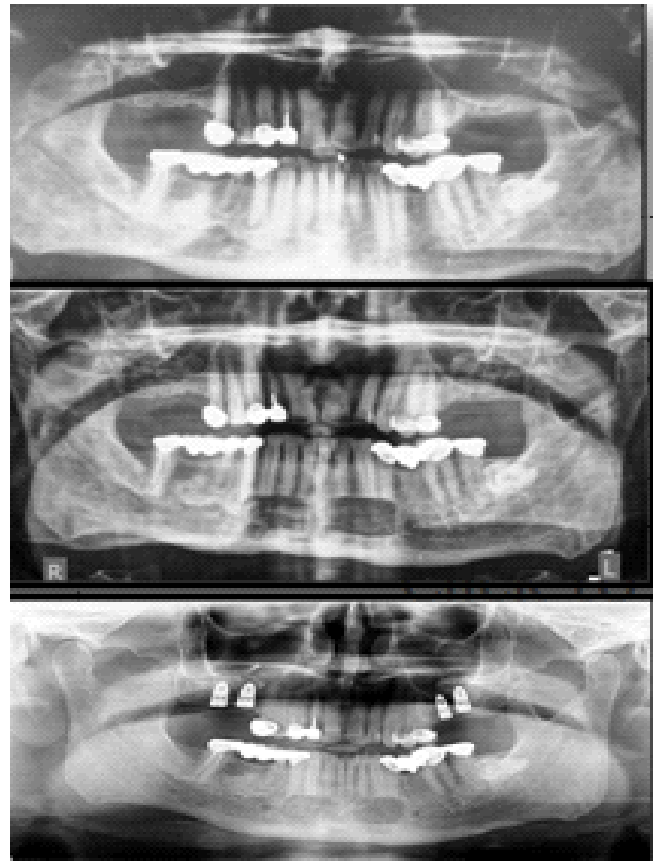


Figure 3 – Chin Graft Patient – (a) Preop OPG, (b) Immediate Post-op OPG, (c) OPG at 1 year shows a nearly filled donor site and implants placed in posterior maxilla.

Patient had a pre operative residual bone height of 4 mm and post operatively it was increased to 13mm.

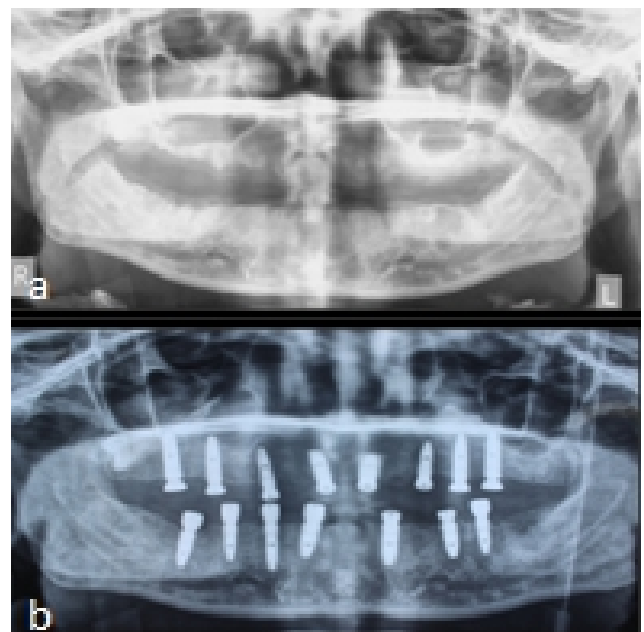


Figure 4 – Iliac Crest Patient – (a) Pre-op OPG, (b) Post-op OPG with Implants placed in maxilla and mandible + bilaterally lifted floor of the sinus.

Case3:

A 42 year male patient was referred to our department with bilateral edentulous posterior maxilla. Patient was taken under GA and standard lateral window technique was used

for sinus lift and bilateral chin grafts were used for augmentation. Patient received implants after a period of six months. Patient had a pre operative residual bone height of 3 mm which increased to 12mms (Figure 3).

The details of all 3 patients are mentioned in Table 1 below -

Table 1

Cases	Pre op residual bone height	Donor site	Post op residual bone height	Height gain	Implant size used
Case 1	Right post Maxilla- 2.4 mm	Right Iliac Crest	Right post Maxilla- 12 mm	Right post Maxilla- 9.6 mm	16-5 x 10 mm
	Left post Maxilla- 3.0 mm		Left post Maxilla- 12 mm	Left post Maxilla- 9.0 mm	26-4.3 x 10mm
Case 2	Right post Maxilla- 4 mm	Right Chin	Right post Maxilla-13 mm	Right post Maxilla-9 mm	15-3.5 x 10 mm 16-4.2 x 10mm
Case 3	Right post Maxilla- 3 mm	Bilateral Chin	Right post Maxilla- 12 mm	Right post Maxilla- 9 mm	16-5 x10 mm 17-5 x10 mm
	Left post Maxilla- 4 mm		Left post Maxilla-12 mm	Left post Maxilla- 8 mm	26-4.3 x 10 mm 27-5 x 10 mm

Discussion:

Sinus augmentation surgery has become the subject of great attention since it was first introduced in 1977 by Hilt Tatum. Since the technique was adopted, there have been several changes to the surgical procedure, different graft materials have been introduced, membranes are now being used and there have been alterations to the macro- and micro-geometry of the implants⁽⁹⁾. Surgeons must be informed about the existence of these changes and their effects, so that they can make the right choices and the patient can benefit from improved techniques and appropriate materials for the specific clinical situation.

In all the three cases the basic surgical technique used was the same, an intra oral access to the anterior maxillary sinus was gained via a crestal incision to expose the anterolateral wall of the maxilla. A bony window was then prepared, the sinus membrane was separated at the edges of the window and lifted from the floor. The bony window that was kept attached to the sinus membrane was then elevated superiorly, in order to enable the insertion of the autologous grafts in the created space.

An ideal bone grafting material should have both osteoinductive and osteoconductive properties and be able to osseointegrate to the implant surface. These properties vary in different bone grafting materials.^(4,5,6)

Ilium is one of the most common sites for bone augmentation. The ease of surgical access, low postoperative morbidity, large amount of readily available cancellous and cortical bone are the advantages of this donor site.

In two of our three patients graft was procured from the symphyseal region. Harvesting graft from the anterior mandible is particularly appealing because of its embryonic derivation from membranous bone and thus the benefit of an

improved resistance to graft resorption^(7,8); none of our patients had a decreased sensitivity over the lower lip and chin region. With the advent of recent techniques and availability of recent biological materials like platelet rich plasma (PRP) and platelet rich fibrin (PRF) addition of such materials to bone grafts surely improves the handling properties and final osteogenic potential of all types of bone grafts. This happens due to the natural concentration of the various growth factors in these autologous materials like PRP & PRF. Voluminous literature is available on the efficacy and popular use of these materials in dental implant practice.

Conclusion:

All three patients had consistent bone augmentation and no difference was found between the symphyseal and the iliac crest grafts. A long term follow up of 7 years has shown no bone loss or implant loss in any of the three patients thereby achieving a satisfactory result. We can thereby conclude that mandibular parasymphyseal region offers a viable and effective alternative to harvest membranous bone in sufficient quantity such as those required for most of the direct antroplasty procedures thereby reducing the need for a distant second donor site and its associated post-operative morbidities. The post surgical recovery is thus less painful and the return to normal life is faster when bone is harvested from the parasymphyseal region. Also since bilateral parasymphyseal regions can be readily used the volume of bone available is also adequate in most of the cases.

Source of support : Nil

Conflict of interest : Nil

Ethical Approval-

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with

the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent –

Informed consent was obtained from all individual participants included in the study

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