

# EFFICACY OF LATERAL ANTROSTOMY AND CRESTAL APPROACH IN MAXILLARY SINUS LIFT

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## ABSTRACT

*In this article a review of maxillary sinus anatomy and techniques for floor elevation which is considered a vital part of restoring the posterior maxilla is discussed. Tatum is the pioneer for lateral antrostomy which is being practised till date for sinus lift. Crestal approach which is a conservative method, proposed by Summers, provides another effective way of placing implant fixture in the atrophic maxilla.*

*Key Words: Dental implants, lateral antrostomy, crestal approach*

## 1. INTRODUCTION

The role of implant dentistry has gained momentum since the advent of modern era and provides an excellent treatment modality in dentistry. Implants provides a stable base upon which dentures are places in case of complete edentulism. Dental implants would a viable treatment option in cases with sufficient quantity and quality of bone. Whereas in patients with resorbed alveolar ridges, the application of implant dentistry jeopardize. Since the quality of bone is poor in posterior maxilla, encountering ridge resorption and sinus pneumatization is common. The ideal procedure to restore the anatomic deficiency is maxillary sinus is the floor elevation method (sinus lift). The objective of this article is to review, and summarize, the maxillary sinus anatomy and techniques for sinus floor elevation procedure.

## 2. HISTORY

Tatum proposed maxillary sinus floor elevation at an Alabama implant conference in the year 1976 which was later published by Boyne in 1980.<sup>1,2</sup> Most importantly it was helpful to restore the posterior maxilla with implants. It is one of the common pre prosthetic surgeries performed in dentistry till date. There are several articles<sup>3-6</sup> available which has been published in this field which highlights on the different grafting materials, modifications to the classic technique, and comparisons between different techniques.

## 3. ANATOMY OF THE MAXILLARY SINUS

The maxillary sinus is a pyramid shaped cavity having its base adjacent located on the nasal wall and apex which points towards the zygoma. The sinus is pea sized till the eruption of permanent dentition. The average measurements for a adult sinus are 2.5 to 3.5 cm width, 3.6 to 4.5 cm height, and 3.8 to 4.5 cm deep.<sup>7</sup> maxillary sinus has an estimated volume of approximately 12 to 15 cm<sup>3</sup>.<sup>8</sup> Anteriorly, its extension is till the canine and premolar area. The sinus floor usually has its most inferior point near the first molar region. The size of the sinus will increase with age if the area is edentulous. The extent of pneumatization varies from person to person and from side to side.<sup>7</sup> Nonetheless, this process often leaves the bony lateral and occlusal

alveolus paper thin in the posterior maxilla. The lining of maxillary sinus known as the Schneiderian or sinus membrane. This membrane consists of ciliated epithelium like the rest of the respiratory tract. It is continuous with, and connects to, the nasal epithelium through the ostium in the middle meatus. The membrane has a thickness of approximately 0.8 mm. Antral mucosa is thinner and less vascular than nasal mucosa.<sup>7</sup> The blood supply to the maxillary sinus is primarily derived from the posterior superior alveolar artery and the infraorbital artery, both being branches of the maxillary artery. Anastomoses between these two arteries in the lateral antral wall is present. The greater palatine artery also supplies the inferior portion of the sinus.<sup>9</sup> Sinus derives its nerve supply from the posterior superior alveolar branch of the maxillary (V2) division of the trigeminal nerve.

#### 4. SURGICAL TECHNIQUES

The lateral antrostomy approach, is one the most commonly preferred technique originally described by Tatum. Second approach advocated by Summers : the crestal approach, wherein osteotomes are used .<sup>10</sup> On comparing the two ,the crestal approach is found to be a more conservative method for sinus floor elevation.

##### *Lateral Antrostomy*

Lateral antrostomy begins with a crestal incision made over the alveolar ridge. In order overcome wound dehiscence noticed in the technique the incision is placed palatal in relation to the crest in order to preserve a wider band of keratinized attached gingiva for a good wound closure. A full-thickness mucoperiosteal flap is then raised to allow access to the lateral antral wall. Antrostomy is done using a round bur and a U-shaped trapdoor is created on the lateral wall of the maxilla, membrane is lifted from the floor using an antral curette. Marx and Garg suggested using a cottonoid soaked with a carpule of 2% lidocaine with 1:100,000 epinephrine and left in the space created for 5 minutes so as to limit bleeding and allow for better visualization for further dissection.<sup>11</sup> It is mandatory to create space around the sinus membrane in all directions that includes anterior, posterior, and medial prior to intervening the trapdoor medially. A elevation of sinus membrane by intervening trapdoor creates a space, in this space various graft materials are used to establish the platform to place implant. Numerous research projects have been published to evaluate the prognosis of implants under different grafting materials.<sup>12,13</sup> Autogenous bone remains the gold standard in bone grafting.<sup>14</sup> Most commonly used autogenous donor sites in maxillary sinus lift is iliac crest, chin, anterior ramus, and tuberosity. Hydroxyapatite mixed with autogenous bone or used alone has also been shown to be viable alternatives.<sup>15</sup> Care should be taken not to overfill the recipient site, because it will cause membrane necrosis. One -stage lateral antrostomy is placement of implants along with the graft or after implants placed after a period of 12 months to allow for graft maturation which is referred to as two stage lateral antrostomy. The initial bone thickness at the alveolar ridge determines the technique to be performed. If the bone thickness is 4 mm or less two-stage lateral antrostomy is done, the reverse holds true for performing a 1-stage procedure.<sup>16</sup> A 1-stage procedure is more technique-sensitive and its success depends on the quality and quantity of residual bone.

##### *Crestal Approach.*

Drawbacks with lateral antrostomy requiring the large flap to be raised for surgical access is overcome with the technique that Summer had proposed.<sup>10</sup> Steps involved in this technique includes a crestal incision placed and a full-thickness flap is raised for exposing the alveolar ridge. An osteotome is used which is tapped into place using a mallet or drilling into the bone. Sequential expansion of the alveolus is performed osteotomes of increasing sizes. As the size of the osteotome increases, bone is compressed, pushed laterally and apically. Summers stated that by performing this technique it improves the bone density of the posterior maxilla where D4 type bone is normally present.<sup>17</sup> Once the largest osteotome has expanded the implant site, a prepared bone mix is added to the osteotomy as the grafting material. Of the various available combination present for grafting Summer suggested a 25% autogenous bone with 75% hydroxyapatite mix. Reinsertion of the largest osteotome into the implant site along with the graft material completes the sinus floor elevation. The elevation of the sinus floor is due to the added bone mix which exert pressure onto the sinus membrane. Grafting material can subsequently be added and tapped in to get the required amount of elevation. After the desired height is achieved, the implant is placed. The implant fixture should be slightly

larger in diameter than the osteotomy site created by the largest osteotome. It becomes the final osteotome, “tenting” the elevated maxillary sinus membrane. The main advantage of the crestal osteotome technique is that it is a less invasive procedure. It enhances the density of the posterior maxillary bone, which gives a better initial stability of implants. It also has the potential for the use of less autogenous grafting material. Summers suggested the crestal incision to be extended distally to the tuberosity area where autogenous bone can be harvested.<sup>17</sup> The only drawback with the crestal approach is that the initial implant stability is uncertain if the residual bone height is less than 6 mm. The possibility of achieving a sufficiently high elevation of the sinus floor with the osteotome technique is minimal.<sup>16</sup>

## 5. CONCLUSION

Treatment planning for restoring edentulous jaw with dental implants should be done meticulously. Pneumatization of maxillary sinuses in relation to posterior maxilla, could limit the amount of alveolar bone for implant placement. In lateral antrotomy though a large amount of bone augmentation to the atrophic maxilla can be done, but to perform this procedure it requires a larger surgical access. In contrast the crestal approach being minimally invasive but allows only a limited amount of augmentation. Therefore, we should mindfully select the type of procedure appropriate to the particular clinical needs, also all relevant anatomic structures in the surrounding region should be preserved to minimize surgical complications.

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