

# Single-Stage Dental Implant Placement with Indirect Sinus Floor Elevation Technique: A Clinical Report

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## ABSTRACT

The posterior maxilla is a challenging site for dental implant rehabilitation. Anatomic limitations in this region provide challenges that may affect successful osseointegration and the fabrication of a functional and esthetic implant-supported prosthesis. The technique of sinus floor elevation has expanded prosthetic options by enabling the placement of additional implant support in maxillary segments with atrophic ridges and pneumatized sinuses.

**Keywords:** Indirect sinus lift, Osteotome, Implant in atrophic maxilla.

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## INTRODUCTION

Implant insertion into the posterior maxilla is more demanding owing to compromised bone quality and quantity.<sup>1-5</sup> The presence of the maxillary sinus floor limits the available bone height for implant placement. Different methods, such as tilted implants, short implants, vertical bone augmentation and sinus floor elevation, have been used to overcome these problems. Sinus floor elevation can be performed through a lateral window<sup>6-8</sup> or via a crestal access.<sup>9-14</sup> The most commonly used technique is sinus floor elevation through a lateral window which was first presented by Tatum in 1977 and was first published by Boyne and James in 1980.<sup>6,14-16</sup> However, this bone augmentation procedure is considered to be invasive, time-consuming and expensive.<sup>8,17,18</sup> Compared to minimally invasive methods, the major shortcomings of this method are potential nerve and vascular injury, requirement of good surgical skills and patient discomfort. Lateral bone fenestration has limitations similar to hinge osteotomy. Summers<sup>9</sup> in 1994 introduced a less aggressive procedure for sinus floor elevation with immediate implant placement known as osteotomy sinus floor elevation (OSFE). A crestal approach rather than lateral window was used followed by osteotome for elevation of sinus membrane and floor and simultaneously implant was placed. Simultaneously, some kind of graft may or may not be placed. The procedure is less invasive as compared to lateral

window technique, requires less time, less traumatic, minimal damage to vital adjacent structure and the postoperative morbidity is less. Recent studies have shown that the prognosis of implants placed by OSFE was same as that of conventional technique.<sup>15</sup> This case report illustrates sinus lift with OSFE procedure with bone grafting followed by implant placement.

## CASE REPORT

A 22-year-old patient was reported to the Department of Prosthodontics with missing maxillary left first molar (Fig. 1). Suggested treatment as approved by the patient consisted of sinus floor elevation using a crestal approach with sinus lift osteotomes along with graft material and simultaneous implant placement. Step-by-step procedure is as follows:

- a. Preoperative evaluation: Bone width and height were measured on computed tomographic (CT) scan. Radiographic stent was fabricated from diagnostic wax up and used as surgical stent also.
- b. Surgical phase:
  1. Antibiotic prophylaxis was initiated a day before surgery.
  2. Under local anesthesia, crestal approach was used.
  3. Soft tissue punch was made with the help of a punch guide.
  4. Initially, a round burr was used to open a defect through the marginal cortical bone. Increasing diameter of burrs was used to enlarge the site and



Fig. 1: Preoperative photograph

preparation of surgical site was assessed at regular interval with radiovisiography.

5. Drilling up to 1 mm away from the floor was continued with the 2.1, 2.8, 3.3 and 3.65 mm drills until final preparation.
6. Then expansion osteotomes were used.
7. Light tapping with a mallet carefully collapsed the sinus floor into the sinus cavity elevating the Schneiderian membrane.
8. Prepared bone graft material with beta-tricalcium phosphate and demineralized freeze-dried bone, which acts as a shock absorber, was added to the preparation site with a carrier. Elevation of the maxillary sinus membrane was achieved using the #3 osteotome that was used previously to force the graft ahead of its tip to achieve the sinus floor up fracture.
9. Integrity of the sinus membrane was confirmed by the Valsalva maneuver.
10. Implant of dimension (4.2 × 11.5 mm) was placed. Primary stability was assessed by finger pressure

exerted on the implant. The implant showed primary stability. Stability can also be increased by the threads or by placing the implant deeper.

11. Abutment was then positioned over the implant and occlusal height adjusted (Figs 2 and 3). Implant was loaded with temporary restoration.
12. Postoperatively (Fig. 4), patient was instructed to rinse the mouth twice a day with a 0.12% chlorhexidine solution for 2 weeks after surgery. Antibiotics were prescribed for 7 days.
13. After a mean healing period of 7 months, patient was rehabilitated with fixed crown (Fig. 5).

## DISCUSSION

Elevation of the maxillary sinus floor was first reported by Boyne in the 1960s. Fifteen years later, Boyne and James reported elevation of the maxillary sinus floor in patients with large, pneumatized sinus cavities in preparation for the placement of blade implants. It is evident that the reduced vertical bone height in the posterior maxillary region often



Fig. 2: Straight abutment placement



Fig. 4: Radiograph showing sinus lift



Fig. 3: Occlusal relation of abutment



Fig. 5: Completed restoration

limited standard implant placement. Elevation of the maxillary sinus floor is an option in solving this problem. Various surgical techniques have been presented to enter the sinus cavity elevating the sinus membrane and placing bone grafts. To date, two main approaches to the maxillary sinus floor elevation procedure can be found in the literature. The first approach, lateral antrotomy, is the classic and the more commonly performed technique originally described by Tatum. More recently, Summers advocated a second approach: The crestal approach, using osteotomes. The crestal approach is more conservative method. In 2003, Wallace and Froum published a systematic review on the effect of maxillary sinus floor elevation and the survival of dental implants. The criteria for review included human studies with a minimum of 20 interventions, a follow-up time of 1 year of functional loading and with the outcome variable of implant survival being reported. Recently, Piezo instruments have been used to open the window of the lateral wall but the risk of perforation when the membrane was elevated from the sinus floor remains.

In this case we used the osteotome sinus floor elevation procedure described by Summers which involves a grafting material that is condensed in the osteotomy site to elevate the sinus membrane. The advantages of this procedure were the avoidance of invasive surgery and permitting treatment within a single surgical step. To enhance the primary stability in low-density bone, the use of osteotomes is more relevant than the use of drills. By compression, the osteotomes can laterally condense bone, thus creating a denser interface at the placed implants,<sup>21</sup> improving the initial bone to implant contact.<sup>22</sup>

The complication can occur if the Schneiderian membrane is perforated, the filling material can migrate into the sinus and lead to inflammation.<sup>19,20</sup> Proper patient evaluation and surgical site preparation will help to avoid this complication.

## SUMMARY

Implant rehabilitation of edentulous atrophied posterior maxilla can be greatly extended and simplified using implants the OSFE technique. The procedure is short, less invasive with minimal chances of postoperative complication and appears to be predictable. It also allows treating the compromised posterior maxilla with reliable long-term results.

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