



Sinus Augmentation and Ridge Expansion by Osseo-Densification and Simultaneous Implant Placement: An Atypical Case Report with Six Months Follow-Up

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Abstract

Background: Deficiency of maxillary ridge height is the most common obstacle in achieving successful implant placement, for which one can either place short implants or go for sinus lift procedures. Osseo-densification is the most user friendly and predictable method of indirect sinus lift. Contrary to traditional bone drilling methods, which excavate bone while preparing osteotomy site; osseo-densification densifies surrounding bone in addition to preserving existing bone. This eventually helps in osseointegration and success of implant; wherein high-speed densifying burs are used with increasing sizes as sinus floor is elevated and/or bone width is expanded.

Materials and Method: Present case reports 64 years old male who wanted implants in upper right first and second maxillary molar. Cone Beam Computed Tomography (CBCT) examination revealed inadequate (4.8 mm) residual bone width 2 mm below level of crest in 16 region. For this osseo-densification procedure was carried out using Versah™ burs to widen the ridge. Also, in 17 region bone height was 6.1 mm, so to increase height, osseo-densification was used for sinus augmentation with simultaneous implant placements.

Results: Primary Stability of 35 N cm was achieved with both implants. Good osseointegration was evident on radiovisiograph at six months follow-up.

Conclusion: Versah™ burs facilitated sinus lift ridge expansion procedure; they can be a good option for pneumatized sinuses with inadequate residual bone height and narrow widths.

Clinical relevance: The success rate of implant is directly proportional to primary implant stability. The more the primary implant stability more will be the survival rate of implant. Therefore, short implants are avoided in this case to achieve maximum stability with the help of osseo-densification which has proved to be a boon for sinus augmentation and ridge expansion in deficient alveolar ridges.

Keywords: Osseo-Densification; Versah™ Burs; Implant Placement; CBCT; Osseointegration

Introduction

Dr. Albrektsson [1], a renowned scientist, expressed that six factors are responsible for reliable osseointegration. First being implant material and design; other factors include: its surface condition, bone status, surgical technique and implant loading

condition. In 2004, he stressed upon the need for site preparation improvement, suggesting that improving surgical techniques will fetch good prospects for enhancing clinical results [2].

Standard drill designs which are routinely used in placing an implant are made to scrape out bone to create space for implant.

Circumferential osteotomy is not prepared by these techniques. There are higher chances of elliptical and elongated preparation of osteotomy site leading to less implant torque value and potential absence of osseointegration. Moreover, drilling in narrow alveolar ridges may result in dehiscence which need bone grafting and more healing time in addition to reduced primary stability [3]. When enough bone is excavated by drilling, residual bone is outstretched to a limit of bone micro-damage (MDX) threshold, this remodeled bone unit (BMU) requires additional three months to rebuild the destructed area, thus nurturing bone bulk will fasten healing [4].

Also, the prerequisite for placing an implant in atrophied maxillary ridge is sinus augmentation. The sinus augmentation can be achieved directly by using Caldwell Luc operation or by indirectly elevating the Schneiderian membrane by sequential osteotomes from the alveolar crest. These procedures involve the major risk of perforation of Schneiderian membrane making implant placement complicated and sometimes, not possible on the same appointment.

Contrast to conventional bone drilling and sinus augmenting techniques, osseodensification neither removes bone tissue nor carry risk of perforation of membrane. Instead, it conserves bone bulk, hence at the same time bone tissue is compacted and autografted to create an osteotomy site. This is achieved by use of densifying burs. Densifying burs are used at high speed in reverse cutting direction with constant irrigation which will enable the implantologist to autograft the maxillary sinus and effectively expand any ridge in either of the jaw with better implant stability [5,6]. In this manner, osseodensification helps in achieving good mechanical stability which is the critical factor in determining the secondary biological stability [7,8].

The aim of the present case report is to portray successful maxillary width and ridge expansion with simultaneous implant placement in 16 and 17 region.

Case Report

The patient was a 64-year-old male presenting with missing tooth no. 6 and 7 in upper right back region of the jaw. Clinical and radiographic and evaluation reported a significant ridge width and bone height deficiency due to alveolar ridge resorption and maxillary sinus pneumatization. Dental history included extraction of teeth one year back due to dental caries. Treatment options with their potential risks and benefits were explained in detail to the patient. A final treatment plan was devised to utilize two implant placements followed by functional prosthesis. Consent was ob-

tained from patient for use of osseodensification site preparation for ridge width and height expansion with immediate implant placements (Figure 1).



Figure 1: Pre-Operative Orthopantomograph (OPG).

As it was evident from the Cone Beam Computed Tomography (CBCT) that bone width at the level of crest was not adequate in 16 region (4.8mm width 2mm below the crest X 10.9mm height) (Figure 2) and in 17 region, bone height was deficient (10.3mm width X 6.1mm height) (Figure 3,4). The upper right posterior area was locally anesthetized using lignocaine with 1:2,00,000 adrenaline. A full thickness flap was reflected using mid-crestal and crevicular incisions. The areas for osteotomies were defined i.e., apart from accommodating diameters of implants; 1.5 mm space was left on either side of implant and 3 mm of space was spared between the two implants. Ridge flattening was done in 16 region using ridge flattening bur of the Osstem Esset™ kit.

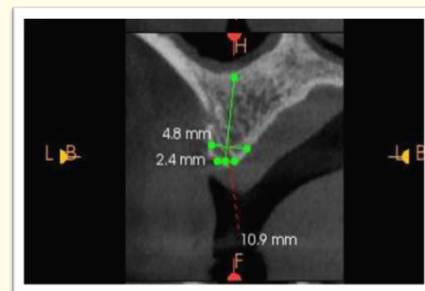


Figure 2: CBCT Measurements in 16 Region.

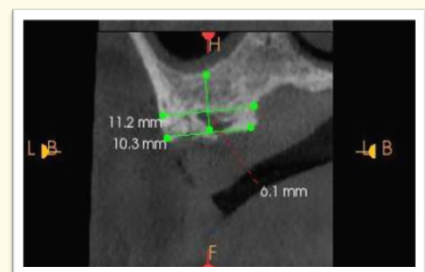


Figure 3: CBCT Measurements in 17 Region.

IMPLANT SITE ASSESSMENT: (measurements in mm)

Tooth No.	BONE WIDTH	BONE HEIGHT	SLICE NO.
16	2.4 mm (at the level of crest) 4.8 mm (2mm below the crest)	10.9 mm	5
17	10.3 mm (at the level of crest) 11.2 mm (2mm below the crest)	6.1 mm	6

Figure 4: CBCT Report.

Next, a lance drill was used of diameter 1.2 mm of Osstem™ implant kit; after which Versah™ burs (Figure 5) with 1200 rpm speed in an anticlockwise direction were used with 60% coolant. Sequential drilling with reversed torque was used.



Figure 5: Osseo-densification Versah™ Burs.

For 16, drilling was done sequentially starting from 2 mm, 2.3 mm, 3 mm, 3.3 mm, and finally 4 mm, (width) at 8 mm (length). Thus, desirable depth and width was achieved and implant of 4.2 x 8 mm of Norris™ was placed in 16 region. Primary stability of 35 Ncm was obtained.

For 17 region, sequential drilling was done using Versah™ burs with 2mm and 2.3mm width at 3mm length; 3mm width at 5mm height; 3.3 mm width at 8 mm height and finally 4mm width at 8mm length; all at 1200 rpm 60% coolant. Then, Versah™ bur of width 4mm and height 8mm was used with nova-bone putty bone graft (allograft) at 300 rpm and 0% coolant in order to condense the material at apical walls of the maxillary sinus (Figure 6). Then,

implant of 4.2 x 8 mm was placed. Cover screws were placed at both sites. Simple interrupted loop mersilk sutures were given with 3-0 black silk sutures. Between the steps, Radiovisuograph (RVG) of the area was shot to check for parallelism. Osseo-densification aided in maxillary ridge expansion and indirect maxillary sinus augmentation to form osteotomy sites without any buccal bone dehiscence and sinus perforation respectively in 16 and 17 regions; which facilitated simultaneous implant placement in maxillary bone.



Figure 6: Novabone Putty Cartridge.

Discussion

The most important basic requirement for implant placement is adequate bone width and height which gets compromised in edentulous maxilla because of pneumatization of maxillary sinus. To beat this limitation, various sinus lift procedures have been devised. The hypothesis backing these procedures is elevation of schneiderian membrane to enlarge bone height. But the main concern of these techniques was the risk of perforation of schneiderian membrane.

The Sinus lift procedures can broadly be classified as direct and indirect depending upon the crestal bone height. If the residual maxillary alveolar ridge height is 5mm or more but less than 6mm; then indirect sinus lift procedures are to be performed from the alveolar crest, known as Trans-alveolar or Crestal approach. In cases where residual bone height is less than 5mm, direct sinus lift by Caldwell luc operation is indicated [9]. After performing direct sinus lift; delayed implant placement is done following which they would receive implant prosthesis restored after 3 to 4 months of healing, needing total time of approximately 1 year. Moreover,

direct sinus lift is a technique sensitive procedure, higher risk of maxillary sinus perforation and has certain contraindications also.

Different surgical techniques have been employed to perform indirect sinus lift procedures like inflated catheter technique by Tatum 1974, which had limitations. Summers in 1994 tried to overcome them by his multiple sequential osteotome technique. Andreasi, *et al.* [10] introduced a newer technique which focuses on advancement of hydraulic pressure exercised on a semisolid graft material to detach the maxillary sinus membrane named Hydraulic Sinus Lift technique.

Osseo-densification seems to be the solution for the challenges of sinus augmentation procedures. With the newer development of implant surgery, most common and safest method of replacing the teeth is dental implants. But, to gain good osseo-intergration, there should be good quality and quantity of bone in proximity of implant [11-13].

Our case report showed good results, which were in accordance with the study conducted by Alhayati, *et al.* [14], where they proved that Densah™ burs were effective in sinus elevation with no membrane perforation, resulting in good primary implant stability.

Similarly, Rodda, *et al.* [15]. concluded that the Densah™ burs facilitated sinus lift procedure which is a good option for pneumatized sinuses with inadequate residual bone height.

But at the same time, this technique has certain limitations; that it cannot be used where alveolar ridge height is less than 4 mm and width is less than 4.5 to 5 mm and successful liability of method relies on many factors such as primary stability achieved, correct use of Versah™ burs, low membrane detachment force, elasticity and deformation capacity of alveolar bone and number of implant sites.

Author’s perspective in this case report is that osseo-densification not only raises height of osteotomy but it also expands lateral aspect of the site by not encroaching the significant neurovascular landmarks. Furthermore, this technique is also user-friendly, removing the fear of sinus perforation and facial plate dehiscence from surgeon’s mind, in turn increasing the confidence in the patient as well.

Conclusion

Osseo-densification is a very promising minimally invasive tool for crestal approach of sinus augmentation. This case report describes the benefits of using Osseo-densification burs (Versahe™) for sinus augmentation as well as alveolar ridge expansion with simultaneous implant placements in maxillary posterior region, which enhanced the function of aesthetics and mastication at six months follow up (Figures 7 and 8). However, researches with good sample size are required to assert its role in sinus augmentation procedures.



Figure 7: Post Operative Clinical View (6months).

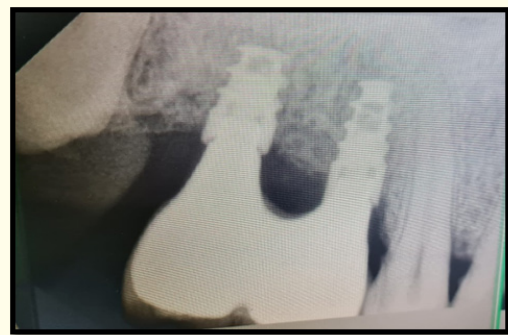


Figure 8: Post Operative RVG (6 months).

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Conflicts of Interest

There are no conflicts of interest.

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