



Placement of Implants Simultaneously With Direct Sinus Lift in Ridges With Minimum Remaining Bone: Lack of Association Between Residual Bone Height and Primary Implant Stability



Thomas T Nguyen, Resident+ Udatta Kher, Oral Surgeon++ Andreas L Ioannou, Resident+ Lanka Mahesh, Oral Surgeon* Georgios A Kotsakis, Resident+ James E Hinrichs, Professor and Director+
+Advanced Education Program in Periodontology, University of Minnesota, MN, ++Private Practice, Mumbai, India * Private Practice, New Delhi, India

Background

In case of minimum residual bone height, direct sinus augmentation is utilized prior to implant surgery to provide adequate ridge dimensions. Most clinicians consider 5mm of residual bone height to be the threshold for simultaneous sinus lift and implant placement.¹ In cases of ridges with minimum residual bone height a staged approach can be a lengthy procedure that increases treatment time until final restoration. The present clinical investigation was conducted to assess the potential benefit of utilizing a putty bone graft with a viscous consistency² to ascertain primary implant stability during simultaneous implant placement in ridges with minimum residual bone height.

Aim

The aim of this retrospective study was to evaluate the clinical outcomes following placement of implants simultaneously with lateral window sinus augmentation with a calcium phosphosilicate (CPS) putty bone substitute in ridges with minimum residual bone height.

Materials and Methods:

Seventeen healthy, adult patients with less than 5mm of vertical bone height in at least one posterior maxillary site, underwent sinus floor elevations according to a modification of the outfracture osteotomy technique.³ Neighboring sites that had greater than 5mm distance from the floor of the sinus were included in the analysis as a separate subgroup to evaluate the effect of residual bone height in primary implant stability.

Following elevation of the schneiderian membrane, the CPS putty bone substitute was delivered pre-mixed using a cartridge delivery system and was directly injected into the prepared sinus cavity.⁴ A total number of 30 implants (Internal Tapered, BioHorizons, Birmingham, AL, USA) were inserted in the severely resorbed ridges (<5mm) and their neighboring sites (≥5mm) and primary implant stability for each subgroup was recorded.

Primary stability was recorded as the maximum insertion torque (MIT) achieved using a torque wrench for the placement of the implant in its final position.² Two distinct torque values were used as reference points (20N/cm², 35N/cm²) and the MIT for each implant was recorded as greater, equal or lesser than the corresponding reference.²

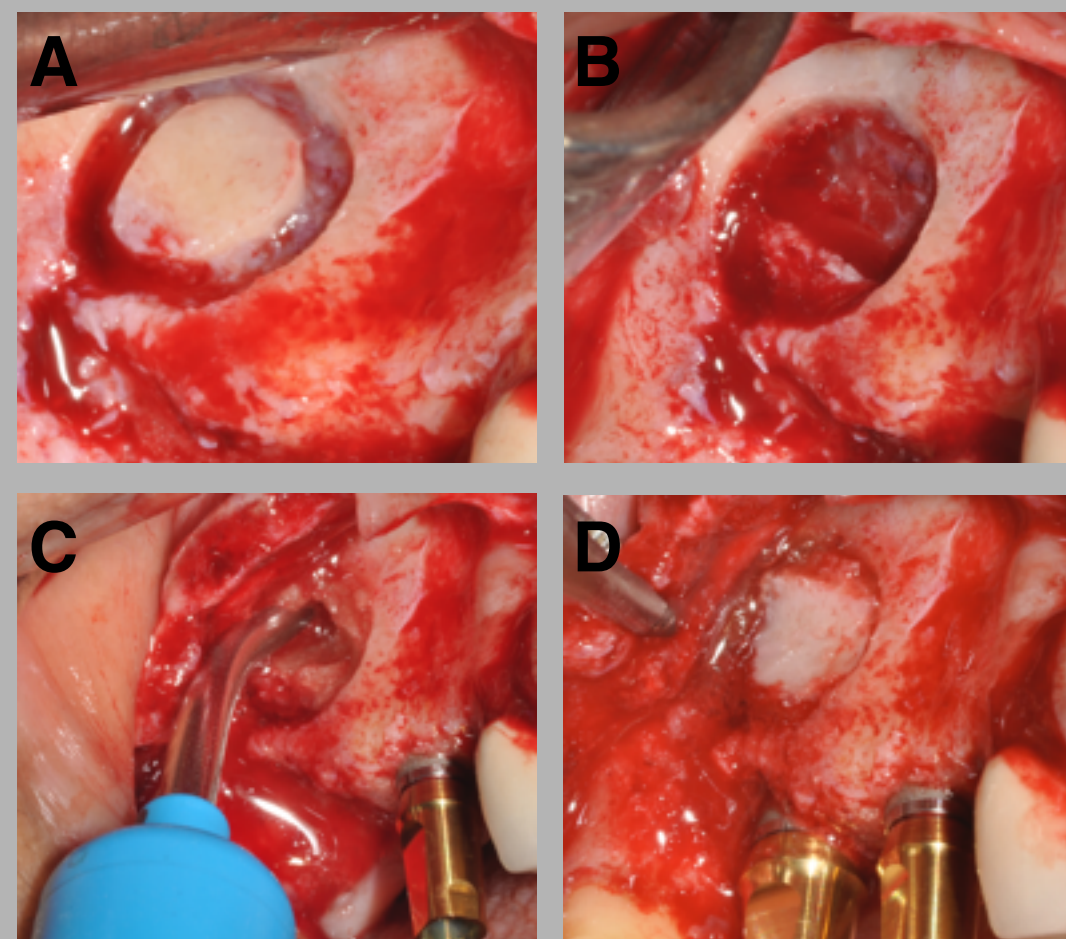


Figure 1:

A) Intra-operative view of the prepared bony window on the lateral wall of the sinus with the aid of a piezotome.
B) The outfractured bone wall was kept in saline throughout the procedure. Sinus curettes were utilized to perform careful elevation of the schneiderian membrane across the floor of the sinus.
C) The putty bone substitute was delivered into the sinus using a cartridge delivery system that simplified the grafting procedure. An implant in the second premolar position was placed in native bone and thus excluded from the analysis
D) An implant in the 1st molar position was placed in the augmented sinus. The outfractured window was replaced in the lateral wall of the sinus.

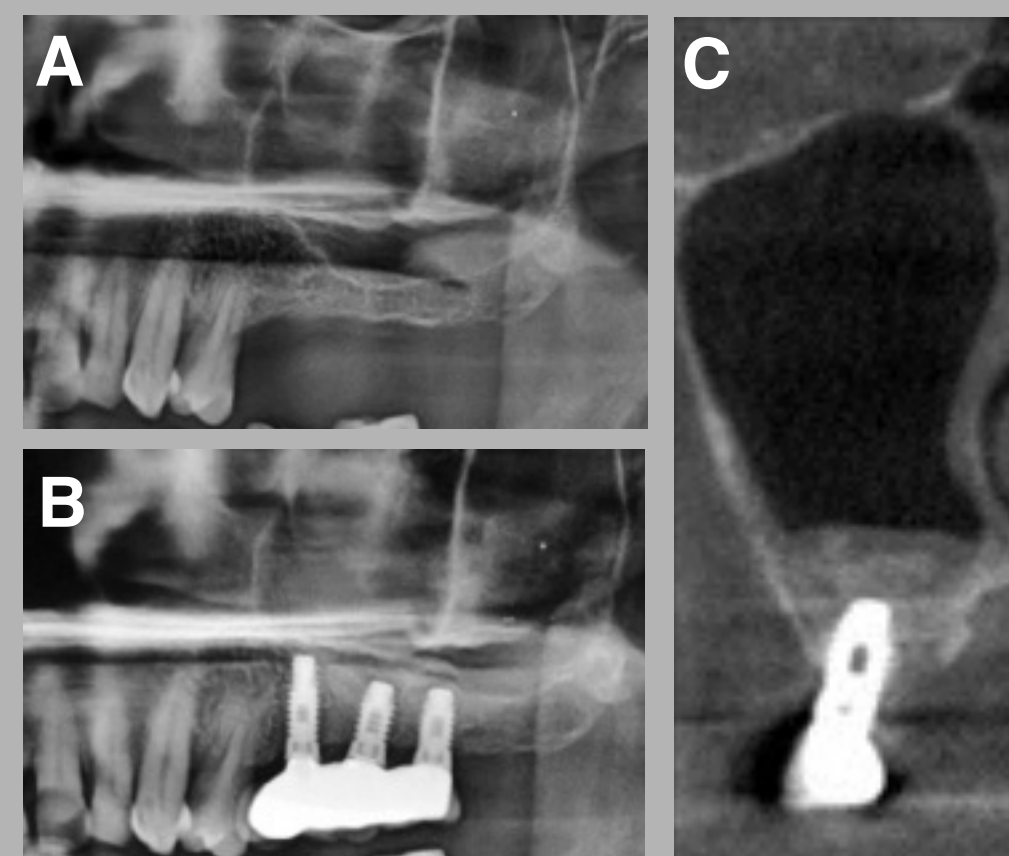


Figure 2:

A) Pre-operative panoramic radiograph showing left pneumatized maxillary sinus.
B) Post-operative panoramic radiograph showing left maxillary sinus 6 months after sinus elevation and implant placement surgery.
C) Post-operative CBCT 6 months after sinus elevation and implant surgery showing new bone formation up to the tip of the implant.

Results:

- No patients experienced any complications associated with the sinus surgery, or the implant placement. 0% sinus perforations
- The preoperative ridge height ranged from 3.32mm to 8.14mm with 61.29% of the sites exhibiting less than 5mm of native bone height.
- In all cases (100%) at least 20N/cm² of MIT were achieved.
- Logistic regression analysis failed to show that the initial bone height of the residual ridges was associated with the MIT achieved during implant placement (P >0.05).
- At the second stage appointment the mean vertical bone height was 13.32mm (±1.82mm) as seen on post-operative radiographs. All implants successfully osseointegrated (100% success). The difference between the initial vertical bone height and the bone height at the time of loading displayed a highly statistically significant difference (P<0.001)

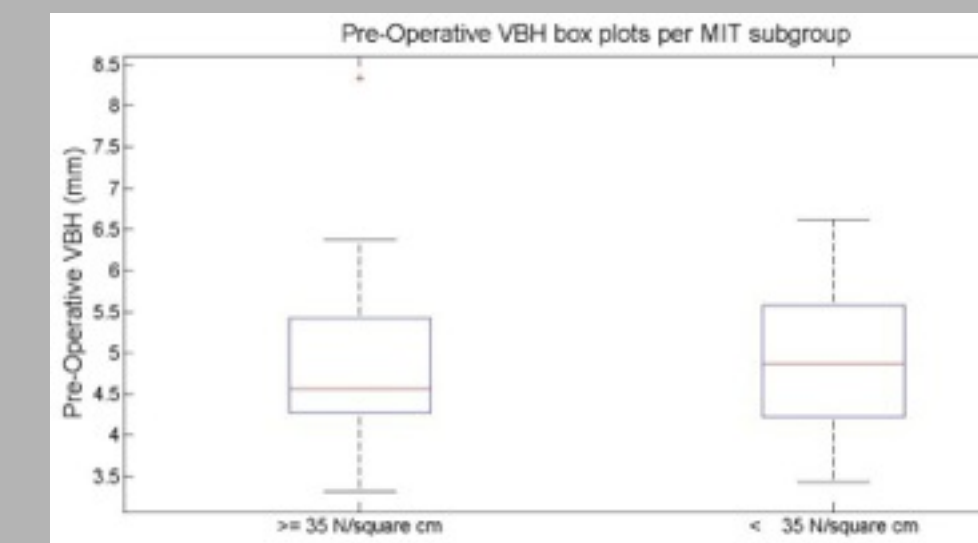


Figure 3:

Each box plot represents the median (red line) and the edges of the box are the 25th and 75th percentiles for the preoperative VBH measurements according to maximum insertion torque (MIT) achieved during implant placement. The left subgroup represents VBH values for implants achieving at least 35N/cm² of MIT (n=19) and the right subgroup for those achieving less than 35N/cm² (n=12). The whiskers extend to the most extreme data points not considered outliers, and outliers are plotted individually. Note how similar the distribution of pre-operative values is in both subgroups. Logistic regression failed to reveal any association between the two values (P>0.05).

Conclusion:

Within the limitations of this study we conclude that:

- The placement of implants simultaneously with direct maxillary sinus lift utilizing the proposed technique for adequate primary stability may be a viable treatment option in severely resorbed posterior maxillary sites.
- The diminished pre-operative vertical dimensions of the residual ridges did not seem to negatively influence the osseointegration of implants placed in this study.

References:

- Hürzeler MB, Kirsch A, Ackermann KL, Quiñones CR. Reconstruction of the severely resorbed maxilla with dental implants in the augmented maxillary sinus: a 5-year clinical investigation. Int J Oral Maxillofac Implants. 1996;11(4):466-75
- Kotsakis GA, Salama M, Chrepa V, Hinrichs J, Gaillard P. A randomized, blinded, controlled clinical study of particulate Anorganic Bovine Bone Mineral and Calcium Phosphosilicate Putty bone substitutes for alveolar ridge preservation. Int J Oral Maxillofac Implants. 2014 Jan-Feb;29(1):141-51
- Cho YS, Park HK, Park CJ. Bony window repositioning without using a barrier membrane in the lateral approach for maxillary sinus bone grafts: clinical and radiologic results at 6 months. Int J Oral Maxillofac Implants. 2012;27(1):211-7
- Mazor Z, Ioannou A, Venkataraman N, Kotsakis G. A Minimally Invasive Sinus Augmentation Technique using a novel bone graft delivery system. Int J Oral Implantol Clin Res 2013;4(2):78-82.