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Case Report

A conservative approach to maxillary sinus elevation and implant placement in posterior maxilla: A case report

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Abstract

Achieving primary implant stability is essential for successful osseointegration and long-term implant success. Stability at the time of placement is largely influenced by the quantity and quality of available bone. The posterior maxilla often presents challenges for implant placement due to factors such as sinus pneumatization and relatively low bone density, making it a less favorable site. This case report describes the treatment of a 45-year-old female patient with missing upper left second premolar and first molar. Radiographic assessment revealed sufficient bone in the premolar region, allowing for conventional implant placement. However, the molar region exhibited reduced bone height and D3 bone quality. To overcome these limitations and achieve adequate primary stability, osseodensification was performed using specially designed Densah burs™, which enhance bone density through a non-excavating, compaction-based drilling technique. A 4.0 × 8.5 mm implant was successfully placed in the molar area following indirect sinus lift via osseodensification, while a 3.5 × 10 mm implant was conventionally placed in the premolar site without sinus elevation. Healing was uneventful, at the end of 6 months follow-up, and final prosthetic rehabilitation was completed using screw-retained porcelain-fused-to-metal crowns. This case underscores the effectiveness of osseodensification in improving primary stability and expanding treatment options in anatomically challenging sites like the posterior maxilla.

Keywords: Sinus elevation, Maxillary implant, Densah bur, Indirect sinus lift

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1. Introduction

Dental implants have become the preferred treatment modality for replacing missing teeth, offering predictable long-term outcomes in terms of both function and aesthetics. Their ability to closely replicate the appearance and performance of natural dentition has positioned them as the gold standard in prosthetic rehabilitation, whether for single-tooth replacements or full-arch restorations.[1] A critical factor influencing the long-term success of dental implants is primary stability, which depends heavily on the mechanical engagement between the implant surface and the surrounding alveolar bone at the time of placement.[2] One of the most common anatomical challenges in implant dentistry is the lack of adequate bone volume in the posterior maxilla. This issue is often compounded by alveolar bone resorption following tooth extraction, as well as sinus pneumatization, which together lead to reduced vertical bone height and compromised bone density.[3] These limitations frequently require surgical intervention to reconstruct the site and establish conditions favorable for implant placement. Sinus augmentation procedures are routinely performed to address vertical bone deficiencies in the maxillary posterior region.[4] These can be carried out using either the lateral (direct) or transcrestal (indirect) approach. The lateral window technique provides direct access to the maxillary sinus but is more invasive and technique-sensitive.[5] In contrast, the transcrestal approach is less invasive, relying on gradual elevation of the sinus floor through the alveolar ridge using osteotomes or specialized tools. A significant advancement in the transcrestal approach is the development of the osseodensification technique, introduced by Huwais[6] in

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2013. This method utilizes specially designed Densah™ burs (Versah, LLC), which operate in a non-excavating, counter-clockwise motion to compact bone around the osteotomy site. The result is increased bone density and enhanced implant stability through autografting and plastic deformation of bone rather than removal.[7] This case report describes the successful rehabilitation of a patient with severe vertical bone loss in the posterior maxilla. A combination of lateral window sinus lift and implant site preparation using Densah burs was employed, resulting in improved bone quality and optimal primary stability for implant placement. The integration of both techniques highlights a practical and effective solution for managing complex anatomical scenarios in implant dentistry.

2. Case Report

A 45-year-old female patient reported to the Department of Periodontology at the Postgraduate Institute of Dental Sciences, Rohtak, with a primary concern of missing teeth in the upper left posterior region. These teeth had been extracted several months earlier due to extensive dental caries. The patient was medically fit and sought replacement of the missing teeth to restore proper function. Clinical and radiographic evaluations were conducted, including cone-beam computed tomography (CBCT) to assess the implant sites involving the second premolar and first molar (**Figure 1**, **Figure 2**). The CBCT scan revealed a residual bone height of approximately 6.5 mm in the first molar region (**Figure 3**), with bone density corresponding to D3 quality, as confirmed by Hounsfield Unit (HU) measurements averaging around 450 HU—consistent with type 3 bone. In contrast, the second premolar site had a residual bone height of 14 mm and a buccolingual width of 3.8 mm, which were deemed adequate for conventional implant placement without the need for bone augmentation. Additionally, a root stump artifact was observed in the second premolar region on CBCT, which was clinically confirmed as a retained root fragment, requiring careful surgical consideration. Based on these findings, a comprehensive treatment plan was formulated, including standard implant placement in the second premolar region and an indirect sinus lift combined with osseodensification in the first molar region due to the reduced vertical bone height.

2.1. Indirect sinus lift technique using Densah™ burs

After administering local anesthesia (2% lignocaine with 1:80,000 adrenaline), a mid-crestal incision was made, and a full-thickness mucoperiosteal flap was reflected to expose the alveolar ridge. In the premolar region, a conventional osteotomy was performed, and a 3.5 × 10 mm dental implant was placed using standard drilling protocols, given the sufficient bone volume. In the first molar region, where the maxillary sinus floor presented a vertical limitation, osteotomy was initiated using a 2.0 mm pilot drill. The drill was carefully positioned till approximately 1 mm below the sinus floor to reduce the risk of perforating the Schneiderian membrane. The osteotomy was then gradually enlarged using Densah™ burs in a counterclockwise (reverse-densifying) mode at 800–1000 rpm under continuous saline irrigation (**Figure 4**, **Figure 5**). A controlled, gentle pumping technique allowed the osteotomy to extend about 2 mm beyond the sinus floor without compromising membrane integrity. Final osseodensification was performed using the last Densah bur at a reduced speed of 150–200 rpm to achieve optimal bone compaction and enhance site stability. A 4.0 × 8.5 mm dental implant was placed into the prepared osteotomy, achieving primary stability with an insertion torque of approximately 35 Ncm, measured with a manual torque wrench in the absence of resonance frequency analysis (**Figure 6**, **Figure 7**). The flap was then repositioned and closed using 4-0 non-resorbable silk sutures in an interrupted pattern, ensuring secure, tension-free wound closure (**Figure 8**). The flap margins were not perfectly approximated postoperatively due to soft tissue tension and limited keratinized tissue, although tension-free closure was achieved to support optimal healing. Sutures were removed after seven days, and the healing period was uneventful, with no signs of dehiscence or infection. The patient was prescribed amoxicillin 500 mg three times daily and ibuprofen 400 mg twice daily for three days, along with standard postoperative care instructions regarding oral hygiene. A postoperative intraoral periapical radiograph (IOPA) confirmed successful sinus membrane elevation around 2mm without complications (**Figure 9**, **Figure 10**).

Figure 1: Pre-operative clinical view

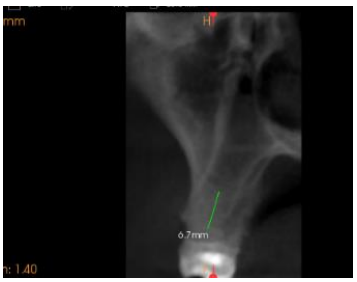

Figure 2: Available bone height assessment for tooth #26

After a six-month osseointegration period, second-stage surgery was performed, and healing abutments were placed. Final prosthetic rehabilitation was completed using screw-retained porcelain-fused-to-metal (PFM) crowns in the second premolar and first molar regions (**Figure 11**). The final treatment outcome was both functionally and esthetically satisfactory, successfully restoring the patient's posterior occlusion and masticatory efficiency. The use of an indirect sinus lift with osseodensification proved effective in

managing reduced vertical bone height in the molar region while preserving the integrity of the sinus membrane.

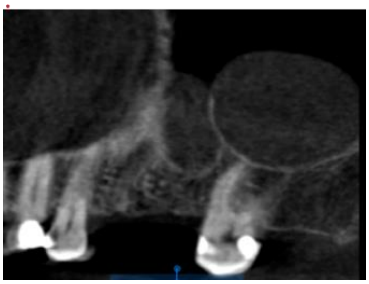

Figure 3: CBCT image of teeth #25 and #26

Figure 4: Use of Densah™ drill for indirect sinus lift

Figure 5: Full-thickness flap elevation and drilling completed

Figure 6: Post-implant placement radiograph

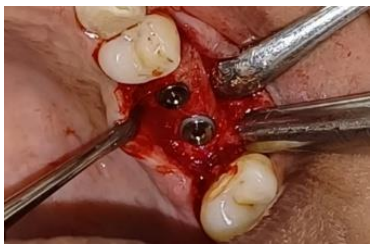

Figure 7: Clinical view after implant placement

Figure 8: Flap repositioning and suturing using interrupted sutures

Figure 9: Gingival former in place

Figure 10: Six-month post-operative radiograph

Figure 11: Final prosthetic restoration with screw-retained PFM crowns in the upper left second premolar and first molar regions.

3. Discussion

Maxillary posterior implant placement is often complicated by insufficient bone height and poor bone quality, both of which can compromise implant stability and long-term success. The crestal or indirect sinus lift technique, first described by Summers in 1994,[8] was developed to address limited vertical bone height, typically in the range of 5–6 mm, without requiring a lateral window approach. This method involves the use of osteotomes to compact the bone apically, allowing for gentle elevation of the Schneiderian membrane through the alveolar crest. While effective, the osteotome technique is associated with several drawbacks, including the risk of membrane perforation, postoperative sinusitis, implant migration, and benign paroxysmal positional vertigo (BPPV) due to malleting forces.[9] To overcome these limitations, the osseodensification technique using Densah™ burs (Versah, LLC) was introduced by Huwais in 2013.[10] This method represents a paradigm shift in implant site

preparation, as it compacts rather than removes bone. The unique design of the Densah burs—with their non-cutting, tapered tip and negative rake angle—enables controlled, counterclockwise drilling that densifies bone around the osteotomy site. This not only improves bone density and primary stability but also minimizes the risk of sinus membrane perforation.[11] In the current case, osseodensification was used in the maxillary first molar region where residual bone height was approximately 6.5 mm, borderline for implant placement without augmentation. The technique facilitated a crestal sinus elevation and simultaneous implant placement without grafting materials. The increased bone density achieved through this method provided adequate primary stability. In contrast, the second premolar region had a residual bone height of 14 mm, which allowed for standard implant placement using conventional drilling protocols. This selective use of techniques optimized both surgical efficiency and clinical outcomes. Multiple clinical and in vitro studies have validated the benefits of osseodensification. Trisi et al. demonstrated significantly greater insertion torque and bone-to-implant contact (BIC) in implants placed using this method compared to conventional drilling, especially in low-density bone.[12] In a biomechanical study by Lahens et al., implants placed with osseodensification showed improved mechanical properties and higher reverse torque values, indicating stronger osseointegration.[13] Furthermore, Galli et al. reported that osseodensification led to improved healing dynamics and increased peri-implant bone formation.[14] Alghamdi et al., in a systematic review and meta-analysis, concluded that osseodensification not only reduces the risk of sinus membrane perforation during transcrestal sinus lifts but also increases implant survival rates in augmented maxillary sites.[15] Additionally, Gandhi et al. observed that the technique may allow for simultaneous sinus lift and implant placement in cases with as little as 4–5 mm of residual bone height, further reducing the need for staged procedures.[16] An additional advantage of this method is the potential to avoid the use of graft materials in select cases. Traditional sinus augmentation often involves the placement of alloplastic, xenograft, or autogenous bone grafts, which introduce additional variables such as graft integration, resorption rates, and potential infection.[17] By enhancing the quality and volume of native bone through compaction, osseodensification can eliminate the need for these materials in many cases, streamlining the procedure and reducing patient morbidity. Overall, the osseodensification technique provides a minimally invasive, predictable alternative for managing limited bone height in the posterior maxilla. Its ability to improve bone density, reduce surgical complications, and support immediate implant placement makes it an invaluable tool in modern implantology. When applied appropriately, it enhances both clinical outcomes and patient satisfaction. However, due to a slight positional discrepancy in implant placement—attributed to the posterior location and irregular crestal bone height—one implant thread remains exposed, as visible in the postoperative image. The patient is under regular follow-up at three-month intervals to monitor the site closely and reinforce oral hygiene maintenance ensure long term peri-implant health.

4. Conclusion

Densah bur technique presents a notable advancement in sinus lift procedures, especially for patients with inadequate bone height in the molar region. By facilitating bone compaction and densification, it helps ensure implant stability while reducing or eliminating the need for bone grafts. This method lowers the risks associated with traditional sinus lifts, such as sinus membrane perforations and graft complications. Furthermore, the technique simplifies the treatment process by avoiding the need for a second surgery, thus minimizing overall treatment time. Overall, the Densah bur technique offers a safer, quicker, and more effective approach to sinus lift and implant placement, leading to improved outcomes and faster recovery for patients.

5. Conflict of Interest

None

6. Source of Funding

None

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