Case Report

SURGICAL TRANSPOSITION OF THE MANDIBULAR ALVEOLAR NERVE: A CASE REPORT

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ABSTRACT

Dental implant placement offers a predictable and long-term solution for tooth loss. However, severe bone resorption in the posterior mandible can pose a challenge due to the proximity of the inferior alveolar nerve. Surgical transposition of the mandibular alveolar nerve emerges as a viable technique to facilitate implant placement in such cases. This paper describes a case report of surgical transposition of the mandibular alveolar nerve, exploring the rationale, surgical technique, and outcomes for implant rehabilitation.

KEYWORDS: *alveolar bone atrophy, dental implants, nerve, injury, jaw surgery, paresthesia*

INTRODUCTION

Dental implants have become a cornerstone of modern dentistry, offering superior functionality and aesthetics compared to traditional dentures. However, anatomical limitations can make placing implants in the posterior mandible challenging. The inferior alveolar nerve, responsible for sensation in the lower lip, chin, and teeth, traverses the mandible within the mandibular canal. In cases of severe bone resorption, particularly following tooth loss and subsequent alveolar ridge atrophy, the available bone height above the mandibular alveolar nerve might be insufficient for safe and stable implant placement. Repositioning can be classified into nerve lateralization and surgical transposition of the inferior alveolar nerve (STIN). Nerve lateralization involves shifting the inferior laterally to the implant site posterior to the mental foramen without a corticectomy around the mental foramen or lateral movement of the mental nerve (1, 2). STIN results in slight posterior displacement of the mental nerve, which may lead to retraction of the incisive nerve.

Surgical transposition of the inferior alveolar nerve offers a solution by carefully repositioning the nerve within the mandible, creating space for implant placement (3,4). STIN can significantly improve implant-based rehabilitation's predictability and success rates in patients with compromised bone anatomy.

When the residual alveolar bone height above the inferior alveolar nerve is less than ideal (typically less than 3-4mm), placing implants poses a significant risk of nerve damage. Inferior alveolar nerve injury can lead to permanent numbness, paresthesia (tingling), and debilitating pain (5). STIN allows the surgeon to safely move the nerve course within the mandible, creating sufficient space for implant placement while ensuring nerve integrity (6, 7).

In STIN, the surgeon should gain access to the inferior alveolar nerve by creating a surgical flap in the edentulous area. A window is opened in the lateral cortical plate of the mandible until the mental foramen. The cortical bone is detached, removed carefully, and conserved in an isotonic solution to be allocated back in the window slot at the end of the surgery, ensuring protection of the inferior alveolar nerve. The nerve is carefully identified and dissected free from

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the alveolar canal. Studies have shown promising results with STIN for implant placement. Success rates exceeding 90% have been reported, with minimal long-term complications (8). However, potential risks should be considered.

Temporary numbness or tingling in the lip and chin is common after surgery, typically resolving within weeks or months. Although uncommon, permanent nerve injury is a potential risk associated with STIN. Bone resorption around the implant can impact long-term success (8). Here, a case report is reported, and pertinent literature is discussed.

CASE REPORT

The patient presented to our clinic complaining about his edentulism. He was 50 years old and was a light smoker. At the clinical evaluation, he had a far-advanced periodontal disease and bone defects following endo-perio failure (Fig. 1). The choice of STIN technique was made considering the geometry of the horizontal bone defect in the area: lack of the bone peak in the mesial side of the defect, would not have guided the vertical bone augmentation leading to failure of the regenerative process.
The preoperative work-up included an assessment of the inferior alveolar nerve using appropriate diagnostic records, such as a panoramic radiograph and computed tomography scan (Fig. 2).

Fig. 1. *Endo-oral photo showing partial mandibular edentulism in posterior right mandible.*

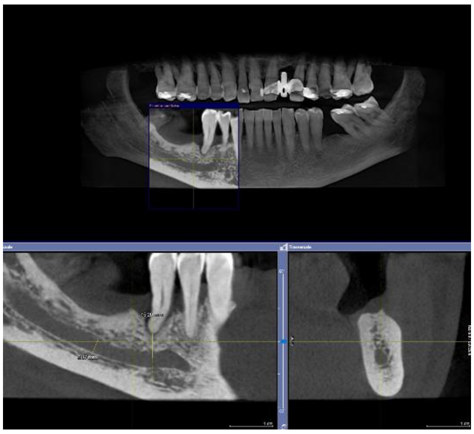


Fig. 2. *Panoramic radiograph and CT scan for the preoperative work-up*.

The risk of postoperative neurosensory disturbances following the inferior alveolar nerve repositioning was discussed during preoperative consultation with the patients.

Surgically, a crestal incision with anterior- and posterior-releasing incisions was made, and a labial mucoperiosteal flap was reflected, exposing the alveolar ridge and buccal cortex (Fig. 3). Then a cortical bone window located posterior to the mental foramen was performed via an osteotomy (Fig. 4).

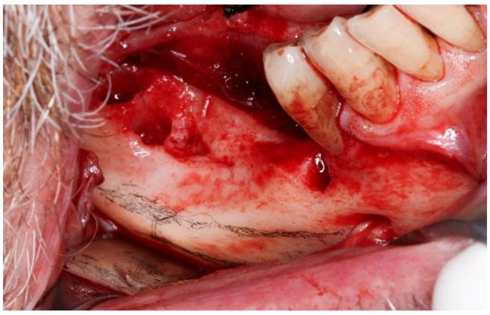


Fig. 3. *Crestal incision exposing the alveolar ridge and buccal cortex. Inferior alveolar canal is designed.*

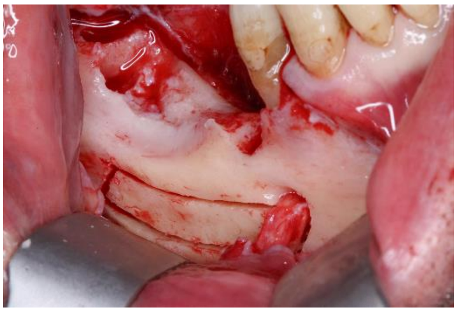


Fig. 4. *Osteotomy of a cortical bone window located posterior to the mental foramen.*

A bone block corresponding to the lateral wall of the mandibular canal was removed using a sonic tip under copious saline solution for irrigation (Fig. 5).

Fig. 5. *Cortical bone window removed.*

Autologous bone chips were collected using a scraper before removing the cortical lateral window bone block (Fig. 6, 7).

The area around the nerve was thoroughly irrigated so the nerve bundle could be seen. The neurovascular bundle inside the canal was freed using special curettes and was moved laterally. Then, implants were positioned beside the nerve, gently securing the nerve laterally with sutures (Fig. 8).

Fig. 6, 7. *Autologous bone collected by mean of a scraper and the quantity of collected bone.*

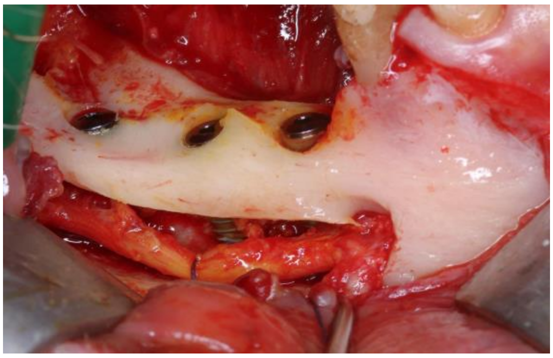
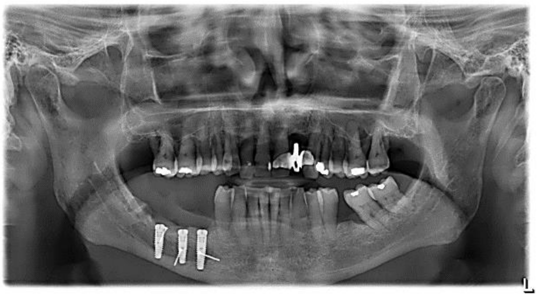


Fig. 8. *Implants positioned beside the inferior alveolar nerve.*

The implants were long enough to pass the cortical bone and engage the basal body below the canal to achieve sufficient primary stability (Fig. 9, 10).



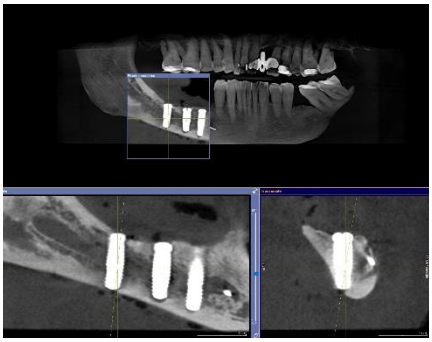


Fig. 9, 10. *Orthopantomography and TC-scan show implants engaging the basal body below the canal, achieving sufficient primary stability.*

Then, the implant surface was covered with previously collected autologous bone (Fig. 11), the nerve was repositioned, and the lateral cortical bone was repositioned and fixed with three mini-screws (Fig. 12).

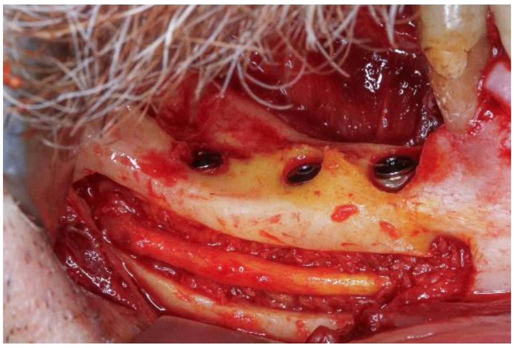


Fig. 11. *The neurovascular bundle repositioned inside the mandibular canal on a bed of autologous bone previously collected to cover implant surfaces.*

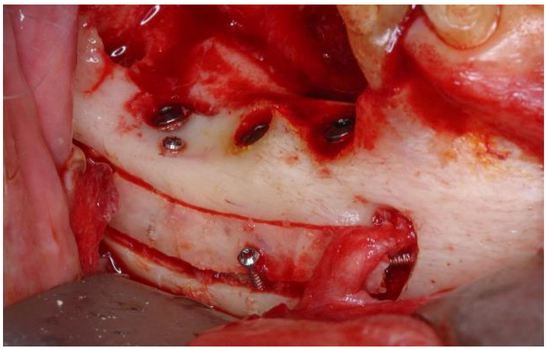


Fig. 12. *The cortical bone window is repositioned and fixed with mini screws.*

Finally, the area was sutured (Fig 13). Then, antibiotics and corticosteroids were prescribed because of the extensiveness and duration of surgery. Using corticosteroids pre- and post-operatively STIN helps diminish swelling and nerve compression.

The patient was discharged and had numbness for one month. Then, the alveolar nerve function completely recovers (Fig. 14).

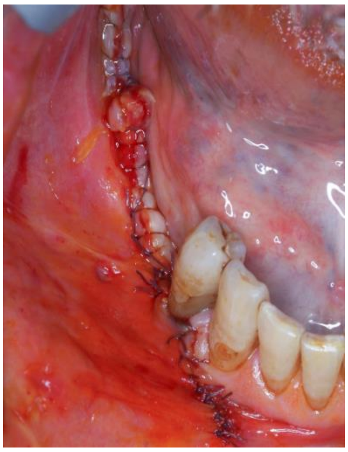


Fig. 13. *The sutured area.*

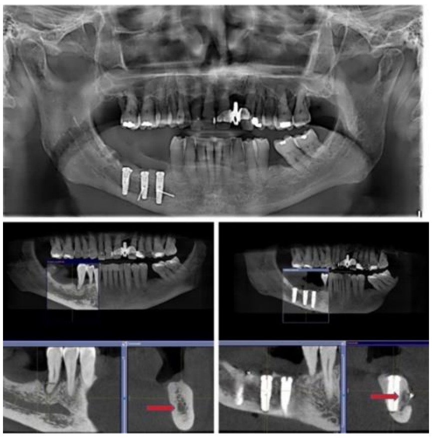


Fig. 14. *TC- scan pre and post-surgery comparison. The red arrow indicates the transposition of the nerve bundle. A shield of autogenous bone is protecting the medial side of nerve by the direct contact with the implant to avoid possible neuropathy.*

DISCUSSION

STIN is a technique that has been used for more than 20 years with good clinical results (9). STIN is a technique for expert oral surgeons and carries potential complications, with temporary inferior homolateral lip mumbles the most frequent. In combination with dental implant insertion, STIN offers advantages, such as increasing implant stability due to the bi-cortical insertion and a "controlled" risk of inferior alveolar nerve damage (10) due to a direct vision of the surgical field. This procedure can be used for implant placement in an edentulous atrophic posterior mandible with careful pre-operative surgical and prosthetic planning, imaging, and exact surgical technique (11).

Since it has some advantages, STIN has been used widely as an alternative to short implants or bone grafts for osteo-integrated implant placement in the posterior atrophic mandible. The bone graft technique requires extended healing due to the graft integration process. In contrast, short implants have less expected success in case of peri-implant infection and bone resorption.

STIN has not been popular because of the high risk of damaging the inferior alveolar nerve. Short implants, osteo-regeneration methods, and new prosthetic solutions using inter-foraminal implants have further reduced the use of STIN. However, there are cases in which this surgical procedure is essential to obtain good morphologic and functional jaw rebalancing.

CONCLUSIONS

STIN is a superior technique in decreasing the need for bone grafting with the immediate insertion of dental implants, thus reducing the overall treatment time, cost, and donor-site morbidity (12). Since the major risk of STIN is neurologic deficiencies of the inferior alveolar bundle and its terminal branches, it should be performed under a strict and meticulous protocol. When used in posterior severely atrophied mandibles, surgical transposition can permit the placement of implants with adequate length and good initial stabilization as used in routine sites, with the same favorable prognosis (13). In addition, STIN allows implants to be placed at a greater depth, enabling an appropriate emergence profile and the desired form of prosthesis.

Finally, implant placement eliminates the need for sequential surgical procedures, minimizing treatment duration and patient inconvenience compared with procedures such as bone grafting, which may require a more extended healing period. STIN is primarily performed to prevent inferior alveolar nerve injury in the posterior mandible in cases with inadequate bone height and anatomical and prosthetic constraints, hindering conventional bone grafting procedures. The reported case adds additional strength to using this technique in selected cases and with a very careful procedure.

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