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Early Implant Repositioning for Inferior Alveolar Nerve Paresthesia Following All-on-4 Rehabilitation in an Atrophic Mandible: A Case Report

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Abstract

Background: The All-on-4 concept has become a predictable treatment option for the rehabilitation of edentulous atrophic mandibles. Neurosensory complications, however, can occur with posterior tilted implants placed in proximity to the inferior alveolar nerve (IAN). Timely intervention and early diagnosis are important for optimal nerve recovery.

Case: A 58-year-old male patient with controlled diabetes mellitus and 6a completely edentulous atrophic mandible was rehabilitated with implants using the All-on-4 concept. Two anterior axial and two posterior tilted implants were inserted. Immediate postoperative paraesthesia of right lower lip was observed. CBCT showed the right posterior tilted implant (46) was close to the IAN canal.

Management: The implant was immediately repositioned under local anaesthesia within 24 hours. The implant was backed out and repositioned slight superiorly. Confirmatory CBCT showed clearance from canal. The patient received treatment with corticosteroids, pregabalin and strict glycaemic control. Follow-up showed progressive neurosensory recovery and retention of implant stability.

Conclusion: Prompt identification and early repositioning of implants causing IAN compression may

achieve favourable neurosensory recovery while maintaining implant stability. Prompt intervention and careful postoperative monitoring are required for patients with systemic comorbidities like diabetes.

Keywords: Anterior Adequacy, Inferior Alveolar Nerve, Oral Hypoglycemics, Rehabilitation.

Introduction

Rehabilitation of the severely atrophic edentulous mandible is still a clinical challenge in dentistry. The All-on-4 concept, by Paulo Maló, uses two anterior axial implants and two posterior tilted implants to make use of the anterior bone and avoid anatomical structures like the inferior alveolar nerve (IAN) and mental foramen.[1]

Tilted implants have advantages, but there is risk of proximity to IAN, especially in atrophic mandibles with reduced vertical bone height. Neurosensory disturbances following placement of an implant have been reported in 0.6–5% of cases and vary from transient to permanent anaesthesia.[2,3]

Early intervention is considered critical. Removal / repositioning of the implant within 24–48 hours has proven improved neurosensory outcomes than delayed management.[4]

Systemic conditions such as diabetes mellitus further complicate nerve healing due to microvascular compromise and impaired axonal regeneration. Therefore, early diagnosis and intervention become even more important in these patients[5]

This report details a case where early implant repositioning followed immediate postoperative inferior alveolar nerve (IAN) paresthesia during an All-on-4 procedure on an atrophic mandible. Here, quick action led to a good recovery of neurosensory function. The patient, a 58-year-old male, reported with complaints about chewing and an unstable lower denture, with a history of edentulism for 12 years. His medical history showed well-controlled type 2 diabetes (HbA1c at 6.8%) managed by oral hypoglycemics, but no signs or history of neuropathy.

Both arches were completely edentulous with severe ridge atrophy, reduced vestibular depth, intact neurosensory function, and CBCT showing limited posterior bone height, anterior adequacy, and canal proximity in posterior region.

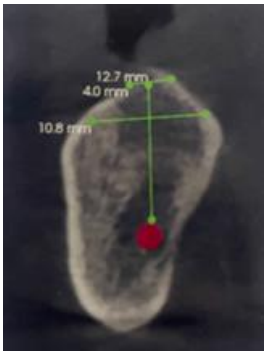

Figure 1: Preoperative CBCT - atrophic mandible and IAN canal position

All-on-4 rehabilitation planned with two anterior axial canine implants and two posterior tilted (~30°) implants, planned for delayed loading and avoiding grafting; primary stability was achieved and flap closure performed. Immediately postoperatively, the patient reported right lower lip numbness, tingling, and reduced pinprick sensation without motor deficit; an urgent CBCT was obtained, which showed implant apex abutting canal cortex without perforation, suggesting compressive neuropraxia. Within 24 hours, flap was reopened and implant was partially unscrewed, repositioned 1.5 mm superiorly, and retorqued to 25 Ncm with stability maintained.

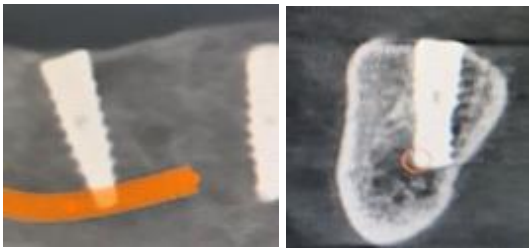

Figure 2: Postoperative CBCT: Close proximity of the right posterior tilted implant placed in the 46 region to the IAN canal.

Postoperative CBCT showed implant apex abutting canal cortex without perforation, suggesting compressive neuropraxia. Within 24 hours, implant repositioned 1.5 mm superiorly under local anesthesia; stability maintained and CBCT confirmed clearance. Postoperative dexamethasone 8 mg IV with tapering oral dose, pregabalin 75 mg BD, vitamin B complex, NSAIDs, and glycemic control were instituted.

Figure 3: CBCT after implant repositioning (clearance from IAN canal)

Neurosensory Evaluation

Neurosensory assessment performed using standardized tests.

Table 1: Neurosensory Evaluation

Time	Light touch	Pin prick	Two-point discrimination	Subjective symptoms
Immediate postop	Reduced	Reduced	>15 mm	Numbness
Day 1 post reposition	Reduced	Reduced	12 mm	Tingling
1 week	Improved	Improved	10 mm	Mild paresthesia
2 weeks	Near normal	Near normal	8 mm	Occasional tingling
4 weeks	Normal	Normal	6 mm	Resolved
3 months	Normal	Normal	5 mm	No deficit

The 3 and 6 months follow-up revealed no implant mobility or peri-implant bone loss; prosthetic loading was completed at six months with no recurrence of paresthesia.

Figure 4: Follow-up radiograph (rehabilitation with prothesis and stable implants after healing)

Discussion

IAN injury remains a significant complication associated with implant placement in severely atrophic mandibles, particularly when posterior tilted implants are used in the All-on-4 concept. The posterior tilt increases the anteroposterior spread but may place the implant apex closer to the inferior alveolar canal due to reduced vertical bone height and altered ridge anatomy. Although the All-on-4 approach minimizes grafting and avoids anatomical structures, neurosensory disturbances remain a reported complication, especially in resorbed mandibles.[1,2]

The reported neurosensory disturbances incidences5 following mandibular implant placement ranges between 0.6% and 5%, with higher risk in posterior mandible and tilted implant placement.[3] Renton et al. emphasized that immediate postoperative paresthesia should be considered a warning sign of potential IAN compression requiring urgent evaluation.[3]

Inferior alveolar nerve injury during implant placement may result from compression neuropraxia, direct mechanical trauma, intraneural hematoma, thermal injury during osteotomy, or ischemic insult.

Compression without canal violation usually causes neuropraxia with favorable prognosis, whereas direct trauma causing axonotmesis or neurotmesis has poorer outcomes and may require repair[5],[6]. Juodzbalys et al. classified implant-related IAN injuries as mechanical, thermal, or chemical, with mechanical compression being most reversible. [6] CBCT here showed superior canal cortical abutment without penetration, suggesting compression neuropraxia.

Management Strategies

Management of implant-related IAN injury depends on severity, proximity to canal, and onset of symptoms. Observation may be considered when the implant is positioned ≥2 mm from the canal, paresthesia is mild, and symptoms are non-progressive; however, recovery may be prolonged and incomplete, with delayed management potentially causing persistent dysesthesia and neuropathic pain. [3] Immediate implant removal is recommended in cases of canal penetration, severe anesthesia, or progressive neurosensory deficit. Khawaja and Renton demonstrated improved sensory recovery when implants impinging on the IAN were removed within 36 hours compared to delayed removal.[4] However, this approach sacrifices implant stability and prosthetic planning. Surgical nerve decompression is indicated in cases of persistent anesthesia, canal violation, intraneural hematoma, or delayed presentation. This involves cortical windowing and nerve decompression but is more invasive and associated with additional morbidity. [9]

Implant repositioning is a conservative approach that relieves nerve compression while preserving implant stability, particularly when the implant abuts the canal without perforation and adequate primary stability remains. Favorable neurosensory recovery is reported, following early repositioning in compression-type injuries, consistent with the present case.[8]

Early management is the most critical factor influencing nerve recovery, with intervention within 24–48 hours associated with improved outcomes[4,7]. Delayed treatment beyond 72 hours may result in persistent paresthesia, dysesthesia, hyperesthesia, and neuropathic pain. Early decompression prevents Wallerian degeneration and secondary neural fibrosis, improving recovery; similarly, intervention within 24 hours in the present case likely contributed to complete neurosensory recovery.[9]

Diabetes mellitus adversely affects peripheral nerve healing through microangiopathy, reduced endoneural blood flow, impaired axonal transport, delayed remyelination, and Schwann cell dysfunction. Ziccardi and Zuniga reported that diabetes negatively influences trigeminal nerve recovery and prolongs neurosensory deficits, making early decompression particularly important[5]. In the present case, strict glycemic control with early implant repositioning resulted in progressive neurosensory recovery despite this systemic risk factor.

Implant Stability After Repositioning

A concern following implant repositioning is loss of primary stability. Minimal repositioning (<2 mm) preserves the osteotomy walls and maintains bone compression. Additionally, implant threads may re-

engage surrounding cortical bone, allowing sufficient stability for osseointegration.[10]

Reduced insertion torque after repositioning is acceptable provided implant immobility is maintained. In the present case, the implant maintained stability and was successfully loaded without complications.

Conclusion

Posterior tilted implants in the All-on-4 concept may increase the risk of IAN compression in severely atrophic mandibles. Immediate postoperative neurosensory changes require CBCT evaluation. Early implant repositioning within 24–48 hours can relieve nerve compression, preserve implant stability, and result in favorable neurosensory recovery. Patients with diabetes require prompt intervention and monitoring to optimize nerve healing.

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