CME LIVE OPEN ACCESS

CME Journal of Clinical Case Report

Case Report ISSN: 3067-7998

Implant Placement with in the Nasopalatine Canal as A Rehabilitative Strategy for Severe Premaxillary Atrophy: A Clinical Case Report

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Received: 2025 Dec 18 **Accepted:** 2026 Jan 05 **Published:** 2026 Jan 20

Abstract

Background

Severe premaxillary atrophy poses a substantial challenge for implant-supported rehabilitation, often requiring invasive grafting procedures. Although traditionally considered a limiting anatomical structure, the nasopalatine canal (NPC) has emerged as a potential alternative site for implant placement in selected cases.

Case Presentation

A 71-year-old female presented with a failed maxillary full-arch prosthesis and severe anterior ridge resorption that precluded conventional implant placement. CBCT analysis revealed marked horizontal and vertical atrophy but a favorable NPC morphology, offering sufficient intra-canal osseous volume for implant insertion. Following careful curettage of the neurovascular contents and controlled osteotomy preparation under low-speed irrigation, a 5 × 8.5 mm implant was placed within the canal, achieving high primary stability. Soft-tissue healing was uneventful, and resonance frequency analysis at 3 months demonstrated adequate stability (ISQ 73). The implant was successfully integrated into a new full-arch prosthetic reconstruction supported by pre-existing posterior implants. At 6 months, clinical and radiographic evaluations confirmed stable peri-implant tissues, preserved crestal bone, and absence of neurosensory disturbances.

Discussion

This case illustrates that, in highly selected scenarios of severe premaxillary atrophy, the NPC can serve as a viable anatomic site for implant anchorage, potentially avoiding extensive augmentation. The approach aligns with minimally invasive treatment principles and may reduce morbidity and treatment duration.

Conclusion

Implant placement within the NPC may represent a feasible alternative in cases of pronounced anterior maxillary atrophy when conventional sites are inadequate. While short-term outcomes appear favorable, broader clinical adoption requires cautious case selection and further evidence from controlled studies.

Keywords: Nasopalatine Canal, Dental Implants, Severe Maxillary Atrophy, Full Arch Rehabilitation, Cone Beam Computed Tomography

1. Introduction

Dental implant therapy is a predictable treatment option with long-term success rates nearing 95% across diverse clinical scenarios.1 However, successful outcomes are highly dependent on adequate alveolar bone volume and morphology at the recipient site. Following tooth extraction, rapid alveolar bone resorption occurs, particularly in the anterior maxilla, where the buccal plate (composed predominantly of bundle bone) undergoes significant remodeling.

The nasopalatine canal (NPC), also known as the incisive canal, constitutes an important anatomical structure traversing the anterior maxilla. It houses the nasopalatine nerve and accompanying vascular branches, and its morphology is highly variable regarding length, width, and shape. In severely atrophic premaxillas, the canal may limit conventional implant placement or necessitate extensive regenerative procedures [1-5].

Historically, the NPC was considered a relative contraindication for implant placement due to its neurovascular content. However, increasing clinical evidence suggests that, when carefully planned and executed, implant placement within or partially engaging the canal can be feasible, yielding satisfactory osseointegration with low rates of neurosensory complications. This approach has been proposed as a minimally invasive alternative to more extensive augmentation techniques in selected cases of anterior maxillary atrophy. This case report documents the intentional placement of a dental implant within the nasopalatine canal as a reconstructive strategy to manage severe premaxillary atrophy in a patient requiring full-arch rehabilitation. It provides a detailed account of the anatomical rationale, surgical decision-making, operative protocol, prosthetic workflow, and clinical outcomes, highlighting the feasibility and translational relevance of this unconventional approach [6-9].

2.Case Presentation

This clinical case was conducted in full accordance with the ethical principles outlined in the Declaration of Helsinki and the institutional guidelines of the Universidad del Desarrollo. The patient received detailed information regarding the nature, purpose, and potential risks of the procedure and voluntarily signed the institution's informed consent form prior to treatment and publication of clinical data and images. A 71-year-old female with no significant systemic comorbidities presented seeking rehabilitation of an edentulous maxilla. The patient had previously undergone full-arch implant-supported restoration, however the anterior implant failed, while the two distal implants remained fully osseointegrated (ISQ 71 Ostell ®) and clinically stable. The primary objective was to restore a new full-arch maxillary prosthesis, requiring the placement of a single anterior implant to support the restoration. Clinical evaluation following removal of the failed prosthesis revealed marked atrophy of the anterior alveolar ridge, precluding conventional implant placement. The soft tissues appeared healthy, with no signs of inflammation or pathology.

Cone-beam computed tomography (CBCT) was performed to assess the residual bone architecture of the anterior maxilla. The scan revealed pronounced horizontal and vertical resorption of the premaxillary ridge, rendering conventional implant placement unfeasible. Detailed evaluation of the NPC demonstrated an apico-coronal height of 8 mm and transverse dimensions of 8 mm at the coronal level, 5 mm at the mid-canal, and 4 mm at the apical portion. This morphology suggested the presence of sufficient intra-canal osseous volume to consider implant insertion within the canal's boundaries. The previously placed distal implants exhibited stable peri-implant bone levels with no radiographic signs of pathology, confirming their suitability as part of the planned full-arch rehabilitation (Fig 1).

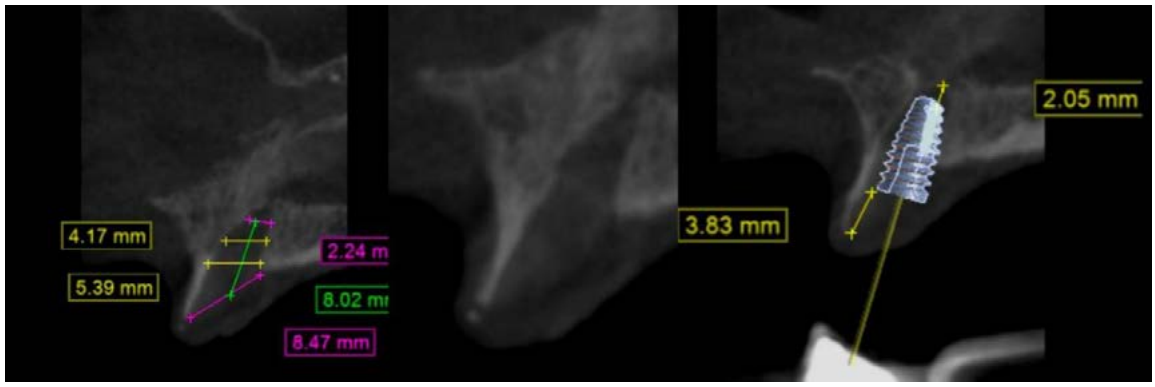

Figure 1: Preoperative CBCT Demonstrating the Dimensions of the NPC and the Three-Dimensional Implant Positioning Planned for the Anterior Maxilla

A full-thickness supracrestal mucoperiosteal flap was elevated, deliberately avoiding vertical releasing incisions to preserve vascular integrity and soft tissue continuity. The soft-tissue contents of the nasopalatine canal were carefully removed using manual curettes, followed by low-speed instrumentation with a round carbide bur at 200 rpm under abundant sterile saline irrigation to ensure complete elimination of the neurovascular bundle and secure controlled access for osteotomy preparation (Fig 2).

Implant site preparation was performed under continuous sterile saline irrigation, adhering to the manufacturer's drilling protocol for a S.I.N. EPIKUT CM® 5 × 8.5 mm implant. The implant was inserted with a primary stability exceeding 45 Ncm. Following placement, the flap was repositioned and secured using 4-0 nylon in a continuous mattress suture configuration, achieving a tension-free and well-adapted closure (Fig 3).

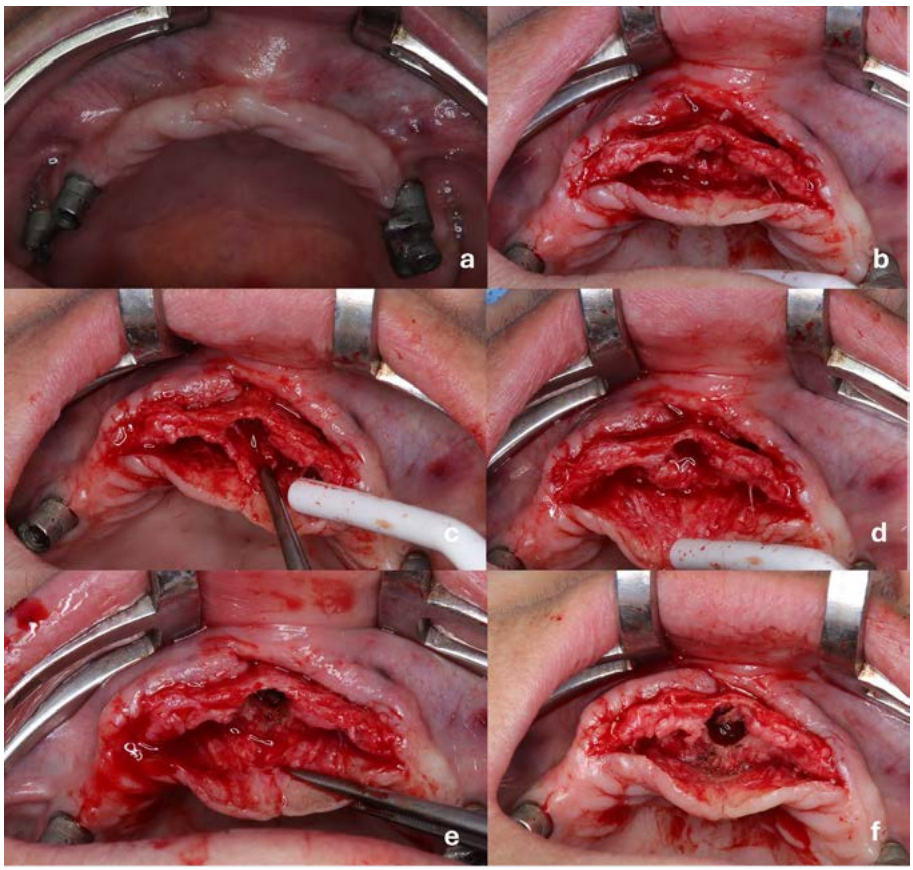

Figure 2: a) Initial Clinical Presentation. b) Full-Thickness Flap Elevation. c–f) Exposure of the Nasopalatine Canal and Careful Removal of its Neurovascular Soft-Tissue Contents to Enable Controlled Osteotomy Preparation

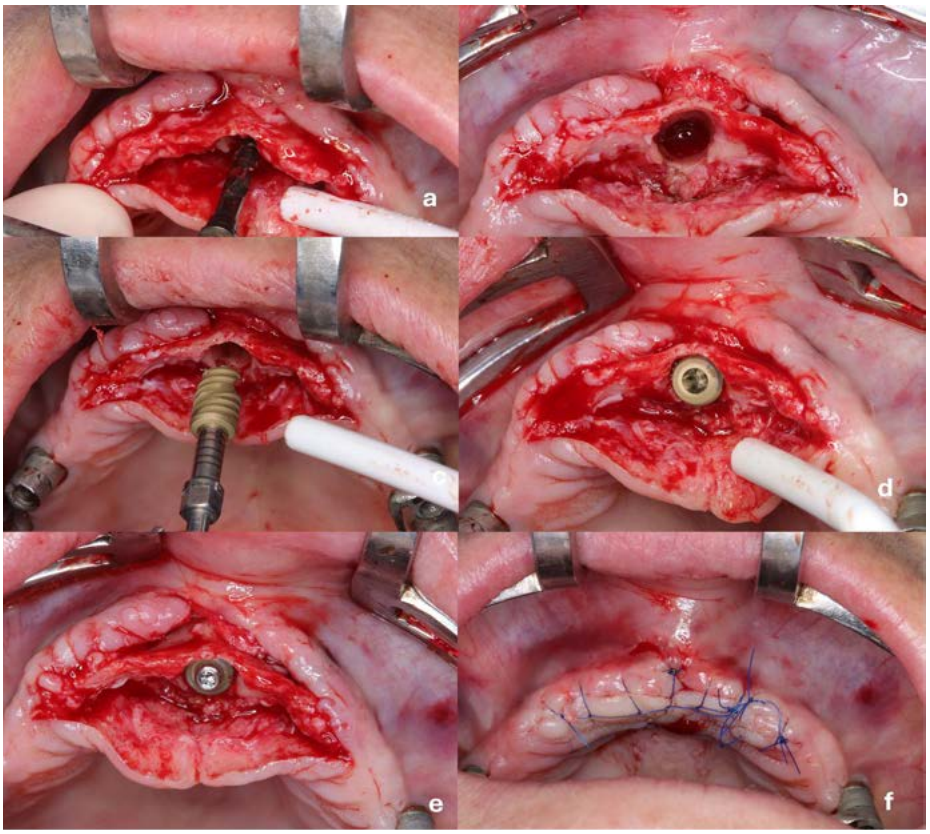

Figure 3: a–b) Osteotomy Preparation Following the Manufacturer's Protocol. c–e) Implant Placement Sequence. f) Flap Closure with 4-0 Nylon Sutures

At 3 months, soft-tissue healing was complete, allowing second-stage surgery and connection of healing abutments. Resonance frequency analysis (Osstell®) confirmed adequate implant stability, with an ISQ value of 73. Following an additional 3-week period of soft-tissue maturation, multi-unit abutments were selected according to peri-implant mucosal thickness and the planned prosthetic emergence profile. Definitive impressions and intermaxillary records were then obtained using a conventional splinted open-tray technique to ensure accurate transfer of implant positions (Fig 4). A new full-arch prosthesis was fabricated and delivered, integrating the newly placed anterior implant with the pre-existing, stable posterior fixtures. The patient reported high satisfaction with both esthetics and function, and no complications were observed during prosthetic delivery. At 6 months post-installation, periodic clinical and radiographic evaluations demonstrated stable peri-implant soft tissues, preservation of crestal bone levels surrounding the implant, and no evidence of neurosensory disturbance. The full-arch rehabilitation remained functionally stable and esthetically satisfactory, with no biological or mechanical complications detected during the follow-up interval (Fig 5).

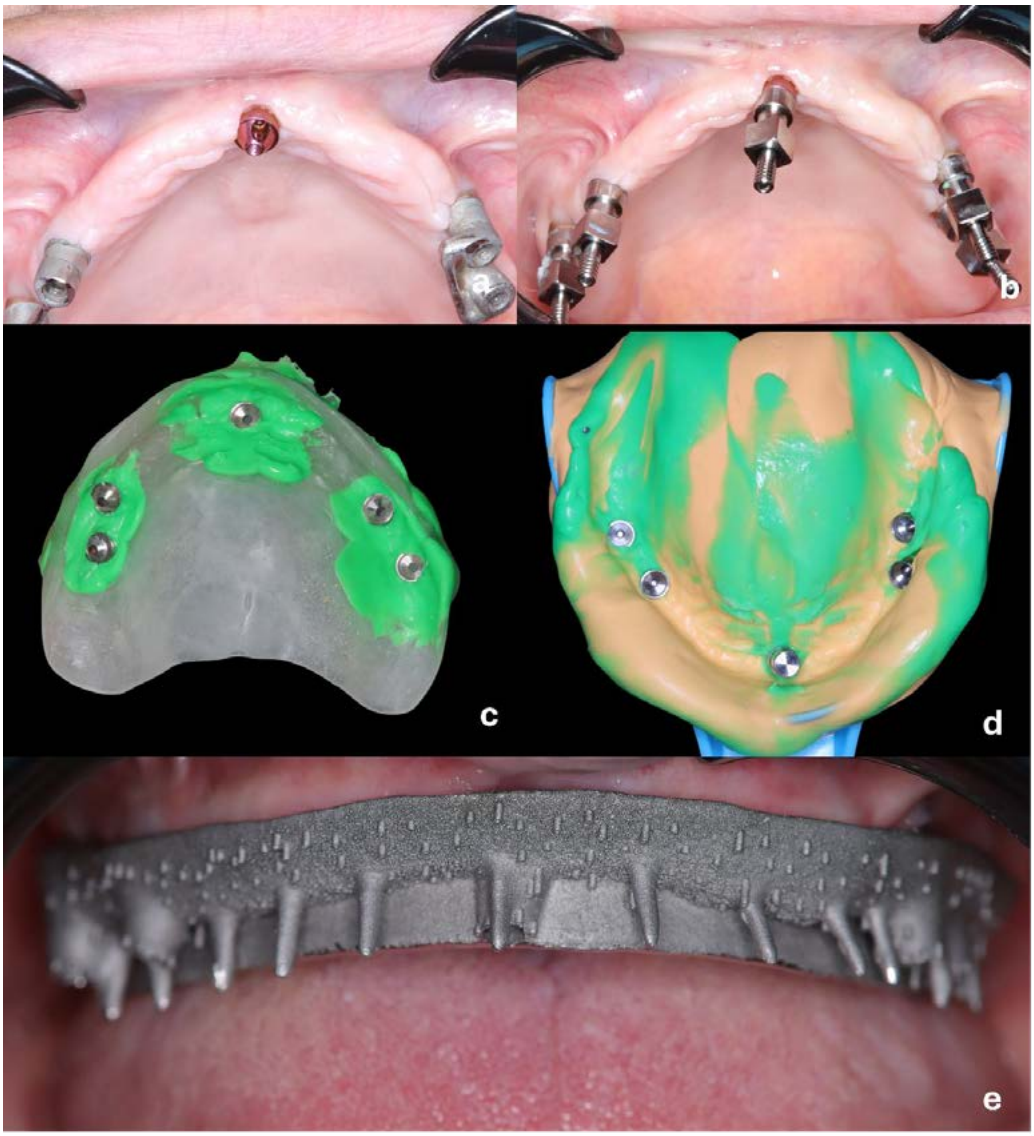

Figure 4: a) Three-Month Follow-Up Control. b) Placement of Open-Tray Impression Copings. c–d) Fabrication of a Dual-Function Custom Tray and Splinted-Coping Impression. e) Metal Framework Try-In

Citation: Cerpa, J., Diaz, A., Marinkovic, D., Collao, F., Miranda, C. (2026). Implant Placement with in the Nasopalatine Canal as A Rehabilitative Strategy for Severe Premaxillary Atrophy: A Clinical Case Report. *CME J Clin Case Rep, 3*(1), 1-7.

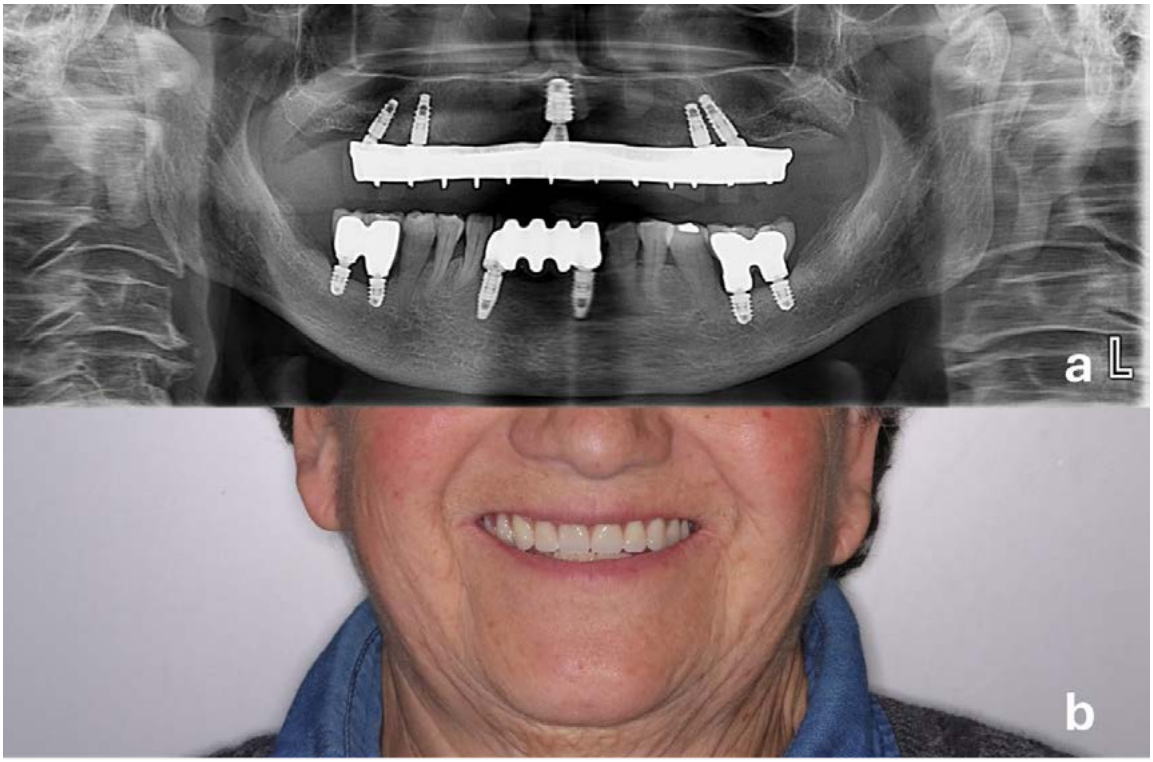

Figure 5: a) Panoramic Radiograph at Final Control Showing Appropriate Fit of the Prosthetic Structures b) Final Clinical Outcome

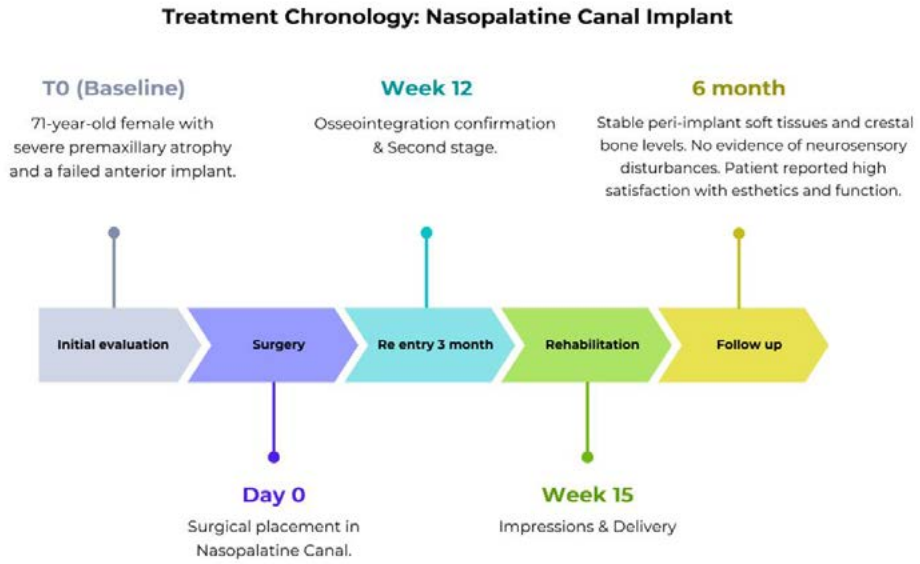

Figure 6: Detailed Chronology of the Intervention

3. Discussion

Severe premaxillary atrophy represents a persistent and clinically significant limitation in implant-supported rehabilitation, particularly in patients with long-standing edentulism, advanced ridge resorption, or previous reconstructive failure. Conventional surgical solutions, such as autogenous block grafting, guided bone regeneration, onlay grafts, or alternative implant trajectories, are effective but inherently associated with increased morbidity, extended treatment timelines, and potential postoperative complications.10,11 In this context, identifying stable anatomic niches that permit implant anchorage while minimizing surgical invasiveness remains a priority in contemporary implantology. Anatomical and radiological studies consistently demonstrate marked inter-individual variability in canal morphology, diameter, and trajectory. In a subset of patients, the canal exhibits a wide, cylindrical, or funnel-shaped configuration capable of providing sufficient bone volume for implant insertion. High-resolution CBCT assessment is indispensable, as it enables three-dimensional evaluation of canal morphology, cortical integrity, and spatial relationships, thereby supporting a more predictable indication framework [10-13].

In the present case, the NPC exhibited a favorable configuration that allowed the placement of a standard-diameter implant with high primary stability, confirming that canal-driven implant anchorage can be a feasible alternative when conventional bone availability is compromised. The controlled displacement or curettage of the nasopalatine neurovascular bundle, performed under meticulous surgical technique, minimizes the likelihood of sensory disturbances, events that the literature consistently describes as infrequent and predominantly transient.14 The absence of neurosensory complications in this case supports previous findings suggesting that morbidity associated with NPC manipulation may be lower than historically assumed. From a rehabilitative standpoint, the integration of the NPC implant with existing posterior fixtures enabled a stable, full-arch reconstruction without the need for adjunctive grafting. This treatment pathway aligns with minimally invasive and cost-efficient paradigms, which are particularly relevant for older adults, medically complex patients, or individuals who prioritize reduced surgical burden. In such scenarios, leveraging anatomic spaces previously considered non-viable may expand the therapeutic armamentarium while maintaining predictable functional outcomes [14,15].

However, several limitations warrant consideration. First, the anatomical heterogeneity of the NPC inherently restricts broad generalization, only a subset of patients will present with canal dimensions compatible with implant placement. Second, the current body of evidence remain limited, with scarce long-term data regarding survival rates, peri-implant remodeling patterns, and the biological response of tissues previously housing neural structures. Additionally, the technique demands advanced imaging interpretation and surgical expertise, representing a potential barrier to widespread adoption [16].

Severe premaxillary atrophy is traditionally managed with autogenous block grafts, which provide reliable reconstruction but require a donor site, increase morbidity and extend treatment duration. Guided bone regeneration offers a less invasive alternative, although its ability to achieve vertical augmentation is limited and highly dependent on defect morphology and membrane stability. These constraints explain the variability reported for anterior maxillary defects [17].

Onlay and interpositional grafts can recover substantial ridge height, yet their multi-stage nature and inconsistent long term performance remain important limitations. Angled implant placement toward the palate or nasal floor may circumvent areas of insufficient bone, but these trajectories do not always provide ideal support for full arch prostheses. Zygomatic and pterygoid implants avoid grafting altogether, although their indications predominantly address extensive posterior atrophy and require advanced surgical training. Within this context, minimally invasive alternatives are increasingly valued for reducing morbidity, provided that adequate native bone remains. In the present case, the nasopalatine canal offered a naturally contained anatomic space that allowed implant placement without major augmentation. The primary stability and uneventful osseointegration observed support the notion that the canal can serve as a valid adjunctive site when premaxillary resorption precludes conventional implant positioning [18].

4. Conclusion

This case suggests that, in carefully selected situations of severe premaxillary atrophy, the nasopalatine canal may represent a potential alternative site for implant placement. The favorable short-term outcome observed here is encouraging but cannot be generalized, as single-case experiences inherently limit broader clinical inferences. Important considerations include the absence of long-term follow-up, the anatomical variability of the canal, and the technical demands associated with its surgical management. Therefore, the use of this approach should remain cautious and individualized, and further studies with larger samples and extended observation periods are needed to better clarify its indications, predictability, and potential risks.

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