Interdisciplinary Approach to Alleviate Severe Pain and Fabricate Complete Denture in a Patient with Severely Atrophic Mandible: A Case Report

Marcel Hertanto[1], Sean Edwards DDS MD FACS FRCD (C)[2], Berna Saglik DDS, MS, FACP[3], and Fei Liu, DDS, MS, PhD FACP[3]

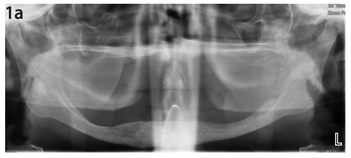
(1) Resident, Department Biologic Material Sciences and Prosthodontics, University of Michigan. (2) Chief of Paediatric Craniofacial Surgery and Associate Chair of OMFS /Hospital Dentistry. (3) Faculty, Department Biologic Material Sciences and Prosthodontics, University of Michigan.

Introduction

Edentulism and aging have well-documented negative effects on mandibular ridge height, residual body height, and cortical thickness. Severe atrophic changes often result in Inferior Alveolar Nerve (IAN) being at the same level as alveolar ridge, causing intense pain due to nerve impingement during denture use. This report describes an interdisciplinary approach between Oral and Maxillofacial Surgery and Prosthodontics to effectively address these challenges in a severely atrophic mandible ACP PDI Class IV.

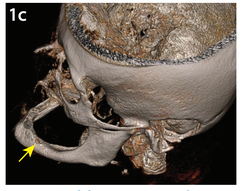
Case Detail

A 79 yo Caucasian female presented with severe pain during swallowing and not able to wear her complete dentures for the last few years. She sought complete denture fabrication at Graduate Prosthodontics Clinic, University of Michigan. Having used complete dentures since nineteen, the CBCT showed severely resorbed mandible (Fig 1a,b,c. Preoperative diagnostics). The resorption leads to the proximity of the left IAN to denture bearing area. This posed difficulties even at the impression-making step. Referral to an Oral Maxillofacial Surgeon led to IAN lateralization (IANL) through creating a broad external oblique ridge notch, accommodating the nerve's lateral position (Fig 2a,b,c. Operative & Postoperative stage). Cancellous allograft with BMP2 was applied for wound coverage. Subsequent healing enabled fabrication of a complete denture with lab soft liner Permasoft (plasticized acrylic resin) facilitating patient comfort and function (Fig 3a,b,c. Delivery photos).



Panoramic :
Severely resorbed mandible

CT axial view :
IAN on top of the ridge



CT oblique : mentalis
foramen on top of the ridge

Discussion

Inferior Alveolar Nerve Lateralization (IANL)

Definition

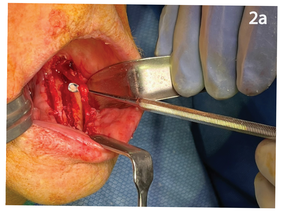
- IANL is a lateral reflection of the IAN without incisive nerve traction[1].
- Alling in 1977 elaborated the first IANL to ease neurosensory disturbance from denture pressure on mental nerve[1,2]. Despite no implant placement, the procedure substantially enhanced the patient's quality of life and permitted continuity of denture wearer[2].

Surgical Procedure

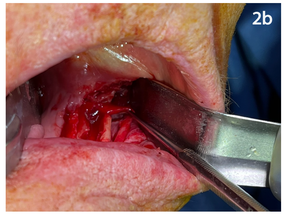
- Preparing the cortical window posterior to mental foramen using round bur and copious irrigation or piezosurgery.
- Meticulous bone removal in vicinity with the neurovascular bundle using curettes parallel of the nerve in anterior-posterior fashion.
- The nerve hook moves the IAN laterally. A 10 mm wide gauze or elastic band is placed underneath the nerve to retract it from surgical site as well as reducing the risk of ischemic trauma and damage to IAN.
- Finally, mucoperiosteal flap suturing completed the surgical procedure without interference with incisive nerve[1].

Materials

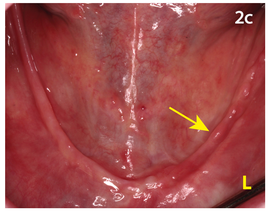
- There are 2 different materials discussed to protect the nerve bundle : membrane & bone graft.
- Similar to this case, Barbu et al suggested utilizing bone grafting surrounding the nerve to substitute the bone block that was remove during access gaining to mandibular canal.
- The allograft material is argued due to high resorption rate that may compromise long term implant survival[2]. Abayev and Juodzbalys corroborated the application of bone over membrane However the authors indicated using combination of allograft and xenograft[1].



The IAN is secured with a nerve hook



The IAN is moved laterally away
from denture bearing area



Postsurgical photograph :
severely resorbed ridge

Advantages and Disadvantages

- The procedure mainly benefits patients that desire implant restoration : longer implants, greater primary stability, allow immediate implant placement and loading, & greater resistance to occlusal forces. Aside from implant therapy, IANL can accomplish restoring the appropriate vertical dimension, occlusal stability, chewing efficiency, avert tissue atrophy, & masticatory muscle balance[1].
- In contrast, IANL carries several complications : unfavorable alveolar ridge, neurosensory disturbance (hypoesthesia, transient paresthesia & anesthesia) or mandibular fracture[1,2].

Soft Reline

- Soft reline is flexible lining layer that is universally used to decrease localized pressure, facilitate equal force distribution, improve denture retention in engaging undercuts, alleviating pain, facilitates adaptation to new dentures & reduce correction time[3-6]. Benefits complete denture wearers with improve retention, providing balance occlusion & equal distribution of occlusal force[4].
- Hardening of the material, bonding failure, abrasion resistance, and fouling by Candida albicans are the main complications of the soft liners[6].

Hardness

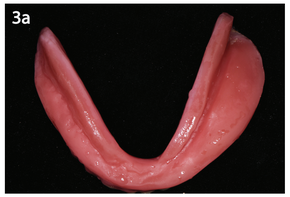
- Hardening is a major failure of a soft liner[6]. In general, acrylate showed greater initial hardness and less stable than silicone overtime[4].
- Kiat Amnuay et al invitro study revealed that Permasoft was the softest of 5 material tested and hardened significantly between 115 and 347 days notably in no sealer or multiple layers of sealer ($p<0.005$).
- Bujak et al[4] and Riberiro Pinto et al[7] pointed out leaching of plasticizer (ethyl alcohol / ethylacetate) from acrylic resin material accounts for hardening in clinical use.

Tensile bone strength and Permanent Deformation

- A reliable bond between denture base and soft liner is essential to prevent bacterial growth in the interface, allow better cleaning, and comfort to the patient[7,8].
- Ribeiro Pinto et al reported PermaSoft satisfactorily bonding to polymerized PMMA denture base and acceptable for clinical use. The tensile test showed termal cycling significantly affected the bond strength of PermaSoft to PMMA denture base resin after 4000 cycles (4 years) and causing permanent deformation after 1500 cycles ($P<.05$).

Candida

- Denture stomatitis is reported to affect 11% to 67% of complete denture wearers. Triclosan has been utilized in oral application (mouth wash and dentrifices) and reported to promote antimicrobial effect towards gram-positive and gram-negative bacteria, molds, and fungi.
- Lefebvre et al indicated that C albicans was not found on the internal aspect of PermaSoft. Triclosan neither alters the cytotoxicity of Permasoft nor significantly decreases the adherence of C albicans on a smooth surface of PermaSoft denture lining. The smooth surface and sealer contribute to no Candida adherence in the early usage of Permasoft[9].



Soft reline of lower denture

Final denture occlusion

Post-treatment photo

Conclusion

The IAN lateralization with bone grafting and soft-liner utilization effectively mitigates the pain associated with the proximity of IAN to denture bearing area. This report showcases exemplary interdisciplinary collaboration between Oral Surgeon and Prosthodontist, yielding optimal treatment outcomes for patients with profoundly atrophic mandibles.

References

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