Evolution of Implant Lateral to Inferior Alveolar Nerve

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INTRODUCTION

Currently, there are several techniques being used in the posterior mandible to increase alveolar bone height and width. However, each of these has potential complications and limitations. The purpose of the current study is to present the surgical technique and restorative considerations for implant placement lateral to the inferior alveolar nerve (IAN) combined with custom alveolar ridge splitting (CARS) technique in severely atrophic posterior mandible.
In the current study, 9 implants in 6 patients were successfully placed with lateral to IAN in conjunction with CARS technique and restored with splinted screw-retained prostheses with a follow-up time after loading ranging from 3 months to 4 years.
Patients with severely atrophic edentulous posterior mandibles with teeth missing for greater than 3-6 months, who desire fixed prostheses, present a challenge for successful implant placement. In these cases, vertical and horizontal bone is often deficient, and subsequently, there is a need for alveolar ridge augmentation procedures to achieve sufficient bone volume prior to dental implant placement. These augmentation procedures include the use of bone and bone substitute grafts (autografts, allografts, xenografts or alloplastic graft materials), guided bone regeneration (GBR) techniques with the use of bone graft and barrier membranes, the use of biologics (Emdogain, Platelet-rich plasma (PRP), Platelet-derived growth factor (PDGF) and bone morphogenic protein (BMP)), onlay/inlay grafting, the alveolar ridge splitting/expansion technique, and distraction osteogenesis. An additional treatment option for implant placement in these areas includes the transposition/lateralization of the IAN. However, this is a very complex technique that carries a high risk and potential complications.

An alternative treatment option is to place an implant lateral to the inferior alveolar nerve. Presently, there are few studies regarding this treatment option. The advantages of this technique include less trauma, less surgical time, less postoperative complications and shortened total treatment time. The limitations of the present technique is technique sensitivity; an adequate thickness of the ridge is needed lateral to the inferior alveolar nerve prior to implant placement, and there is a risk of paresthesia. In the case of limited bone width, horizontal augmentation techniques (CARS technique and GBR) were used in this case series to increase bone volume lateral to the IAN. With precision in robotic technology, implant placement lateral to IAN could be executed with less complication. Recently, YOMI robots has facilitated quick and precise placement without post operative paresthesia in lateral to IAN cases. More researches are needed to validate the results found in the current study and to compare the implant placement lateral to IAN procedure to other technique being used today.

CASE REPORT

Patients with severely atrophic edentulous posterior mandibles with teeth missing for greater than 3-6 months and desire dental implants to replace those teeth often present as a challenge for successful implant placement. This is because vertical and horizontal bone is often deficient. As a result, there is usually a need for alveolar ridge augmentation procedures to achieve adequate bone volume prior to dental implant placement. These augmentation procedures include the use of bone and bone substitute grafts (autografts, allografts, xenografts or alloplast), GBR, biologics (Emdogain, platelet-rich plasma (PRP), platelet-derived growth factor (PDGF) and bone morphogenic protein (BMP)), onlay/inlay grafting, the alveolar ridge splitting/expansion technique, and DO. An additional treatment option for implant placement in these areas includes the transposition/lateralization of the IAN. However, this is a very complex technique that carries a high risk and potential complications (18,19).

An alternative treatment option is to place an implant lateral to the inferior alveolar nerve, which may avoid the necessity of alveolar ridge augmentation. Presently, there are limited studies regarding this alternative treatment option for the severely atrophic posterior mandible. Additionally, this option may require prior or concomitant bone augmentation procedures to enable the placement of implant lateral to the IAN. Lateral placement of implant to the IAN is viable in cases of atrophic posterior edentulous mandibles (20-21). The advantages of this technique include less trauma, less surgical time, less need for alveolar ridge augmentation and less postoperative complications. The limitations of the present technique include operator skills, adequate lateral thickness of the alveolar ridge and risk of paresthesia. Where limited bone width existed, horizontal augmentation techniques (CARS and GBR) were used in this case series to increase bone volume lateral to the IAN.

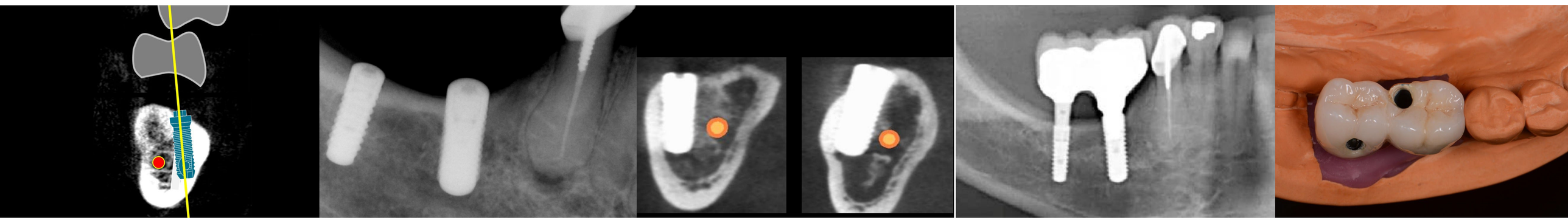
Greatest challenge of placing dental implant in deficient posterior mandible is the inferior alveolar nerve. In addition, mental foramen is also an anatomic structure that needs to be considered. As a result, careful flap management is necessary to prevent trauma to the mental foramen. CARS can be combined with ILIAN (implant lateral to inferior alveolar nerve technique) in order to prevent damage to IAN. Therefore, the trephine angulation is especially critical in this region.

Labial bone contour is often very protrusive in the posterior mandible (Fig. 8). This protrusion prevents trephine to be made in a coronal-apical direction. Therefore, labial bone contouring should be performed in order to allow the trephine to be made lateral to the IAN in order that dental implants can avoid IAN. In the scenario where labial bone contouring is not indicated, trephine from the lingual direction is viable, but such angulation is not ideal for prosthetic restoration. If multiple dental implants are treatment planned, they can be placed individually at different times in order to verify numbness.

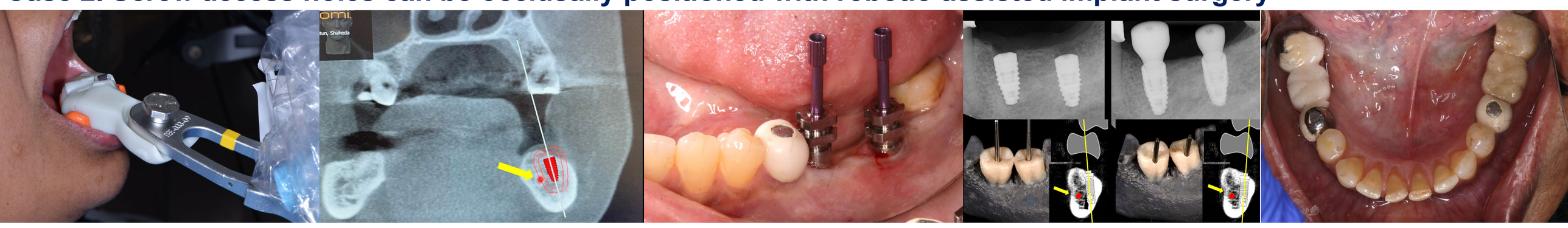
Case 1. Implant lateral to inferior alveolar nerve
Case 2. Implant lateral to inferior alveolar nerve with robotic assisted surgery to improve screw access hole
Case 3. Implant lateral to inferior alveolar nerve with custom alveolar ridge splitting

SEQUENCE OF PROCEDURE

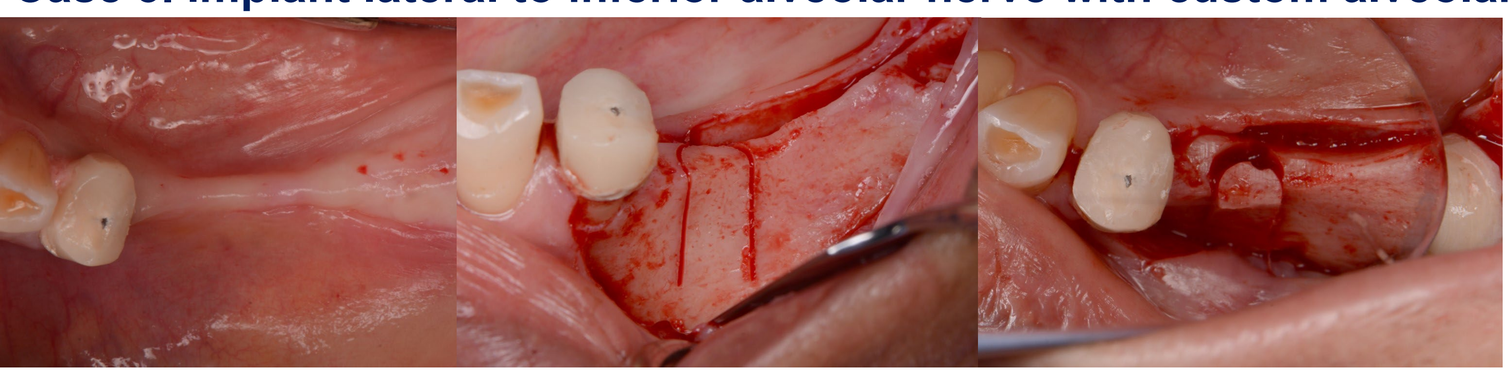
Case 1. Implant lateral to inferior alveolar nerve

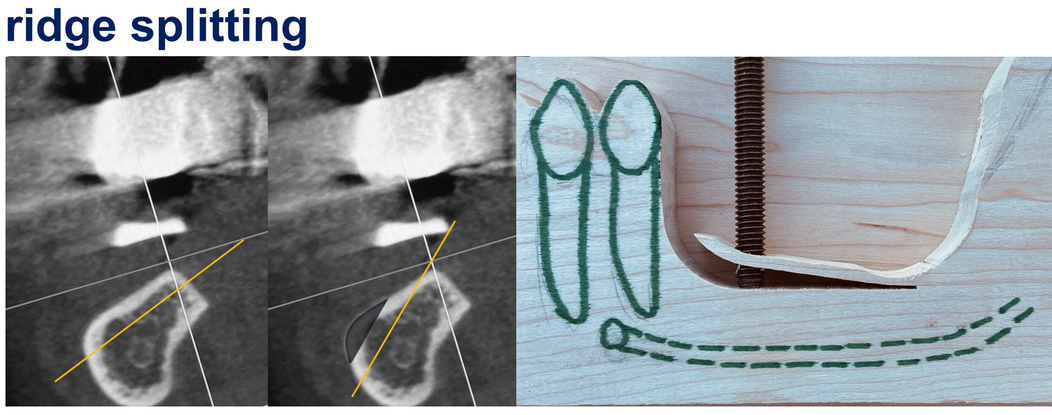


Case 2. Screw access holes can be occlusally positioned with robotic-assisted implant surgery



Case 3. Implant lateral to inferior alveolar nerve with custom alveolar ridge splitting





Concept of Vertical Alveolar ridge Splitting (VCARS) Technique

CONCLUSION

To summarize, 30% of the cases are qualified for implant placement lateral to the inferior alveolar nerve (ILIAN). Throughout those cases, the authors found that 70% of the cases presenting a horizontal defect can be treated for implant placement lateral to the inferior alveolar nerve (ILIAN) with CARS. Moreover, 90% of the implant placement lateral to the inferior alveolar nerve (ILIAN) can be done with CARS and horizontal ridge contouring to adjust the angulation of the expansion. The remaining 10% can be approached with VCARS due to limited horizontal bone. However, further studies are needed. Also, robotic-assisted implant surgery allows more prosthetically oriented implant placement without damaging the IAN.

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Presented at the 98th Annual Session of the Greater New York Dental Meeting in 2022