Neurological Risks During Implant Placement in the Anterior Maxilla and Anterior Mandible: A Literature Review

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INTRODUCTION

The anterior maxilla and anterior mandible present with neurological structures that can make surgical treatment planning quite difficult. Neurological structures in the anterior maxilla and anterior mandible are interpreted through a review on their anatomical and radiographic presentations.

OBJECTIVE

The purpose of this literature review was to educate the dental surgeons to consider the anterior jaw's neurological structures when performing procedures like implant surgery.

METHODS

A literature search for the period (1928 to 2022) was performed using different inclusion criteria. A total of 38 papers were included in the review.

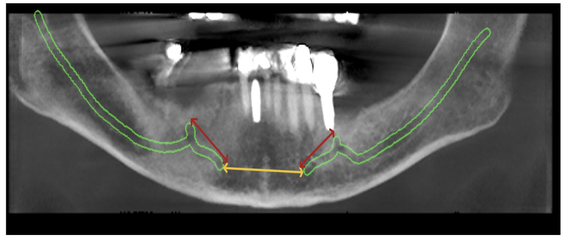


Figure 1. A separate panoramic radiograph depicting the inferior alveolar nerve canal outlined in green. The mandibular incisive canal is also outlined in green with its complete length measured by the red arrows bilaterally. The yellow line indicates the denervated midline band in the mid-symphyseal region.

RESULTS

In the mandible, the mandibular incisive canal (MIC) presents as an extension of the inferior alveolar canal that runs within the bone structure between the mental foramina. This anterior mandibular structure was easily depicted in CBCT imaging and was present in most subjects in gross anatomical studies. Dimensional analysis of the MIC was addressed. The anterior loop of the mental nerve is another structure which is discussed more frequently in literature. Although its structure is accurately depicted in CBCT images as well, its anatomical variations in patients can make implant treatment planning quite difficult. With such variations, it makes it less predictable for a clinician to evaluate the risk of neurosensory damage when drilling osteotomies near the mental foramen. Other treatment plans for full-arch implant-supported mandibular restorations must be suggested to avoid neurosensory damage from implant surgery.

The maxilla contains two prominent neurological structures, such as the nasopalatine canal and canalis sinuosus. Case reports were reviewed which outline a prophylactic enucleation and bone grafting of the nasopalatine canal prior to implant placement. The canalis sinuosus, which houses the anterior superior alveolar nerve, is also of concern during implant placement in the central/lateral incisor region. Case studies involving nerve damage to the canalis sinuosus with follow-ups were discussed.

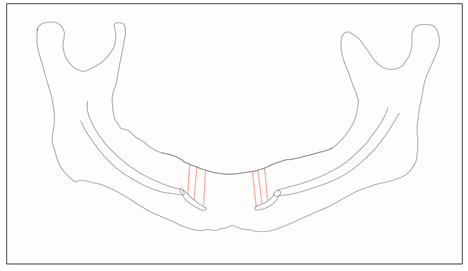
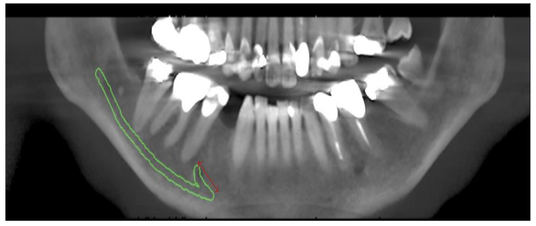


Figure 2. A graphically reconstructed mandible in a panoramic radiograph illustrating the mandibular canal and the MIC. The distance between the alveolar crest and the MIC (red lines) determines the position of future implants and this distance may challenge treatment planning.

Figure 3. A separate panoramic radiograph depicts the inferior alveolar nerve canal outlined in green with the length of the anterior loop of the mental nerve measured by the red arrow.



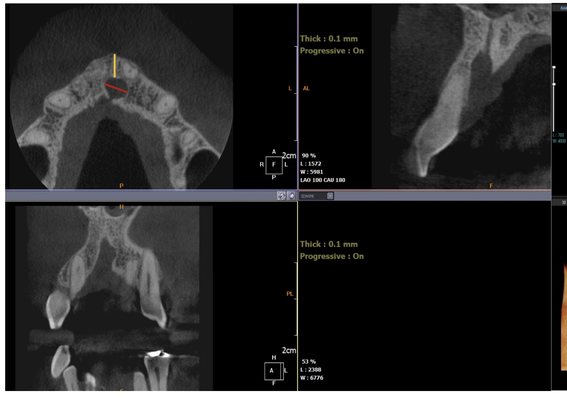


Figure 4. CBCT imaging of the nasopalatine canal with an axial section labeling the width of the nasopalatine canal (red line) and the distance between the canal and the most anterior bony part of the buccal plate (yellow line).

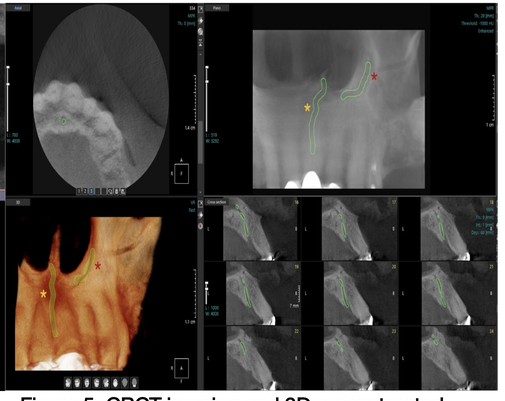
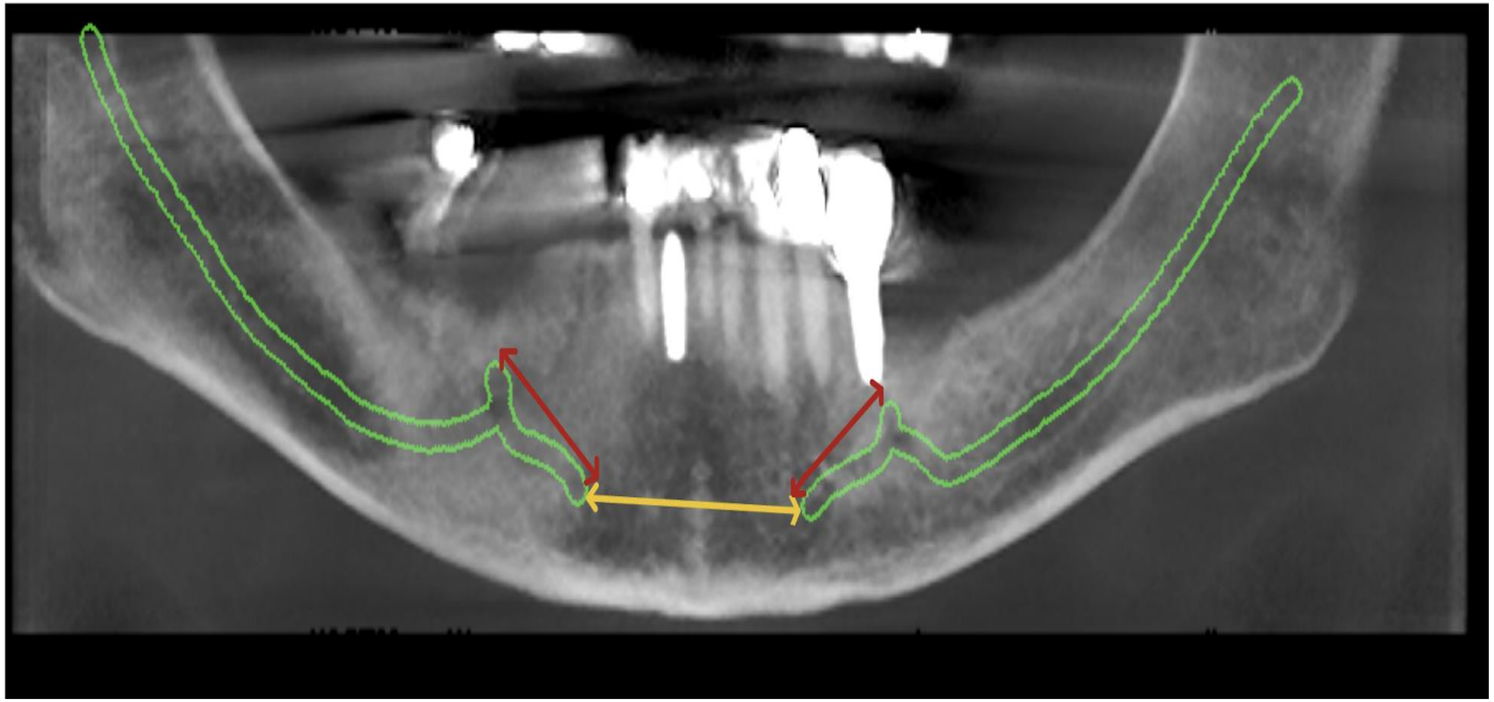


Figure 5. CBCT imaging and 3D reconstructed image depicting the canalis sinuosus outlined in green. The anterior canal of the canalis sinuosus is an accessory canal that migrates closer to the alveolar crest (yellow star). The posterior canal is the main branch of the CS that houses the anterior superior alveolar nerve (red star).

CONCLUSION

Neurological anatomical evaluation before surgery and knowledge of the literature is required to control intra-operative and postoperative complications. This might challenge treatment options, avoid legal implications, and introduce updated informed consents for patients.



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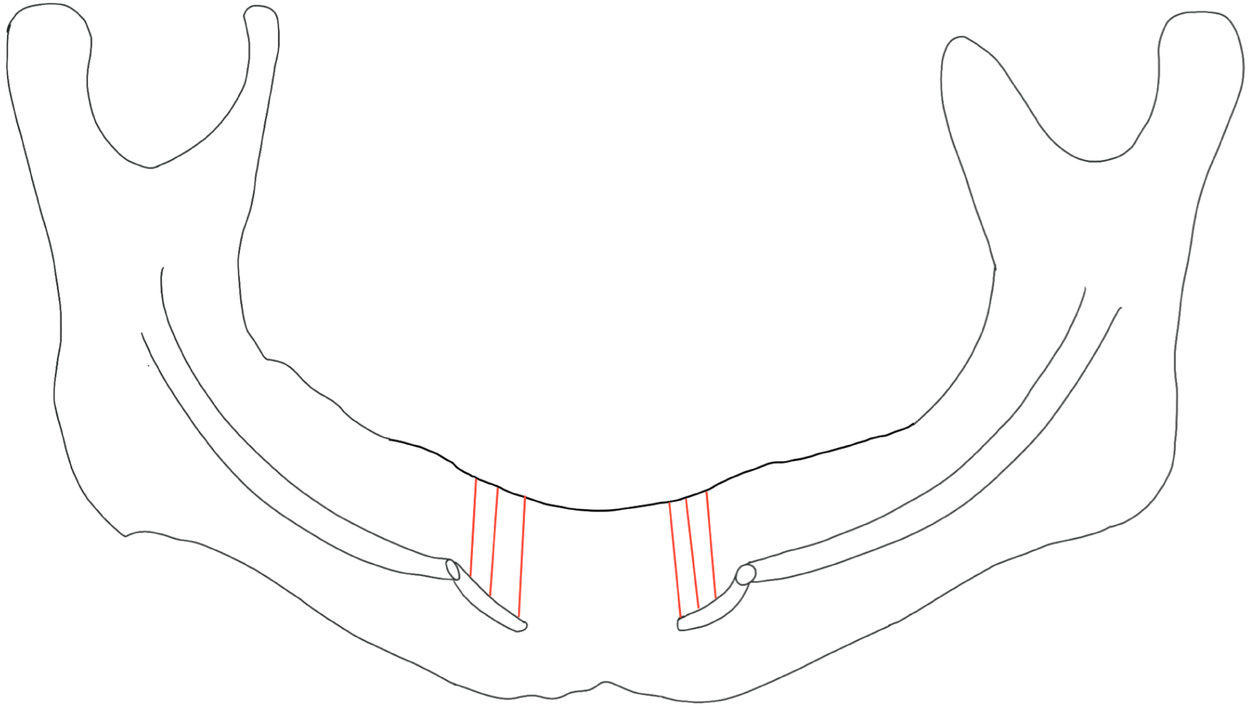

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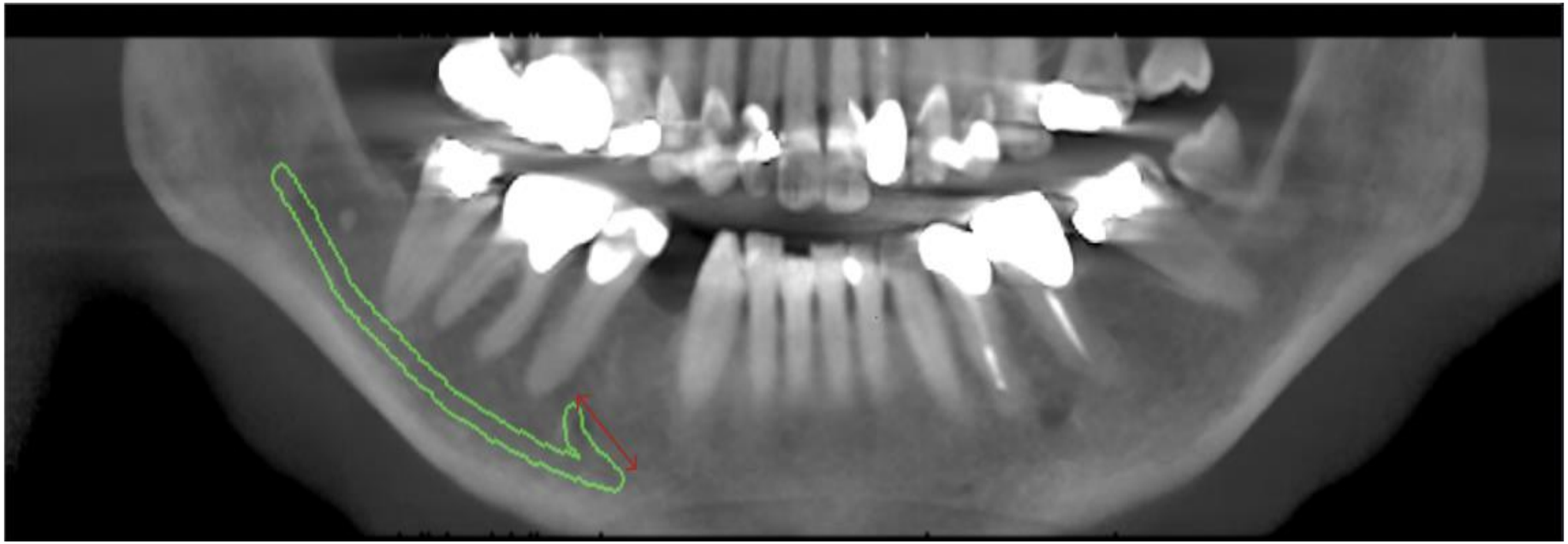

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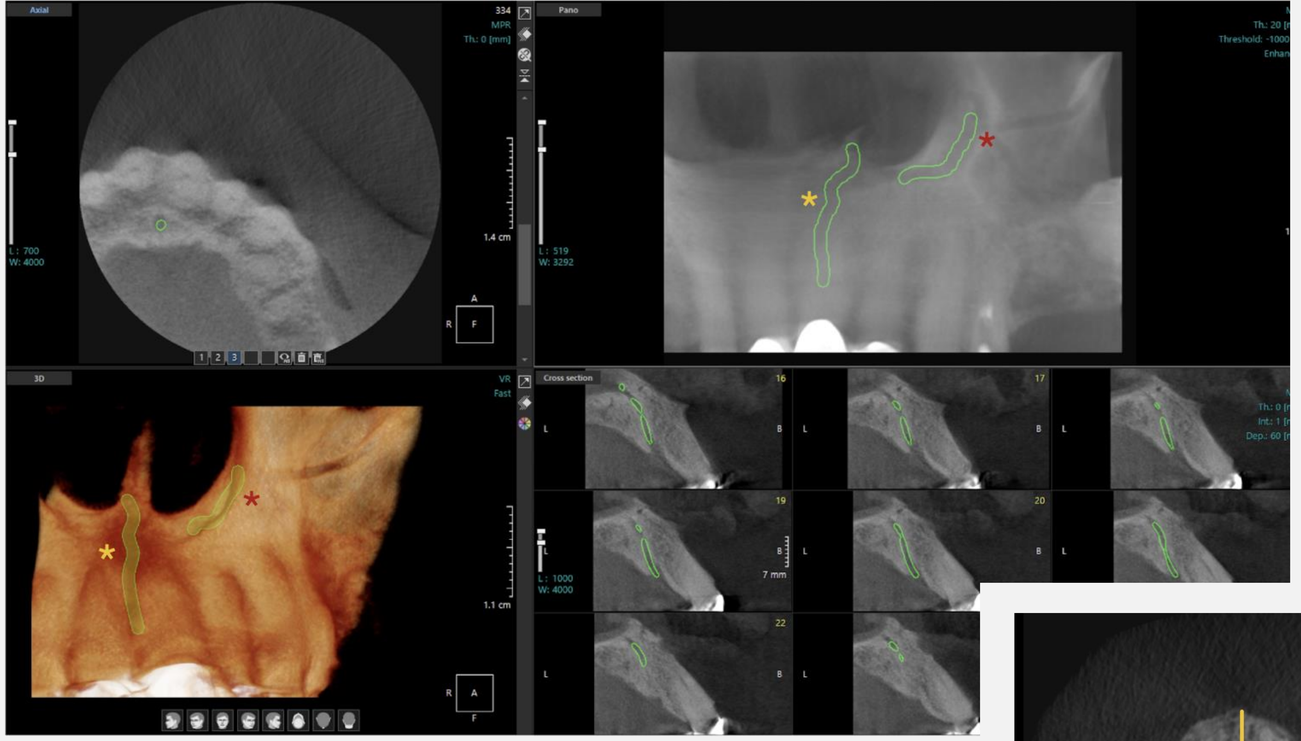

(Left) Figure 4. CBCT imaging of the nasopalatine canal with an axial section labeling the width of the nasopalatine canal (red line) and the distance between the canal and the most anterior bony part of the buccal plate (yellow line).

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