

Use of Guided Surgery for Implant Placement in a Patient with Two Right Accessory Mental Foramina and Anterior Loop: A Case Report

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Introduction

The mental foramen is an important landmark when performing oral surgical procedures and dental implant placement.¹ Anatomical variations in the mental foramen have been described throughout the literature with different reported prevalence rates and demographic characteristics.² Indeed, missing mental foramina and supernumerary mental foramina have been reported.³⁻⁵ The latter variations are called “accessory mental foramen” (AMF) and are due to branching of the mental nerve prior to its passing through the mental foramen.⁵ It has been reported that a possible cause of an AMF is an early branching of the mental nerve during the fetal period before the mental foramen is completely formed during the 12th week of intrauterine development. Typically, the mental foramen remains incomplete until the end of the 12th week of gestation. Thereafter, the mental nerve splits in several fasciculi in the premolar region.⁶ We describe the case of an African American male patient who presented for routine dental implant therapy and who was identified with a triple foramen on the right side and a double mental foramen on the left side of the mandible after cone beam computed tomography (CBCT) imaging.

Case History

A 62-year-old African American male was referred to ECU School of Dental Medicine for implant evaluation of the right mandibular edentulous space due to a failing tooth-supported bridge between #29 and #31. Tooth #29 presented with a root fracture. The patient reported a history of controlled high cholesterol, gout, learning disorders, and seasonal allergies. The patient signed a detailed informed consent form. A CBCT of the mandible was exposed as part of the implant planning phase (OrthoPHOS SL 3D, Dentsply Sirona, North Carolina, United States). The scan was performed using a standard exposure and patient positioning protocol (85 kV, 14 s, 7 mA). The data were reconstructed at a voxel size of 0.08 mm. Simplant software (Dentsply Implants NV, Pennsylvania, USA) was used to reconstruct the image in two-dimensional and tridimensional planes. Images obtained were evaluated for implant placement and ridge measurements were performed. The CBCT image revealed an uncommon anatomical variant characterized by the presence of five mental foramina and two mandibular anterior nutrient canals (Figures 1-3). Three foramina were present on the right side and two on left side of the mandibular body, respectively (Figure 1B and 1C). The three foramina were located in the area apical to #29 and #30 (Figure 1B). Figure 2 shows the area of the right mandibular nerve trifurcation and the presence of an anterior loop (Figure 2B). On the left side, the two mental foramina were both located apical to the mandibular left second premolar (Figure 3).

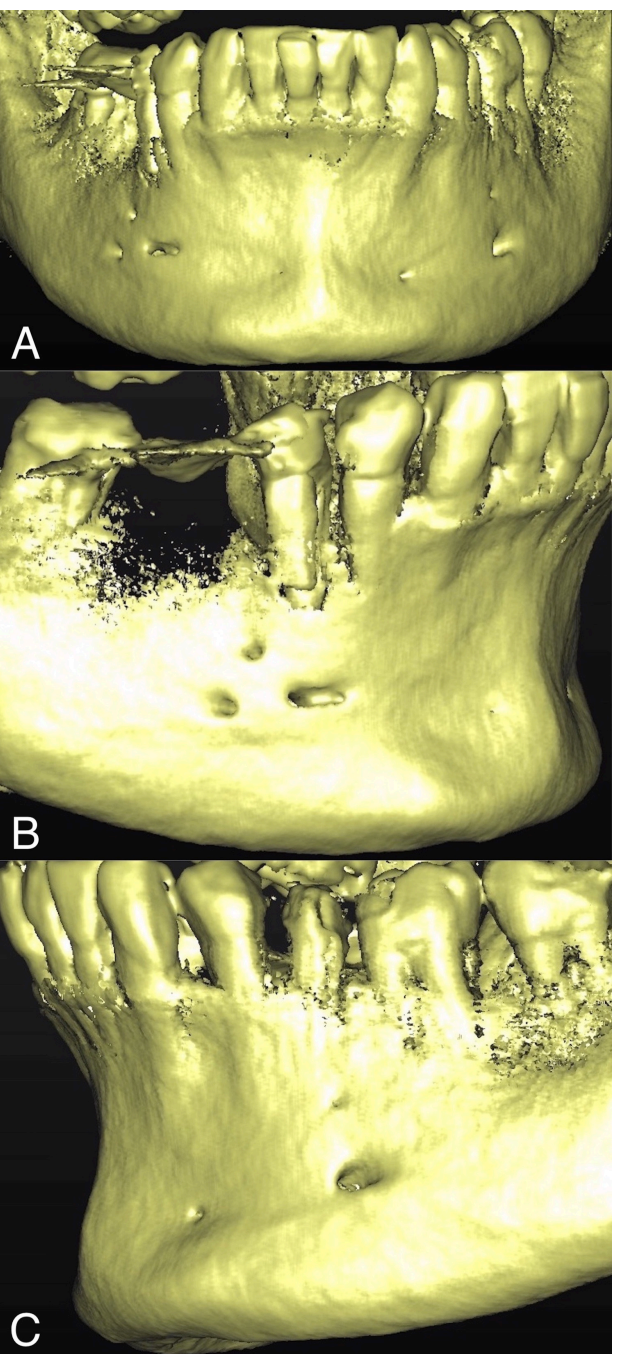


Fig. 1 3D volumetric rendering showing (A) frontal view, (B) right view, (C) left view of the body of the mandible.

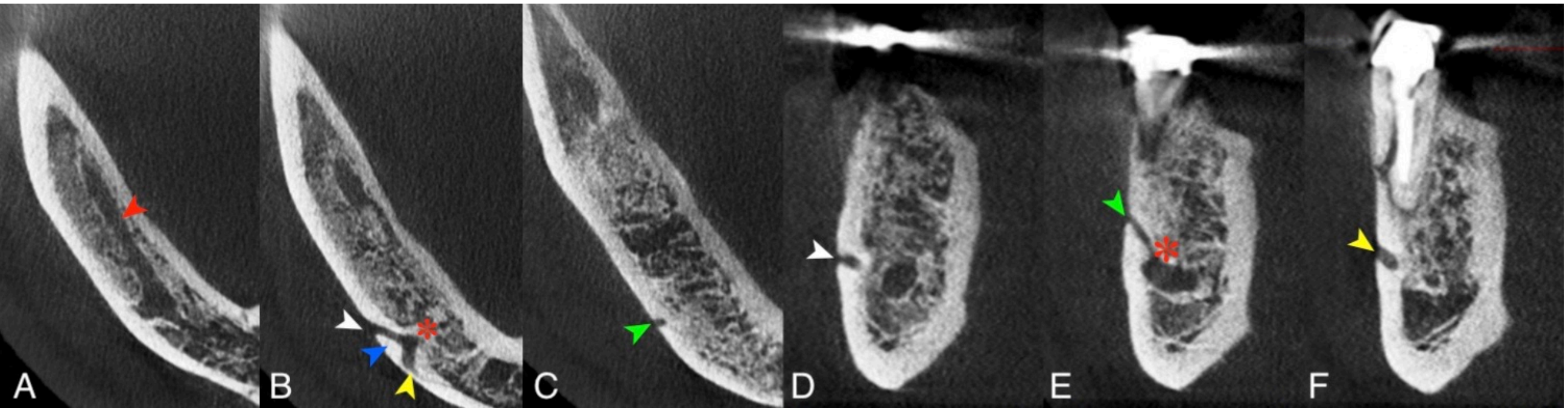


Fig. 2 (A-F) Cross sectional and sagittal views showing the right mandibular nerve (red arrowhead), trifurcation (red asterisk), anterior loop (blue arrowhead), and foramina. AMFR-1: accessory right mental foramen 1 (white arrowhead); AMFR-2: accessory right mental foramen 2 (green arrowhead); MFR: mental foramen (yellow arrowhead).

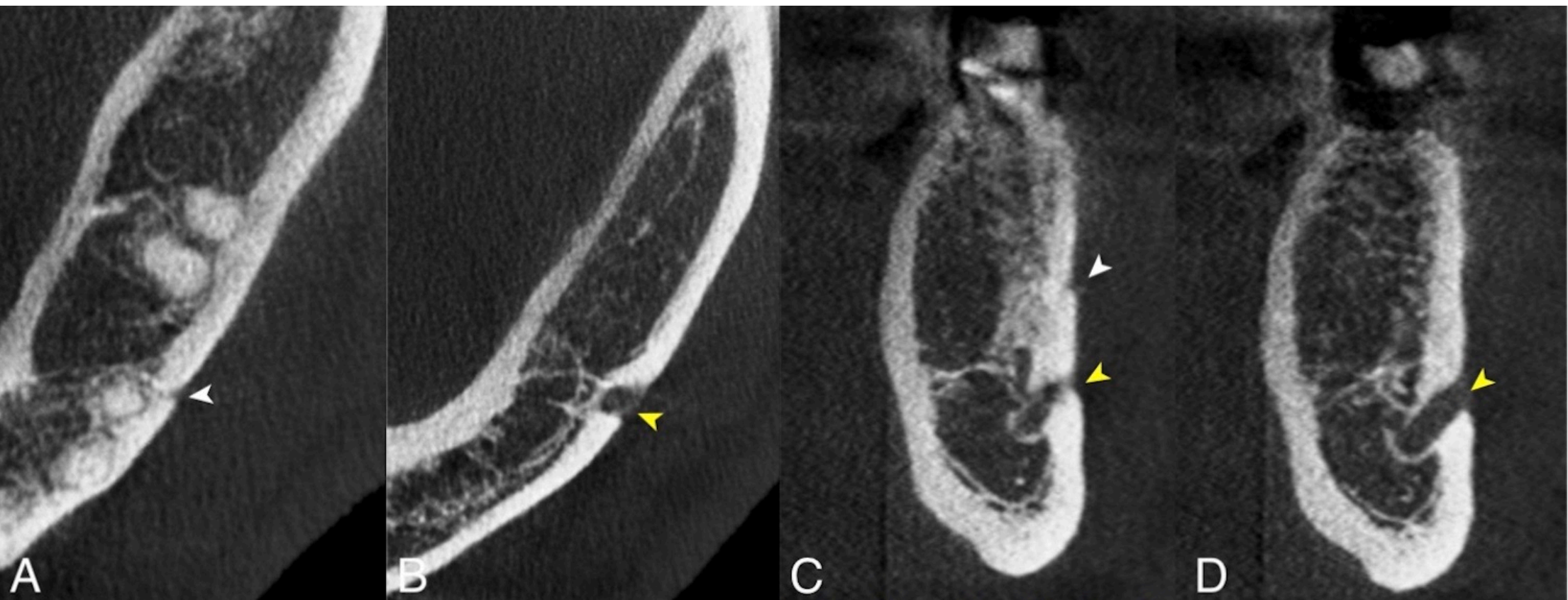


Fig. 3 (A-D) Cross sectional and sagittal views showing the left mandibular nerve, and foramina. AMFL-1: accessory left mental foramen 1 (white arrowhead); MFL-2: left mental foramen (yellow arrowhead).

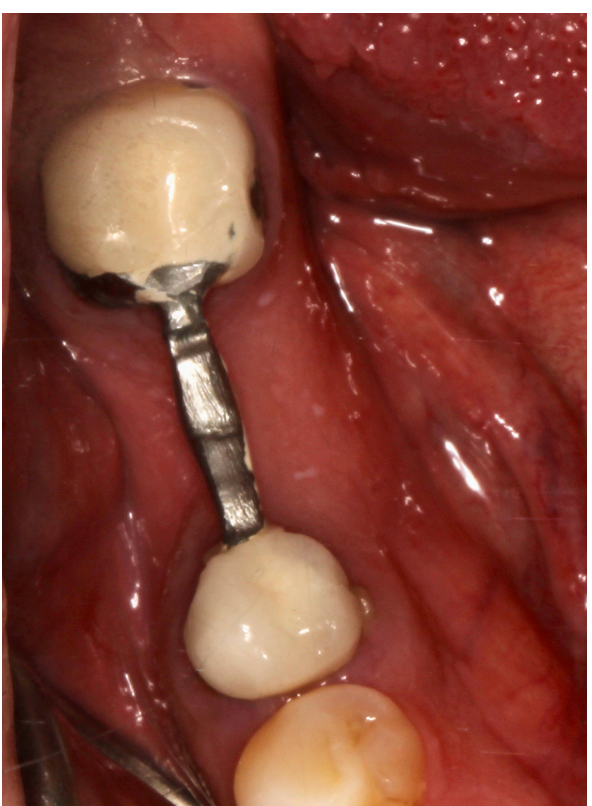


Fig. 4 Pre-operative lateral view of the right side of the mandible.

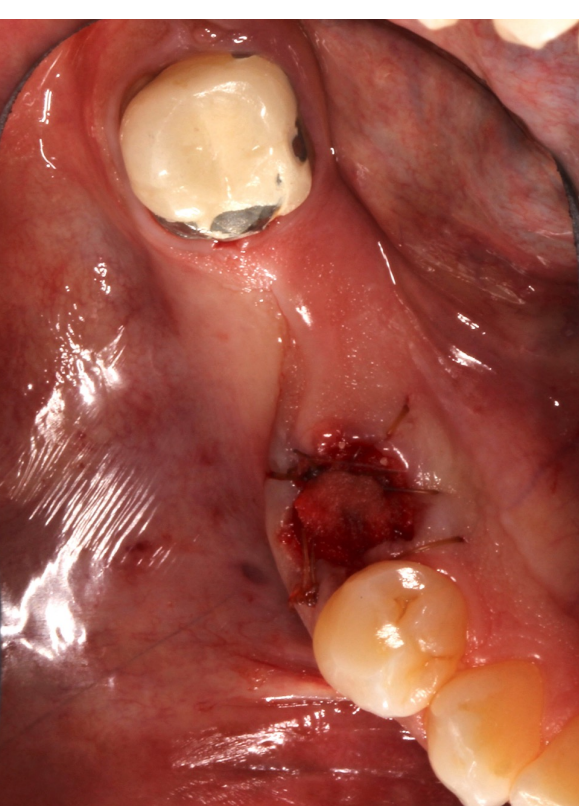


Fig. 5 Pre-operative occlusal view of the right side of the mandible.



Fig. 6 Post-operative clinical view after extraction and ridge preservation of #29.



Fig. 7 Sectioned bridge between #29 and #31, and #29 fractured root.



Fig. 8 Post-operative view after 9 months of healing of #29 extraction site.

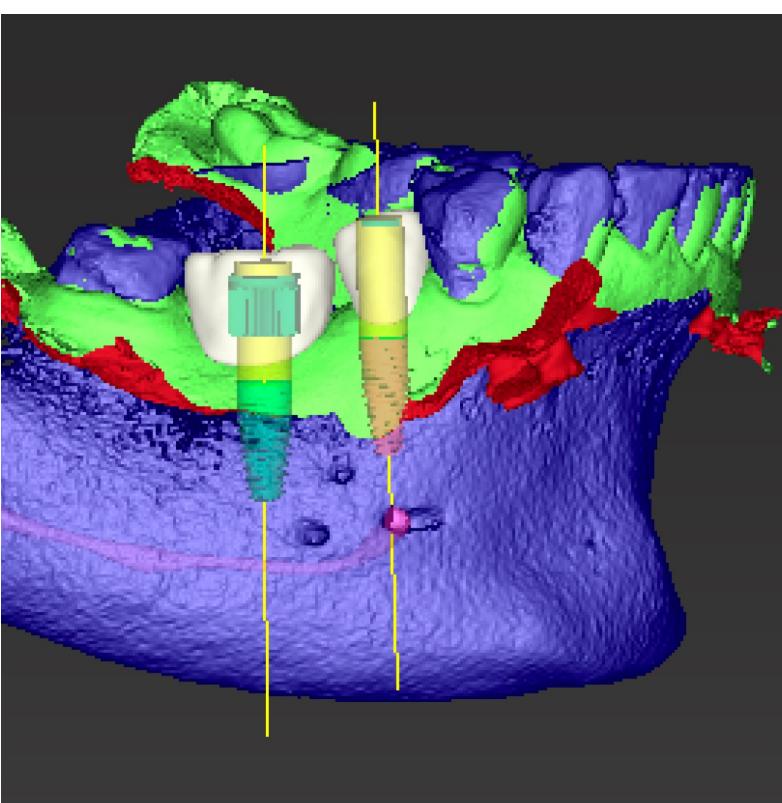


Fig. 9 Clinical view 3 years after extraction and orthodontic treatment.

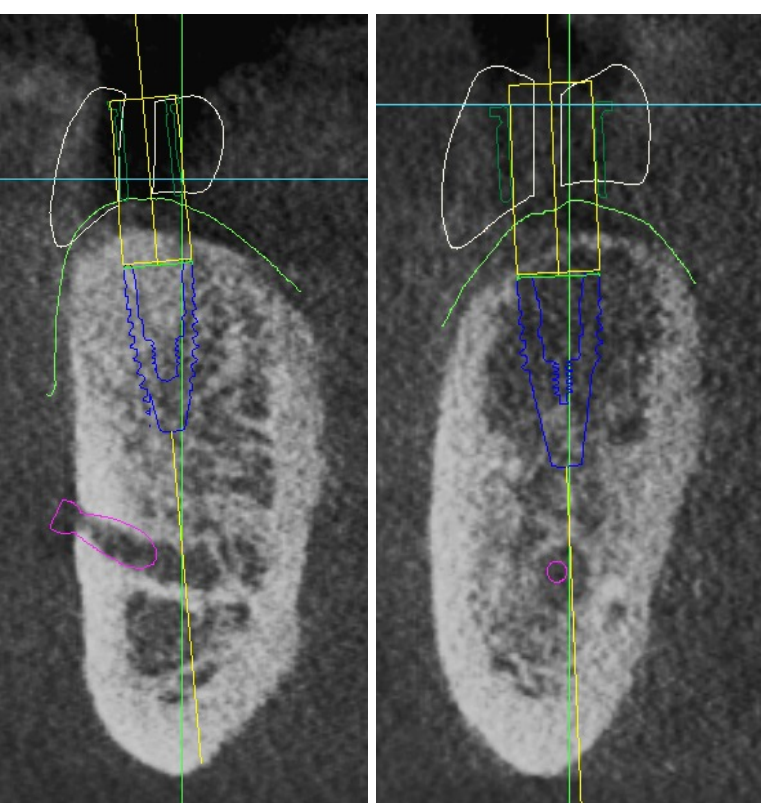


Fig. 10 Digital tooth arrangement and implant planning.

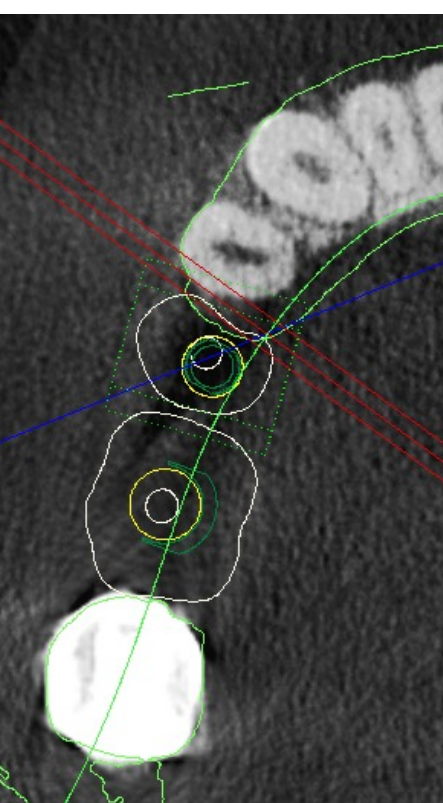


Fig. 11 (A) Sagittal view showing planning of implant #29; (B) Sagittal view of implant #30; (C-D) Cross-sectional and panoramic view of the same implants.

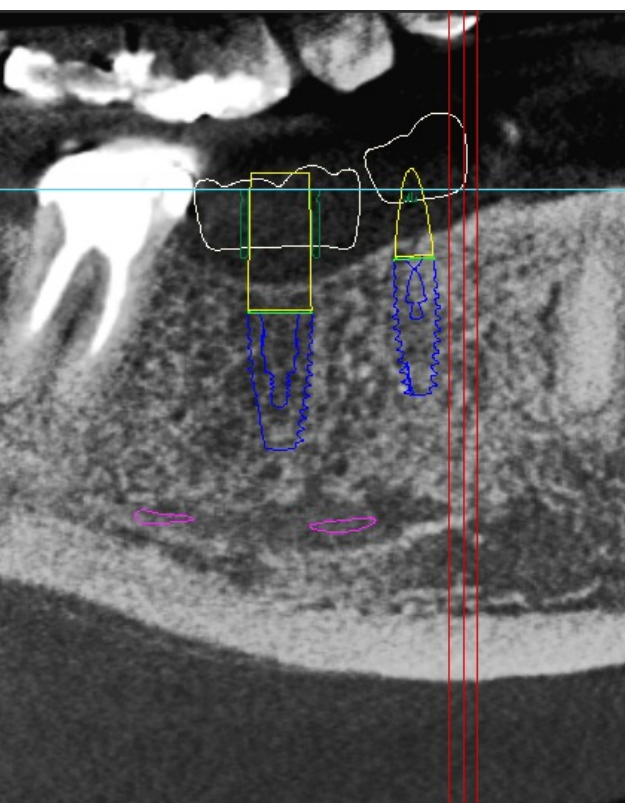


Fig. 12 Surgical guide STL file.

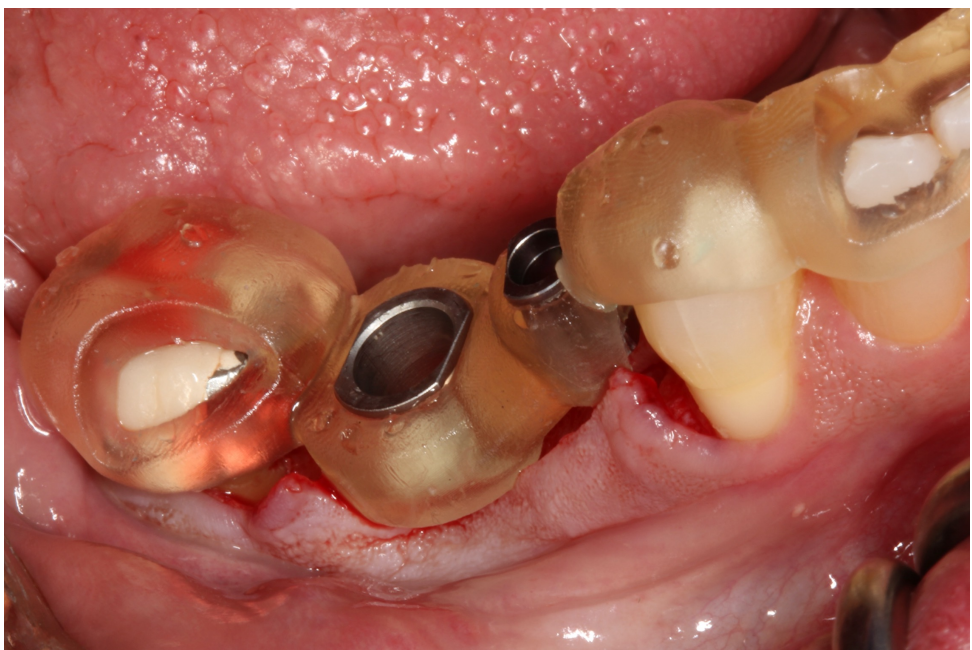


Fig. 13 Intra-operative view showing static implant guide in place.

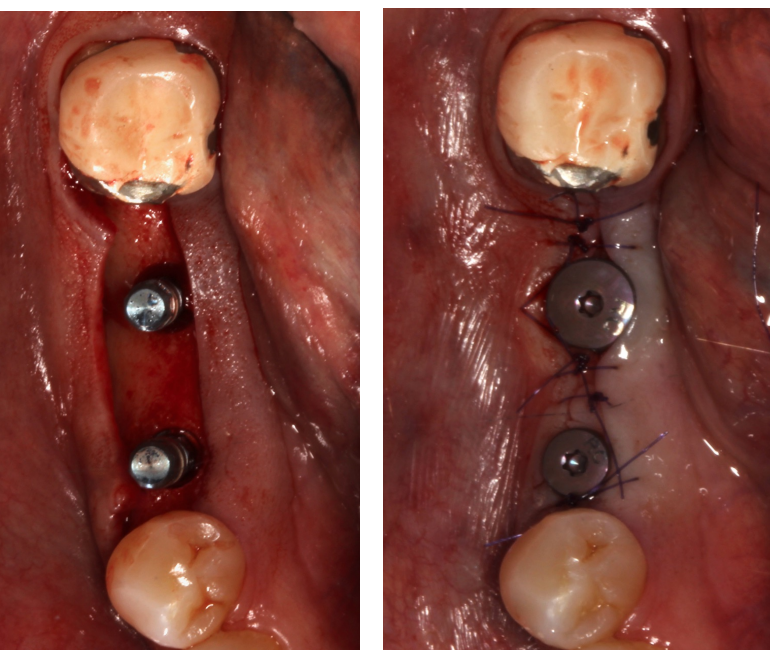


Fig. 14 Intra-operative view showing implants #29 and #30 in place.

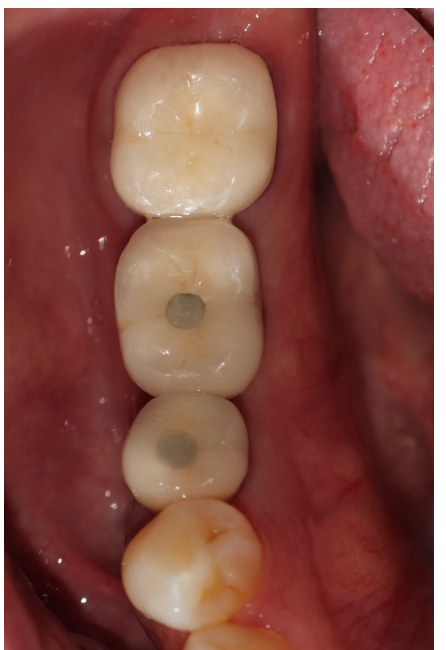


Fig. 15 Intra-oral photos showing implant-supported PFM crowns #29 and #30.

Patient was diagnosed with Generalized Stage I Periodontitis Grade B, and received two quadrants of scaling root planing, and after re-evaluation of initial therapy was placed in a 4 months maintenance protocol. Tooth #29 was extracted and ridge preservation was performed to minimize the ridge remodeling (Figures 4-8) using cortico-cancellous allograft (Puros, Zimmer Dental Inc., Carlsbad, CA). Once the periodontal disease was under control, patient expressed interest in orthodontic treatment due to crowding and was referred to a local orthodontist, before implant therapy was performed.

After two years of orthodontic treatment patient was ready for implant planning #29 and #30 (Fig. 9). A second CBCT was exposed and coDiagnostiX software (Dental Wings Inc., Montreal, QC, Canada) was used to reconstruct the image in two-dimensional and tridimensional planes. A digital tooth arrangement and implant planning #29 and #30, using bone level tapered fixtures, was created, sleeves were selected, and an implant guide was planned (Figures 10-12). The static implant guide was printed using the Form 2 3D printer (Form labs Inc., Somerville, MA, USA). Implants #29 and #30 (Straumann USA, Andover, MA, USA) were placed using the printed static surgical guide and a standard surgical technique, with no complications (Figures 13-16). Implants were then restored after 6 months with two porcelain-fused to metal screw retained restorations. A new orthodontic retainer was then fabricated.

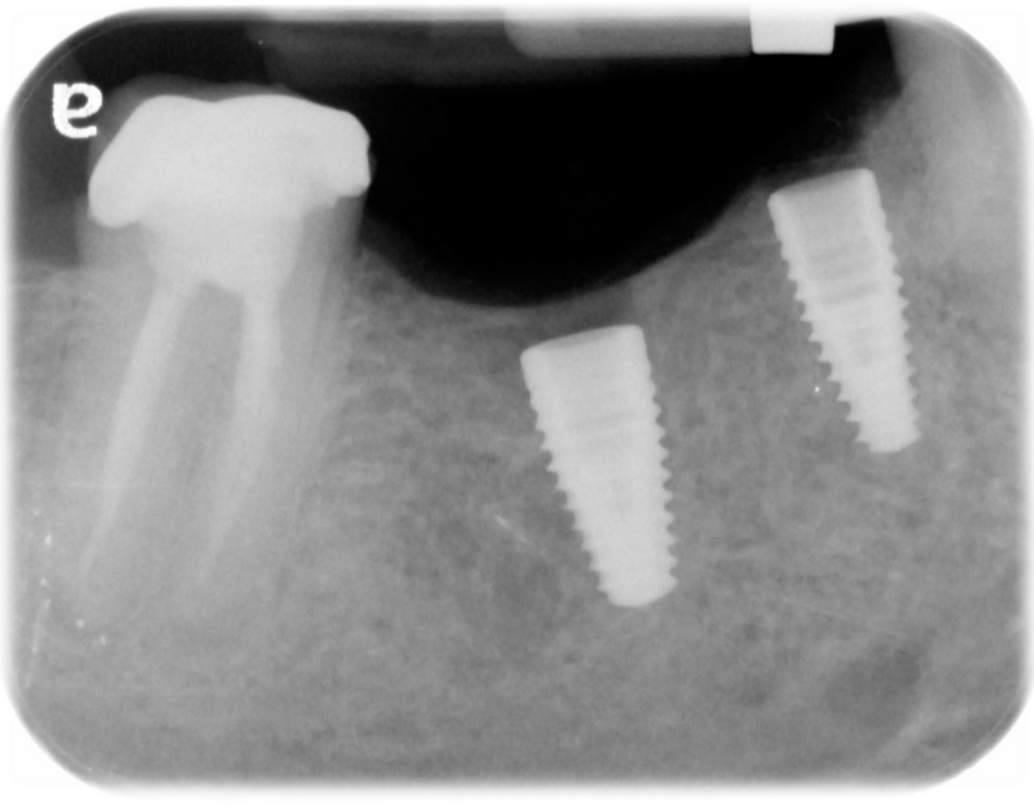
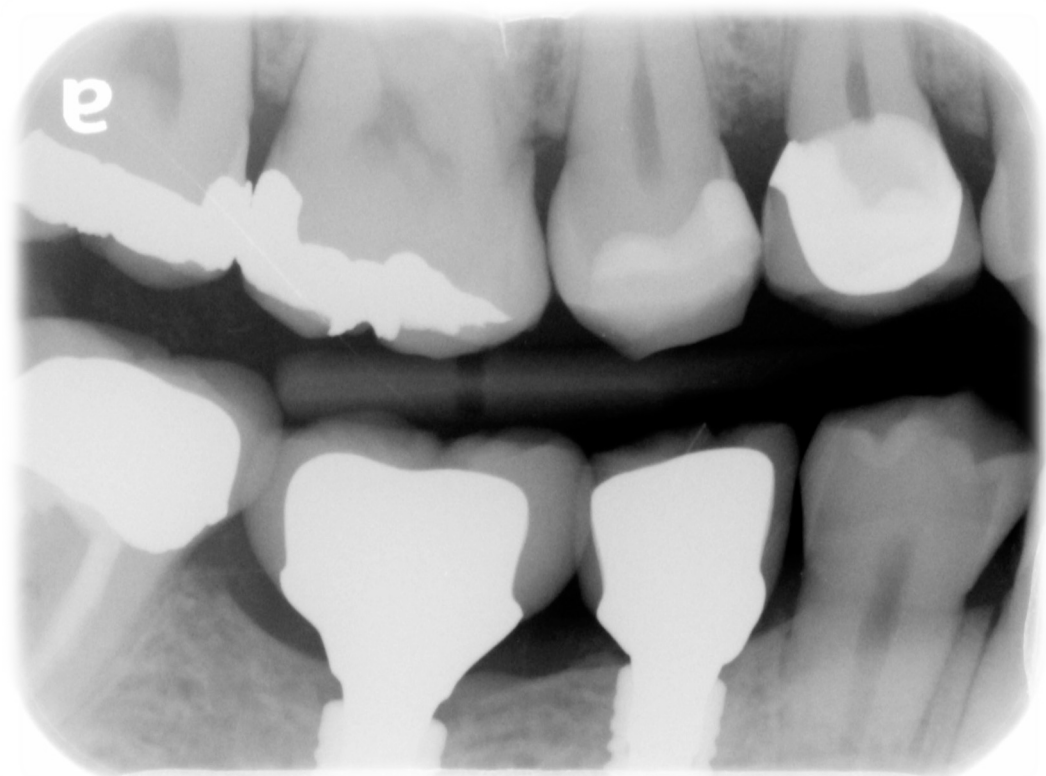


Fig. 16 Intra-oral radiographs showing implant placement and restoration of implants #29 and #30.

Conclusions

This case demonstrates that CBCT and guided implant surgery are of paramount importance for accurate implant placement in anatomically challenging cases, and to avoid neurosensory disturbances, or other undesired complications.

References

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