

A 36 year old African American Female presented to the Department of Oral and Maxillofacial Surgery Clinic at the University of Tennessee College of Dentistry with a complaint of a large swelling of the right mandible. The patient stated this swelling had been noticeable for less than six months. The patient denied any pain or numbness associated with this swelling. Clinical exam revealed a firm, non-fluctuant swelling extending from the right angle to the right parasymphysis of mandible. The teeth in the area of interest were non-mobile, non-painful and tested vital. A CBCT was obtained (Figure 1 and 2) which revealed a large mixed radiopaque/radiolucent lesion in the right body of the mandible. Radiologic study of the lesion was performed in the Xelis Dental 3D viewer which provided valuable information regarding the size and extent of invasiveness of the tumor. This diagnostic study also revealed that this area had very minimal normal bone providing structural support to the mandible. An incisional biopsy was performed on the day of consultation which revealed a histological diagnosis of an ossifying fibroma (Figure 3).



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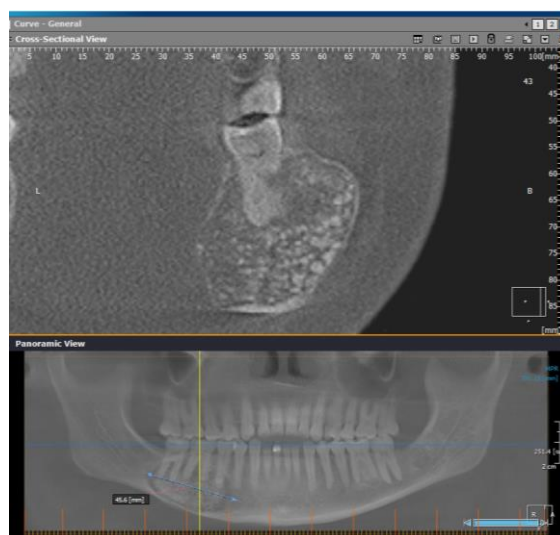


Figure 1. Initial CBCT (Transaxial slice through lesion).

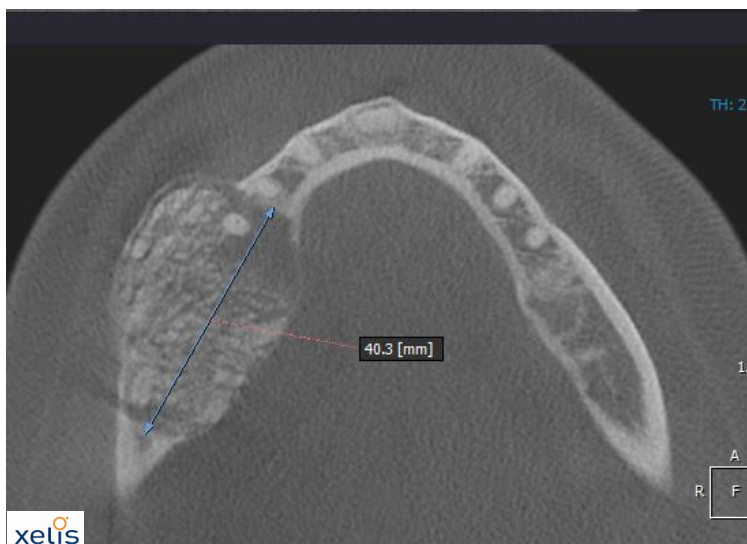


Figure 2. Initial CBCT (Axial slice through lesion with measurement).

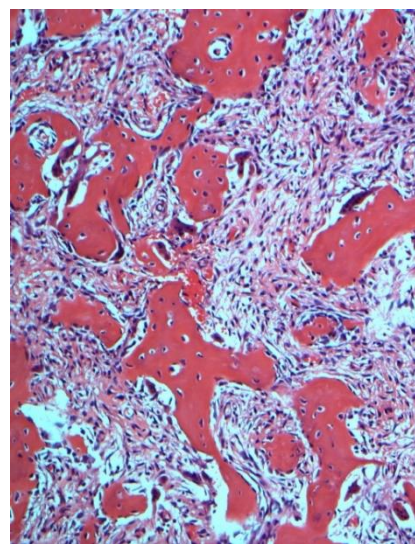


Figure 3. Histopathology.

A comprehensive, staged treatment plan was formulated to address the pathology in this case. Conservative curettage and peripheral ostectomy was not considered an option in this case due to the large size of the lesion, the extensive buccal to lingual expansion and the lack of normal mandible in the area of the lesion (Figure 4). The treatment of choice in this case would include a resection and immediate reconstruction of the mandible with autogenous bone graft augmented with rhBMP-2/ACS. Teeth in the area of resection were extracted immediately and the area was allowed to heal for 8 weeks prior to the definitive surgery in order to allow the resection and bone graft to be performed without violating the non-sterile area within the oral cavity. Teeth #s 44, 45, 46, and 47 (FDI notation) were extracted and primary closure was obtained in the areas of the extraction sites. The patient was appointed for serial post-operative appointments to follow the healing of this area and prepare the patient for the definitive procedure.

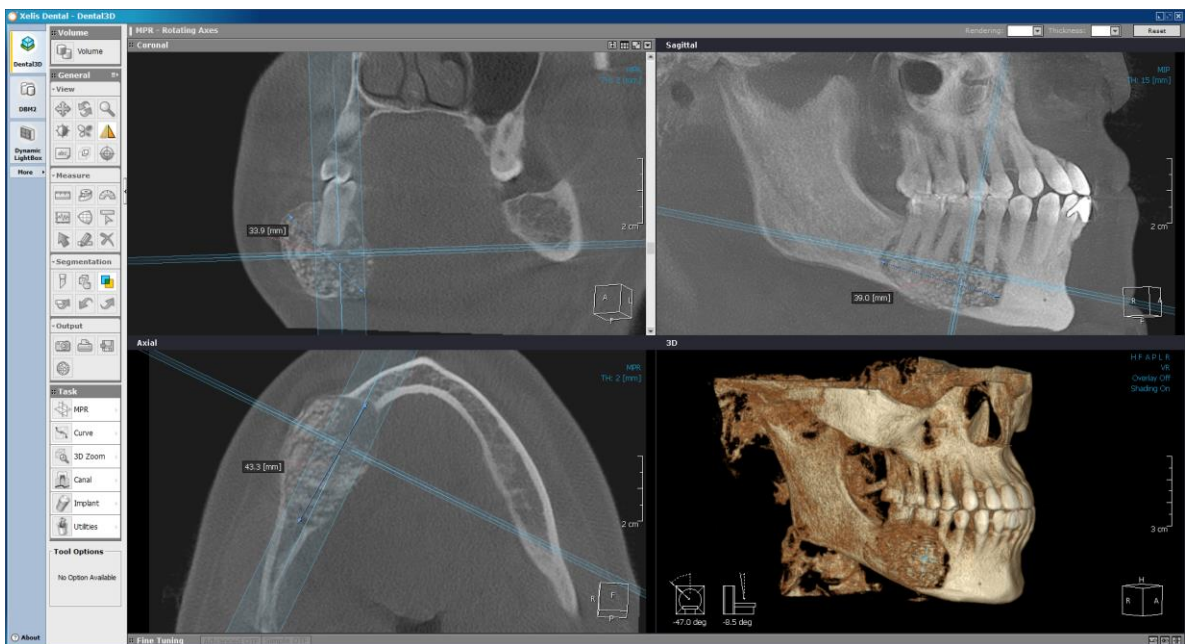


Figure 4. Initial CBCT (MPR/Rotating Axis view with 3-D rendering).

A standard panoramic radiograph and a 16 X 10 FOV CBCT were obtained after allowing eight weeks of healing of the extraction sites. The panoramic study revealed good healing of the previous extractions (Figure 5). As is standard protocol in our department, a CBCT (Figure 6) was obtained to evaluate the intra-bone pathology for changes and to allow for the 3-D printing of a “bio-model”. The CBCT demonstrated approximately 3 mms of additional linear growth of the lesion from the previous CBCT indicating moderately aggressive behavior of this lesion.

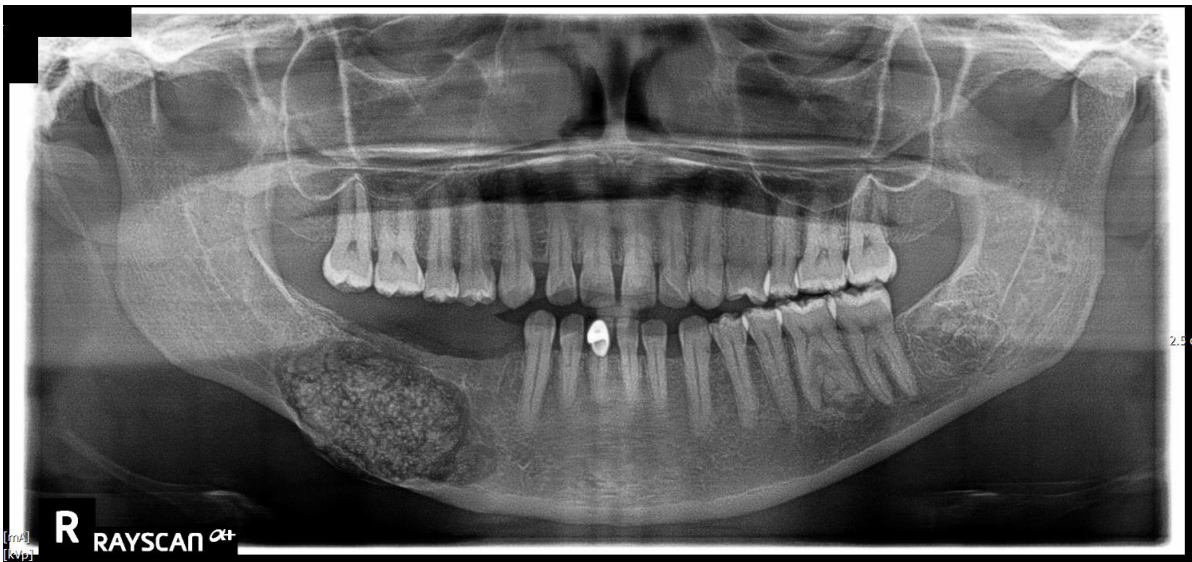


Figure 5. Panoramic radiograph obtained prior to surgical resection of lesion.



Figure 6. CBCT obtained prior to surgical resection of lesion.

The pre-surgical CBCT, obtained within the OMFS clinic, was utilized to generate and export a STL file to allow a 1:1 bio-model to be printed in the clinical setting. Xelis Dental software that was provided with the RAYSCAN Alpha Plus CBCT unit and is utilized in the UTHSC Oral and Maxillofacial Surgery Clinic allows the clinician to export this file directly within the diagnostic interface (Figure 7). The file was then used to print two bio-models with a 3D Systems, CubePro Trios printer (Figure 8). The bio-models are instrumental in pre-bending the titanium reconstruction plate that was used to stabilize the discontinuity defect. The bio-models also allowed the titanium mesh to be contoured and trimmed for a customized fit ready for the procedure. All steps of this process are completed in the clinical setting and greatly benefits the surgeon in providing the optimal treatment in this case. The surgical time in the operating room is greatly shortened and the three-dimensional fit of the plate/mesh to the bone is much improved when using this technique (Figure 9).

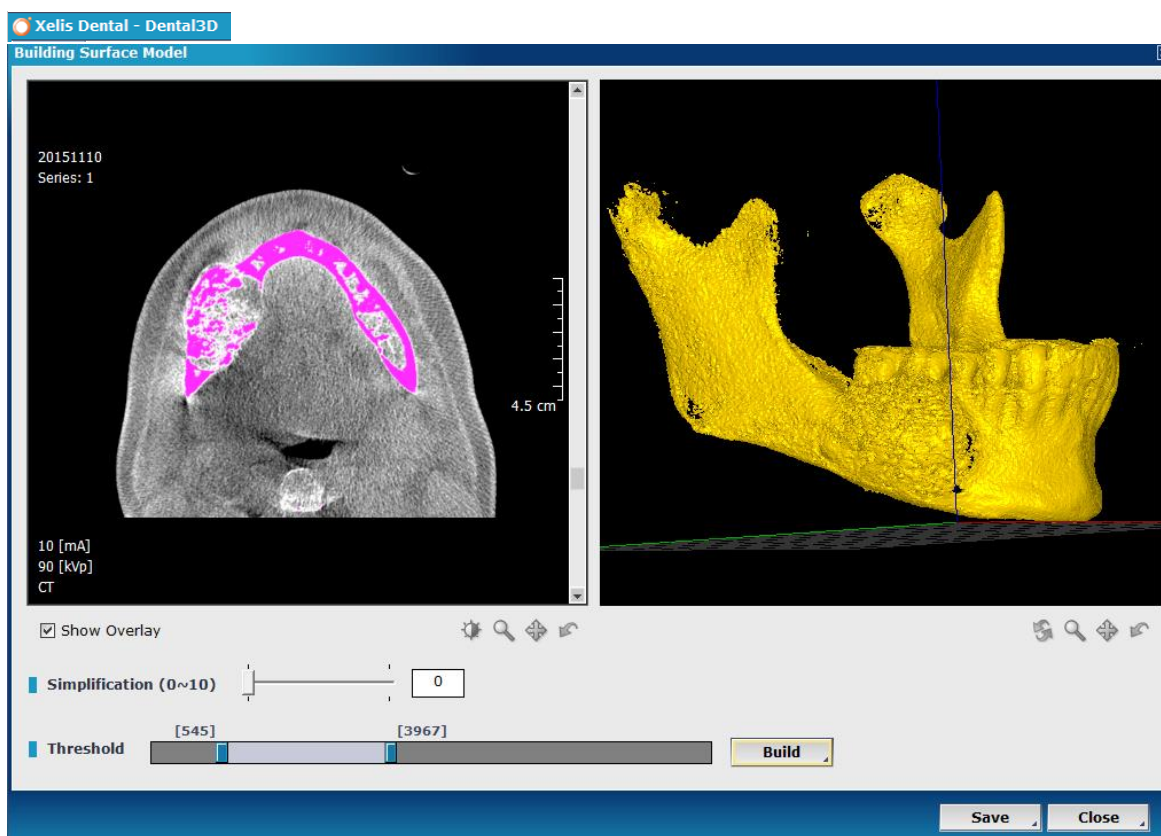


Figure 7. Xelis software used to generate a virtual bio-model and export file to allow 1:1 3-D print.



Figure 8. Bio-Models printed on 3D Systems CubePro Trios.



Figure 9. Titanium Plate and mesh bent and contoured to bio-model printed from CBCT Export.

The patient was taken to the surgical suite where resection of the ossifying fibroma was performed with immediate bone grafting of the defect. The “pre-bent” titanium reconstruction plate and mesh were placed and found to fit with the same precision that was seen on the bio-models printed in the OMFS clinic (Figures 11 and 12). The defect was grafted with a combination of autogenous bone harvested from the patient’s anterior iliac crest, allograft and rhBMP/ACS (INFUSE®, Medtronic) (Figure 10).



Figure 10. Composite graft of autogenous, DF DB allograft and rhBMP/ACS.

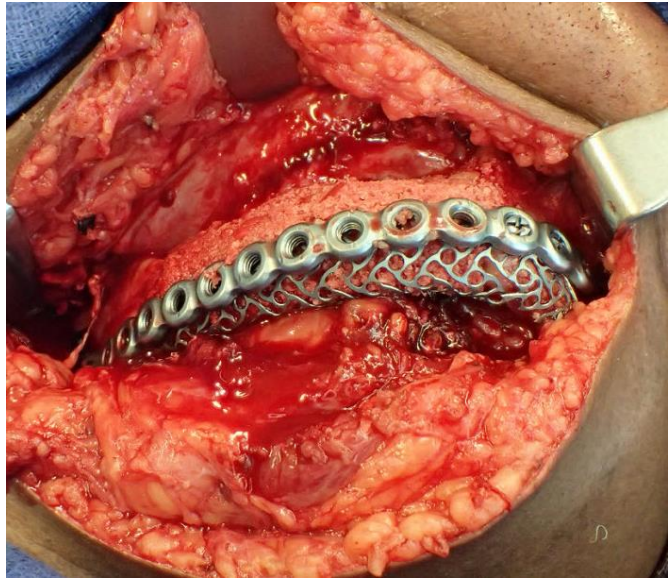


Figure 11. Graft and reconstruction plate from inferior view.

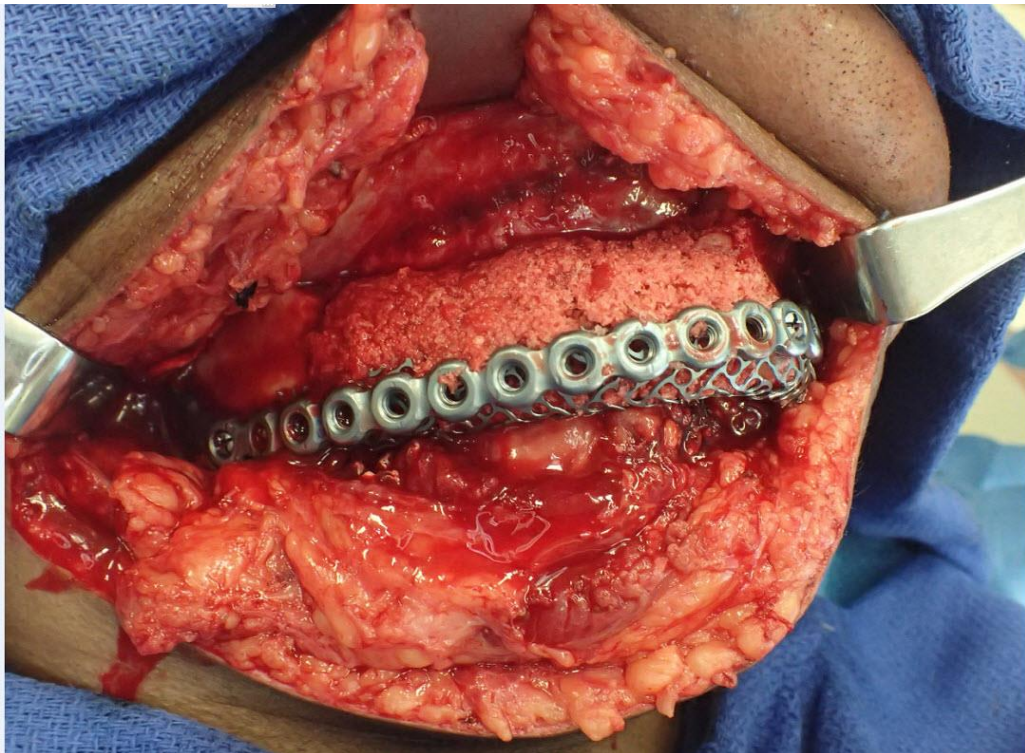


Figure 12. Graft and reconstruction plate from facial view.

The patient tolerated the procedure well and had an expected immediate post-operative course. Post operative CT scans were obtained which demonstrated excellent position and contour of the hard ware with good position of the graft material. (Figures 13, 14, and 15)



Figure 13. Immediate Post-Operative CT (¾ view)



Figure 14. Immediate Post-Operative CT (posterior) view)

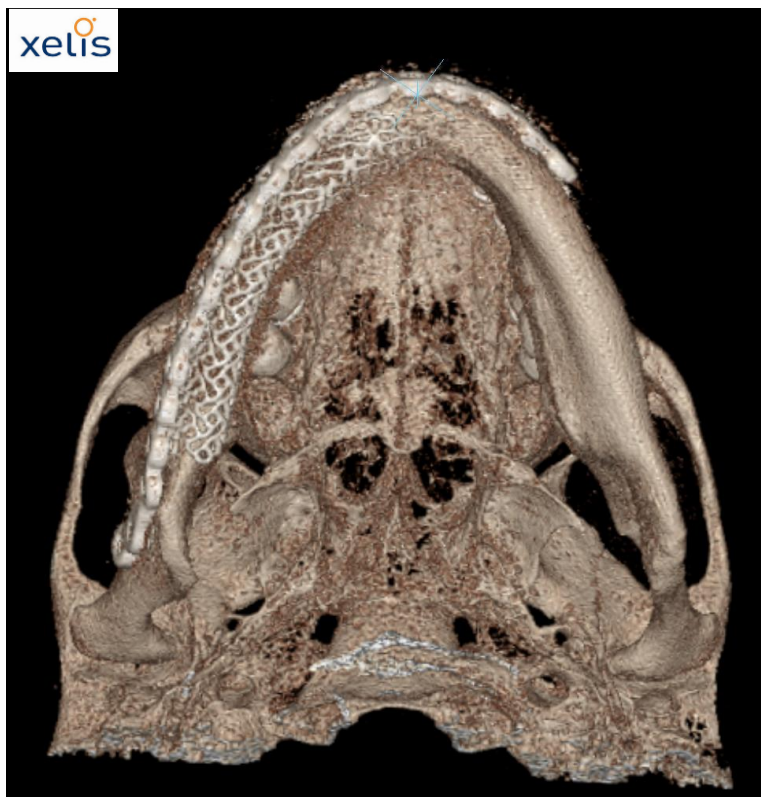


Figure 15. Immediate Post-Operative CT (inferior "foot" view)

The patient was maintained in maxillo-mandibular fixation for six weeks. A follow-up panoramic radiograph was obtained at six weeks post-procedure (Figure 16) which demonstrated excellent early consolidation of the graft. The patient will continue close follow-up with our department with anticipated further treatment to include dental restoration of the lower right edentulous area with dental implants. Also, areas of mixed radiopacity/radiolucency were noted distal to tooth # 37 (FDI notation) on the contralateral side of the mandible. These were apparent on both the pre-operative panoramic radiograph and also the CBCT. These lesions will be watched with serial panoramic radiographs and a CBCT will be obtained if changes are noted.

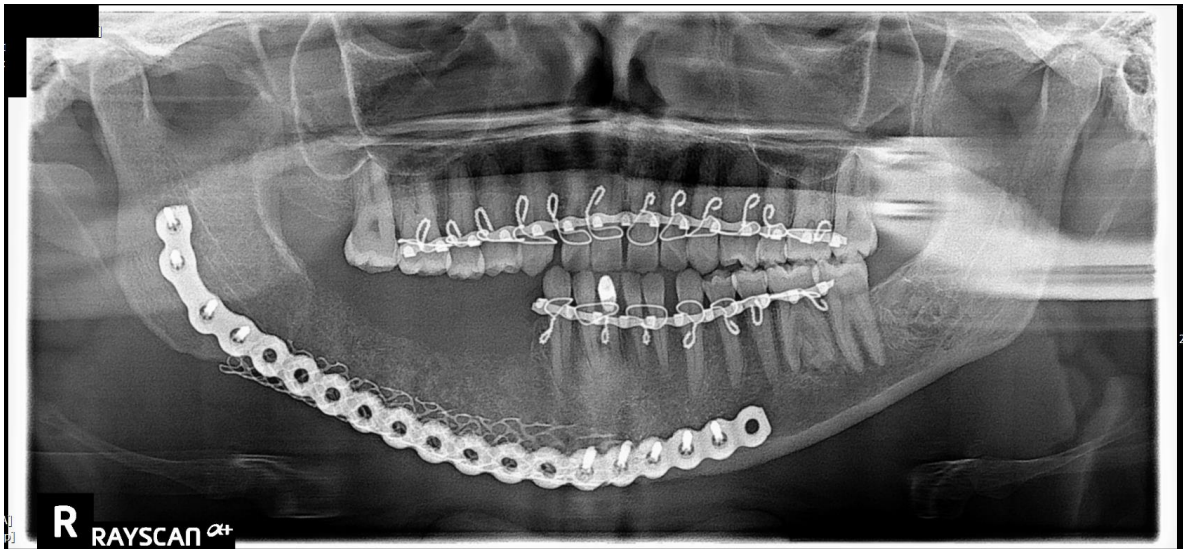


Figure 16. Post-operative (six weeks) panoramic radiograph.