

Introduction

Excessive gingival display with a short clinical crown is a common esthetic concern that can be caused by gingival enlargement or altered passive eruption. Lack of ferrule, on the other hand, is a common restorative concern that can be caused by extensive dental caries or iatrogenic factor. Treatment options, including crown lengthening surgery or gingivectomy can increase crown length and improve esthetic outcome. However, respecting biological width is essential in these periodontal surgeries. According to Ingber 1977, a minimum of 3mm coronal to alveolar crest is suggested to permit healing. CBCT allows accurate diagnosis by evaluating the bone crest position relative to the cementoenamel junction, guiding the selection of osseous resection versus gingivectomy alone.

Digital dental technology, like CAD/CAM, 3D printing, and digital smile design software, enables convenience in treatment planning, visualization of outcomes, and creation of 3D printed surgical guides for precise crown lengthening surgery. The case presented demonstrates the advantages of using a digitally designed 3D printed surgical guide for crown lengthening procedure, showing predictable treatment outcome.

The objective of this study is to show how to precisely communicate with surgeon regarding the amount of bone and gingival reduction needed when planning crown lengthening at esthetic zone.

Case Report

36-year-old female patient presented with alter passive eruption, missing #8 crown, and peri-apical pathology on #8. Patient had stable occlusion with maxillary completely dentated dentition and mandibular short dental arch. There was no MIP-CR shift. From extra-oral photograph, we could appreciate that patient’s full smile displayed up to maxillary canines. Treatment plan was to perform esthetic crown lengthening from #6,7,9,10,11 to improve esthetic outcome, and #8 functional crown lengthening to obtain sufficient ferrule for ceramic crown restoration.

RCT on #8 was performed. Provisional crown and post were made after diagnostic tooth preparation. Prior to crown lengthening procedure, the extraoral photograph and digital wax-up (yellow) served as a starting point to visualize the desired outcomes. They were imported into dental digital software to provide information for ideal restorative margins. Intra-oral scan (green) was also imported to provide existing crown margins. The planned restorative margin (provided by digital wax-up) minus 3mm (average biological width) provided the estimate amount of hard and soft tissue to be removed. At the same time, we needed to be mindful of crown-root ratio not being larger than 1:1, and the planned restorative margin not exceeding anatomical CEJ. From intra-oral scan, we learned the amount required to apically position restorative margin to provide sufficient ferrule on #8. Surgical guide was 3D printed to indicate expected restorative margins based on all information given.

At the time of surgery, the crown lengthening guide was tried in both before and after full thickness flap. The alveolar crest bone was removed until the distance between the bone crest and planned restorative margin was 3mm. Lastly, the full thickness flap was closed, and gingival margins were accurately positioned with single interrupted sutures.

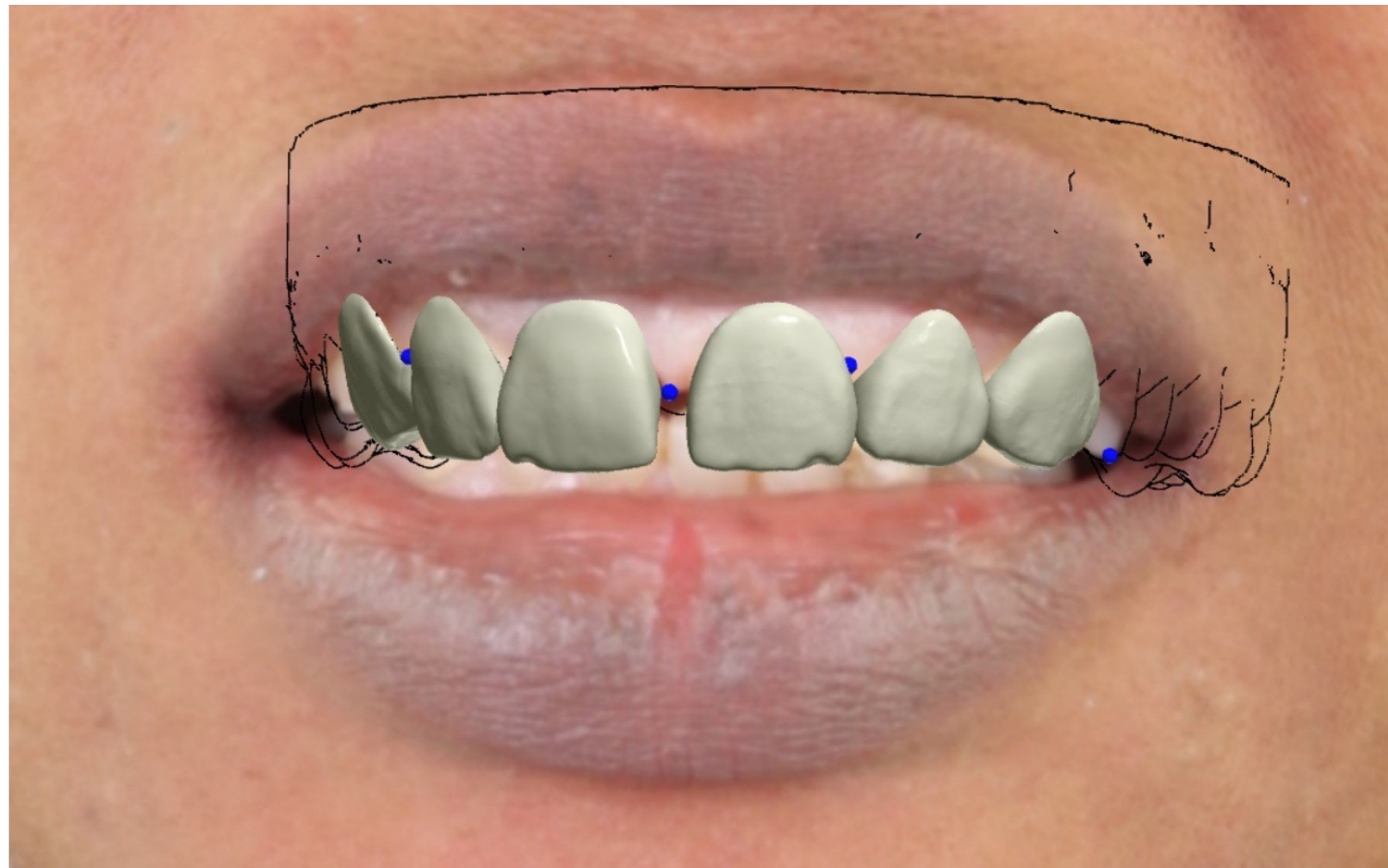
Technique



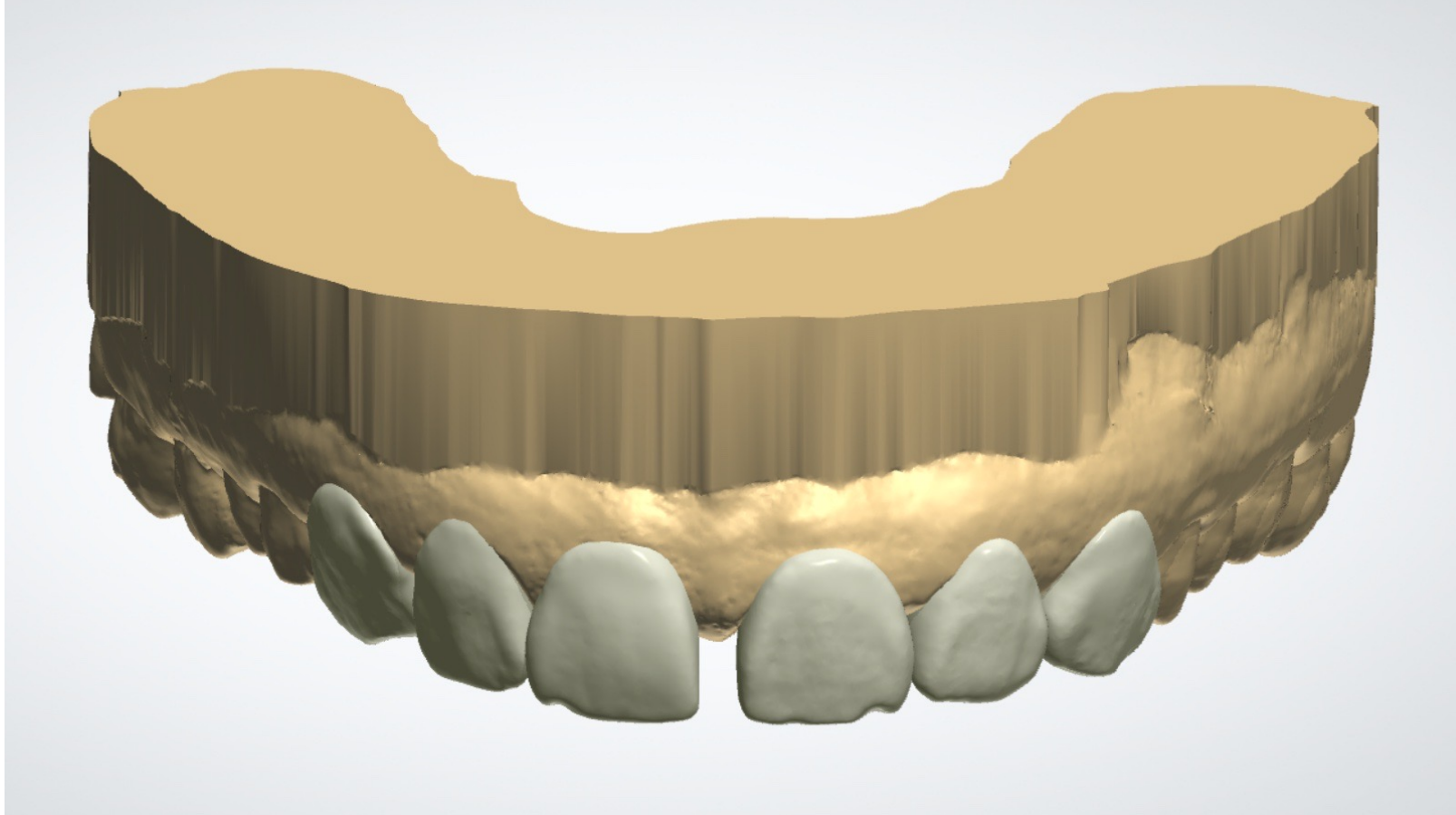
1. Pre-Op



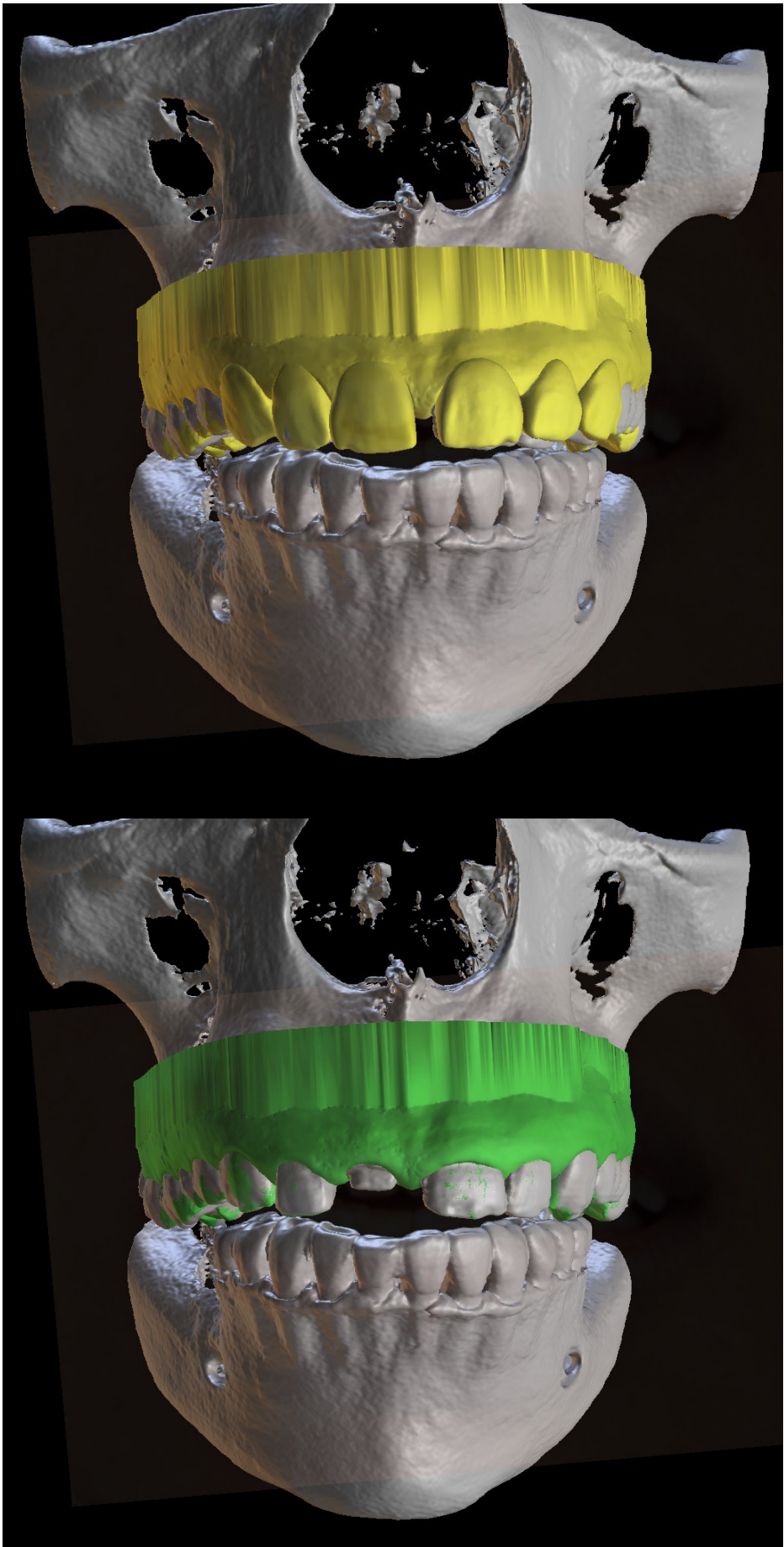
2. Provisional Crown and Post



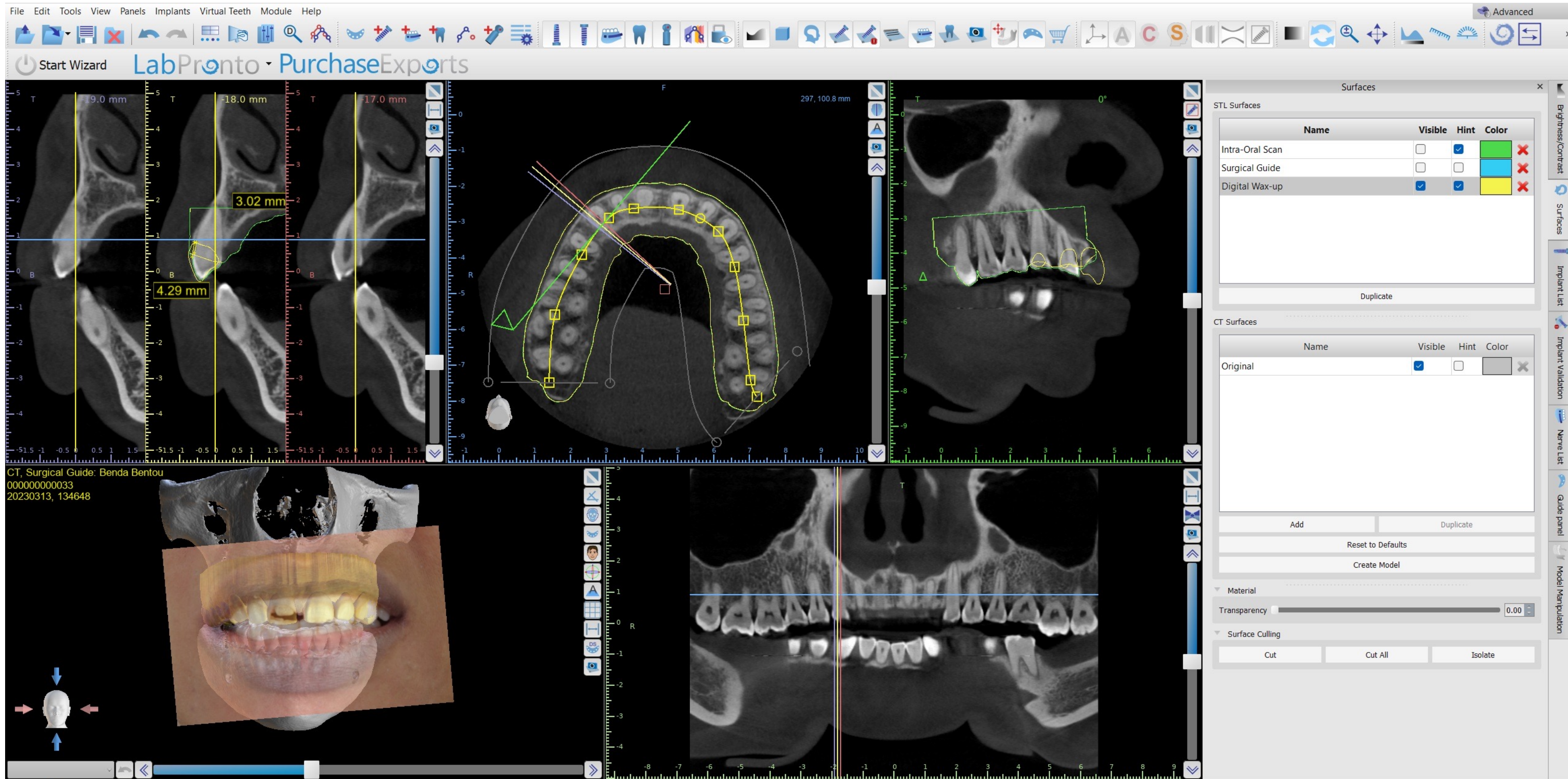
3. Digital Smile Design



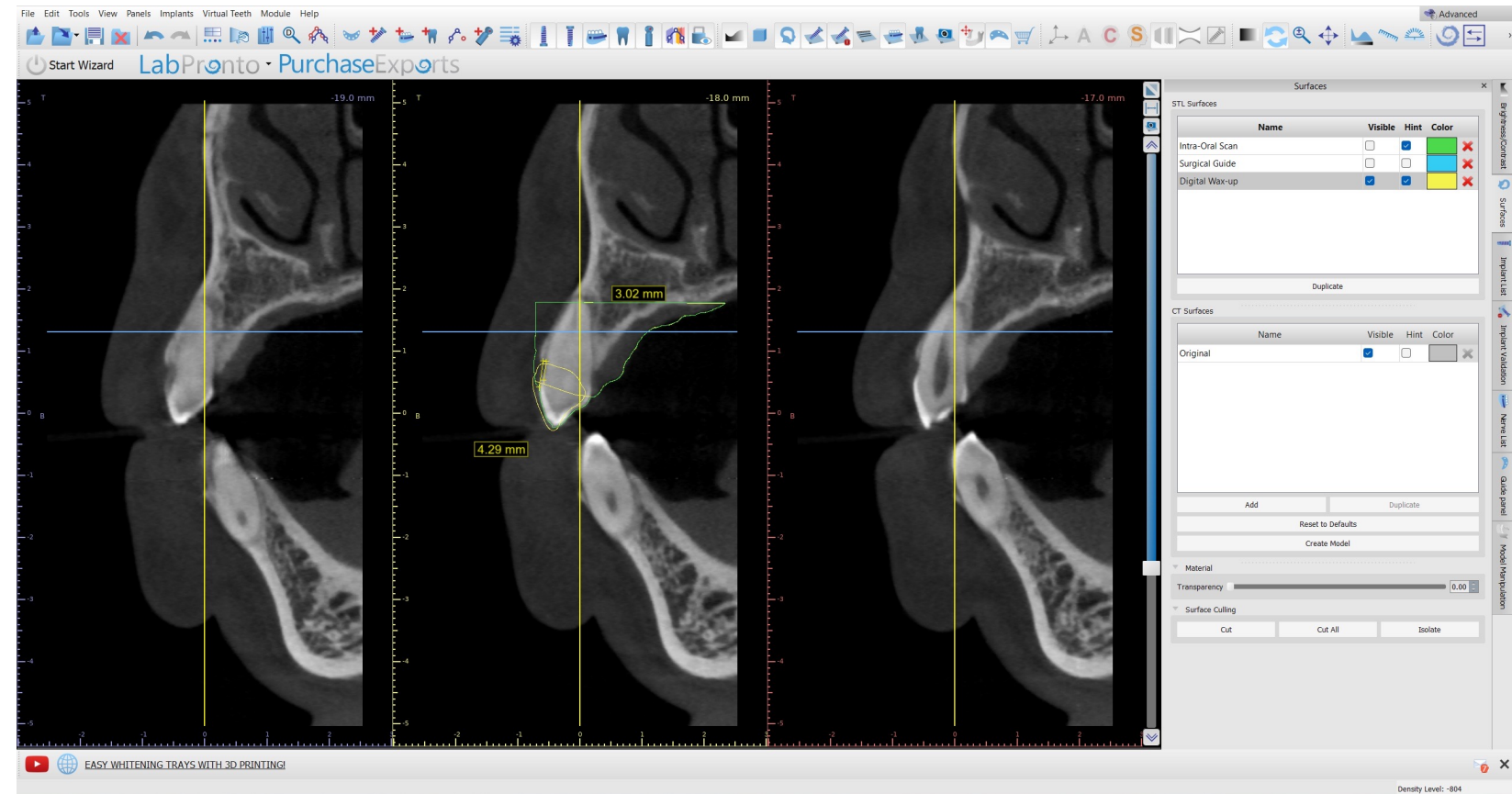
4. Digital Wax-up



5. STL files of Digital Wax-up (yellow) and Diagnostic Impression (green)



6. Osseous and Gingival Reduction Measurements



7. Crown Lengthening Guide Design



8. Crown Lengthening Guide Try-in



9. Crown Lengthening Procedure



10. Provisional Crown after Surgery



11. Final Crown (PFZ) Try-In



12. Final Crown (PFZ) Delivery

Results

After 3-4 months of surgery, clinical gingival margins were fallen at the same level of digitally planned restorative margins. Sufficient amount of ferrule on #8 was confirmed. Tooth preparation refinement on #8, and provisional crown remade to re-contour the soft tissue. #8 pre-fab metal post and composite core were cemented. PFZ final crown required additional anatomical modification and staining after try-n. At cementation of PFZ crown, the gingival margins #6-11 were all achieved at desired level.

Conclusion

Digitally designed crown lengthening guide can provide precise amount of bone and gingival reduction to the surgeon. With the aid of digital planning, we can achieve appropriate gingival zeniths and sufficient ferrule on tooth #8 without violating biological width. And desired esthetic outcome can be accomplished at the time of definitive crown cementation.

Reference

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