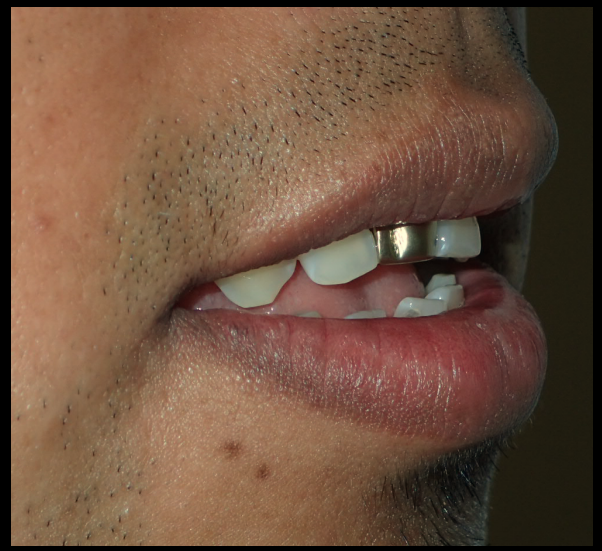
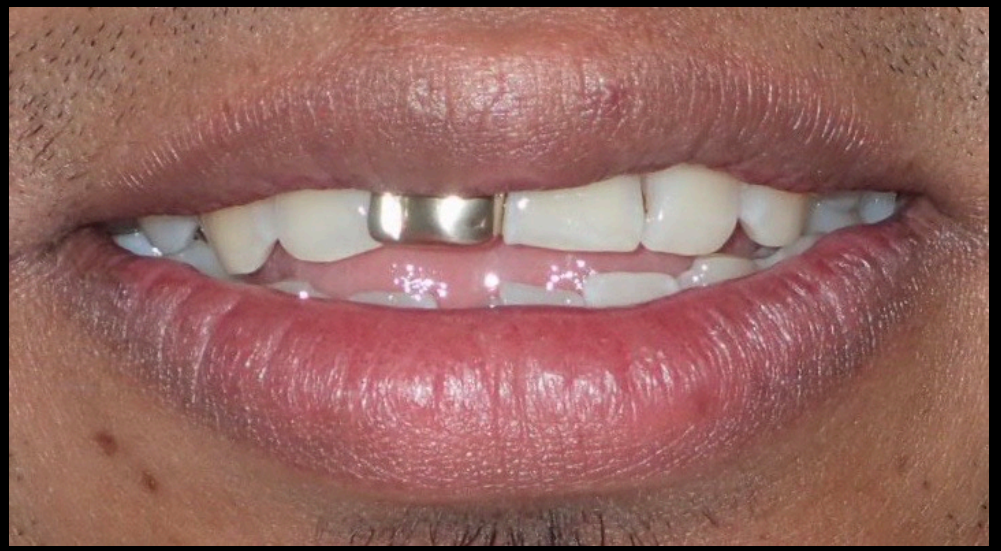
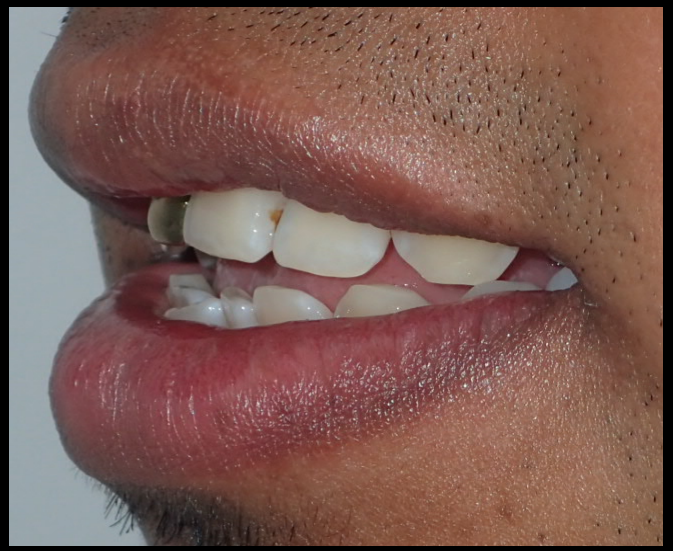
Restoration in the esthetic zone for a patient with an anterior open-bite

HETAL TRIVEDI – IDS 2020

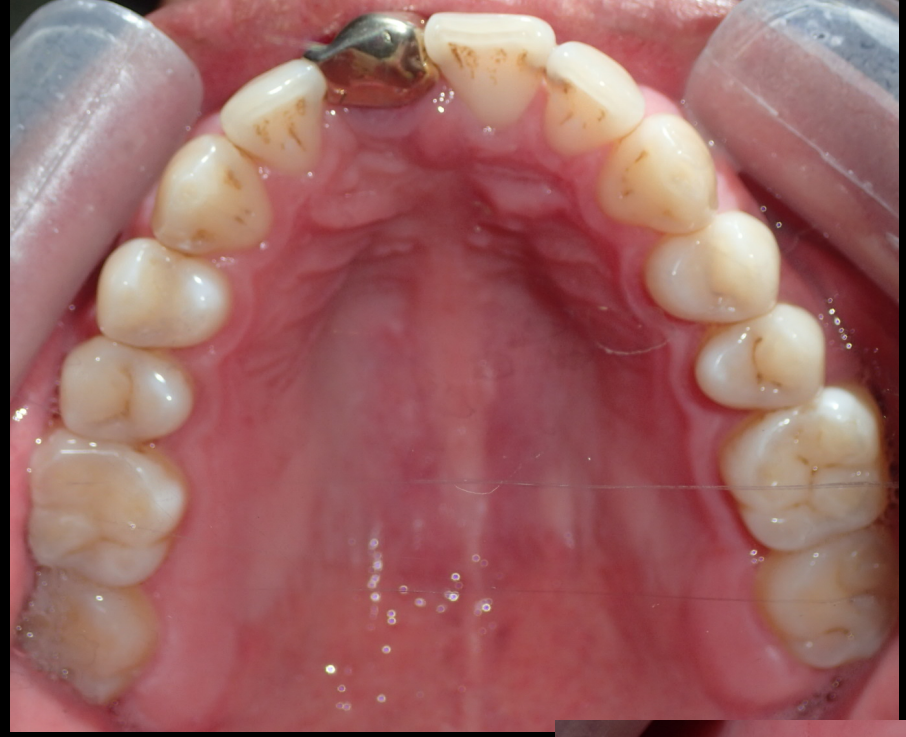
C/C: “I want to change the gold crown on my front tooth and make my smile look good”

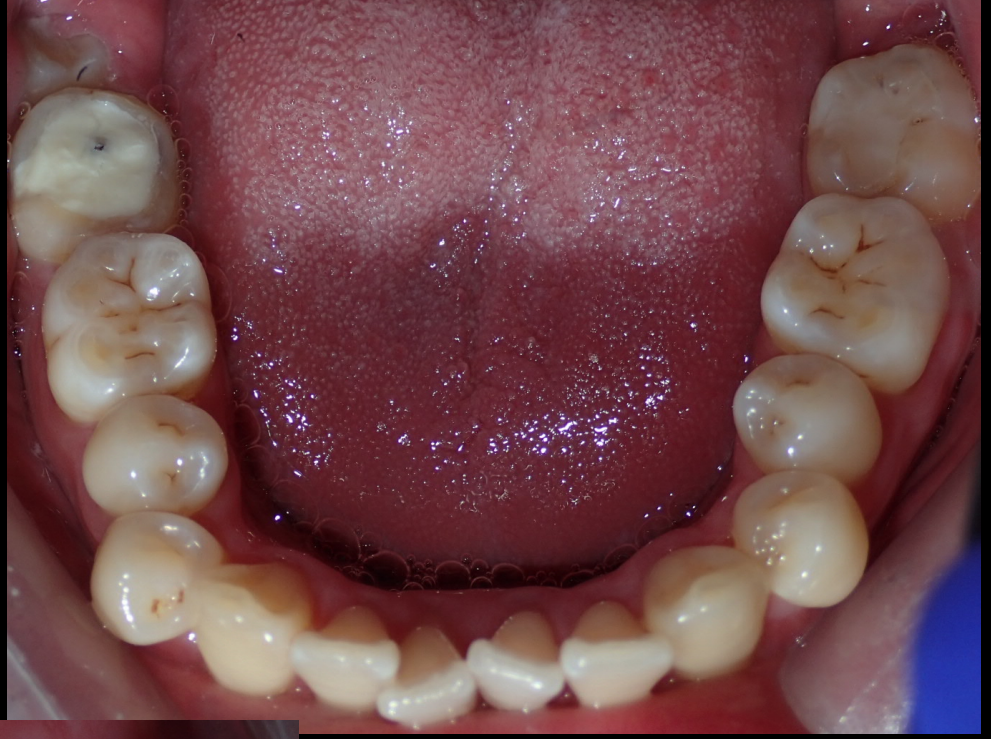


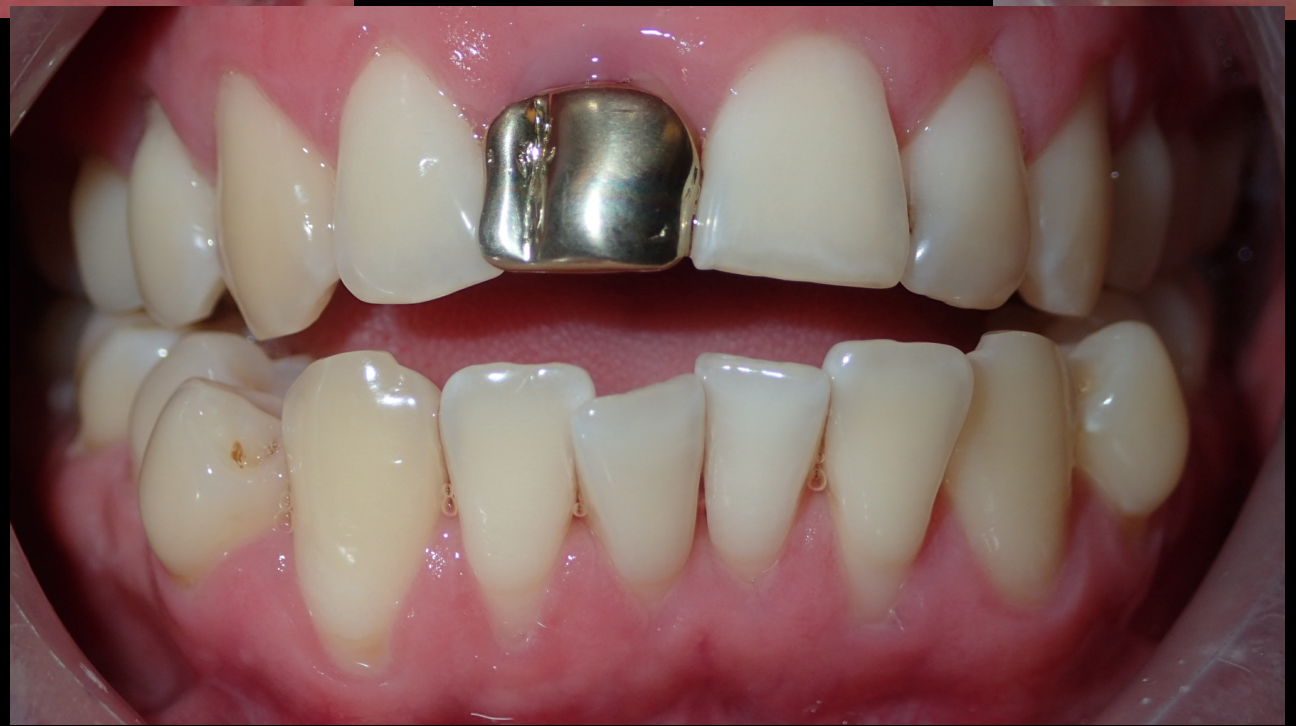


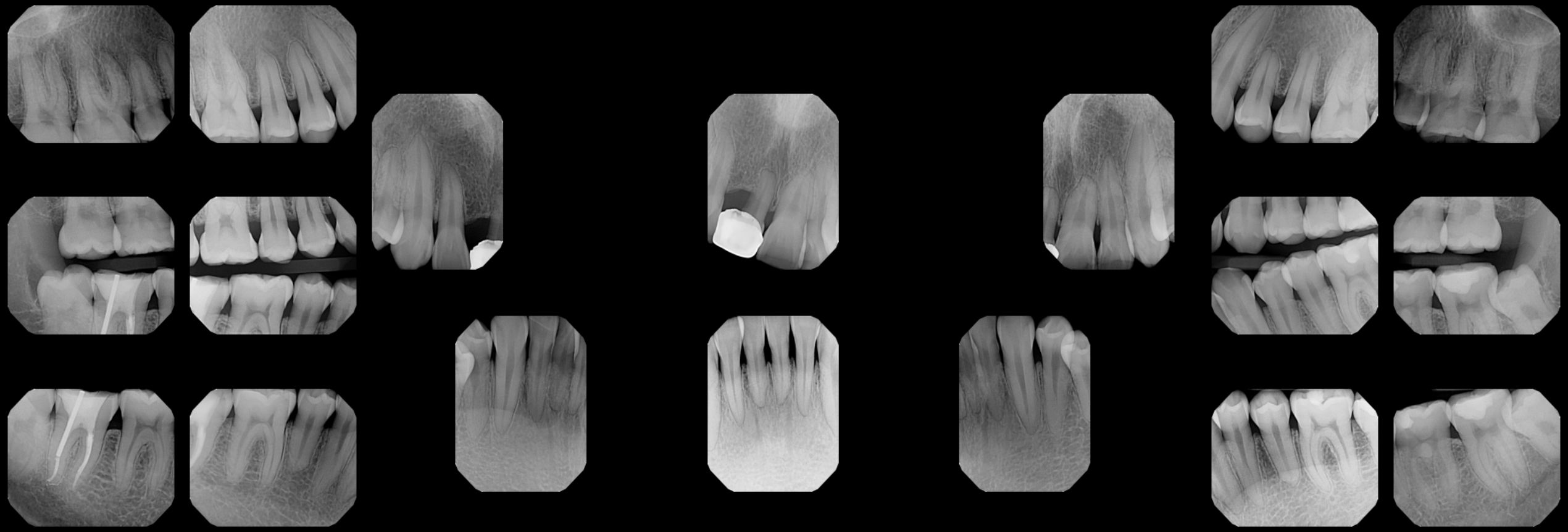


Our Patient



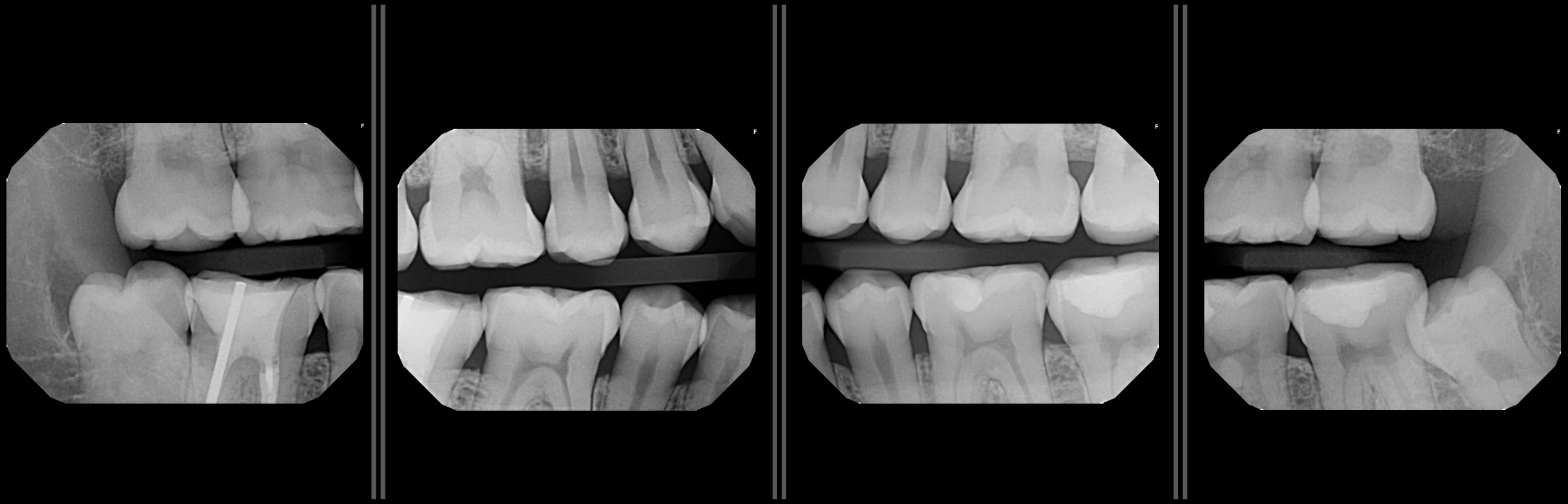






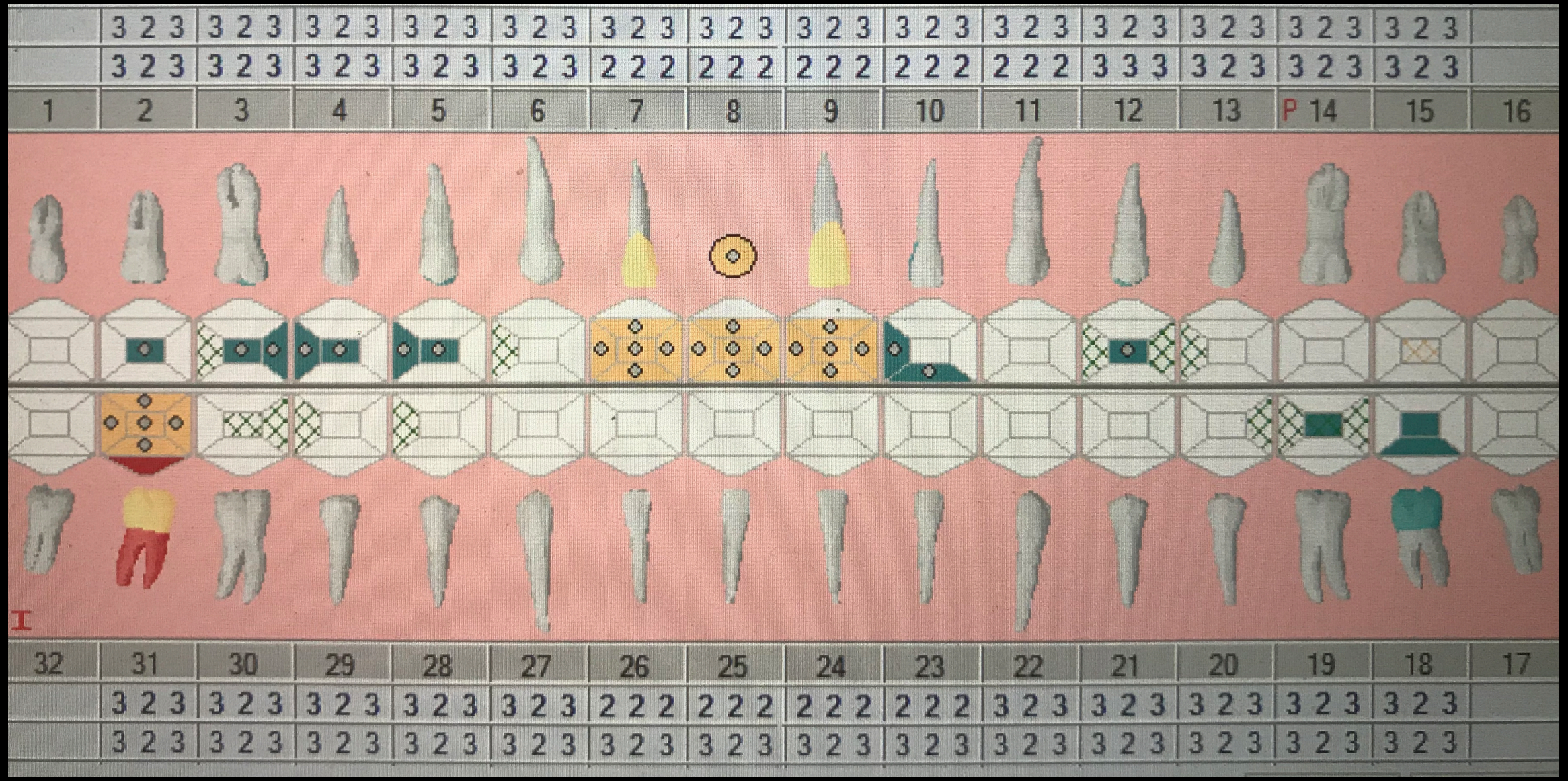
The patient has no significant medical history

The disease control phase included oral prophylaxis followed by composite restorations on #2, #3, #4, #5, #10, #12, #18 and #19.



A closer look into the bitewing radiographs

Odontogram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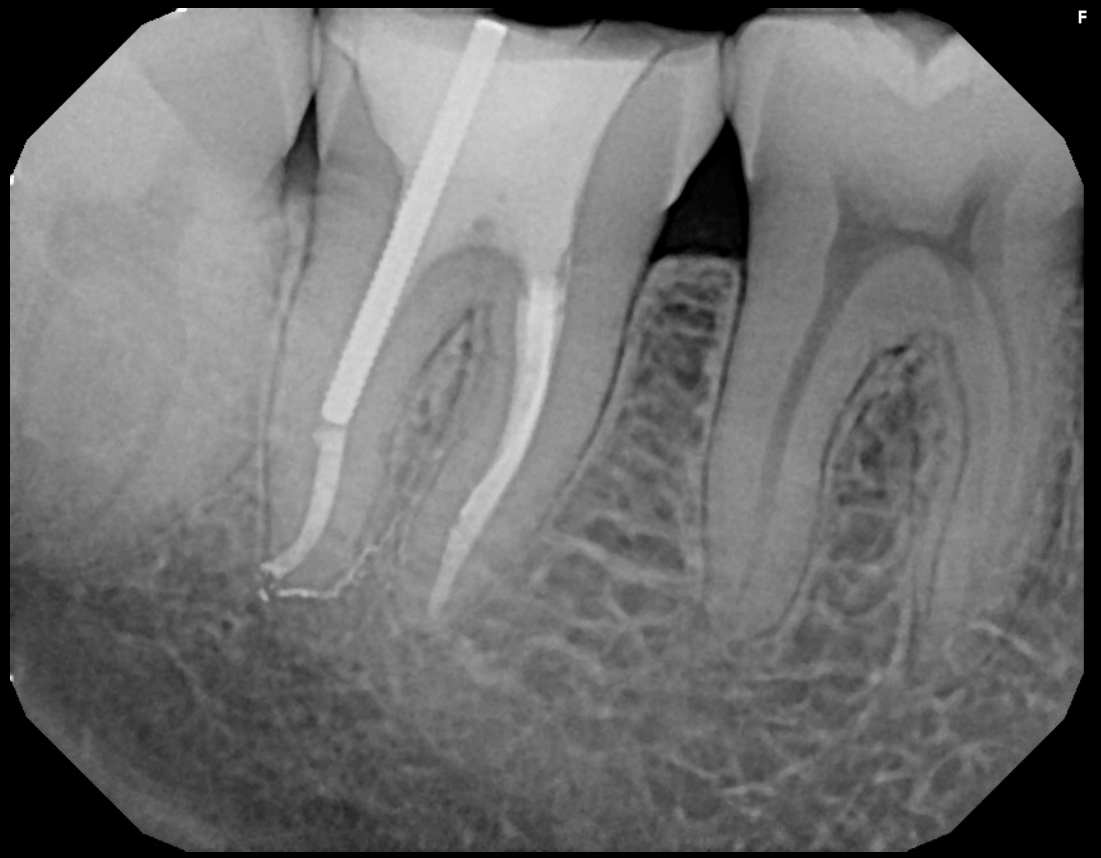
The Patient was provided with all the required dental care before initiating any treatment in the esthetic zone.

#31 was endodontically treated at a private dental office. I performed cold test and EPT and got an endo consult.

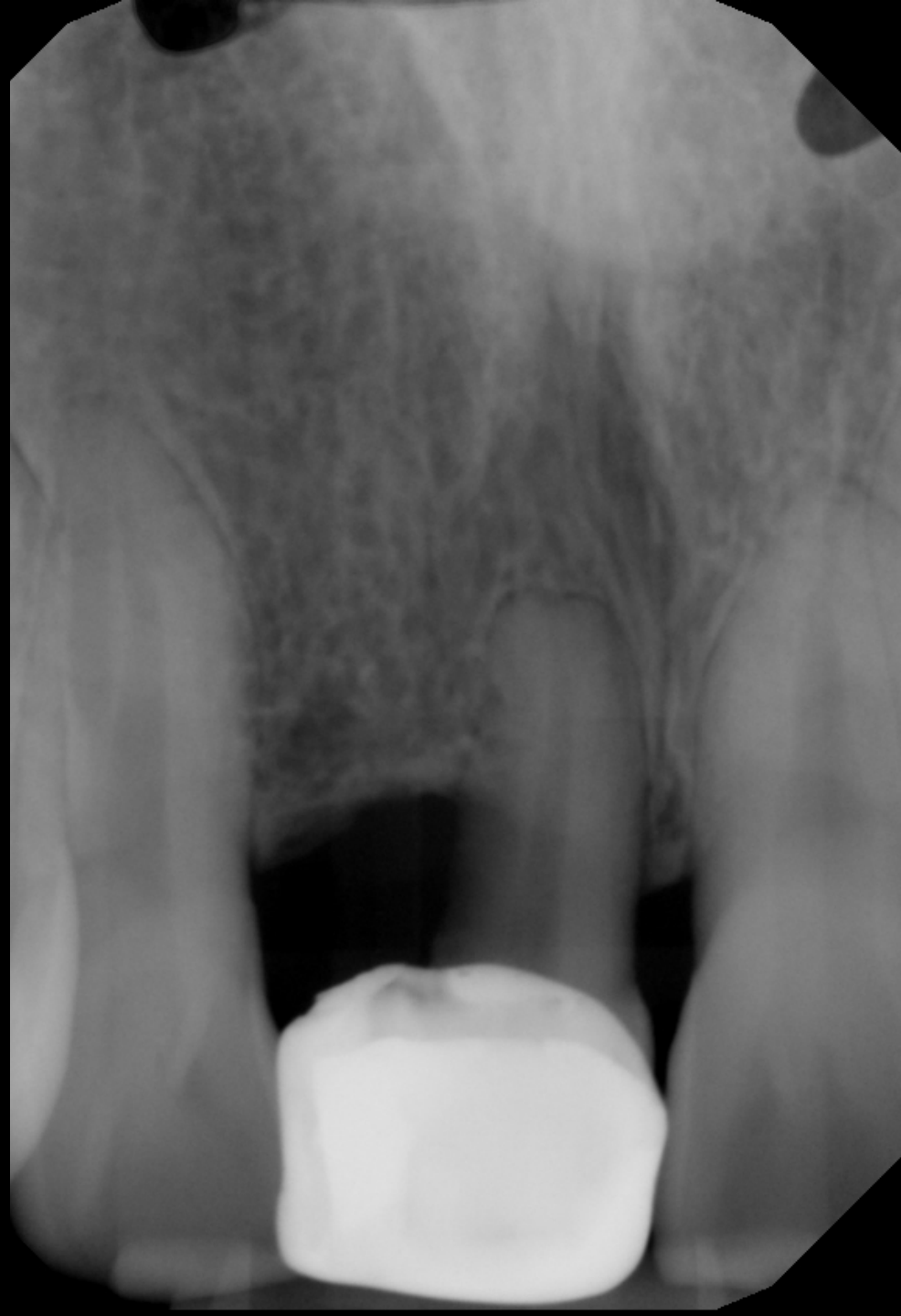
#31 was treatment planned to get a full coverage restoration.

A monolithic zirconia crown was fabricated and delivered on #31.



History of chief complaint and other factors

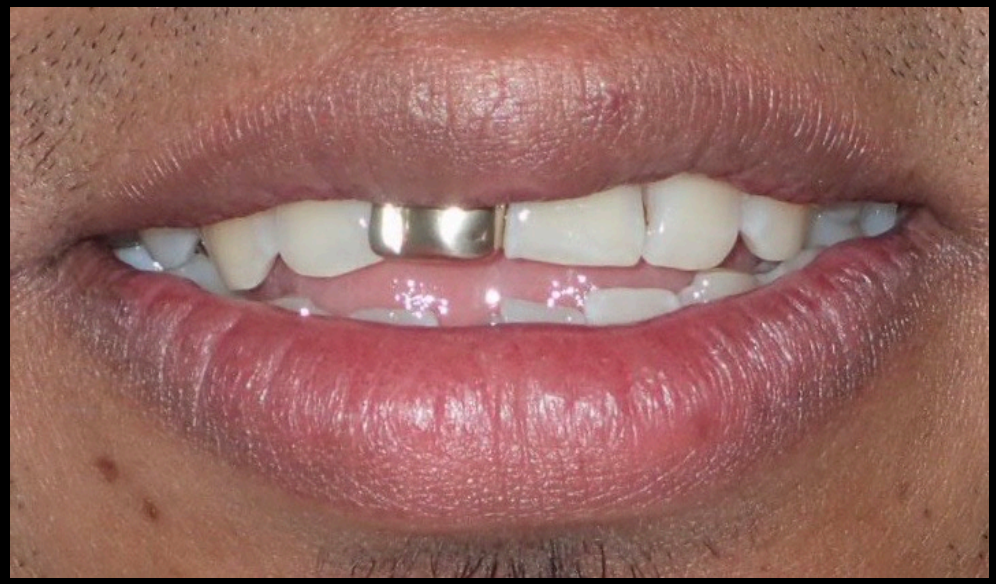
- The patient had received a gold crown on his front tooth in Guatemala about 7 years ago.
- #8 is missing, and the gold crown is placed on a mesiodens.
- On examining the patient's swallowing pattern, it was seen that he has a tongue thrust. Patient did not report any thumb sucking habit as a child, from what he remembers.
- Patient goes into MI in two different positions and does not realize or feel any difference.
- He reports no TMJ discomfort or pain in muscles of mastication.



C/C: “I want to change the gold crown on my front tooth and make my smile look good”

Available options:

1. Orthodontics
2. Implant restoration for #8
3. Bridge for #7-8-9
4. No treatment.



RBAs of all the options were discussed with the patient. He did not prefer a removable treatment option. He requested for a treatment plan that takes the least amount of time.

Orthodontics?

The patient did not choose it because of the lengthy treatment period

The evidence suggests that anterior open bite is best treated by orthodontic treatment with early intervention. The mixed dentition period is the most favorable period for successful outcome. Permanent dentition makes the outcome unpredictable when treated with orthodontics alone. Orthognathic surgery is often necessary, and the **over all treatment may take 2-3 years.**

Our patient did not have the time and resources for a lengthy treatment option.

- *Orthodontic Treatment Timing and Modalities in Anterior Open Bite: Case Series Study. Wisam Al Hamadi et al. Open Dent J 2017. doi: 10.2174/1874210601711010581. PMCID: PMC5725483*
- ***Orthodontic treatment of anterior open bite: a review article--is surgery always necessary?*** *Reichert I et al. Oral Maxillofac Surg. 2014 Sep;18(3):271-7. doi: 10.1007/s10006-013-0430-5. Epub 2013 Aug 16.*
- ***Orthodontic treatment of anterior open bite.*** *Ng CS et al. Int J Paediatr Dent. 2008 Mar;18(2):78-83. doi: 10.1111/j.1365-263X.2007.00877.x.*
- ***Orthodontic treatment for a patient with anterior open bite and severe condylar resorption.*** *Moon Det al. Am J Orthod Dentofacial Orthop. 2020 Mar;157(3):392-407.e2. doi: 10.1016/j.ajodo.2018.10.030.*

Dental Implant?

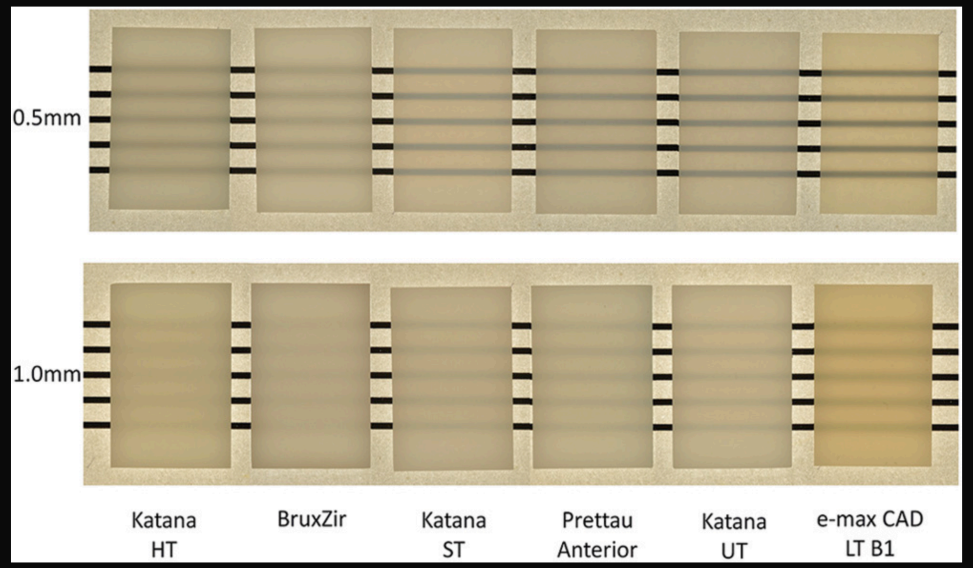
The patient did not choose it because this option limits the opportunity of future orthodontic treatment and does not allow the closure of open bite

Replacing the mesiodens with an implant restoration would not solve the issue of open bite and this option does not provide the opportunity to recontour the adjacent teeth (which can be done in an FDP)

Implants also limit the option of future orthodontic treatment. The orthodontic resident providing the consult said that a bridge can be moved orthodontically as one unit when needed.

Bridge? YES!

Lithium Disilicate fixed dental prostheses for #7-8-9



Translucency of Lithium disilicate makes it highly esthetic and suitable for anterior restoration.

The *adequate connector size* in the anterior region contributes to the strength and success of Lithium Disilicate bridges.

Mean biaxial flexural strength for IPS e.max CAD: 530 MPa.
Source: R&D Ivoclar Vivadent, Schaan, Liechtenstein

A comparative evaluation of the translucency of zirconia and lithium disilicate for monolithic restorations. Harada K et al. J Prosthet Dent. 2016. doi: 10.1016/j.prosdent.2015.11.019

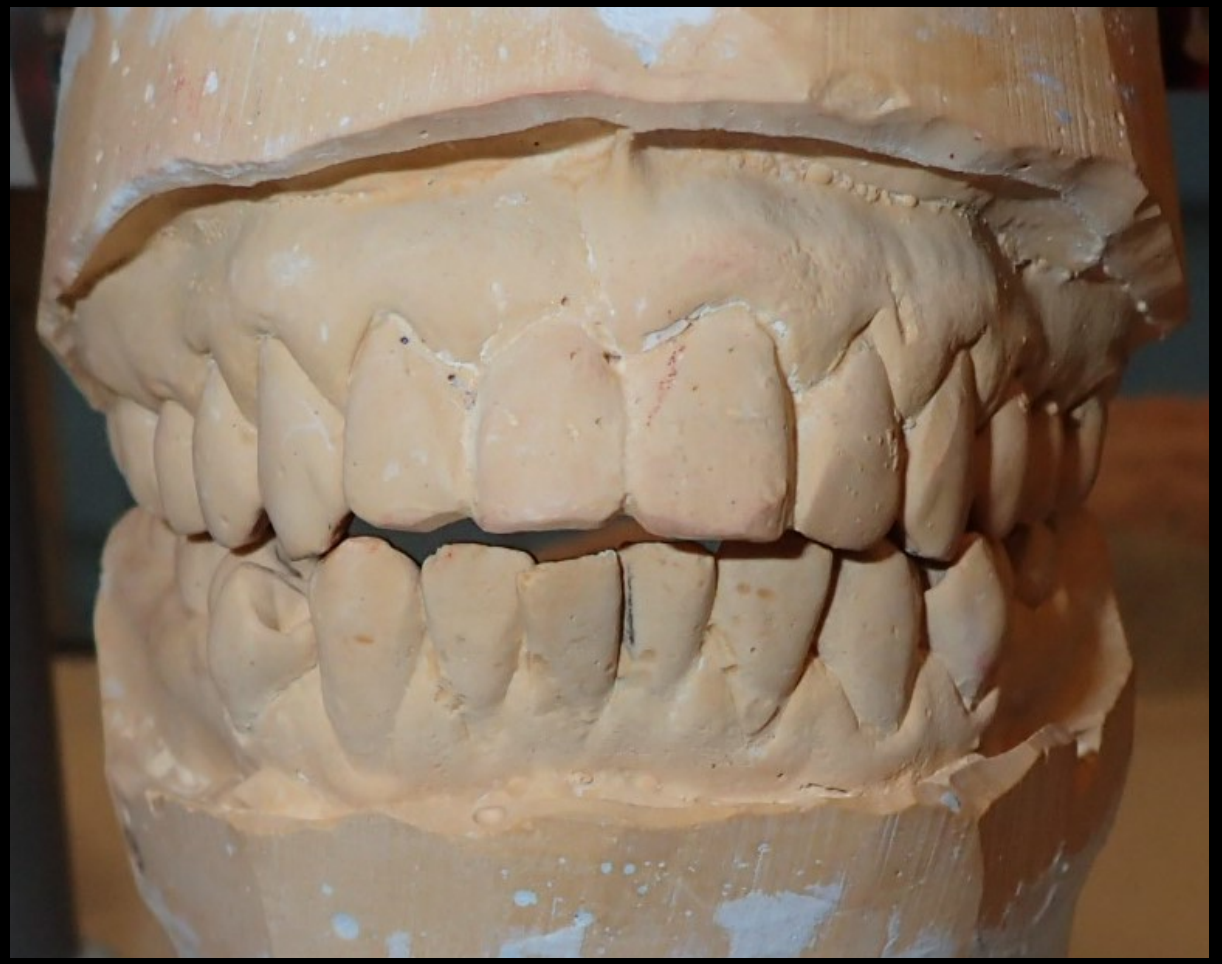
Fracture Strength and Mode of Anterior Single-Retained All-Ceramic Resin-Bonded Bridges Using a CAD/CAM System. Tsitrou E et al. Int J Comput Dent. 2012;15(2):125-136.

Planning for a Lithium Disilicate Bridge in esthetic zone

I started with a wax-up for #8.

The clinical process includes:

1. Shade selection
2. Crown prep with Provisionals for #7 &#9
3. Extraction of mesiodens and a provisional bridge
4. Digital Impression
5. Delivery of the final restoration



Step 1: Shade Selection

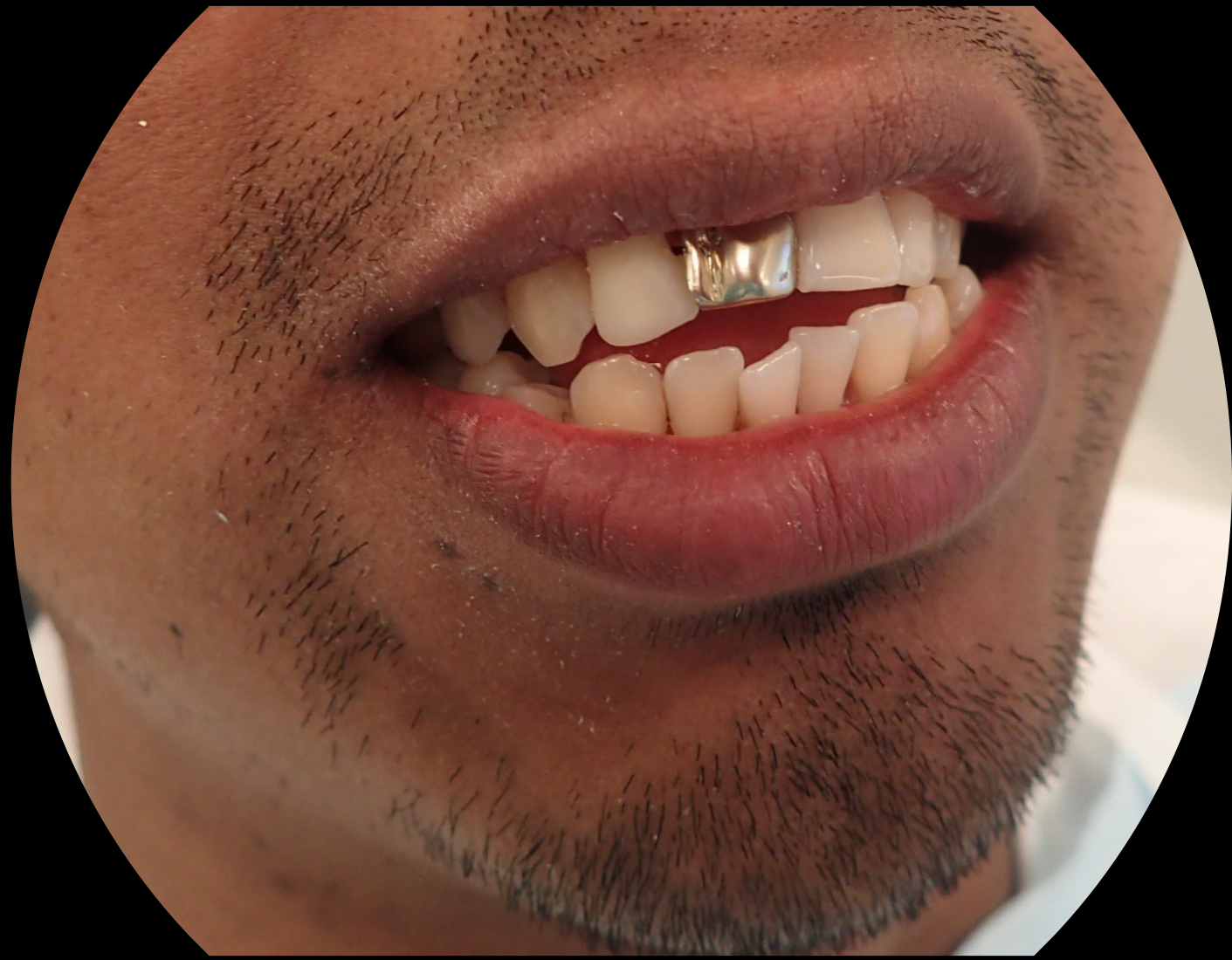
Good quality photographs showing the shade-tab and adjacent teeth must be sent to the lab for accurate replication

Step 2: Tooth preparation for #7 & #9

#7 and #9 were prepared adequately to receive a Lithium Disilicate crown.

Provisional crowns are fabricated for #7 and #9 separately.

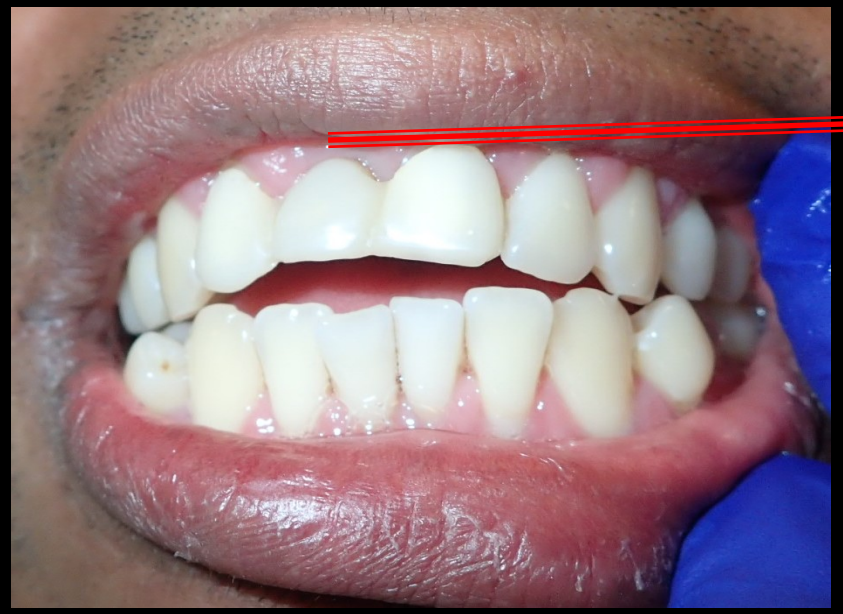
After the extraction of mesiodens, a provisional bridge will be delivered for #7-8-9.



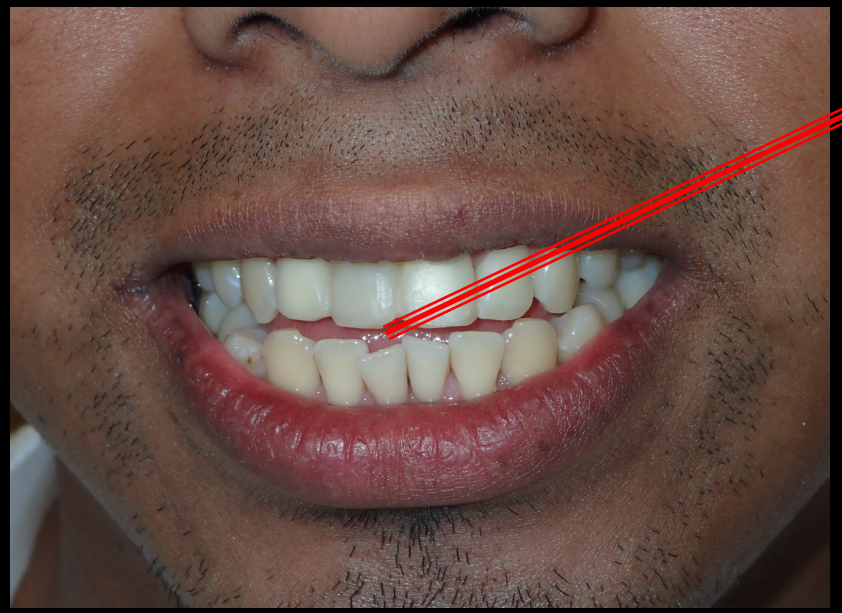
Step 3: Extraction of mesiodens

The provisional bridge was delivered immediately after the extraction of mesiodens.

The facial surface was contoured with composite to make it more esthetic and to reduce the appearance of the open bite. It also provides an esthetic try-in for our patient



The gingiva is contoured after the extraction with the provisional bridge. This provisional was left for **8 weeks** for adequate healing and healthy gingival contour.



The incisal and facial surface is contoured with composite to make the provisional longer so that the open bite can be reduced.

Digital VS Conventional workflow

- Digital workflow provides efficiency and patients prefer it over PVS.
- Digital workflow saves space for models as the information is recorded and stored on the computer.
- Digital impression helps us get feedback from the computer regarding any undercuts and discrepancies in the margins.
- The recorded impression (or a portion of it) can be deleted and re-recorded if required.
- In case of any fabrication errors, the same records can be used for reference.
- Digital impressions can record the arch as well as the bite.

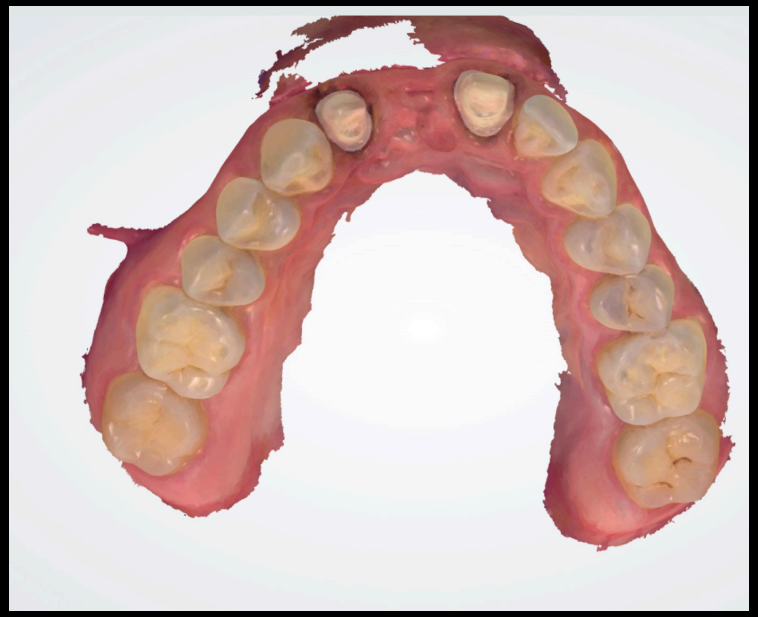
Digital impression requires adequate mouth opening and access for the scanner to record the details 3 dimensionally. This may make it harder to use for terminal tooth in the arch with limited intra oral access to the scanner.

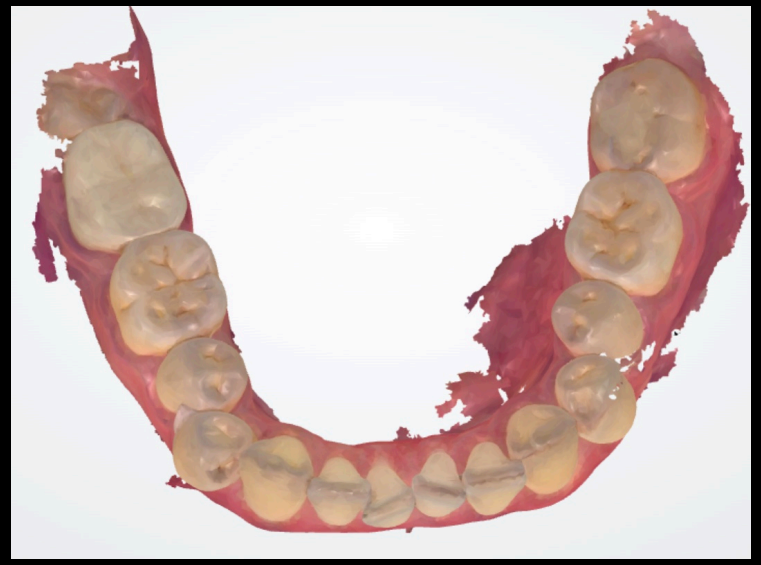
The Complete Digital Workflow in Fixed Prosthodontics: A Systematic Review - *Tim Joda et al. BMC Oral health. 2017 Sep19; 17(1):124. doi: 10.1186/s12903-017-0415-0.*

A Trios digital scanner was used for our patient in the main clinics

Adequate mouth opening and supra gingival preps made digital impression a favorable choice for our patient.

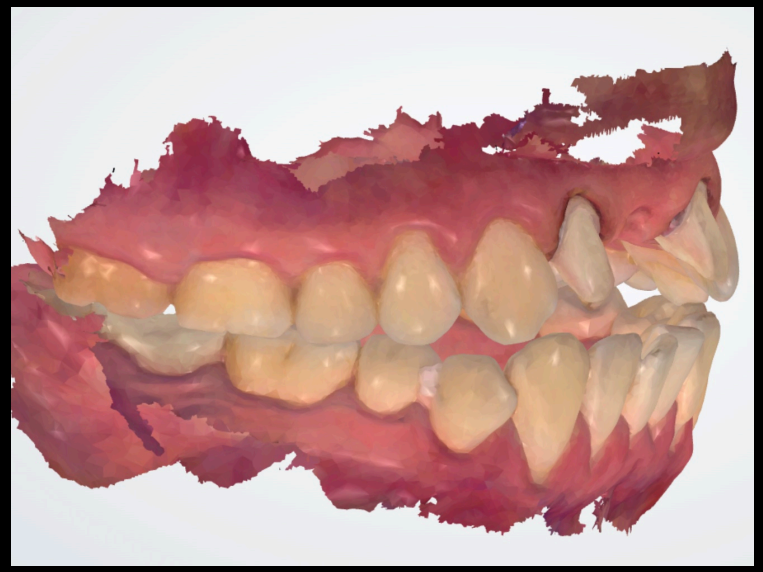
Step 4: Digital impression and stump shade selection

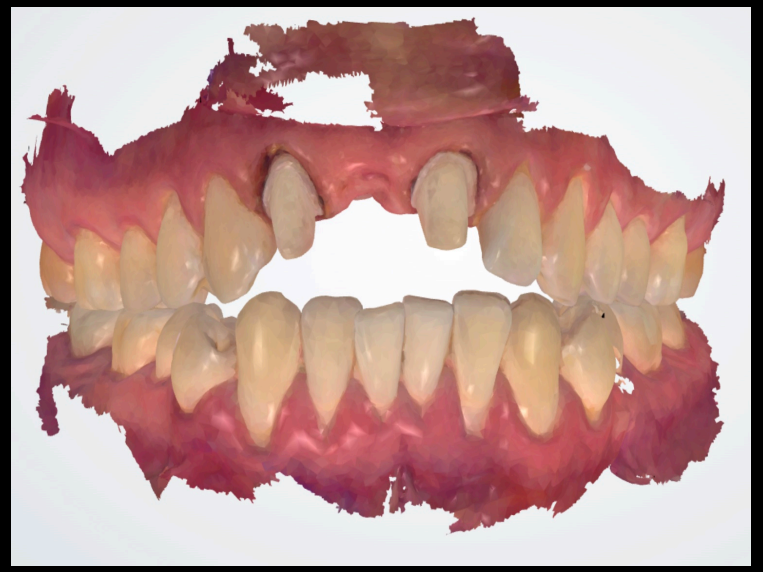


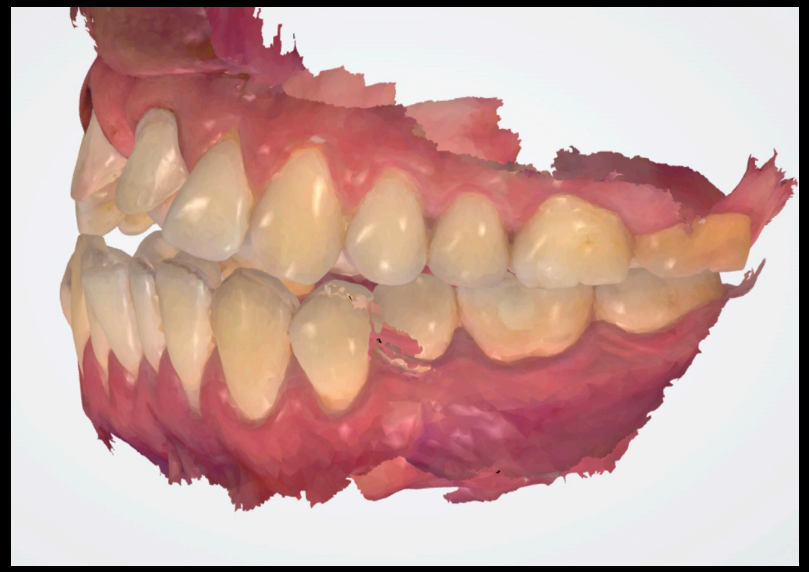


For a translucent restorative material like Lithium Disilicate, it is important to record the stump shade

We can record the patient's occlusion near the premolar area, after which the computer can mount the upper and lower digital models together

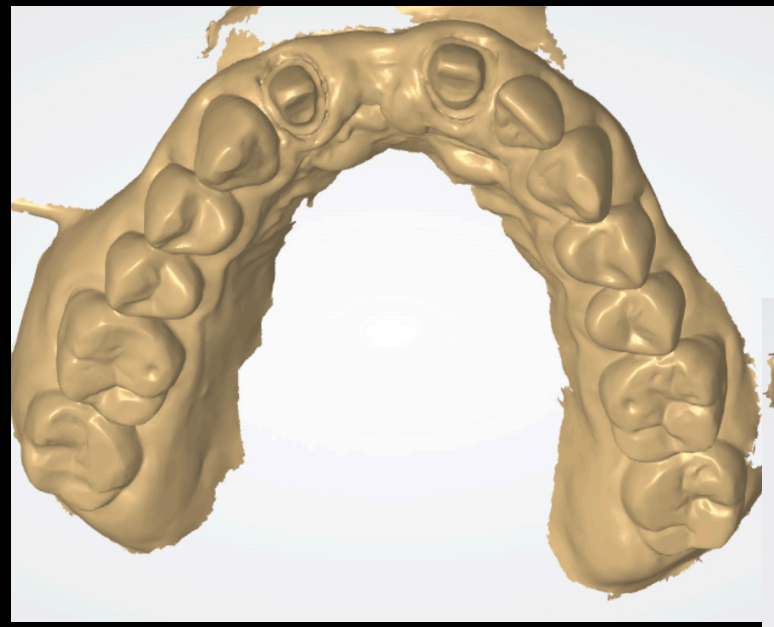


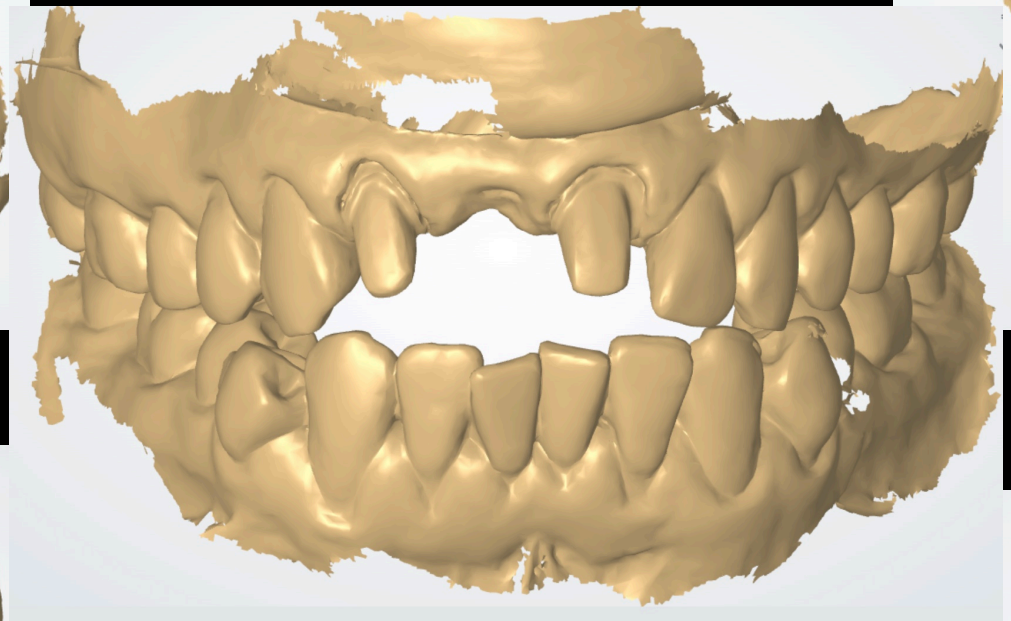


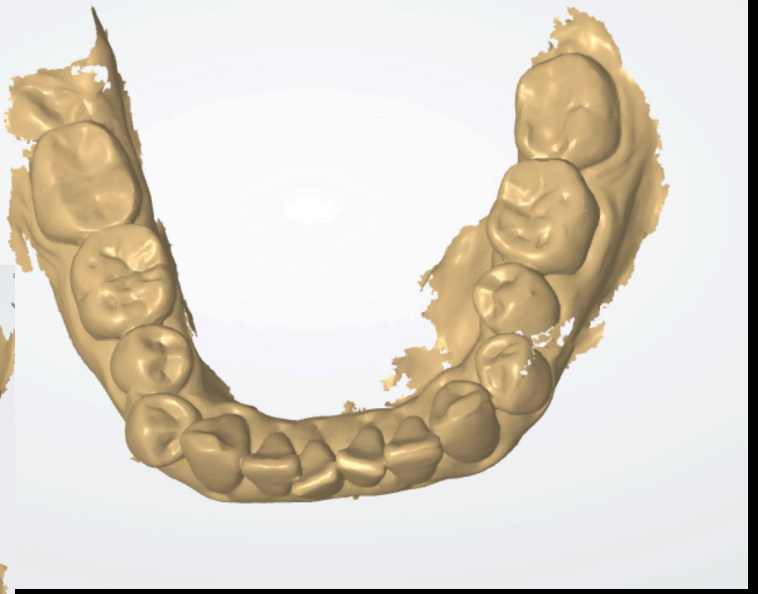


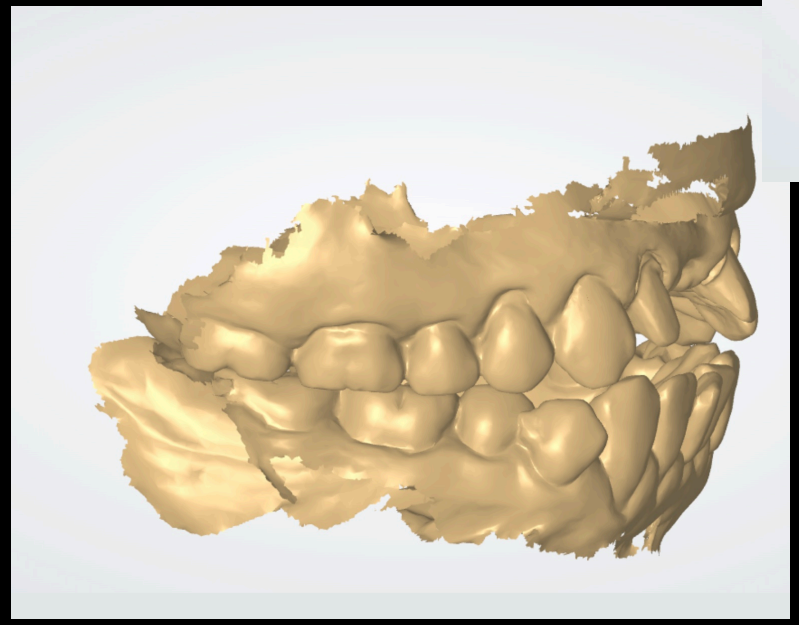
The patient needs to bite in MI when the clinician is recording the occlusion

Stone view









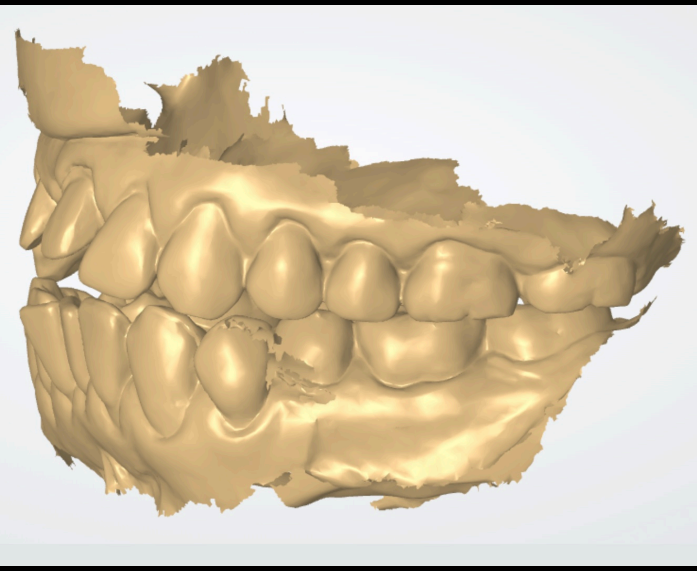
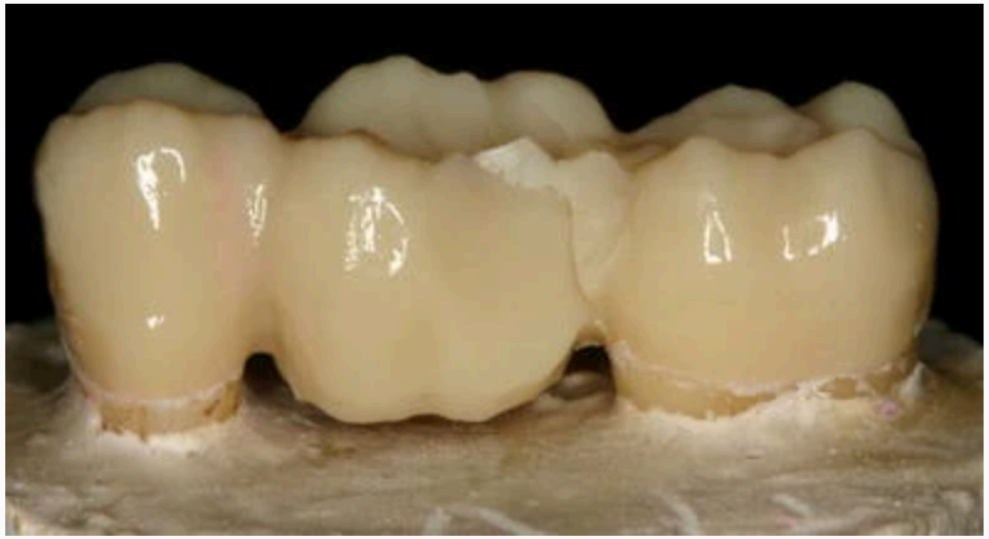


Photo Credits: Dr Bina Surti

Why monolithic and not layered Lithium Disilicate?



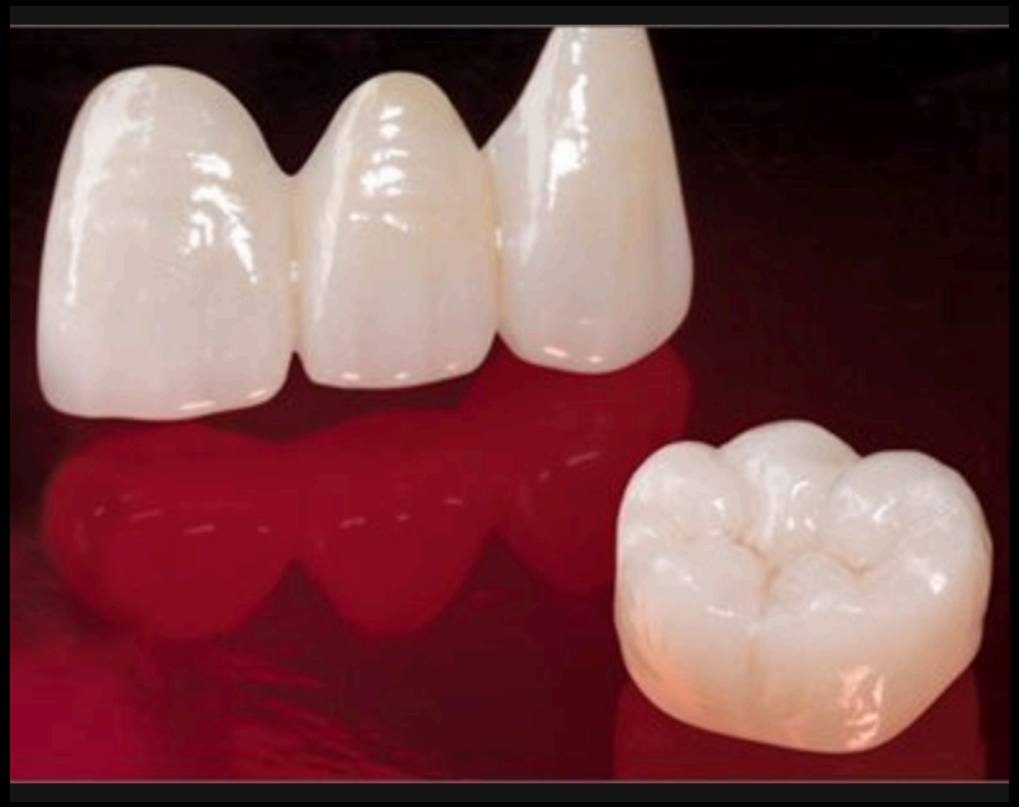
Ceramic bulk fracture at the distal connector of a M-LiCAD FDP

The higher fracture resistance of the full-anatomic CAD/CAM lithium–disilicate FDPs can be predominately attributed to the monolithic fabrication. As no veneer is applied, the thickness of the CAD/CAM lithium–disilicate FDPs is significantly higher in all dimensions as compared to bi-layer FDP restorations.

The presently investigated monolithic CAD/CAM lithium–disilicate FDPs showed fracture failure at comparable load levels to the metal–ceramic gold standard and therefore appeared to be as fracture resistant.

Monolithic and bi-layer CAD/CAM lithium–disilicate versus metal–ceramic fixed dental prostheses: Comparison of fracture loads and failure modes after fatigue. Stefan Schultheis et al. Clinical Oral Investigations ***volume 17****, pages1407–1413(2013)*

Long term success of the Lithium Disilicate bridge



Present evidence suggests success for single unit Lithium Disilicate crowns over fixed dental prostheses.

Most of the studies test the 3 unit fixed dental prostheses under fatigue. With the limited evidence available till date, monolithic prostheses are favored over veneered, and bridges in anterior region are favored over the posterior region.

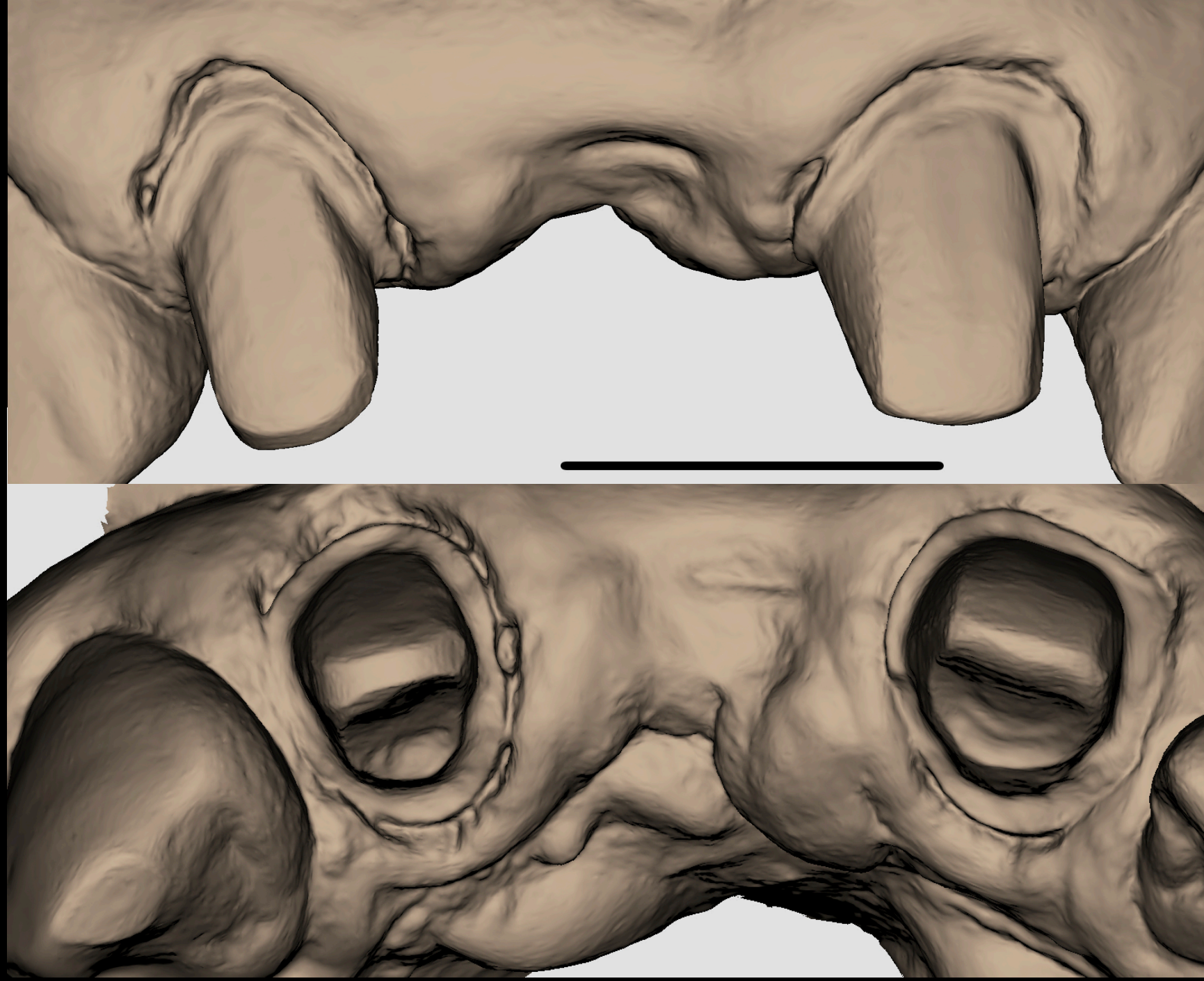
For our patient, the open-bite situation works in our favor as there will not be cyclic loading of the prostheses. Sufficient reduction of the tooth preparations ensures good thickness of the restorative material.

Clinical outcomes of lithium disilicate single crowns and partial fixed dental prostheses: a systematic review. *Pieger S et al. J Prosthet Dent. 2014 Jul;112(1):22-30. doi: 10.1016/j.prosdent.2014.01.005.*

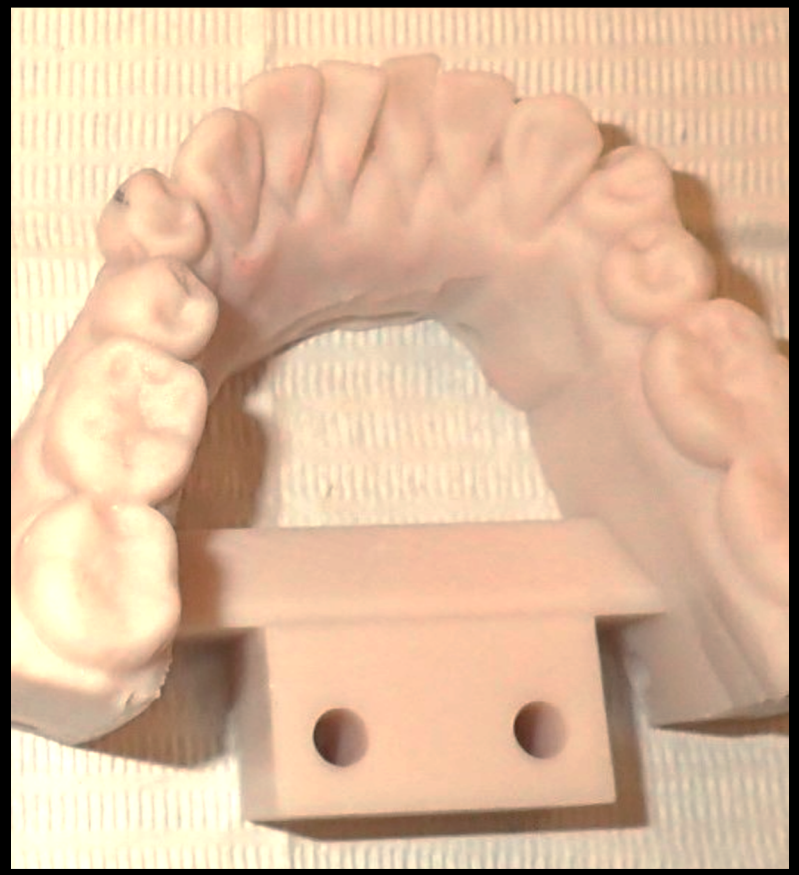
Close-up of facial and incisal view of digital stone model shows sufficient reduction for adequate thickness of the restorative material.

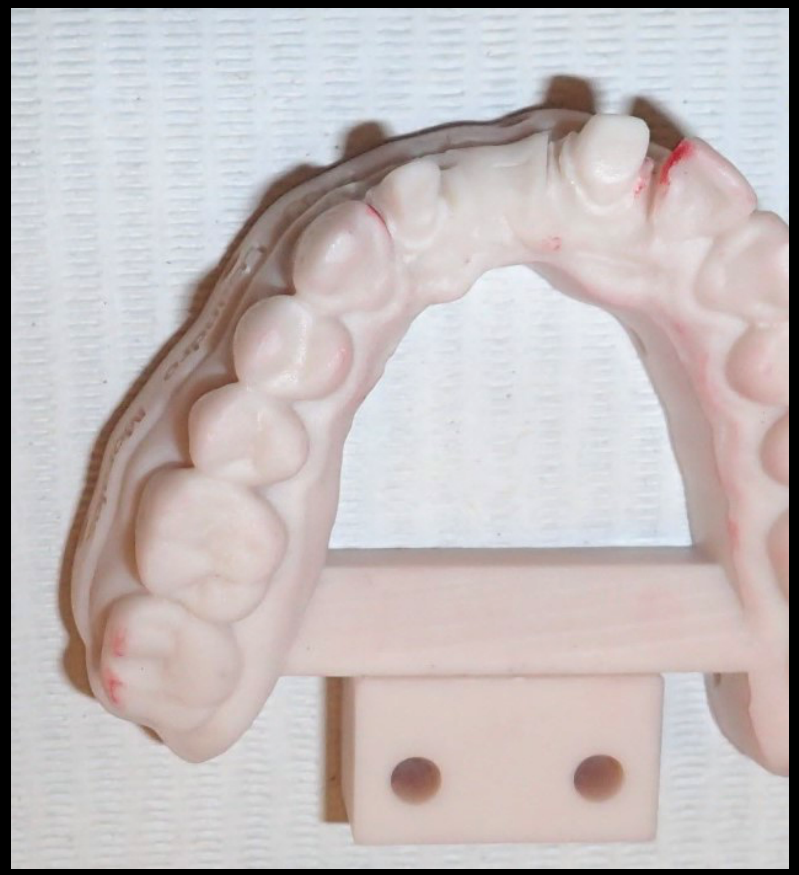
It is important to record the adjacent teeth well to get good contacts in the restoration.

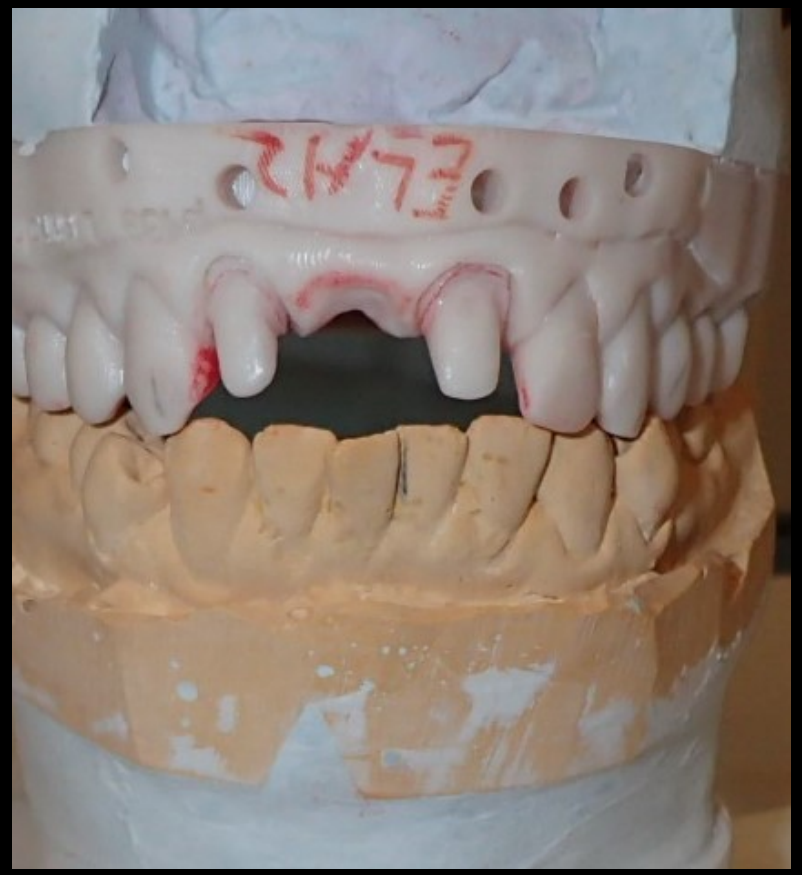
Margins should be verified on the stone view after the intra-oral scan is completed.



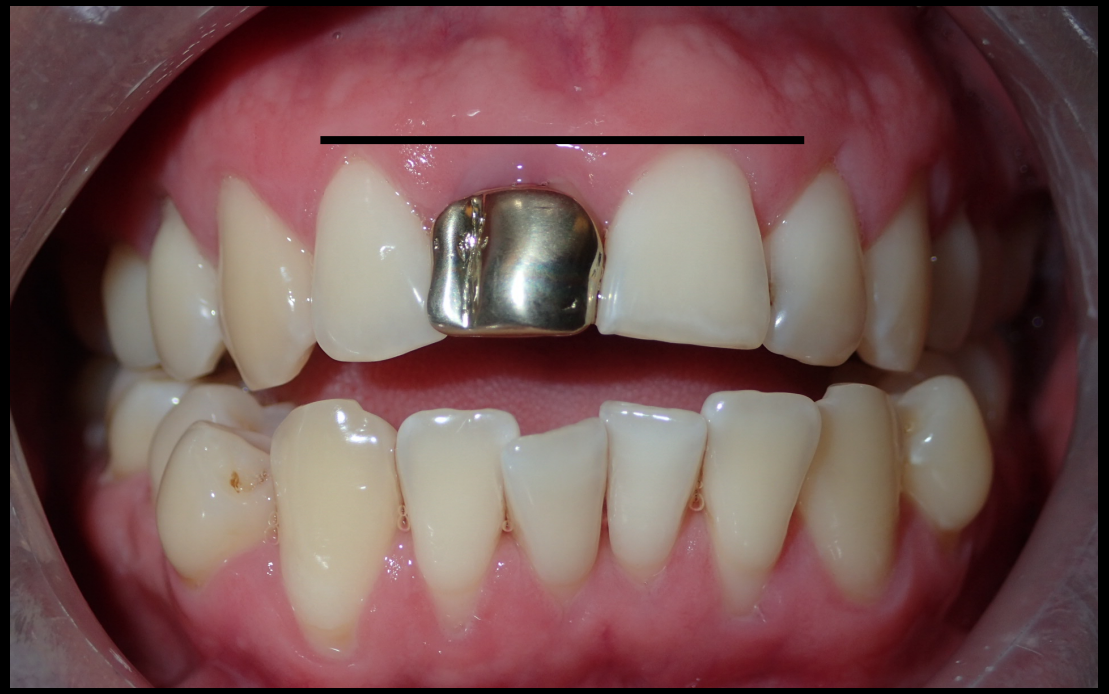
Mounting of the 3D printed models







Selection of Modified ridge lap pontic to match the gingival contour of contralateral incisor and provide access for cleaning



After the healing of the socket, there was still excessive GINGIVAL display in #8 region as compared to #9.

This situation demanded more coverage on the facial of #8 by the restorative material.

For this reason, I chose to use a *modified ridge lap* pontic so that it can provide esthetics and hygiene and provide adequate facial coverage.

- ***Different pontic design for porcelain fused to metal fixed dental prosthesis: Contemporary guidelines and practice by general dental practitioners.*** *Syed Murtaza Raza Kazm et al. Eur J Dent. 2018 . doi: 10.4103/ejd.ejd_232_18: 10.4103/ejd.ejd_232_18*
- *Restoration using gingiva-colored ceramic and a ridge lap pontic with circumferential pressure: A clinical report. Tae Hyung Kim et al. The Journal of Prosthetic Dentistry. Volume 104, Issue 2, August 2010. https://doi.org/10.1016/S0022-3913(10)00107-1*

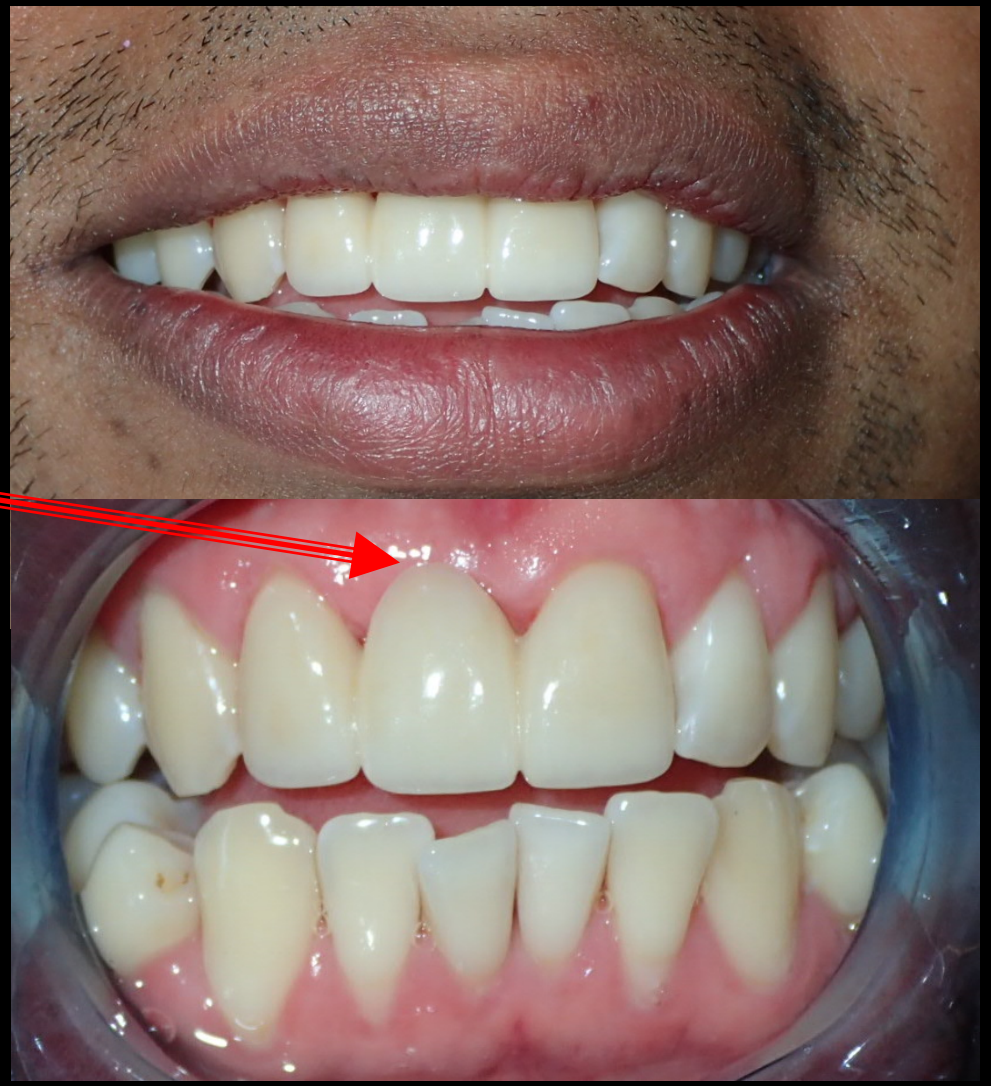
Step 5: CIMOE of the bridge on #7-8-9

The CIMOE appointment went very smoothly requiring almost no modification on the prosthesis. The mild adjustment in the contact area was done using a fine diamond and then polished with the ceramic polishing kit.

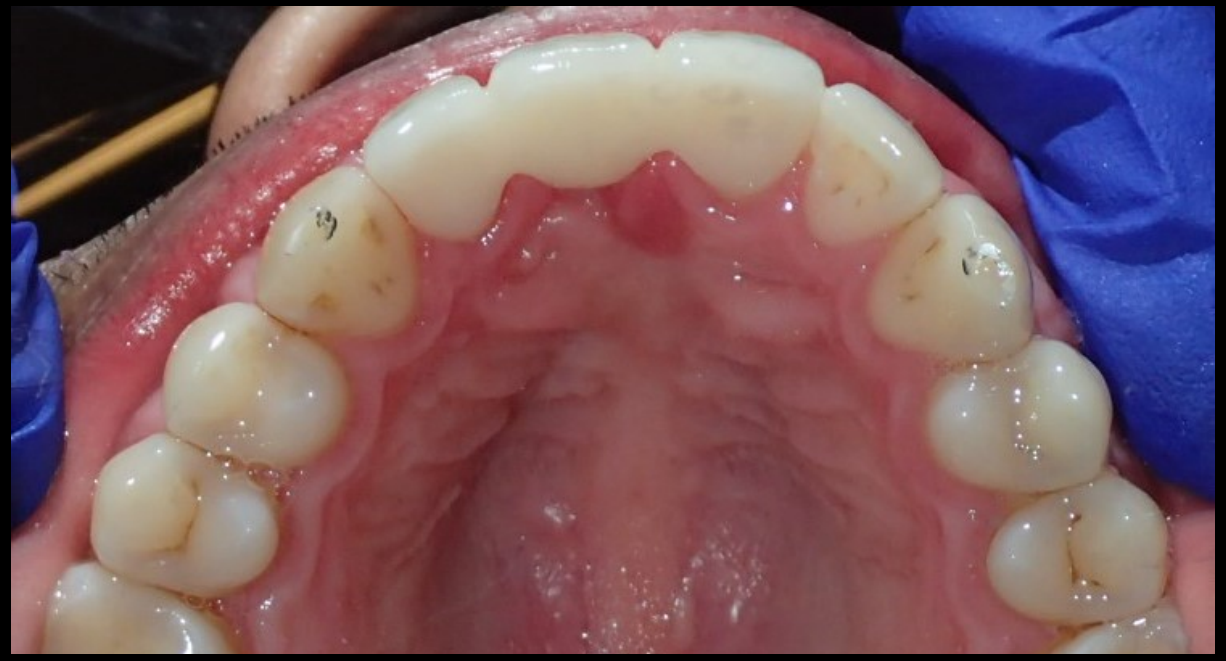
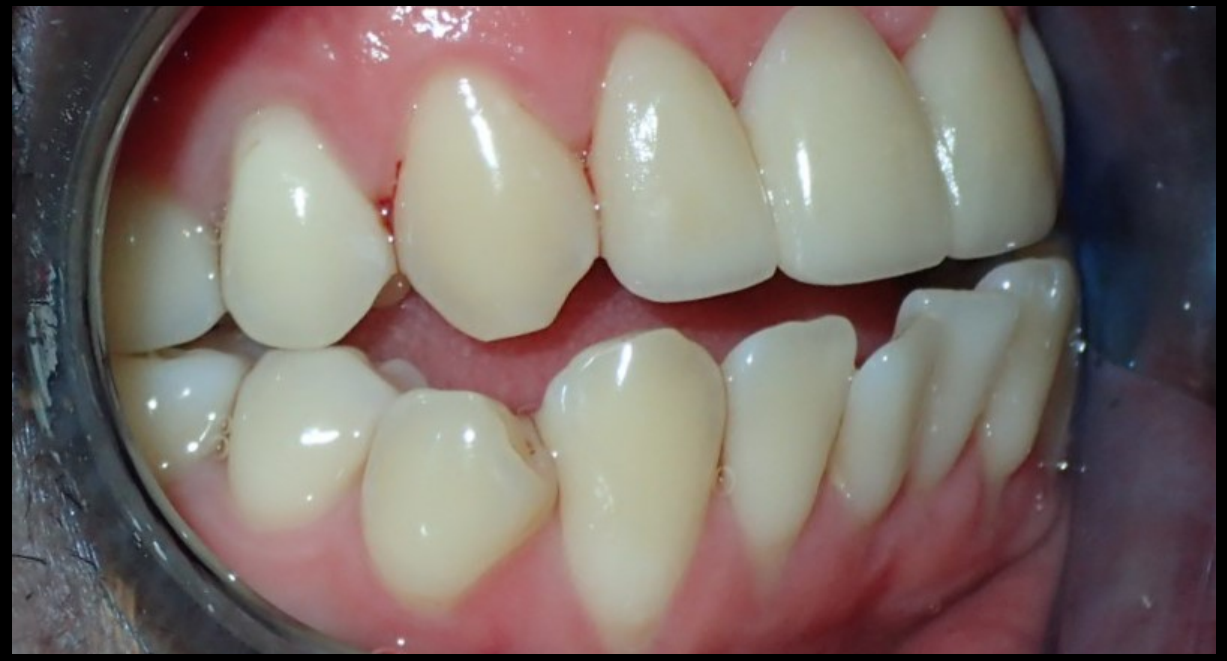
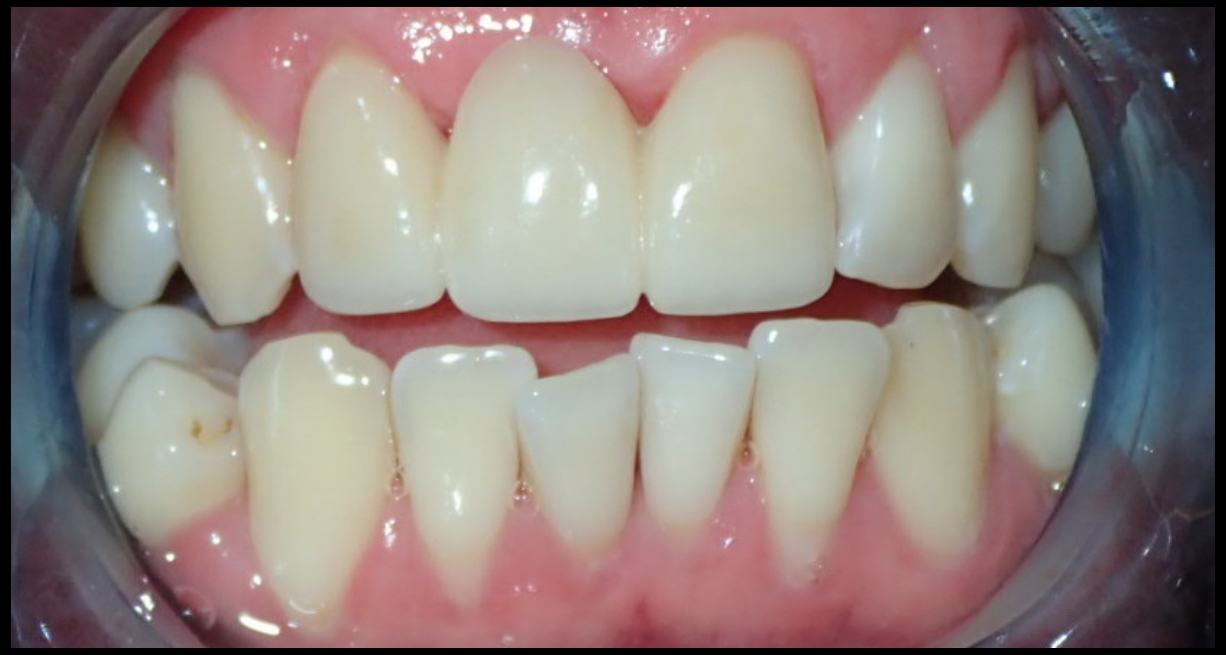
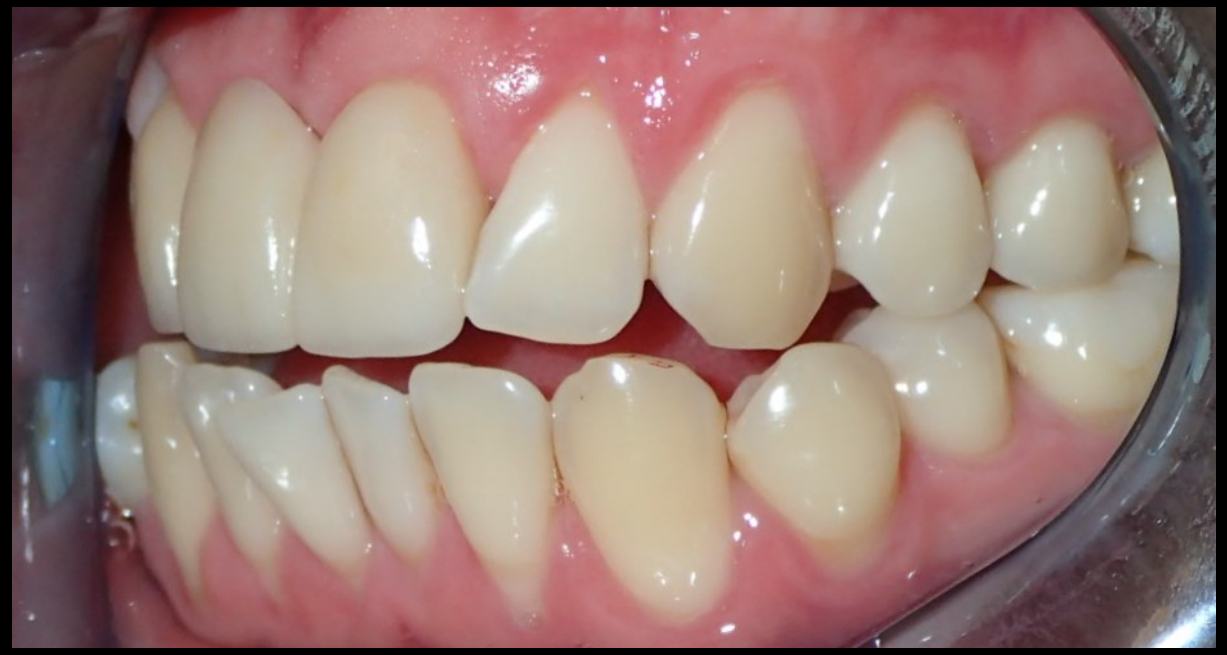
A modified ridge-lap pontic was used to match the gingival margin of the adjacent tooth #9.

The bridge was cemented with Rely X (Self-adhesive resin cement)

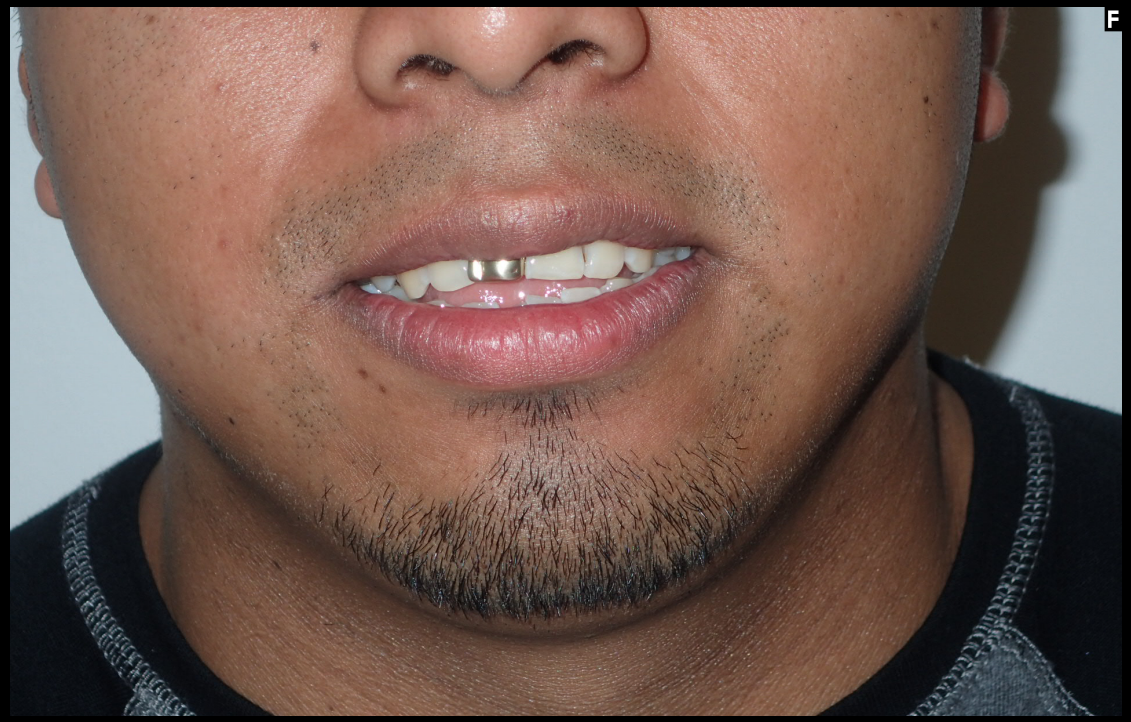
Patient is extremely happy with the result and reports satisfaction with esthetics and easy access to cleaning during the 6-month follow-up.

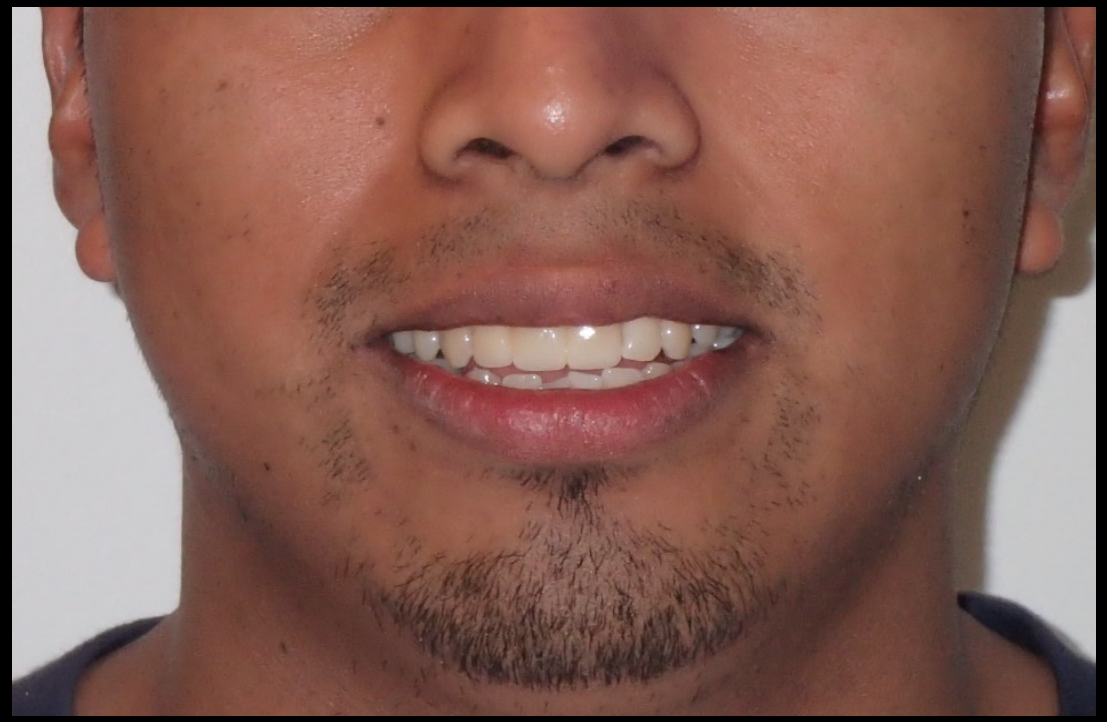


Fracture Strength of Lithium Disilicate Cantilever Resin Bonded Fixed Dental Prosthesis. J Mech Behav Biomed Mater. 2020 Mar. doi: 10.1016/j.jmbbm.2019.103615.

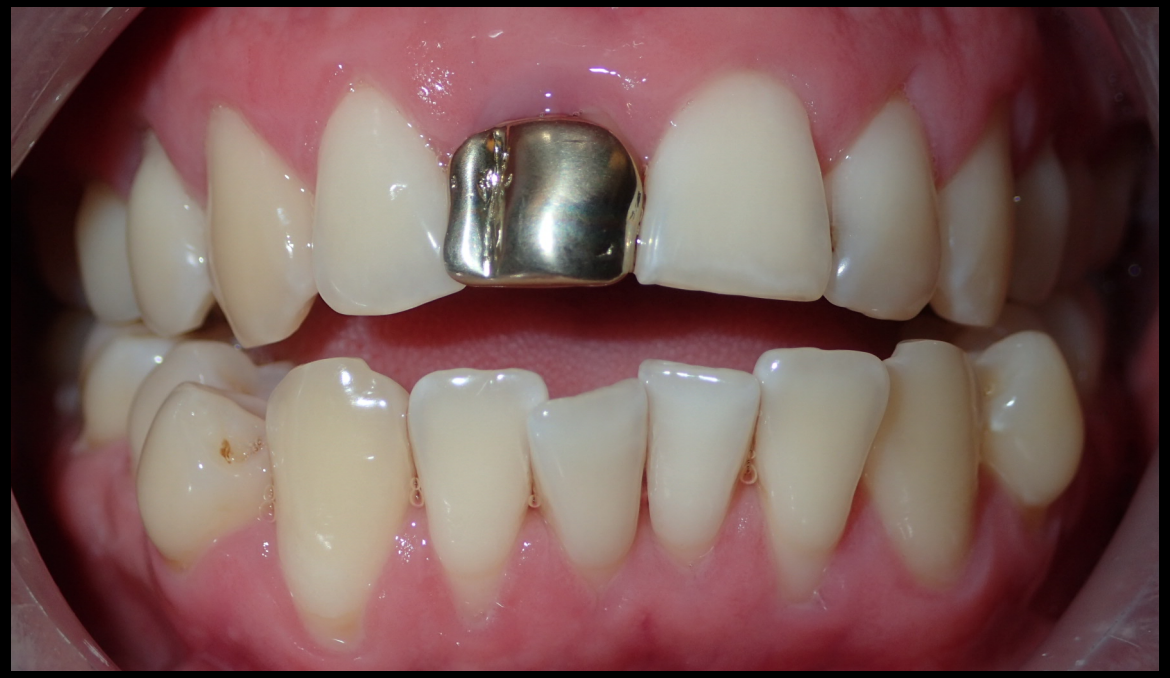





Significant improvement in smile

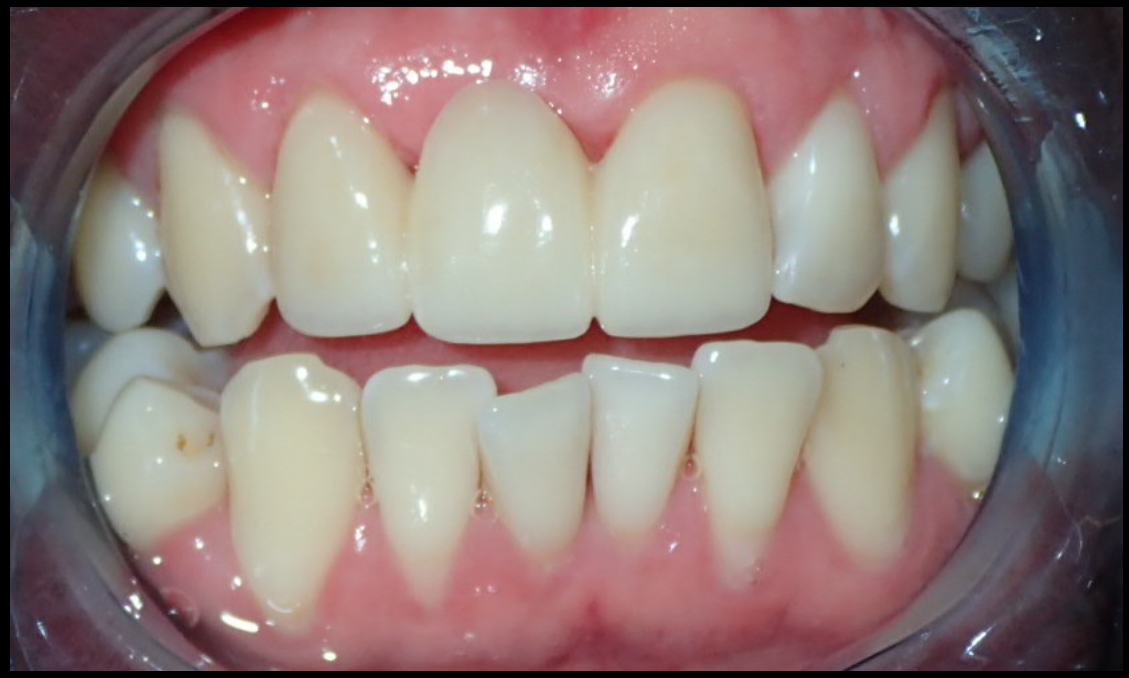




Accurate shade selection, translucent restorative material, and closure of the open bite played a crucial role in improving the smile and boosting the confidence of the patient. A Nightguard will be fabricated and delivered by the next student doctor .



Before



After

STUDENT DOCTOR : HETAL TRIVEDI

Thanks to Dr Gupta, Dr Orson and Dr Sheridan for their guidance on this case

References

- *Orthodontic Treatment Timing and Modalities in Anterior Open Bite: Case Series Study. Wisam Al Hamadi et al. Open Dent J 2017. doi: 10.2174/1874210601711010581. PMCID: PMC5725483*
- ***Orthodontic treatment of anterior open bite: a review article--is surgery always necessary?** Reichert I et al. Oral Maxillofac Surg. 2014 Sep;18(3):271-7. doi: 10.1007/s10006-013-0430-5. Epub 2013 Aug 16.*
- ***Orthodontic treatment of anterior open bite.** Ng CS et al. Int J Paediatr Dent. 2008 Mar;18(2):78-83. doi: 10.1111/j.1365-263X.2007.00877.x.*
- ***Orthodontic treatment for a patient with anterior open bite and severe condylar resorption.** Moon Det al. Am J Orthod Dentofacial Orthop. 2020 Mar;157(3):392-407.e2. doi: 10.1016/j.ajodo.2018.10.030.*
- *A comparative evaluation of the translucency of zirconia and lithium disilicate for monolithic restorations. Harada K et al. J Prosthet Dent. 2016 Aug;116(2):257-63. doi: 10.1016/j.prosdent.2015.11.019. Epub 2016 Mar 17.*
- ***The Complete Digital Workflow in Fixed Prosthodontics: A Systematic Review -** Tim Joda et al. BMC Oral health. 2017 Sep19; 17(1):124. doi: 10.1186/s12903-017-0415-0.*
- *Monolithic and bi-layer CAD/CAM lithium–disilicate versus metal–ceramic fixed dental prostheses: Comparison of fracture loads and failure modes after fatigue. Stefan Schultheis et al. Clinical Oral Investigations **volume 17**, pages1407–1413(2013)*
- *Clinical outcomes of lithium disilicate single crowns and partial fixed dental prostheses: a systematic review**.** Pieger S et al. J Prosthet Dent. 2014 Jul;112(1):22-30. doi: 10.1016/j.prosdent.2014.01.005.*
- ***Different pontic design for porcelain fused to metal fixed dental prosthesis: Contemporary guidelines and practice by general dental practitioners.** Syed Murtaza Raza Kazm et al. Eur J Dent. 2018 . doi: 10.4103/ejd.ejd_232_18: 10.4103/ejd.ejd_232_18*
- *Restoration using gingiva-colored ceramic and a ridge lap pontic with circumferential pressure: A clinical report. Tae Hyung Kim et al. The Journal of Prosthetic Dentistry. Volume 104, Issue 2, August 2010. https://doi.org/10.1016/S0022-3913(10)00107-1*
- *Fracture Strength and Mode of Anterior Single-Retained All-Ceramic Resin-Bonded Bridges Using a CAD/CAM System. Tsitrou E et al. Int J Comput Dent. 2012;15(2):125-136.*
- *Fracture Strength of Lithium Disilicate Cantilever Resin Bonded Fixed Dental Prosthesis. J Mech Behav Biomed Mater. 2020 Mar. doi: 10.1016/j.jmbbm.2019.103615.*


Thank You!