Rounds Case: Prosthodontics

Group 3A-2, October 7th 2020

Rounds Team

- **Group Leader: Dr. Grady**
- **Specialty Leader: Dr. Abere**
- **Project Team Leader: D4 Grant**
- **Project Team Participants: D1 Sarah; D2 Tina; D3 ZJ**

Patient: *Jane*

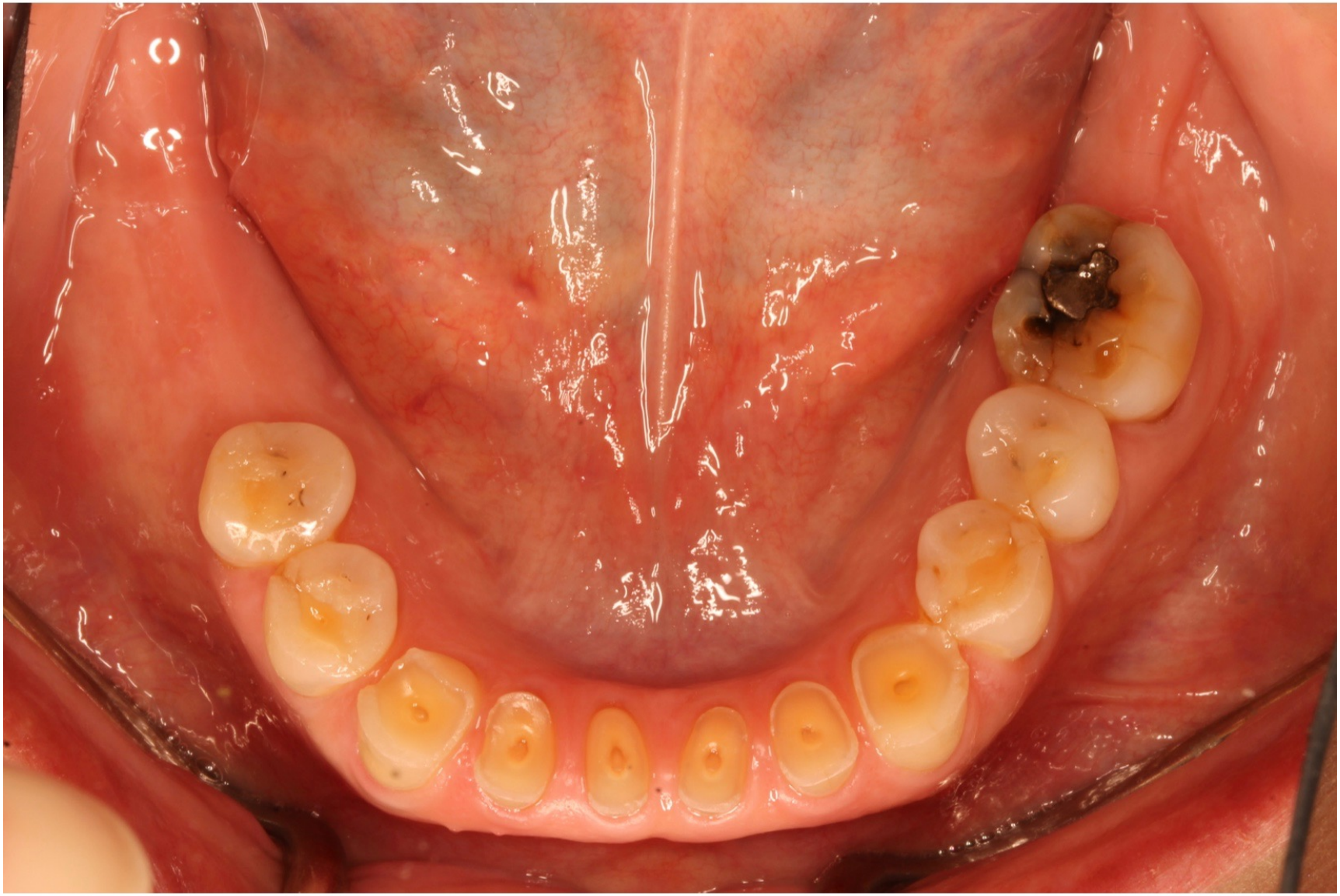
- 64-year-old, Caucasian female
- Presented to MUSoD “”
- Under care of previous D4 student Shania
- Chief Complaint: “ I want to smile again“
- Additional pertinent information
  - Traumatic Personal history

Medical History

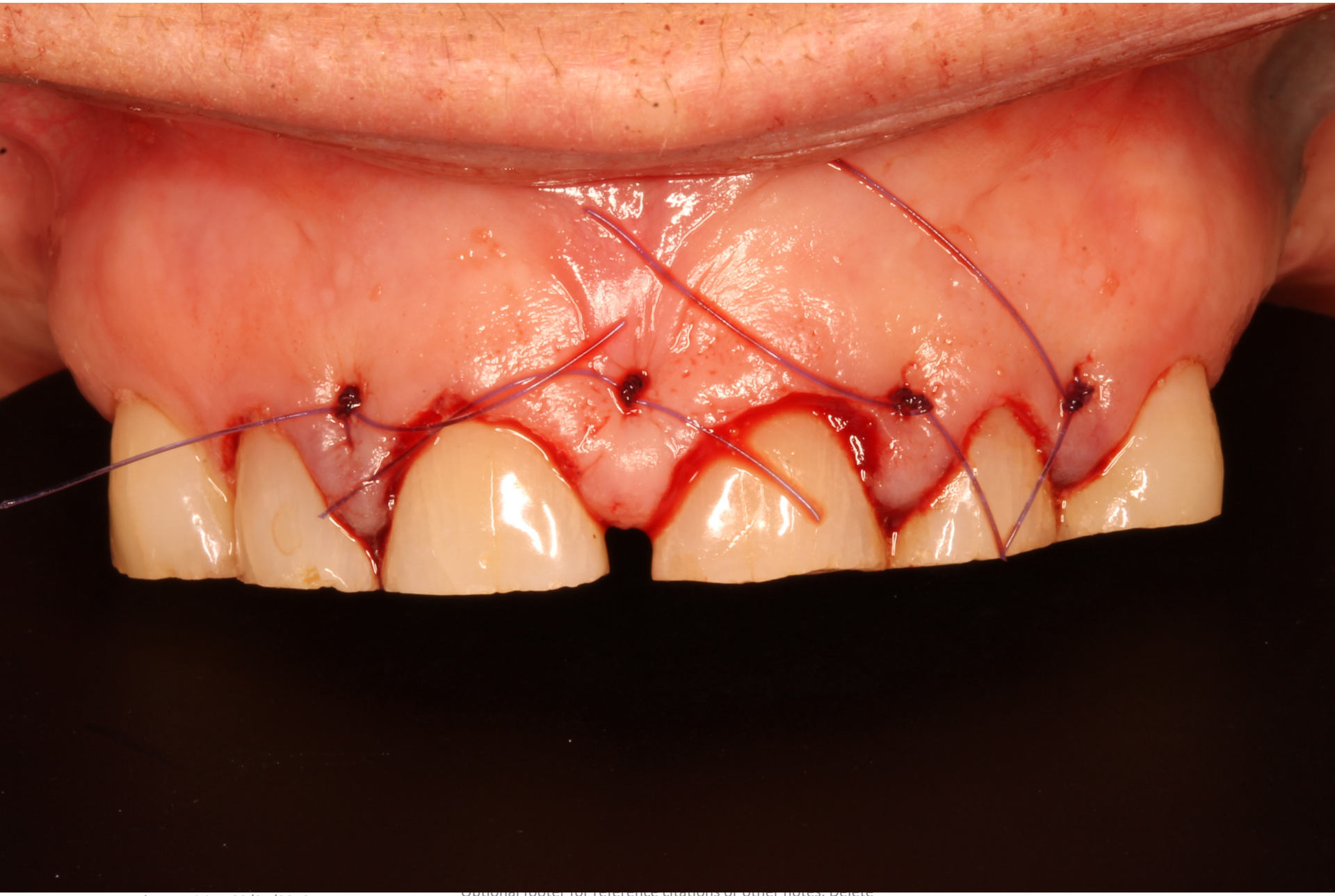
- Depression
- Diagnoses
  - Heavy attrition of dentition
- Conditions
  - No known drug allergies
- Medications
  - Tumeric
  - Vitamin D
  - Vitamin B
  - Lexapro 20mg for depression
- Treatment considerations
  - Crown lengthening to restore remaining dentition

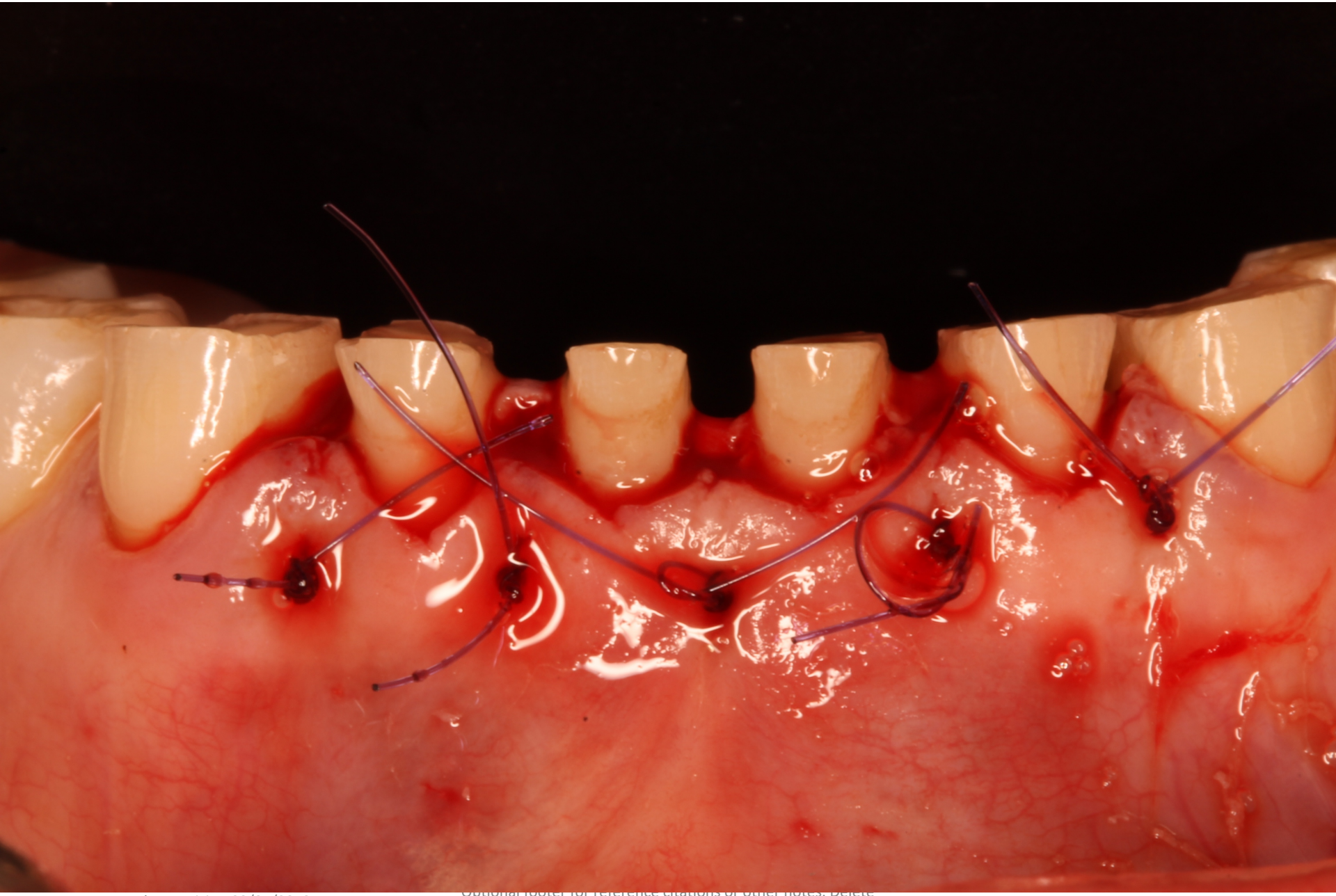
Dental History

- Missing Teeth 1,2,3,4,12,13,14,15,16,17,18,30,31,32
- Crowns- none
- Restorations – O Amalgam on #19

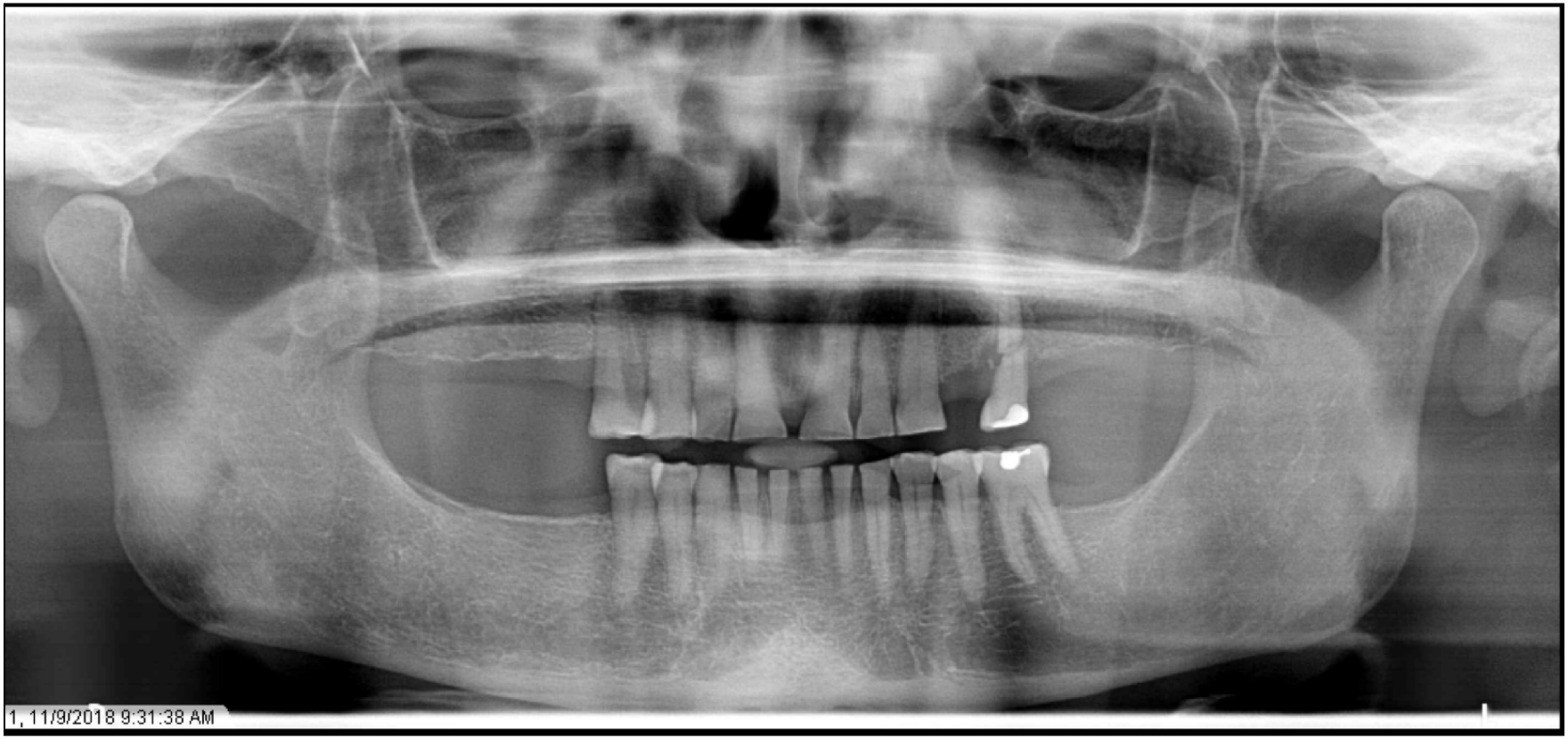


if not needed.

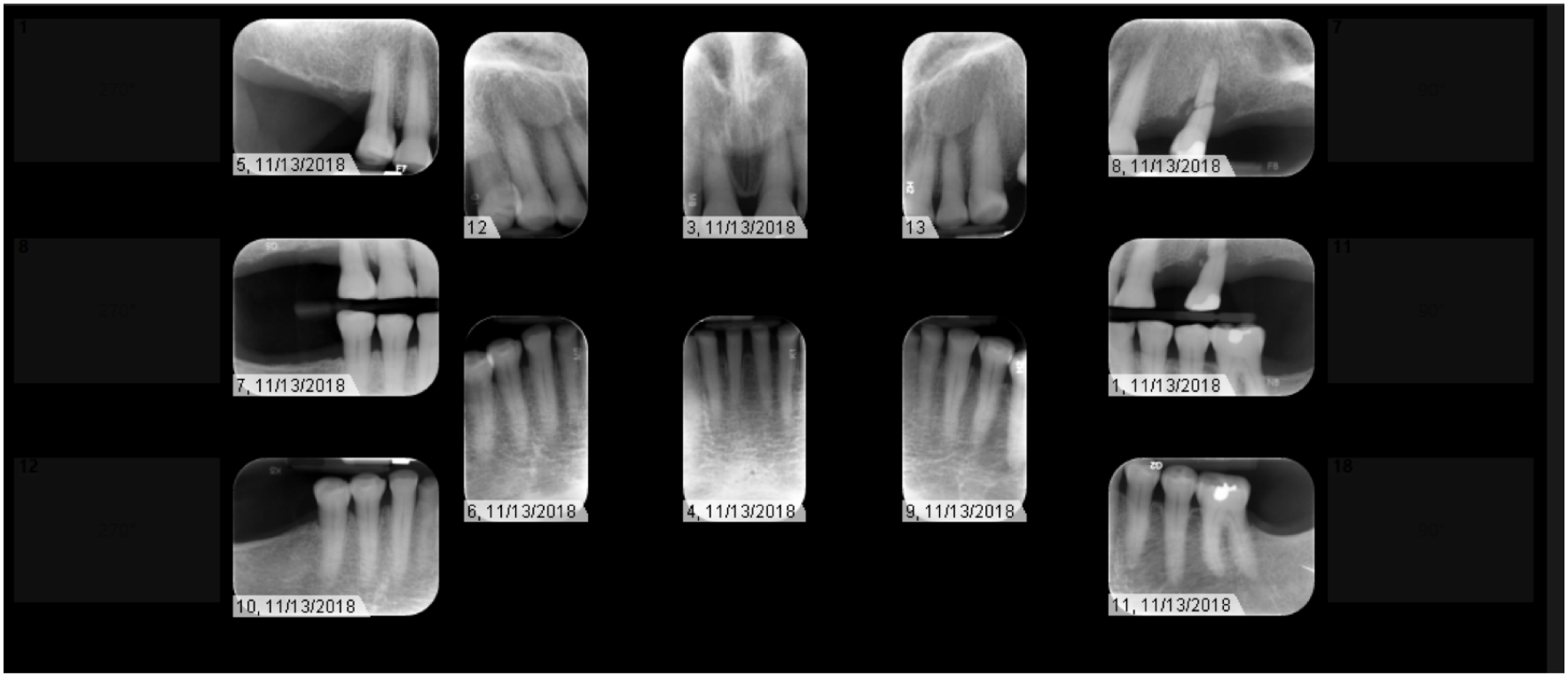




Radiographs



Radiographs



Radiographic Findings

- Fractured #13 and associated PARL
- Heavy tooth attrition on remaining dentition

Clinical Findings

- Heavy tooth attrition on all dentition
- #5 primary caries, #13 fracture tooth, #27 fracture tooth

Specific Findings

- Findings specific to the Rounds discussion, 1 slide
- Heavy attrition
- Full mouth reconstruction

Periodontal Charting

				3											MOBILITY
															FURCA
				P	P P	P P	P P	P							PLAQUE
				B		B									BOP
				4 4 4	6 6 6	7 7 7	7 7 7	7 7 7	8 8 8	7 7 7					MGJ
				8 6 5	2 1 1	1 1 2	2 1 2	2 1 2	2 1 1	2 1 2					CAL
				5 3 3	3 2 2	2 2 3	3 2 3	3 2 3	3 2 2	3 2 3					P.D.
				3 3 2	-1-1-1	-1-1-1	-1-1-1	-1-1-1	-1-1-1	-1-1-1					FGM
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
				2 0 -1	-1-1-1	-1-1-1	-1-1-1	-1-1-1	-1-1-1	-1-1-1					FGM
				5 2 2	3 2 2	3 2 2	2 2 2	3 2 2	2 2 2	3 2 2					P.D.
				7 2 1	2 1 1	2 1 1	1 1 1	2 1 1	1 1 1	2 1 1					CAL
															MGJ
				B	B			B							BOP
															PLAQUE
															FURCA
				H								H			PROGNOSI

Problem List

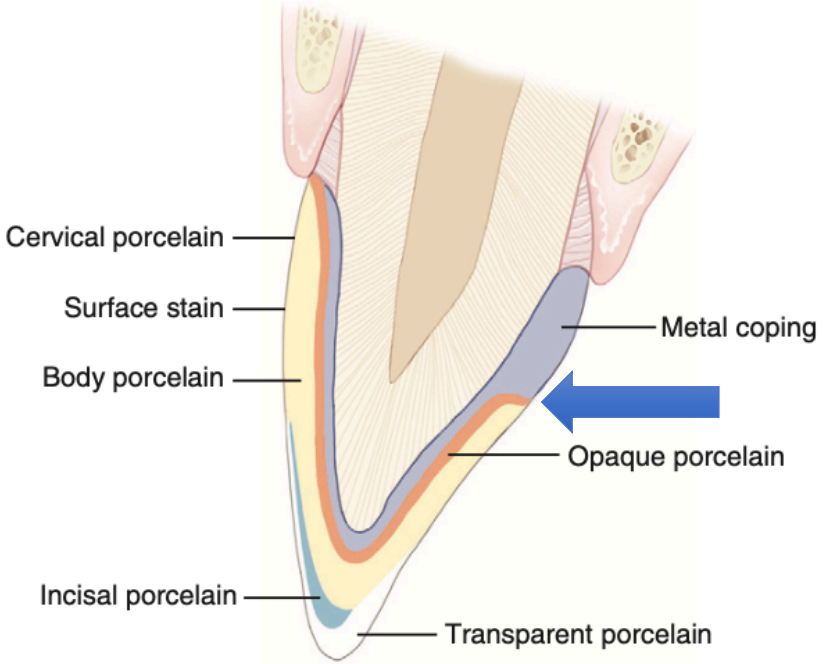
- Loss of VDO
- Worn dentition
- Esthetics
- Missing Teeth

Treatment Plan

- Ext #5 and #13 hopeless teeth
- Crown lengthening of 9/ 10, 23-26
- All Ceramic Crowns on teeth 6 ,7,8,9,10,11
- 19,20,21,22,23,24,25,26,27,28,29
- Implant supported bridge sites 3-5 and 12-14
- Single implant site #30
- Interim maxillary denture
- Bilateral posterior maxillary implants and associated bone grafts

D1 Basic Science

Porcelain Fused to Metal (PFM) Restoration



- Porcelain veneer on a metal substructure
  - Oxide layer between metal and porcelain
  - Requires a more extensive preparation
- Highly resistant to Fracture
- More likely to be over-contoured
- Potential Allergic Reaction

(Anusavice et al., 2013)

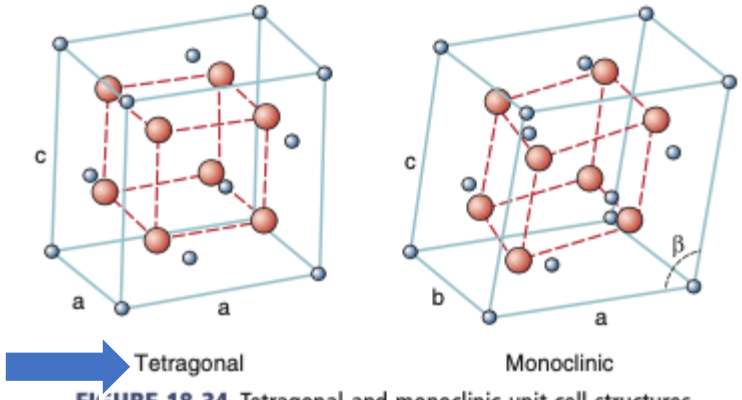


FIGURE 18-34 Tetragonal and monoclinic unit cell structures.

Layered Zirconia Restoration

- Made from zirconium dioxide and yttrium
  - stabilizes the tetragonal structure
- More Control of Translucency and Opacity
- Conventional or Facial Layering (only surface)
- Can cause Abrasion on opposing surfaces
- 5-year single crown survival rate=92.1%
  - PFM=94.7%

(Sailer et al., 2015)

D2 Pathology

What are the clinical signs & symptoms of bruxism & attrition?

Attrition (Lobbezoo & Wetselaar, 2016)

- Tooth to tooth contact → loss of dental hard tissues
- Intrinsic mechanical wear
- Clinical signs
  - Shiny facets
  - Enamel and dentin wear at the same rate
  - Matching wear on occluding surfaces
  - Fracture of cusps/restorations, if present
  - Impressions in cheek, tongue, lip
- Clinical symptoms (Rees & Somi, 2018)
  - Tooth grinding
  - Mobile teeth
  - Jaw pain & fatigue
  - Sore teeth/gums
  - Headaches

What are the clinical signs & symptoms of bruxism & attrition?

Bruxism

- Definition (Carra et al., 2012)
  - 2 types: while asleep or awake
    - For diagnosis of bruxism → electromyography of masticatory muscles
  - Repetitive activity of jaw muscles
  - Grinding or clenching of teeth
    - Sounds heard by others
  - Bracing or thrusting of mandible
- Signs & symptoms (Lobbezoo et al., 2013):
  - Hypertrophy of masseter & temporalis
  - Tenderness or pain of jaw muscles upon palpation
  - Tongue indentation
  - Tooth wear
  - Morning headache

D3 PICO

- **Clinical Question:**
- In patients with an implant supported FPD. What is the relative success and failure rates of layered zirconia implant supported FPDs compared to porcelain fused to metal implant supported FPD?

PICO

- P- Patients with Implant supported FPD
- I- Layered-zirconia FPD
- C- Porcelain fused to metal FPD
- O- Long term success

- Pico Question:
  - In patients with an implant supported FPD. What is the relative success and failure rates of layered zirconia implant supported FPDs compared to porcelain fused to metal implant supported FPD?

Research Details

- Date of Search:
  - September 9th, 2020
- Key words:
  - Dental prothesis, implant supported, fixed partial denture, porcelain fused to metal, layered-zirconia
- Mesh terms:
  - Dental prothesis, implant supported*
  - Dental restoration failure
  - Denture, partial, fixed*
  - Metal Ceramic Alloys
  - Layered Zirconia

Article 1

- A systematic review of the survival and complication rates of zirconia – ceramic and metal – ceramic multiple unit fixed dental prosthesis
- Article selection: directly related to PICO question
- Level of Evidence: Systematic Review

Article 1

- Overview:
- Reports from electronic MEDLINE search complemented by manual search was conducted to identify RCT, cohort studies and retrospective case series on implant supported FPDs with a mean follow-up of at least 3 years.
- Failure and complication rates were analyzed using robust *Poisson* regression models to obtain summary estimates of 5 – year proportions.
- The search provided 5,263 titles and 455 abstracts. Full text analysis was performed for 240 articles resulting in 19 studies on implant FPDs that met inclusion criteria.

Article 1

- Results:
- The studies reported on 932 metal – ceramic and 175 zirconia – ceramic FPDs.
- Meta analysis revealed an estimated 5-year survival rate of 98.7% for metal – ceramic implant supported FPDs and 93.0% for zirconia- ceramic implant supported FPDs.
- 13 studies including 781 metal-ceramic implant supported FPDs estimated a 5-year rate of ceramic fractures and chippings to be 11.6% compared with a significantly higher complication rate for zirconia implant-supported FPDs of 50% reported in a small study with 13 zirconia implant supported FPDs.
- 4.1% of the zirconia – ceramic implant supported FPDs were lost due to ceramic fractures compared to only 0.2% of the metal ceramic implant supported FPDs.
- No studies on monolithic zirconia implant supported FPDs fulfilled the inclusion criteria of the review.

Article 1

- Limitations to the study
- The present systematic displayed some limitations of the available literature and the present results need to be interpreted with this in mind.
- The numbers of metal-ceramic and zirconia ceramic FPDs included in this meta analysis were highly differing
- More information was available on metal ceramic FPDs, while Zirconia ceramic FPDs seemed to suffer from more technical problems, yet this result came from few studies and will need further observation. No Randomized control trials comparing the two treatment options were available for this review.
- No studies on monolithic zirconia could be included at this point; hence, the interpretation of the results is limited to veneered zirconia.
- The results obtained by the present meta-analysis are in accordance with previously published outcomes of the zirconia-ceramic FPDs.
- Future research should focus on the more recent monolithic zirconia reconstructions to evaluate their outcomes as compared to metal – ceramics.

Article 1

- Conclusions
- For implant supported FPDs conventionally veneered zirconia shall not be considered the material of priority, due to persisting pronounced risk for fractures of the framework and chipping of the zirconia veneering ceramic.
- Monolithic zirconia maybe an interesting alternative, but its clinical medium to long term outcomes have not been analyzed yet.
- Hence, metal ceramics appear to stay the golden standard for the implant supported FPDs.

Research Details

- Date of Search:
  - September 9th, 2020
- Key words:
  - Dental implants, hardware complications, survival rates, zirconia
- Mesh terms:
  - Dental Prosthesis, Implant-Supported/adverse effects*
  - Denture, Partial, Fixed* / adverse effects
  - Dental Restoration Failure
  - Zirconium

Article 2

- Hardware complications and failure of three - unit zirconia – based and porcelain – fused – metal implant – supported fixed dental prostheses: a retrospective cohort study with up to 8 years
  - Jun-Yu She, Xiao-Meng Zhang, Shi-Chong Qiao, Shu-Jiao Qian, Jia-Ji Mo, Hong-Chang Lai.
- Article selection: Directly related to the PICO question
- Level of Evidence: retrospective cohort study

Article 2

- Overview:
- The aim of the present study was to assess the hardware complications and survival of three-unit implant supported zirconia based fixed dental prostheses and implant – supported porcelain – fused – metal fixed dental prostheses.
- The study is a retrospective cohort study with up to 8 years follow-up. Patients with conventional three-unit implant supported fixed dental prostheses (without cantilever) in posterior area were reviewed.
- Chi square test was used to test differences between zirconia and porcelain fused to metal FPDs.
- 237 patients with 279 three-unit restorations participated in the study

Article 2

- Results:
- The overall survival rate was 95.3% in zirconia FPDs and 94.7% in PFM supported FPDs at implant level and 94.6% in zirconia group and 94.4% in porcelain fused to metal group at subject level.
- Veneer chipping was the most frequently seen complication.
- Significantly higher minor veneer chipping rate was found in zirconia group
- No significant difference of veneer chipping rate was found between the two groups.
- The overall hardware complication rates of zirconia were significantly higher than porcelain fused to metal. 33.07% and 18.42%

Article 2

- Limitations to the study
- This study revealed several shortcomings. The retrospective design could lead to some degree of selection and measurement bias, though efforts has been made to avoid confounding factors.
- Thus, well designed studies with high evidence level are still needed to further explore the hardware complications and clinical survival of zirconia and porcelain fused to metal FPDs

Article 2

- Conclusions
- High survival rate of zirconia-based and porcelain fused to metal restorations can be achieved with up to 8 years follow-up.
- Well-designed studies with high evidence level are still needed to further explore the hardware complications and clinical survival of zirconia compared to PFM FPD restorations.

Clinical Bottom Line

- PFM Implant supported FPDs have a long track record of success and have been considered the gold standard for FPDs. However, with All-Ceramic materials like layered zirconia and monolithic zirconia becoming more common
- Studies demonstrating its respective success and failure rates will become clearer with time.
- Until more studies can conclusively show a positive or negative relationship compared to PFM FPDs. The current evidence supports using PFM in posterior implant supported FPDs

Levels of Evidence

☐ **1a** – Clinical Practice Guideline, Meta-Analysis, Systematic Review of Randomized Control Trials (RCTs)
☐ **1b** – Individual RCT
☒ **2a** – Systematic Review of Cohort Studies
☒ **2b** – Individual Cohort Study
☐ **3** – Cross-sectional Studies, Ecologic Studies, "Outcomes" Research
☐ **4a** – Systematic Review of Case Control Studies
☐ **4b** – Individual Case Control Study
☐ **5** – Case Series, Case Reports
☐ **6** – Expert Opinion without explicit critical appraisal, Narrative Review
☐ **7** – Animal Research
☐ **8** – In Vitro Research

Double click table to activate check-boxes

Optional footer for reference citations or other notes. Delete if not needed.

Strength of Recommendation Taxonomy (SORT)

☐	**A** – Consistent, good quality patient oriented evidence
☒	**B** – Inconsistent or limited quality patient oriented evidence
☐	**C** – Consensus, disease oriented evidence, usual practice, expert opinion, or case series for studies of diagnosis, treatment, prevention, or screening

Double click table to activate check-boxes

Conclusions

- D3: how does the evidence apply to this patient?
  - Selecting the optimal restorative materials is important in every case especially one involving so many restorations. Ultimately the current evidence points to the PFM FPD to be a trusted restorative material to select, but due to the limited studies on layered zirconia it is an unfair comparison with a smaller sample size. With more studies done in the future comparing the relative survival rates of PFM and Zirconia the true differences in materials will become more definitive.
- D4: how will you advise the patient?
  - Selecting optimal restorative materials is an important part of delivering dental care. Cost, longevity, and esthetics are all factors to be considered. Although both implant supported FPDs for this pt are in the posterior maxilla; the pt may not like the idea of showing any metal substructure.
  - I would explain to the pt the long-term success has been proven with PFM restorations but if maximizing esthetics is a primary driver for seeking treatment then layer zirconia is an alternative option.

Discussion Questions

- Does the tooth position of the different material matter? Molar force vs anterior force?
- How is choice of material determined for FPD?
- How do zirconia and PFM FPDs compare in regards to the wear they produce on opposing natural dentition?
- How do zirconia vs PFM FPDs compare in a bruxer?

Discussion Questions

- Does the material PFM vs Zr recommendation change based on the length of the FPD?
- What chairside questions and clinical signs can you use to tell if someone is a bruxer?
- Can you ever immediately load an implant when the patient is a bruxer?