THE MAGICAL BRIDGE TO PROSTHODONTICS

EVIDENCE BASED DENTISTRY ROUNDS

PROSTHODONTICS

9B-3

ZACH FINNEGAN, AMANDA WADDLE, RACHEL EHLERS, ALEXIS SCHROEDER

10/28/2020

ROUNDS TEAM

- **Group Leader: Dr. Derderian**
- **Specialty Leader: Dr. Keesler**
- **Project Team Leader: D4 Zachery Finnegan**
- **Project Team Participants:**
  - **D1- Alexis Schroeder**
  - **D2- Rachel Ehlers**
  - **D3- Amanda Waddle**

PATIENT

- 1-2 slides, patient background
- Age: 41
- Gender: Female
- Ethnicity: Caucasian
- Chief Complaint: "I want to get my crowns"
- Misc. Pt Info:
  - REFUSES removable options
  - Cannot be without A tooth (posteriors included)
    - Maybe 3 weeks?

MEDICAL HISTORY

- Current & past:
  - Diagnoses: Renal failure
  - Conditions: n/a
  - Medications: none
  - Medical Consults, if any: none

  - Treatment considerations:
    - Antibiotic adjustments? (GFR dependent?)
    - Caution with NSAIDs
      - Acetaminophen for dental pain

DENTAL HISTORY

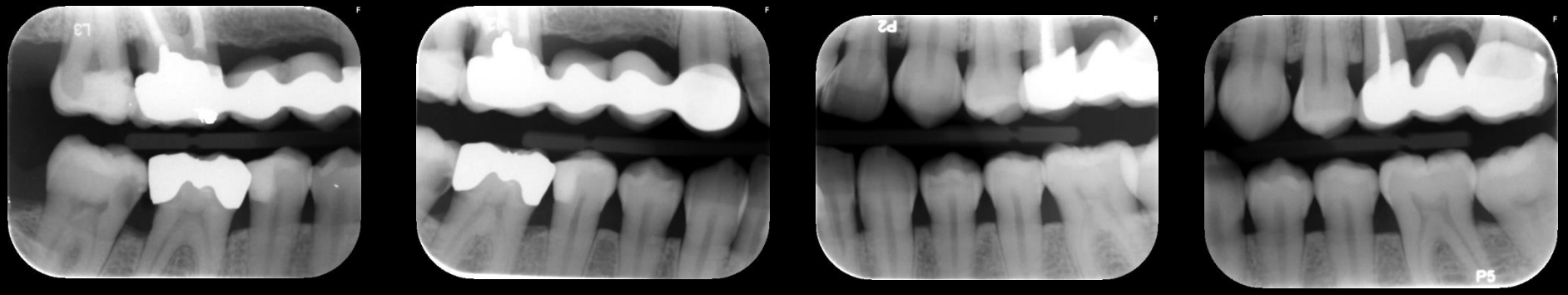
- Past Perio Tx – "deeper cleanings"
- Lingual veneers on Mx anteriors (outside of the US)
- Bridges
- Root canals
- Prior to Marquette – no extractions???

RADIOGRAPHS

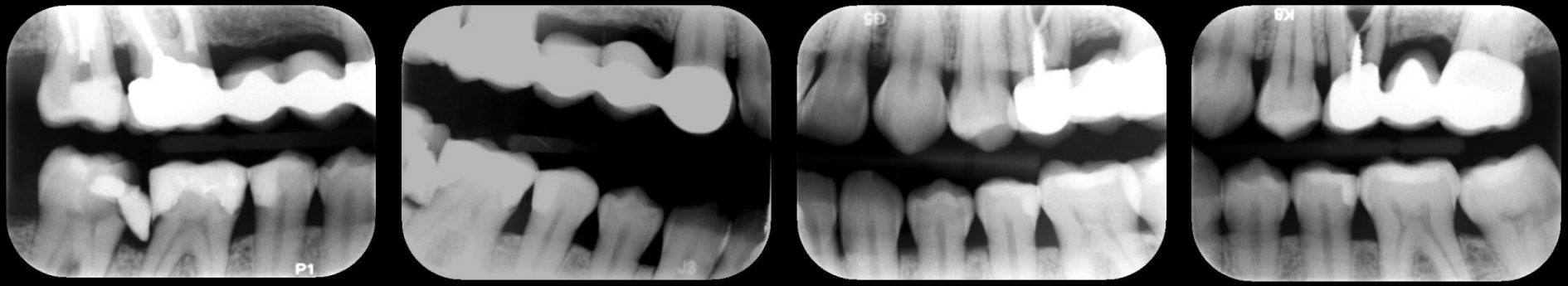
RADIOGRAPHS – LAST FMX

1/23/2017

RADIOGRAPHS - BWS



10/9/2018



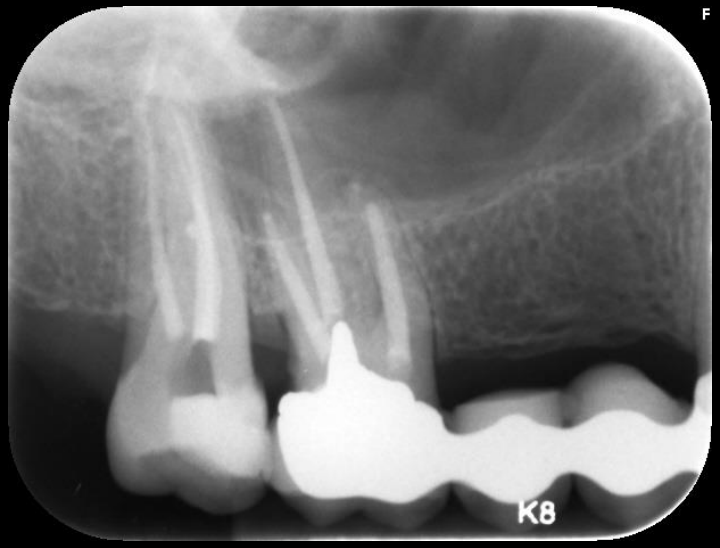
10/30/2019

RADIOGRAPHS – RECENT BWS

10/30/2019

RADIOGRAPHS

2/4/2020



9/9/2020

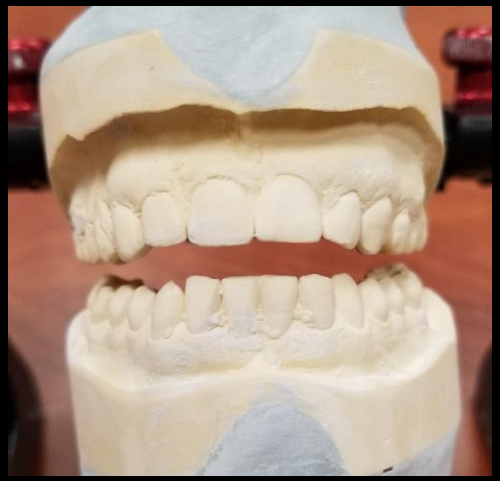
RADIOGRAPHIC FINDINGS

- Bone loss
- RCT: #2, 3, 13 (w/ tapered, threaded post), 31
- Recurrent decay D #3, 29, & #30 and M #31
- Fractured root #13,

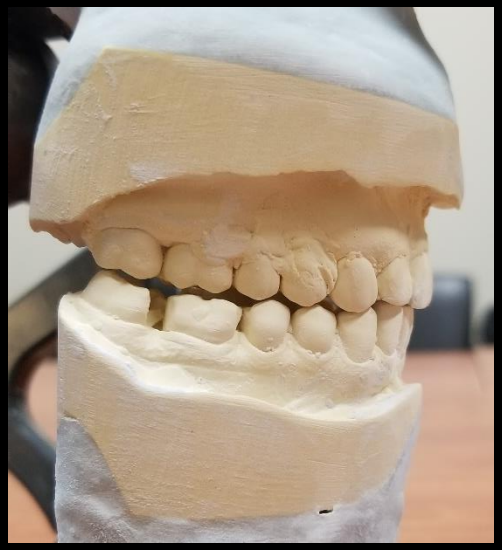
CLINICAL FINDINGS

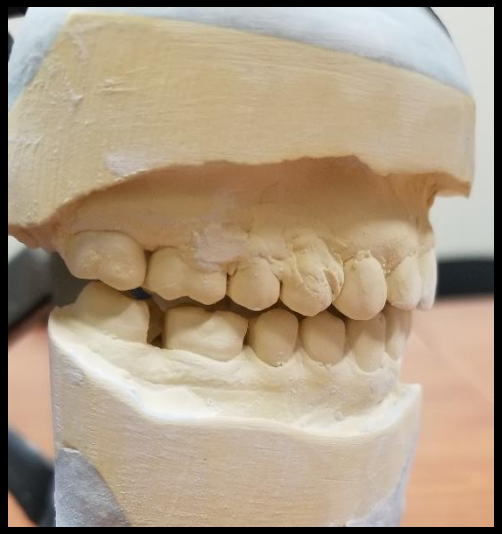
- Extraoral: non-significant
- Soft Tissue: generalized BOP
- Hard Tissue:
  - Visible fracture #13
  - Temporary restorations: MO#2,31
  - Primary Caries O#18
  - Recurrent decay (D#3, O#12, D#30, MO#31)
    - #30 and 31 deemed non-restorable
  - Defective restoration #3, #15, #31

CLINICAL FINDINGS

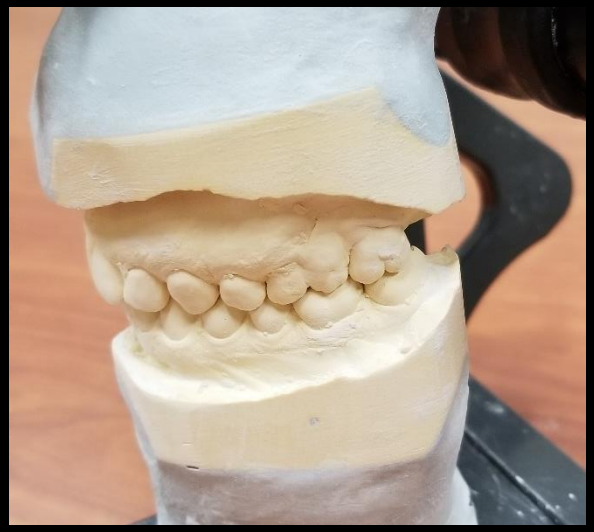


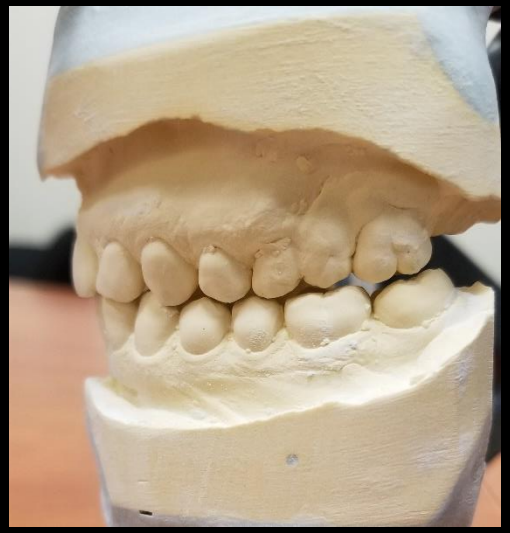
CLINICAL FINDINGS

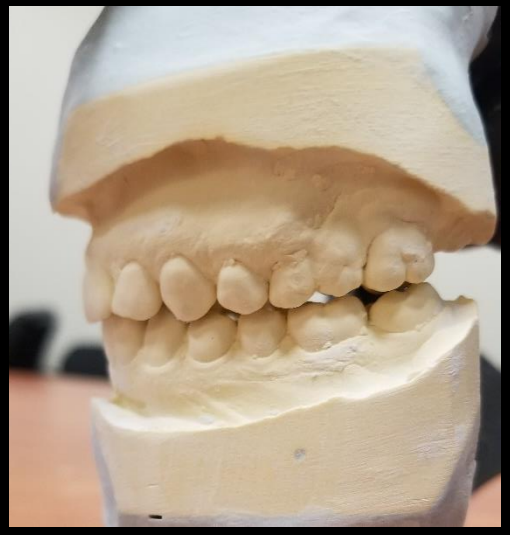




CLINICAL FINDINGS







SPECIFIC FINDINGS

- #3- recurrent decay on D
- #13- fractured
- #15- defective restoration (interference to arc of closure)

PERIODONTAL CHARTING

	1	2	3	4	5	6	7	8
MOBILITY								
FURCA								
PLAQUE		P P	P P			P P	P P	P P
BOP						B B		B
MGJ		3 3 3	5 5 5	3 3 3	4 4 4	5 5 5	5 5 5	5 5 5
CAL		2 3 4	5 3 2			3 1 [illegible]	2 1 5	[illegible] 1 1
P.D.		2 2 4	5 3 2			4 2 3	3 2 6	[illegible] 2 2
FGM		0 1 0	0 0 0			-1 -1 -1	-1 -1 -1	[illegible] -1 -1
FGM		0 0 0	0 1 0			0 0 0	0 0 0	0 0 0
P.D.		3 2 4	4 1 3			3 2 3	5 3 2	[illegible] 1 3
CAL		3 2 4	4 2 3			3 2 [illegible]	5 3 2	[illegible] 1 3
MGJ								
BOP			B [illegible]			B B B		
PLAQUE		P P	P P			P P	P P	P P
FURCA								
PROGNOSI								

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

	32	31	30	29	28	27	26	25
PROGNOSI								
FURCA								
PLAQUE		P P	P P	P P	P P	P P P	P P P	P P P
BOP					B			
MGJ		4 4 [illegible]	6 6 6	5 5 5	6 6 6	5 5 5	6 6 6	4 4 4
CAL		2 2 2	6 4 3	[illegible] 1 2	3 1 3	2 1 2	3 1 3	2 1 3
P.D.		2 2 2	4 2 2	[illegible] 1 2	3 1 3	2 1 2	3 1 3	2 1 3
FGM		0 0 0	2 2 1	0 0 0	0 0 0	0 0 [illegible]	0 0 0	0 0 0
FGM		1 1 1	1 2 1	0 0 0	0 0 0	0 1 [illegible]	0 0 0	0 0 0
P.D.		2 2 2	3 2 5	[illegible] 1 3	3 1 2	2 1 [illegible]	4 1 6	6 1 4
CAL		3 3 3	4 4 6	[illegible] 1 3	3 1 2	2 2 3	4 1 6	6 1 4
MGJ		5 5 5	5 5 5	4 4 4	4 4 4	6 6 6	5 5 5	5 5 5
BOP							B	
PLAQUE		P P	P P	P P	P P	P P P	P P P	P P [illegible]
FURCA								
MOBILITY								

	24	23	22	21	20	19	18	17
PROGNOSI								
FURCA								
PLAQUE	P P P	P P P	P P P	P P	P P	P P	P P	
BOP			B		B B	B B B	B	
MGJ	4 4 4	4 4 4	5 5 5	4 4 4	5 5 5	5 5 5	4 4 4	
CAL	3 1 3	2 1 2	3 1 2	3 2 3	3 1 2	3 2 3	3 5 2	
P.D.	3 1 3	2 1 2	3 1 2	3 2 3	3 1 2	3 2 3	3 3 2	
FGM	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	
FGM	0 0 0	0 0 0	0 1 0	0 1 0	0 0 0	1 1 1	1 1 0	
P.D.	4 1 4	4 2 3	3 2 2	3 1 2	3 1 3	2 2 3	2 3 2	
CAL	4 1 4	4 2 3	3 3 2	3 2 2	3 1 3	3 3 4	3 4 2	
MGJ	4 4 4	6 6 6	5 5 5	5 5 5	5 5 5	5 5 5	3 3 3	
BOP								
PLAQUE	P P P	P P P	P P P	P P	P P	P P	P P	
FURCA								
MOBILITY								

DIAGNOSIS

(As pertaining to rounds discussion topic)

- ADA Class III – Moderate Chronic Periodontitis (unstable)
- Repeated recurrent caries
- #3 = recurrent decay; questionable prognosis
- #13 = RCT, symptomatic apical periodontitis, non-restorable

PROBLEM LIST

- Missing teeth
- Defective and [longstanding] temporary restorations
- Caries (primary and recurrent)
- Fractured tooth
- Periodontitis and gingival inflammation

D1 BASIC SCIENCE

D1 Question: What is Ante's Law?

"The combined root surface area of the abutment teeth should equal or be greater than that of the teeth being replaced by pontics."

-Irwin Ante, 1926

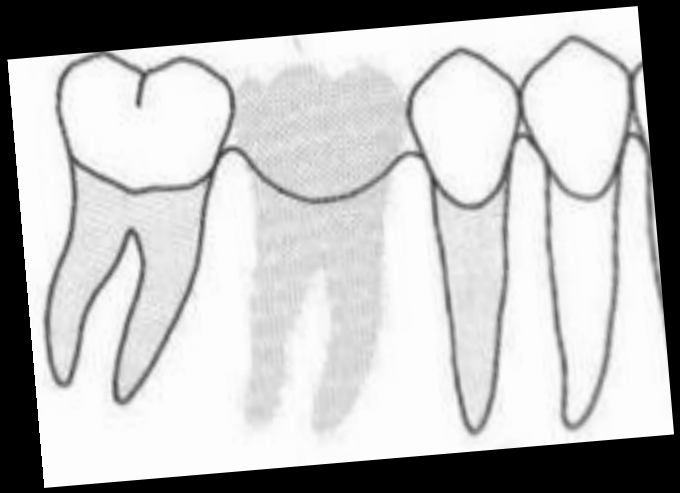
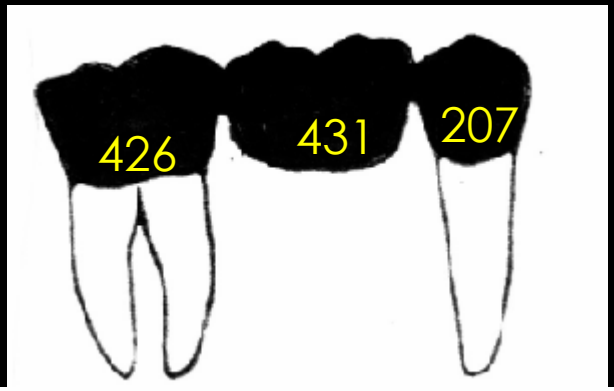


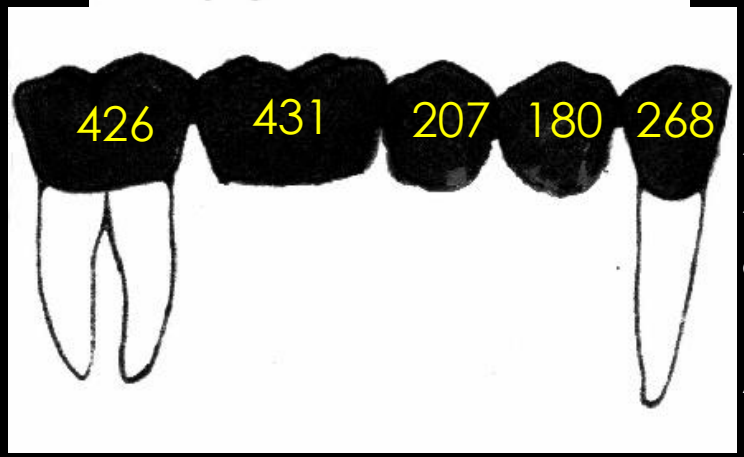
Photo from The Dental Advocate and dentalscience2019.com

ANTE'S LAW

Mandibular	
Central incisor	154
Lateral incisor	168
Canine	268
First premolar	180
Second premolar	207
First molar	431
Second molar	426
Third molar	373



426+207= 633
633 > 431
Obeys Ante's Law



426+268= 694
431+207+180=818
818 > 694
Does NOT obey Ante's Law

References:

Ante IH, "The Fundamental Principles of Abutments," *Mich State Dent Soc Bull*, 1926.

Jepsen A, "Root Surface Measurement and a Method for X-ray Determination of Root Surface Area," *Acta Odontol Scand*, 1963.

Lexicomp for Dentistry. (13, March 28). Average Root Surface Area and Fixed Prosthetic Replacements. Retrieved October 18, 2020, from http://0-online.lexi.com.libus.csd.mu.edu/lco/action/doc/retrieve/docid/ihcd/908997?cesid=alto6QAHG0s

WHAT ARE THE CLASSIFICATIONS AND LOCATIONS OF THE DIFFERENT TYPES OF BONE DENSITIES WITHIN THE JAW

Rachel Ehlers-D2

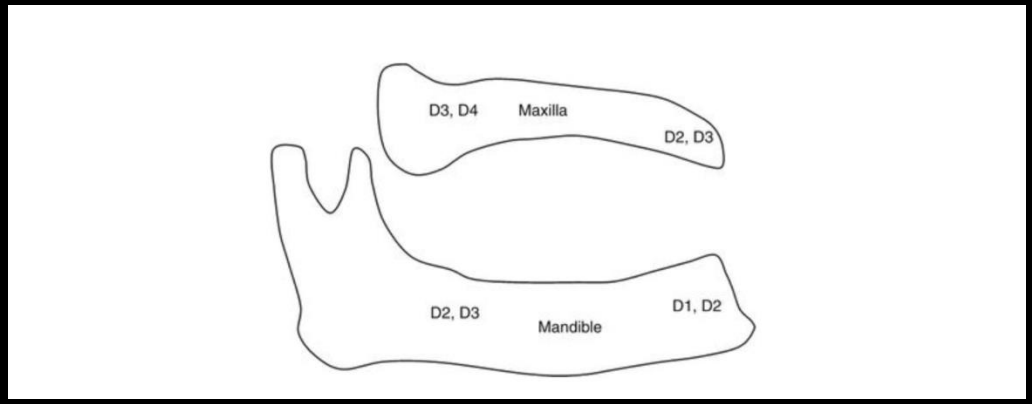
Group 9B-3

- Jaw is made up of cortical and trabecular bone
    i. Differences seen microscopically
    ii. Cortical bone= stiffer and more brittle
    iii. Cortical bone= heals with little to no woven bone which yields bone strength when healing next to an implant
    iv. Trabecular bone= sparsely located in the jaw→ surgical implant challenges

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4955555/
https://www.researchgate.net/publication/221917615_Bone_Quality_Assessment_for_Dental_Implants

MISCH BONE DENSITY CLASSIFICATION

- D1= Homogenous, dense cortical
- D2= Thick, porous cortical with coarse trabecular
- D3= Thin, porous cortical with fine trabecular
- D4= Fine trabecular



https://pocketdentistry.com/bone-density-for-dental-implants/

- Trabecular bone in D4 can be up to 10x weaker than the cortical bone in D1
- Implant success is generally most predictable in D1/D2 bone (anterior mandible). D3/D4 (maxillary posterior) has the most complications/failures.
- Higher implant failure rates in posterior maxilla
- Mandible has higher implant success rate compared to maxilla- specifically posterior mandible

https://www.researchgate.net/publication/221917615_Bone_Quality_Assessment_for_Dental_Implants

D3 PICO

- **Clinical Question:**
  - What is/are the best fixed treatment options when it comes to restoring long-span edentulous areas?

PICO FORMAT

P: Patients with long-span edentulism
I: 3-unit implant-supported FDPs
C: 4+ unit tooth-supported FDPs
O: Higher long-term survival

PICO FORMATTED QUESTION

- In patients with long-span edentulous areas, will 3-unit implant supported fixed dental prostheses, compared with 4+ unit tooth-supported fixed dental prostheses, have increased long-term survival.

CLINICAL BOTTOM LINE

- Recommend 3-unit implant supported FDP on patients UR, and 3-unit implant-tooth supported FDP on UL.

SEARCH BACKGROUND

- **Date(s) of Search: 9/19/2020, 10/18/2020, 10/19/2020**
- **Database(s) Used: Pubmed, Google Scholar**
- **Search Strategy/Keywords:** Long-span, bridge, dental implant, implant-supported, tooth-supported

SEARCH BACKGROUND

- **MESH terms used:**
  - **Dental restoration failure**
  - **Denture, partial, fixed**

ARTICLE 1:

- Pol CWP, Raghoebar GM, Kerdijk W, Boven GC, Cune MS, Meijer HJA. A systematic review and meta-analysis of 3-unit fixed dental prostheses: Are the results of 2 abutment implants comparable to the results of 2 abutment teeth?. J Oral Rehabil. 2018;45:147–160.
- Study Design: systematic review & meta-analysis
- Study Need / Purpose: To compare the performance of 3-unit bridge on teeth with 3-unit bridges on implants, evaluating survival of the bridges, survival of the support, conditions of the hard and soft tissues surrounding the supports, complications and patient-reported outcome measures after at least 1 year.

ARTICLE 1 SYNOPSIS

- Method
  - Literature search completed, and eligibility criteria applied, resulting in 66 articled included in the analysis, identifying 1973 3-unit FDPs supported by teeth, and 765 supported by implants.
- Results
  - No significant differences found in survival of the supporting abutments or survival of the prosthesis.
- Conclusions
  - Implant-supported 3-unit FDPs seem to be a reliable treatment with survival rates comparable to 3-unit tooth supported FDPs at 5-years.
- Limitations
  - Most studies were limited to short- or medium-term follow up; lack of long-term survival statistics.

ARTICLE 1 SELECTION

- Reason for selection
  - Relevance to PICO (implant vs. tooth supported)
- Applicability to your patient
  - Looking at edentulous space of three adjacent teeth on upper right.
- Implications
  - Recommendation of 3-unit implant supported fixed dental prosthesis.

ARTICLE 2:

- Manja von Stein-Lausnitz, Hans-Joachim Nickenig, Stefan Wolfart, Konrad Neumann, Axel von Stein-Lausnitz, Benedikt Christopher Spies, Florian Beuer, Survival rates and complication behaviour of tooth implant–supported, fixed dental prostheses: A systematic review and meta-analysis, Journal of Dentistry, Volume 88, 2019, 103167, ISSN 0300-5712, https://doi.org/10.1016/j.jdent.2019.07.005.
- Study Design:
  - Systematic review & meta-analysis
- Study Need / Purpose:
  - To assess the survival and complication rates of tooth-implant supported fixed dental prostheses.

ARTICLE 2 SYNOPSIS

- Method
  - Electronic search for randomized control trials or prospective studies with observation period of at least 3 years with at lest 10 participants. Studies were qualitatively assessed. Survival rates, technical and biological complications of tooth-implant FDPs were obtained, and were pooled by weighting each rate in inverse proportion to its variance.
- Results
  - 8 studies were considered, and showed that Estimatd surivval rates of T-I FDPs were 90.8% for 5 years and 82.5% after 10 years. Implant survival rates were 94.8% and 89.8% for 5 and 10 years respectively.
- Conclusions
  - Tooth-implant supported dental prostheses are recommendable treatment option in partial dentition, and should be rigidly constructed with a maximum of four units.
- Limitations
  - Lack of 10+ year follow up, so difficult to determine long-term prognosis.

ARTICLE 2 SELECTION

- Reason for selection
  - Level of evidence
  - Relevance to PICO and clinical questions
- Applicability to your patient
  - Treatment option for edentulous space on UL
- Implications
  - Consider tooth-implant supported 3-unit FDP in UL

ARTICLE 3:

- De Backer H, Van Maele G, De Moor N, Van den Berghe L. Long-term results of short-span versus long-span fixed dental prostheses: an up to 20-year retrospective study. Int J Prosthodont. 2008 Jan-Feb;21(1):75-85. PMID: 18350953.
- Study Design:
  - Retrospective study
- Study Need / Purpose:
  - To evaluate the efficacy and determine the frequency and causes of failures in short-span and long-spans fixed dental prostheses.

ARTICLE 3 SYNOPSIS

- Method
  - 236 Ss-FDPs and 86 Ls-FDPs made in an undergraduate university clinic for 149 and 70 patients, respectively, were evaluated over a 20-year period.
- Results
  - Overall survival of short-span FDPs is higher than long-span FDPs (70.8% vs. 52.8%). No significant difference at year 19 between RCT abutments. Most common reason for failure in short-span FDPs was biological, compared to technical failure in long-span FDPs.
- Conclusions:
  - Overall survival of short-span and long-span FDPs favorable over 20 years, but short-span statistically significantly better. The use of RCT abutment becomes more significant in FDPs with 4 or more units.
- Limitations
  - Single cohort. Limited by patients who returned to remain in the study over time.

ARTICLE 3 SELECTION

- Reason for selection
  - Relevance to PICO and clinical questions
- Applicability to your patient
  - Patient has RCT abutment teeth for FDPs in both edentulous areas.
- Implications:
  - Avoid using RCT teeth as supports, especially if using a 4+ unit FDP.

LEVELS OF EVIDENCE

- [x] **1a** – Clinical Practice Guideline, Meta-Analysis, Systematic Review of Randomized Control Trials (RCTs)
- [ ] **1b** – Individual RCT
- [ ] **2a** – Systematic Review of Cohort Studies
- [x] **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

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

CONCLUSIONS: D3

How does the evidence apply to this patient?

Span of planned FDP; FDP support; RCT abutment teeth

Based on the above considerations, how will you advise your D4?

3-unit implant-supported FDP in UR, discuss options of 4-unit tooth-supported bridge or 3-unit tooth-implant supported FPD in UL.

CONCLUSIONS: D4

Based on your D3's bottom line recommendations, how will you ***advise*** your patient?

- UR: 3-unit implant supported prosthesis
- UL: 4-unit FDP
  - 3-unit implant-tooth supported prosthesis???
- [Lower: Single implants]

How will you ***help*** your patient?

- **Refer**
- CARIES CONTROL & OHI, Manage pt. expectations

DISCUSSION QUESTIONS

- What is the difference in success rates of a long span FPD with natural teeth as abutments as opposed to an implant supported long span FPD?
- What requirements or conditions aid in determining the best material or treatment option for restoring long-span edentulous areas?
- Is there an age requirement for an implant or tooth-supported fixed dental prostheses?
- What/how does occlusion play a role in this decision? Which option provides a better result in a patient with a less than ideal occlusal scheme?
- What factors should be considered when determining whether an implant-supported or tooth-supported FPD would have better long-term success?
- How does a longer edentulous span affect the abutment placed or chosen?
- Are implant abutments as successful as a virgin tooth or a crowned tooth?
- For edentulous areas, are implant supported or tooth supported FPDs explicitly better, or are there advantages and disadvantages to both depending on the situation?

DISCUSSION QUESTIONS

- What are the survival rates between 3, 4, 5-unit FPDs?
- What is the number one cause of failure for both a long span FPD and implant supported FPD?
- How is an FPD prognosis affected when the prosthesis crosses the midline?
- If an implant placed in a D4 area with low density and little to no crestal bone has a higher chance of failure why does implants placed in other areas with a higher cortical bone presence D1 have a tendency to succeed?
- How many implants would be appropriate for an implant supported FDP?
- How does bone density affect the type of dental prostheses you choose to use in a patient?
- What is the deciding factor for a fixed dental prosthesis versus a removable one in long-span edentulous patients?
- If one of the implants fails in the long span edentulous area, at what point would you switch treatment to a removable appliance?

THANK YOU

AND THEN I SAID, "YOU MIGHT LOSE THE TOOTH...

...BUT WE'LL CROSS THAT **BRIDGE** WHEN WE GET TO IT"