Evidence Based Dentistry Rounds
Specialty: Prothodontics
Group: 1A-2
Date: 10/14/20

Rounds Team

- Group Leader: Dr. Smithy
- Specialty Leader: Dr. An
- Project Team Leader: D4 Justin Roche
- Project Team Participants:
  - D1 Nicole Broz and Mumal Tunio
  - D2 Austin Lingle
  - D3 Alexis Koutsios

Patient

Patient

- 65 year old Caucasian male
- CC: “I’m here because I know I need dental work. I know I’ll need these blue fillings replaced.”

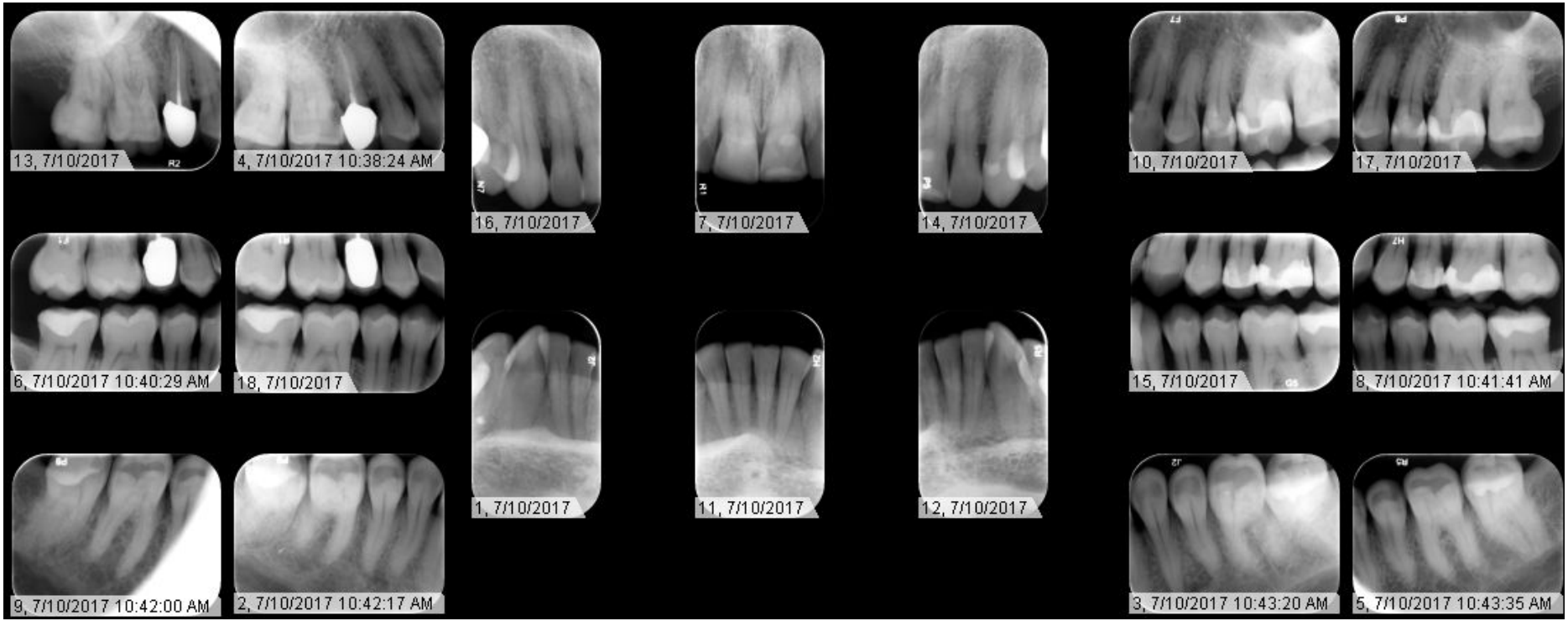
Medical History

- Medical conditions: Peyronies disease, high cholesterol
- Medications: Atorvastatin
- Allergies: Benadryl
- Past smoker

Dental History

- 4 Quads SRP completed in 2017
- Resins: #2 OL, #3 MO, #6 F, #8 F, #9 IF, #11 F, #15 OL
- RCT and PFM crown: #4
- Implant #5

Radiographs



Radiographs

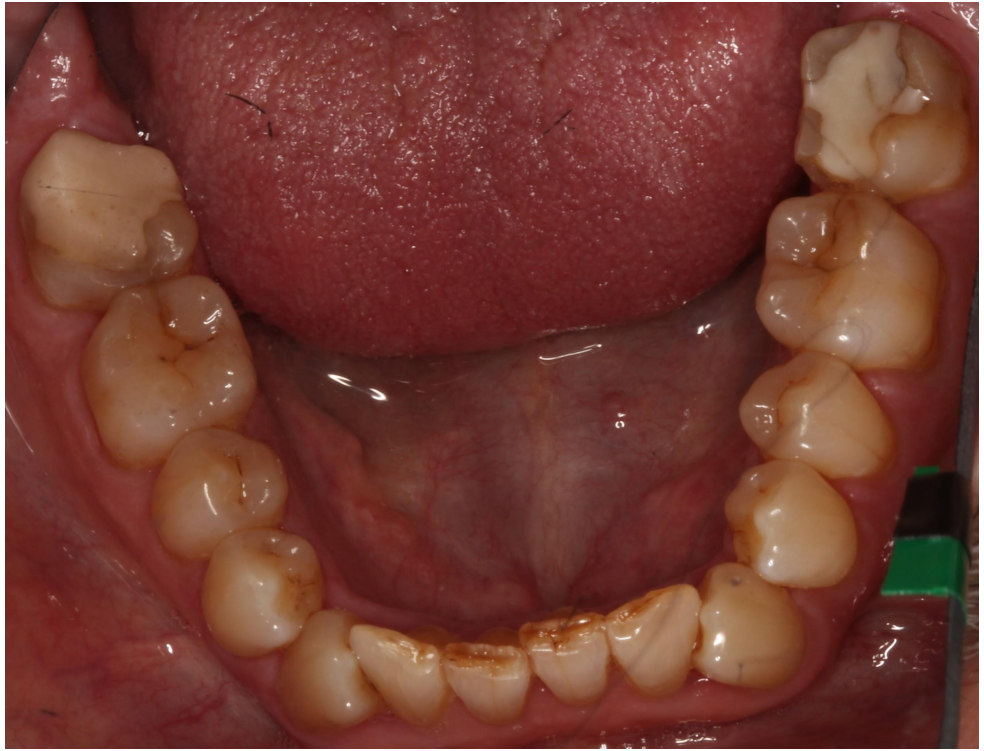
Radiographic Findings

- Large core build-ups on #13, #14, #18, and #31
- Mesial marginal ridge fracture on core build-up #31
- PARL #9

Clinical Findings

Clinical Findings

Clinical Findings



Clinical Findings

Clinical Findings

Clinical Findings

- Core build-ups on #13, #14, #18, and #31 placed by another dentist
  - #13 lingual cusp fracture
  - #14 underfilled at DL
  - #18 chipped off mesial marginal ridge
  - #31 dislodged
- #9 discolored due to trauma
  - Pulpal necrosis - recommend RCT, core build-up, and crown

Specific Findings

- Core build-ups placed by another dentist are recommended for cuspal coverage
  - Recommended to excavate cores and re-do these per MUSoD
- #13 recommended for elective endo, followed by post/core, then crown after caries excavation completed
  - Pt elects to retain vitality of #13 -> recommend ceramic onlay

Periodontal Charting

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

Periodontal Charting

																	PROGNOSI
																	FURCA
																	PLAQUE
																	BOP
	5 5 5	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	4 4 4	5 5 5	5 5 5	4 4 4	5 5 5		MGJ
	4 2 3	3 2 3	3 2 3	3 2 3	3 3 3	2 3 2	2 3 2	2 3 2	2 3 2	2 3 2	3 2 3	3 2 3	3 2 3	3 3 3	3 2 3		CAL
	4 2 3	3 2 3	3 2 3	3 2 3	3 2 3	2 2 2	2 2 2	2 2 2	2 2 2	2 2 2	3 2 3	3 2 3	3 2 3	3 2 3	3 2 3		P.D.
	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0		FGM
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17		
	1 1 1	1 1 1	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	1 2 1	1 2 1			FGM
	3 2 3	3 2 3	3 2 3	3 2 3	3 2 3	3 2 2	3 2 3	3 2 2	2 2 2	3 2 3	3 2 3	3 2 3	3 2 3	3 2 3			P.D.
	4 3 4	4 3 4	3 3 3	3 3 3	3 3 3	3 3 2	3 3 3	3 3 2	2 3 2	3 3 3	3 3 3	3 3 3	4 4 4	4 4 4			CAL
	4 4 4	5 5 5	5 5 5	4 4 4	3 3 3	4 4 4	4 4 4	4 4 4	4 4 4	3 3 3	3 3 3	5 5 5	4 4 4	4 4 4			MGJ
																	BOP
																	PLAQUE
																	FURCA
																	MOBILITY

Diagnosis

- Perio diagnosis: stage 2, grade B, generalized periodontitis

Problem List

- Caries
- Defective restorations
- Fracture
- Home care
- PARL
- Periodontal disease
- Sensitivity

D1 Basic Science

- *Mumal Tunio*
- *What Is A Post and Core Restoration?*

Post and Core Restorations

- Used on abutments of restorations such as crowns and bridges following a root canal
- Main purpose of post- retain the core and prevent the crown from fracturing
  - Retaining = adhere core in "intimate contact" with the floor of the pulp chamber
- Without post- only thing maintaining core is abutment.

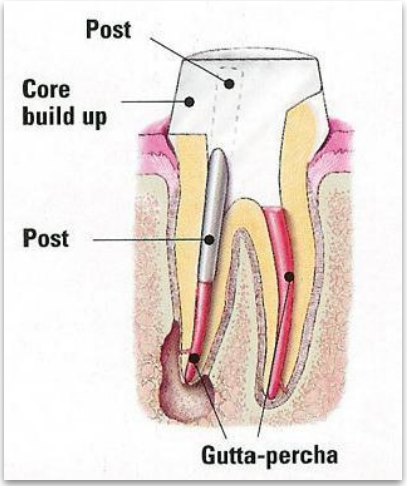


Image:
http://medellindentalsolutions.com/post-and-core/

Post and Core Restorations

- If an abutment without a post is crowned, occlusal forces could cause the tooth to fracture faster
- Core- fills space created in the endodontic chamber as well as protecting it from invading bacteria and reinforcing the tooth if it is resin bound. It does this by more evenly distributing masticatory forces that would otherwise be concentrated
- Cast v. Prefabricated
- Examples of materials (cast) - ceramic core enhanced by leucite pressed into a post made fully from zirconium.

Sources

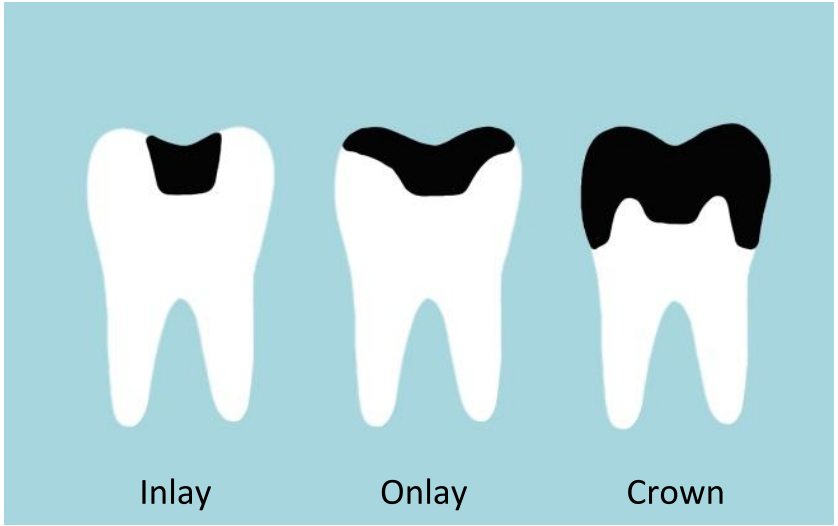
- Mamoun, J. (2017). Post and core build-ups in crown and bridge abutments: Bio-mechanical advantages and disadvantages. *The journal of advanced prosthodontics*, 9(3), 232-237.

- Quadaih, M.A., Yousief, S.A., Allabban, M., Nejri, A., Elmarakby, A. M. (2020). Effect of Two Different Core Materials. *Clinical, cosmetic and investigational dentistry* vol. 12 87-100. 30 Mar. 2020.

D1 Basic Science

- *Nicki Broz*
- *What Are Inlays and Onlays?*

Inlays/Onlays



- Direct vs. indirect restorations
- Inlays
  - Isthmus too wide for filling
  - No cuspal involvement
- Onlays
  - Involves 1+ cusp
  - Conserves healthy cusps

Features of Inlays and Onlays

- Conservative approach
  - Preserves as much healthy tooth structure as possible
- Strength
  - Mechanical forces - mastication
  - Bonding systems for indirect restoration
- Esthetics
  - Ceramic option is tooth colored

References

- Angeletaki, F., *et. al.* (2016). Direct versus indirect inlay/onlay composite restorations in posterior teeth. A systematic review and meta-analysis. *Journal of Dentistry, 53, 12-21.* https://doi.org/10.1016/j.jdent.2016.07.011

- Hopp, C. D., & Land, M. F. (2013). Considerations for ceramic inlays in posterior teeth: A review. *Clinical, Cosmetic and Investigational Dentistry*, *5*, 21–32. https://doi.org/10.2147/CCIDE.S42016

D2 Pathology

- ***Austin Lingle***
- ***What are the risks of smoking that are related to dental care and treatment?***

https://www.shutterstock.com/video/clip-1307809-skull-smoking-cigarette-exhaling-smoke

D2 Pathology: Smoking and Dentistry

- Inflammation
- Saliva, staining, halitosis, loss of taste/smell
- Increased periodontitis and bone loss
- Decreased wound healing
- Dose response for PD and CAL
- Implant failure 2x non-smokers
- Smoking cessation is important!

Kaldahl, W. B., Johnson, G. K., Patil, K. D., & Kalkwarf, K. L. (1996). Levels of cigarette consumption and response to periodontal therapy. *Journal of periodontology*, *67*(7), 675–681. https://doi.org/10.1902/jop.1996.67.7.675

Heitz-Mayfield, L.J.A. (2005), Disease progression: identification of high-risk groups and individuals for periodontitis. Journal of Clinical Periodontology, 32: 196-209. doi:10.1111/j.1600-051X.2005.00803

D3 PICO

- Clinical Question:
- What is the effectiveness and survivability of ceramic onlays as a treatment option in teeth requiring cuspal coverage?

PICO Format

P: Patients that require cuspal coverage restorations

I: onlays

C: crowns

O: survival rates

PICO Formatted Question

- In patients with teeth that require cuspal coverage restorations, do ceramic onlays, specifically lithium disilicate, have a comparable survivability to full coverage crowns?

Clinical Bottom Line

- Survival rates of onlays are high and comparable to single crowns. Failures that were noted in ceramic onalys were mostly due to ceramic fractures. However, more high-level studies are necessary.

Search Background

- **Date(s) of Search: 9/15/2020 and 9/24/2020**
- **Database(s) Used: PubMed and Google Scholar**
- **Search Strategy/Keywords:** Focused on lithium disilicate restorations, more specifically onlays and crowns. Searched ceramics if lithium disilicate was too specific, and focused on articles regarding longevity/survival rates.

Search Background

- **MESH terms used:**
- Onlay
- Crowns
- Longevity
- Survival
- Lithium disilicate
- Ceramic
- Full coverage crown
- Partial coverage crown

Article 1 Citation, Introduction

- Citation: Vagropoulou GI;Klifopoulou GL;Vlahou SG;Hirayama H;Michalakis K; “Complications and Survival Rates of Inlays and Onlays vs Complete Coverage Restorations: A Systematic Review and Analysis of Studies.” Journal of Oral Rehabilitation. 2018 Nov;45(11)903-920.
- Study Design: Systematic Review
- Study Need /Purpose: Identify clinical studies in which biological and technical complications along with survival rates of crowns were compared to inlays/onlays.

Article 1 Synopsis

- Electronic search was conducted to find articles published between 1980 and 2017. Randomised controlled studies on this topic were very limited/non existent.
- 9 studies were selected
- Aim was to determine if different types of restorations had different complications and their survival rates at 5 years.
- If the restoration remained in situ for the observational period with or without modifications, it was considered as survival.
- 4 groups were identified: inlay, onlay, inlay/onlay and crowns

Article 1 Synopsis

- Inclusion criteria:
- Had absolute mean follow-up time of at least 1 year
- Compared at least one type of partial restoration directly to a complete coverage restoration
- Complications or lack of were reported at follow ups
- Contained total number of each restoration and total number of failures

Article 1 Synopsis

- One study specifically compared lithium disilicate onlays to lithium disilicate crowns
  - 58/62 onlays survived: 93%
  - 414/428 crowns survived: 96%
  - Failures were mostly due to ceramic fracture

Article 1 Synopsis

- Mean survival for onlays and crowns was 93.5% and 95.38%
- Estimated survival rates for glass ceramics ranged from 92%-95% at 5 years, and 91% at 10 years
- Main biological complication: caries, followed by root/tooth fractures
- Main technical complication: ceramic fracture, followed by loss of retention
- Bruxism was associated with an increase in complications
- Other factors to consider: patient, dentist and position in arch

Article 1 Synopsis

- Conclusion: In 5/9 studies, onlays demonstrated a slightly better clinical outcome compared to full coverage, but it was not statistically significant. Survival rate of both restorations is very high (greater than 90%).

- Limitations: small number of articles. Low quality due to heterogeneity; different evaluation criteria/requirements was used amongst the studies, total number of restorations varied by study, different treatment protocols.

Article 1 Selection

- This article was selected because it compared survival rates of onlays to crowns

- However, these articles varied in restoration material used, so only the authors who used ceramic/lithium disilicate pertains to our clinical question

Article 2 Citation, Introduction

- Citation: Sulaiman TA, Delgado AJ, Donovan TE. Survival rate of lithium disilicate restorations at 4 years: A retrospective study. J Prosthet Dent. 2015 Sep;114 (3) 364-6
- Study Design: Retrospective study
- Study Need / Purpose: Analyze failure rate of lithium disilicate restorations at 4 years

Article 2 Synopsis

- Over 45 months, restorations from 2 commercial laboratories were collected. Failures consisted of fractures that required the restoration to be remade
- Restorations that were returned to lab for poor marginal fit, esthetic concerns, and contour were excluded
- Categorized by monolithic or layered, and complete coverage crowns, fixed dental prostheses, e.max veneers, and inlay/onlay
- Total of 21,340 restorations (15,802 were monolithic and 5,538 were layered)/. IPS e.max was chosen because it is a commonly used system

Article 2 Synopsis

- Lithium disilicate (IPS e.max):
  - Crowns: failure rate for monolithic was .91%
    - 11,603 units placed
    - 106 failed
  - Inlay/onlay: failure rate for monolithic was 1.01%
    - 1,093 units placed
    - 11 failed

Article 2 Synopsis

- Conclusion: Lithium disilicate (IPS emax) restorations do not experience high rate of failure.
- Since fabrication process and clinical tooth preps weren't analyzed, failure can not be solely attributed to material choice
- Limitations: was short term (45 months) and did not differentiate between inlays/onlays

Article 2 Selection

- This article was selected because it focused specifically on lithium disilicate (IPS e.max) restorations.

Article 3 Citations, Introduction

- Citation: Abduo J, Sambrook RJ. Longevity of ceramic onlays: A systematic review. J Esthet Restor Dent. 2018 May;30 (3): 193-215
- Study Design: Systematic review
- Study Need/purpose: Identify factors that affect longevity and survival of ceramic onlays

Article 3 Synopsis

- Total of 21 studies were included. They were gathered from an electronic search.
- Focused on medium term survival (2-5 years) and long term (greater than 5 years).
- Asked 12 questions for every article to ensure trustworthiness and relevance. Highest score to achieve was 12, which indicated high quality.

Article 3 Synopsis

- Survival indicated that the restoration did not need replacement

- Failure was grouped by: fracture, debonding/loss of retention, caries, endo complications, perio complications and extraction of tooth.

Article 3 Synopsis

- Studies that focused on lithium disilicate:
  - One stated that the only failure noted was due to fracture. The second study stated majority failed due to debonding, and the third study was also fracture.
  - Overall, most common cause of failure amongst ceramics was fracture (76.2%), followed by debonding and lastly, caries.
  - Material and technique aside, deterioration was evident amongst onlays. Most common being margin quality, however the prevelance was low and not a major limitation

Article 3 Synopsis

- Overall, at 2-5 years, ceramics had a survival rate of 91%-100%. More than 5 years, survival ranged from 71%-98.5%.
- Suggested that not one ceramic restoration performs better than another, ceramic onlays have acceptable medium and long term survival rates.
- Molar onlays were noted to have higher failure rates compared to premolars
- Occlusal ceramic thickness of at least 2mm was reported to decrease fractures

Article 3 Synopsis

- Limitations: limited number of studies, variations in materials and assessments used

Article 3 Selection

- This article did not focus as much on lithium disilicate, however, it went into great detail on ceramic onlay survival.

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

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

- Based on these studies, onlay survival rate was high. However, since the quality was limited, the decision is sometimes left to personal preference.

- I would advise my D4 to place an onlay due to the fact that the patient in question is not a bruxer, it is placed on a premolar, and it will conserve the tooth while providing cuspal coverage. The survival rate is high for onalys. However, I would be aware of the risk of ceramic fracture and take all necessary steps to avoid or decrease the risk of that happening.

Conclusions: D4

- Based on our bottom line, I have advised the patient that a ceramic onlay seems to be a viable treatment alternative to elective endo and a post and core restoration, albeit with somewhat limited evidence
- Patient has elected to proceed with this treatment option and is satisfied that he can maintain the vitality of his tooth.

Discussion Questions

Discussion Question
What are the indications for an onlay versus a full coverage crown?
what is the rate of recurrent decay with onlays, when compared to that of fullcoverage crowns?
From the two, which one is indicated for malformed teeth?
Does wearing an occlusal guard contribute to the success or failure of ceramic restorations?
Does the type of tooth matter in regards to success rates for onlays premolars vs molars for example?
How much weight does a patients input have on determining if they will receive an onlay or crown?
Does diabetes influence the care, treatment, or prognosis of the procedure?
Do ceramic onlays experience wear, fracture antagonist teeth or dimensional change at proximal contacts. Do these factors contribute to their failure?

THANK YOU