# Longevity of Posterior Crowns

Evidence Based Dentistry Rounds

**Dental Materials**

**4B - 4**

11-18-2020

# Rounds Team

- Group Leader: Dr. Grady
- Specialty Leader: Dr. Berzins
- Project Team Leader: D4 - Furqaan Siddiqui
- Project Team Participants:
- D1 – Ana Hernandez
- D2 – Payton TeDuits
- D3 – Zoe Vainikos

# Patient

- 79 Years Old
- Female
- Caucasian
- CC: I am here to resume my treatment at Marquette and make sure everything is ok with my dental care.
- Additional pertinent information

# Medical History

- Non-Contributory
- Past Smoker (Quit 20+ years ago)
- Radiation Therapy for Benign Pre-Cancerous Lesion on Nose in 2006
- Arthritis

- Medications
  - Spectravite Adult 50+ Multivitamin 1 Tablet after breakfast
  - Glucosamine Chondritin Dietary Supplement 1 Caplet after Breakfast
  - Vitamin D3 2000 IU 1 soft get after breakfast
  - Fiber Gummies Daily Supplements 1 per day after breakfast

# Dental History

- Deep Pockets
- Plaque
- Calculus
- Brushes Twice Daily and Flosses Once a Day
- Previous RCT on 3, 4, 20
- Maxillary Bridge 4-6 and 13-16 placed 60+ years ago
- Implant #30

# Radiographs

- Pan from 2017 – From Dentist in Florida

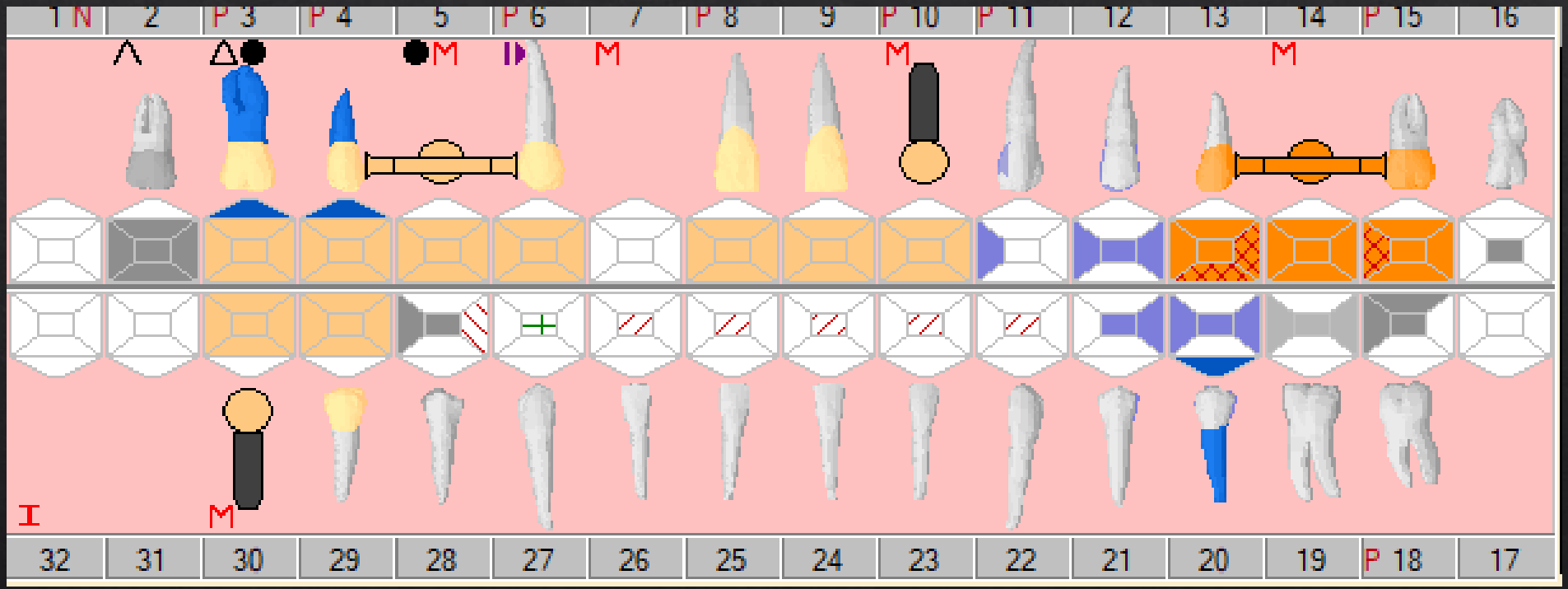
# Radiographs

# Radiographs

# Radiographic Findings

- Missing Teeth: #1, #7, #14, #31, #32
- Bridge from #4-6 with 6 replacing #7 in the arch
- Pin Retained cored #8
- Caries: #18M Recurrent, #11M, #13D Recurrent, #15 Recurrent
- Furcations: #3 Class 2
- PARL: #3 MB Root

# Clinical Findings



# Clinical Photos

# Clinical Findings

- Caries: #18M-RC, #13D-RC, #15 Recurrent
- Incisal Wear: 22-26
- Fracture: #27-I, smooth
- RCT: #3, #4, #20
- Crowns: #3, #8, #9, #30
- Bridges: #4-6, $13-15
- Implant: #30
- Prior Restorations: #2MODBL Amalgam, #11M Resin, #12MOD Resin, #16O Amalgam, #18MOL Amalgam, #19MOD Resin, #20MOD Resin, #21DO Resin, #28DO Amalgam

# Specific Findings

- Extensive Radiographic Decay #13D
- Radiographic Decay #13M, #15 Crown Margins
- Bridge Sectioned, #13 deemed non-restorable
  - Extensive decay, loss of tooth structure, and poor crown to root ratio after bone loss
- #15 had minimal recurrent decay, restorable

# Periodontal Charting – Pre TX

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# Periodontal Charting – Post S/RP

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| | 2 2 2 | 5 5 4 | 4 2 5 | | 5 2 2 | | 2 2 4 | 3 1 2 | 3 5 4 | 3 1 2 | 2 1 2 | 2 1 2 | | 3 2 4 | 3 3 3 | | P.D. |
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| | | 4 4 4 | 2 2 2 | 4 4 4 | 4 4 4 | 6 6 6 | 3 3 3 | 3 3 3 | 3 3 3 | 3 3 3 | 4 4 4 | 3 3 3 | 2 2 2 | 3 3 3 | | | MGJ |
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| | | . . . | P P P | P P P | P P . | . . . | P P P | P P P | P P P | P P P | P P P | P P P | P P P | P P P | | | PLAQUE |
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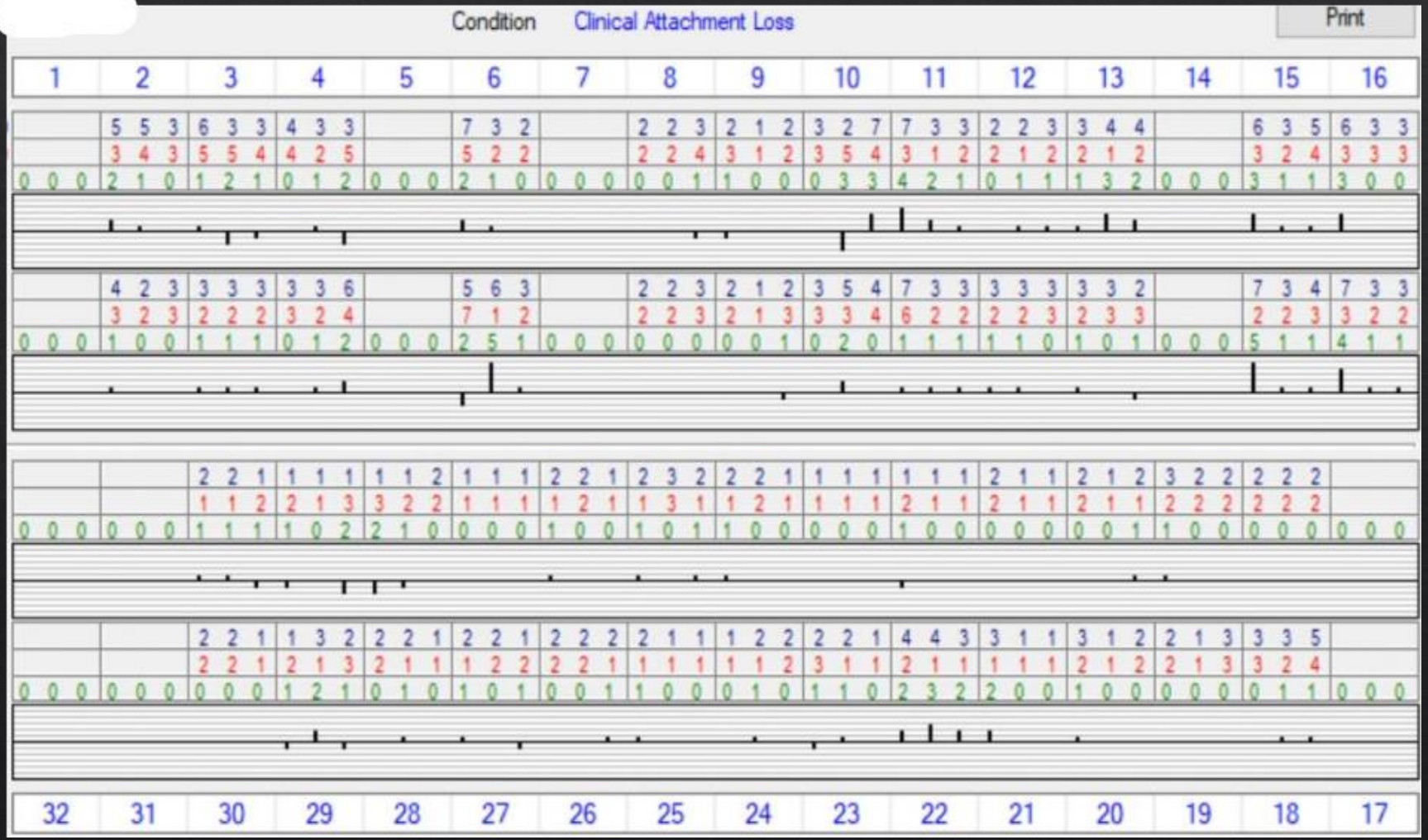
# Periodontal Charting



# Diagnosis

- Periodontal Findings:
  - Enamel Pearl on #2, Grade 1 Furcation on #2, Grade 2 Furcation on #3, Deep Pockets, Significant Bone Loss
- Periodontal Diagnosis:
  - IV – Advanced Chronic Periodontitis
- #13-15 Bridge Diagnosis
  - #13 = Non-Restorable; EXT
  - #15 = Restorable

# Problem List

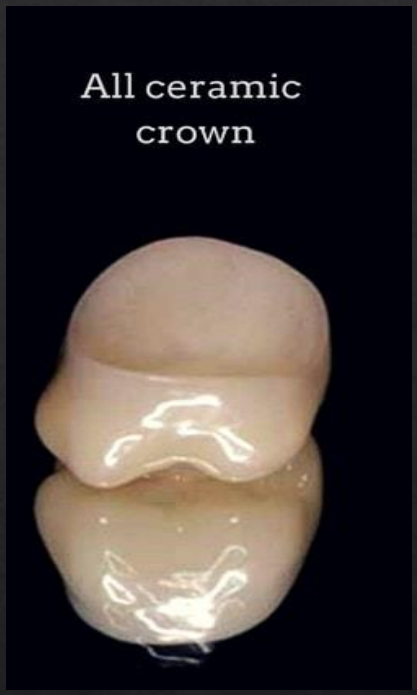
- Caries
- Defective Restorations
- Esthetics
- Fractured Tooth
- Gross Caries
- PARL
- Perio Disease

D1 Basic Science
Question:

What are the differences in the strength of PFM vs. FCC vs. ACC?

# All-Ceramic Crowns (ACC)

- No metal aspect involved
- Multiple types of ceramics can be used (ex. Lithium or zirconia)
- More aesthetically please
- Drawback: less fracture resistant and shorter longevity

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# Porcelain-Fused to Metal (PFM)

- Been used since the 19th century
- Underlying metal band with porcelain fused over the top.
  - Overall bond strength and resistance to fracture increases
- True adhesion between the two materials meaning if a fracture was to occur it would be in the porcelain rather than the metal
- Drawback: grey appearance of gingiva near the CEJ


https://i.pinimg.com/736x/26/27/f9/2627f947626684cd9cd71242b598c9fb.jpg

https://www.bing.com/images/search?view=detailV2&ccid=yLezrzMV&id=FB0A49E4E19AF36E8FA2DC70DA36890BB6F103D8&thid=OIP.yLezrzMVyksbvTQU6ExvwwHaFS&mediaurl=https%3a%2f%2fwww.infodentis.com%2fimages-eng%2fporcelain_crowns_types.jpg&exph=500&expw=700&q=porcelain+fused+to+metal+crown+vs+acc&simid=607989836973281105&ck=9538ECEF503A2DD3B805546F341E5E05&selectedIndex=6&qpvt=porcelain+fused+to+metal+crown+vs+acc&FORM=IRPRST&ajaxhi

# Full- Casted Crown (FCC)

- Can otherwise be called a full metal crown
- Often used in posterior teeth containing greater occlusal forces and aesthetics are not of concern
- Requires very little dentin to be removed and is durable even with thin layer of metal
- Very durable and has few issues with fracture
- Is rather gentle on opposing teeth but can become problematic over time if opposite to a FPC.
- Drawback: long preparation, time, sensitivity, allergic reactions, potential wear over multiple years ( grinding/clenching)

http://sunnydms.com/wp-content/uploads/2016/08/FULL-CAST-CROWNS-w_watermask.jpg

# Overall Longevity Comparison

FCC > PFC > ACC

# References


1.“ Porcelain-Fused-to-Metal Crowns versus All-ceramic Crowns: A review of the Clinical and Cost-Effectiveness.” Canadian Agency for Drugs and Technologies in Health. 29 May 2015.

2.Hobo, S. and Shillingburg, H. “Porcelain fused to metal: Tooth preparation and coping design”. The Journal of Prosthetic Dentistry.30.1(2006):28-36.

3.Kassardijian, V., Varma, S., Andiappan, M., Cruegers, N., & Bartlett,D. “A systemic review and meta analysis of the longevity of anterior and posterior all-ceramic crowns.” 01 September. 2016.

4.Selberg, A. “A full Cast Crown Technique.” Journal of Prostehetic Dentistry. January 1957

5. Rich, M. “ A Comparison of Dental Crown Materials.” Health Centered Dentistry

D2 Pathology
Question:

What is contact stomatitis and what dental materials can cause it to occur?

# Contact Stomatitis

- Contact stomatitis refers to inflammation of the oral tissues, caused by mechanical or chemical irritants.
- Contact stomatitis caused by dental materials is usually caused by some sort of allergic reaction to the irritant.
- Allergic contact stomatitis is usually a result of a type IV hypersensitivity reaction to a specific allergen but is rarely the result of type I hypersensitivity reaction: it can be acute or chronic.
- Contact stomatitis, both acute and chronic, occur more commonly in females compared to males.
- The most common symptom of acute contact stomatitis is burning of the affected tissue. Its appearance is variable from mild, barely visible redness to extremely erythematous lesion with or without edema.
- Chronic contact stomatitis appears either erythematous or white and hyperkeratotic around the area of contact in the mouth.
- Treatment of contact stomatitis involves either removal or avoidance of the irritant, but sometimes will require anti-histamine therapy in severe cases.

# Causes of Contact Stomatitis

- Dentifrices, mouthwashes, gloves and rubber dam materials, topical anesthetics, restorative metals and composites, acrylic denture materials, impression materials, and denture adhesive materials have all been mentioned as causing contact stomatitis.

- When it comes to restorative materials, base metals are the most common irritants but almost all materials used in restorative procedures have been shown to cause contact stomatitis in some cases.

- Noble metals, such as gold, titanium,  have been shown to have a very low prevalence of contact stomatitis, but it still does occur on occasion.

- High noble cast crowns seem to be the best metal crowns to avoid contact stomatitis.

# D3 PICO

**Clinical Question:**

How does the longevity of a PFM crown compare to a FCC or ACC?

# D3 PICO

**P:** patients needing posterior crown

**I:** PFM crown

**C:** FCC crown

**O:** better longevity

# D3 PICO

**PICO Format Question:**

Among patients needing Posterior Crowns, do PFM crowns, as opposed to FCC crowns, offer better longevity?

# Clinical Bottom Line

- Full cast crowns (FCC) offer superior longevity when compared to both all ceramic crowns (ACC) and porcelain fused to metal (PFM) crowns
- PFM crowns offer reliable and long lasting treatment to patients
- ACC crowns can serve as a good alternative to PFM and FCC when esthetics are a concern

# Search Background

**Dates of Search:** 10/28/20, 11/8/20

**Database:** PubMED

**Search Strategy/Keywords:** PFM, ACC, full cast crown, longevity, posterior

**MESH terms:** Crowns / adverse effects, Dental Porcelain / therapeutic use, Dental Prosthesis Design, Dental Restoration Failure, Gold / therapeutic use, Treatment Outcome, Zirconium / therapeutic use

# Article #1

*Five-year results of a prospective randomised controlled clinical trial of posterior computer-aided design-computer-aided manufacturing ZrSiO4 -ceramic crowns. (2013)*

- N. Passia, S. Sampf. & J.R. Strub
- Journal of Oral Rehabilitation
- Study design = RCT

# Article #1 - Synopsis

*Five-year results of a prospective randomised controlled clinical trial of posterior computer-aided design-computer-aided manufacturing ZrSiO4 -ceramic crowns. (2013)*

- 123 ceramic crowns and 100 gold crowns over a 5yr period
- Survival probability:
  - ACC: 98.3% at 6 mo, 73.2% by 5 yrs
  - Gold: 99% at 6mo, 92.3% by 5 yrs.
- Failure was defined by presence of fracture, caries, need for EXT, and tooth loss.
  - Gold crown failure was mostly due to need for EXT or caries
  - Ceramic crown failure was mostly due to fracture

# Article #1 - Synopsis

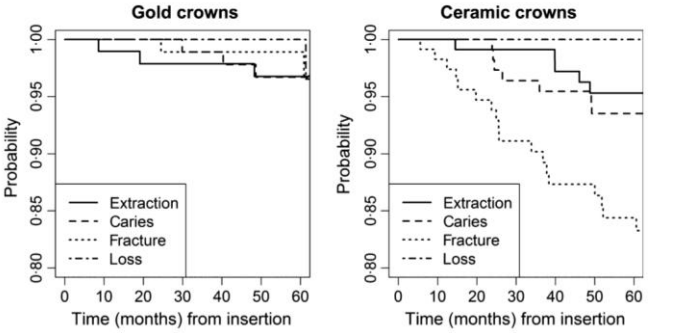


**Fig. 2.** Probability for not having an event of fracture, caries, extraction or loss.

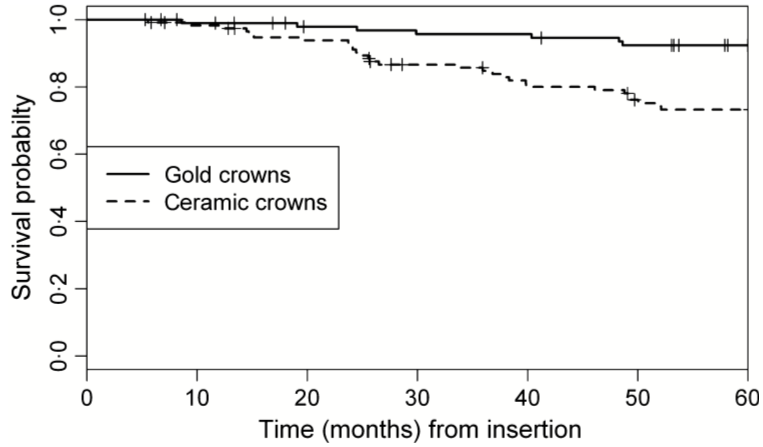


**Fig. 3.** Survival probability of gold crowns versus ceramic crowns. +: censored data.

# Reason for Selection

- High level of evidence
- Relevant to PICO question

# Level of Evidence & Strength of

- ☐ **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

| | |
|---|---|
| ☒ | **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 |

# Article #2

*Porcelain-Fused-to-Metal Crowns versus All-ceramic Crowns: A Review of the Clinical and Cost-Effectiveness (2015)*

- Canadian Agency for Drugs and Technologies in Health
- Study design: meta analysis

# Article #2 - Synopsis

*Porcelain-Fused-to-Metal Crowns versus All-ceramic Crowns: A Review of the Clinical and Cost-Effectiveness (2015)*

- Short term survival (< 5ys)
  - Takeichi et al. reported survival rates of 95.9% for zirconia-based crowns and 95.4% for PFM crowns
  - Burke et al. reported survival rates of 92% for ACC and 93% for PFM crowns
- Mid-term survival (5-8yrs)
  - Sailer et al. reported 96% for PFM crowns
  - all-ceramic crown types; these were feldspathic/silica-based ceramic (90.7%), leucite or lithium-disilicate reinforced glass ceramic (96.6%), glass-infiltrated ceramic (94.6%), densely sintered alumina (96%), densely sintered zirconia (92%), and composite crowns (83.4%).
  - Burke et al.[33] reported lower survival rates for both PFM crowns (76%) and all-ceramic crowns (68%).
- Long-term survival (10+ yrs)
  - Burke et al. reported a long-term survival rate of 62% for PFM crowns and 48% for all-ceramic crowns

# Reason for Selection

- *Good level of evidence
  - Limitations of this meta analysis are the inclusion of small number of RCTs and a larger number of uncontrolled retrospective and prospective studies
- Relevant to PICO

# Level of Evidence & Strength of

- [x] **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
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# Research - Article #3

*Zirconia-based versus metal-based single crowns veneered with overpressing ceramic for restoration of posterior endodontically treated teeth: 5-year results of a randomized controlled clinical study (2017)*

- Monaco, C., Llukacey, A., Baldissara, P., Arean, A., Scotti, R.
- Journal of Dentistry
- Study design = RCT

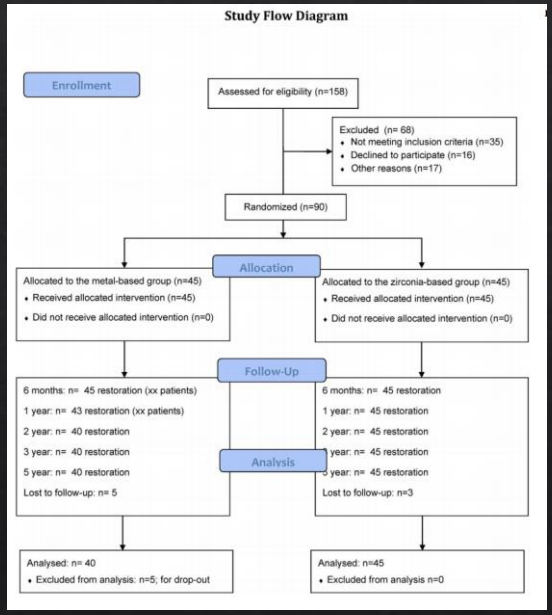
# Article #3 - Synopsis

*Zirconia-based versus metal-based single crowns veneered with overpressing ceramic for restoration of posterior endodontically treated teeth: 5-year results of a randomized controlled clinical study (2017)*

- 5yr RCT comparing longevity and clinical behavior of single posterior crowns made with pressable ceramic on zirconia and on metal frameworks
- 72 patients; all teeth endo tx
- 90 single crowns; survival assessed at 6mo, 1-4yrs, and 5 yrs
- Conclusion: survival of zirconia-based and metal-based single crowns is similar over a follow up period of 5yrs
  - "The ECS of the zirconia-based crowns after 5 years (97.73 ± 2.19) was similar to that of the metal-based crowns. (97.44 ± 2.39). In the same way the ECSs of the two groups decreased to 91.11 ± 4.27 and 92.64 ± 4.14 respectively for zirconia- and metal-based crowns. No statistical differences were detected between the two groups."

# Article #3 - Synopsis

*Zirconia-based versus metal-based single crowns veneered with overpressing ceramic for restoration of posterior endodontically treated teeth: 5-year results of a randomized controlled clinical study (2017)*



# Reason for Selection

- Good level of evidence
  - Limitation - only 5yr period, not long ter
- Relevant to PICO

# Level of Evidence & Strength of

| | |
|---|---|
| ☐ | **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 |

| | |
|---|---|
| ✖ | **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

If longevity is determined to be the most important factor and highest priority for the patient, then I would recommend treatment using full cast crowns to the D4.

# Conclusions: D4

Based on the results of the caries excavation, the  patient will need a recommends that incorporates restoring the edentulous area of #13-14. I will recommend a surveyed crown on #12 and #15. If patients main concern continues to be longevity of the restoration, I will follow my D3s recommendation of an FCC. However, with the new development that we will be moving more anterior and likely including #12, the patient's concerns might evolve to include esthetics, in which case I would recommend PFM.

# Discussion Questions

- 1-2 slides
- List posted discussion questions
- Questions may also be from Group Leader or Specialist

# Discussion Questions

# THANK YOU