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Case Report

Clinical Case Presentation: Challenging the American Board of Operative Dentistry Certification Examination

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Submitted: 07 August 2013

Accepted: 07 August 2013

Published: 09 August 2013

Challenging The American Board of Operative Dentistry Certification (ABOD) was one of the most humbling, challenging and gratifying experiences of my dental career. To say that it is an honor to join the elite names on that list would be a serious understatement. Organized dentistry is priceless to the success of our profession and challenging board examinations allows us to peer-review top clinicians in their respective fields. I can still recall entering the oral examination room with the 3 elite examiners around the table thinking, "what have I gotten myself into." Thankfully, I was equipped with the knowledge (peer-reviewed publications) and confidence needed to defend my clinical decision making and dental material selections. The peer-reviewed process of both research publication and board certification keeps our cherished field of dentistry on the cutting edge of technology and patient care. It is my hope that more dentists would seek these peer-reviewed challenges to continue the legacy of organized dentistry that we hold so dear.

The board certification includes a full day written examination, a three day clinical examination, and an oral case defense of two separate cases. I want to share the oral case defense presentations with our readers to help them better understand the clinical process involved and the utilization of various direct and indirect restorative materials. The following excerpt is directly from the American Board of Operative Dentistry, Inc. certification program at the time the oral examination was challenged. The URL for the current version is hyper-linked below.

https://www.academyofoperativedentistry.com/docs/ABOD_Procedural_Guide_2012.pdf

EXAMINATION INSTRUCTIONS AND PROCEDURAL GUIDE FOR THE CERTIFICATION PROCESS

The oral examination is based on cases presented to the board. The questions will be related to the cases and such supporting information as deemed reasonable by the examiners. The total amount of cases presented must be a minimum of two but there may be as many as four as long as all the requirements are met (see subtitle "Cases"). It is my recommendation that candidates provide comprehensive care by meeting the examination requirements with as few total cases as possible (two). It is advantageous to screen 2 patients that meet all 24 direct and indirect requirements as described in "general requirement" section of this case presentation. However, one or two additional cases may be necessary to accommodate all 24 total restorations required (12 direct and 12 indirect). The candidate should be familiar with the current textbooks and refereed journals, as related to operative dentistry and supporting disciplines. I have included the textbooks and peer-reviewed journal article used for this defense in (Table 1) (current at time of defense). The examination will be conducted and evaluated by a minimum of two (2) examiners although three (3) are usually in attendance, all of whom have reviewed the cases and accompanying documentation. The oral examination will be recorded for future reference and the recording becomes the property of the American Board of Operative Dentistry, Inc. The completed case documentation will be returned immediately to the candidate on completion of the examination but should be retained by the candidate for future reference. The oral examination may be scheduled during the three day clinical examination in such a manner so as not to interfere with the clinical

Examination. The oral examination may be taken at another site and time other than during the clinical examination at the convenience of the candidate and based on the demand. However, in all cases, the oral examination must be successfully completed during the board eligible time window. The oral examination will not exceed one hour in length.

GENERAL REQUIREMENTS

All submitted cases must conform to the following general requirements:

1. Only one of the submitted cases may have had the diagnosis and treatment initiated during any formal residency, advanced education, or postgraduate program ever

Table 1: Literature Used for Case Defense (Literature was current at time of defense).

Resin Composite	Textbooks: • Sturdevant's Art and Science of Operative Dentistry, 3e • Craig's Restorative Dental Materials, 10e • Journal Articles: • Kameyama A, Nakazawa T, Haruyama A, Haruyama C, Hosaka M, Hirai Y. Influence of finishing/polishing procedures on the surface texture of two resin composites. Open Dent J. 2008;2:56-60. • Thomsen KB, Peutzfeldt A. Resin composites: strength of the bond to dentin versus mechanical properties. Clin Oral Investig. 2007 • Mar;11(1):45-9.
Dentin Bonding	Textbooks: • Sturdevant's Art and Science of Operative Dentistry, 3e • Craig's Restorative Dental Materials, 10e • Journal Articles: • Guéders AM, Charpentier JF, Albert AI, Geerts SO. Microleakage after thermocycling of 4 etch and rinse and 3 self-etch adhesives with and without a flowable composite lining. Oper Dent. 2006 Jul-Aug;31(4):450-5. • Mitsui FH, Peris AR, Cavalcanti AN, Marchi GM, Pimenta LA. Influence of thermal and mechanical load cycling on microtensile bond strengths of total and self-etching adhesive systems. Oper Dent. 2006 Mar-Apr;31(2):240-7.
Dental Amalgam	Textbooks: • Sturdevant's Art and Science of Operative Dentistry, 3e • Craig's Restorative Dental Materials, 10e • Journal Articles: • Berry TG, Summitt JB, Chung AK, Osborne JW. Amalgam at the new millennium. J Am Dent Assoc. 1998 Nov;129(11):1547-56. • Opdam NJ, Bronkhorst EM, Roeters JM, Loomans BA. A retrospective clinical study on longevity of posterior composite and amalgam restorations. Dent Mater. 2007 Jan;23(1):2-8. • Bonsor SJ, Chadwick RG. Longevity of conventional and bonded (sealed) amalgam restorations in a private general dental practice. Br • Dent J. 2009 Jan 24;206(2):E3; discussion 88-9. • Lauterbach M, Martins IP, Castro-Caldas A, Bernardo M, Luis H, Amaral H, Leitão J, Martin MD, Townes B, Rosenbaum G, Woods JS, Derouen T. Neurological outcomes in children with and without amalgam-related mercury exposure: seven years of longitudinal observations in a randomized trial. J Am Dent Assoc. 2008 Feb;139(2):138-45.
Direct Gold Foil	Textbooks: • Sturdevant's Art and Science of Operative Dentistry, 3e • Craig's Restorative Dental Materials, 10e • Journal Articles: • Small BW, Johnson W. Gold foil and its use in modern dentistry. Dent Today. 2006 Mar;25(3):92, 94, 96.
Glass Ionomer Cements	Textbooks: • Sturdevant's Art and Science of Operative Dentistry, 3e • Craig's Restorative Dental Materials, 10e • Journal Articles: • Santos VR, Lucchesi JA, Cortelli SC, Amaral CM, Feres M, Duarte PM. Effects of glass ionomer and microfilled composite subgingival restorations on periodontal tissue and subgingival biofilm: a 6-month evaluation. J Periodontol. 2007 Aug;78(8):1522-8. • Dietrich T, Lösche AC, Lösche GM, Roulet JF. Marginal adaptation of direct composite and sandwich restorations in Class II cavities with cervical margins in dentine. J Dent. 1999 Feb;27(2):119-28. • Kovarik RE, Haubenreich JE, Gore D. Glass ionomer cements: a review of composition, chemistry, and biocompatibility as a dental and medical implant material. J Long Term Eff Med Implants. 2005;15(6):655-71. • Weiner R. Liners, bases, and cements: an in-depth review, Part 3. Dent Today. 2008 Nov;27(11):65-6.
Indirect Pressed Leucite Ceramics Inlays/Onlays	Textbooks: • Sturdevant's Art and Science of Operative Dentistry, 3e • Craig's Restorative Dental Materials, 10e • Journal Articles: • Meyer A Jr, Cardoso LC, Araujo E, Baratieri LN. Ceramic inlays and onlays: clinical procedures for predictable results. J Esthet Restor • Dent. 2003;15(6):338-51. • Hayashi M, Wilson NH, Yeung CA, Worthington HV. Systematic review of ceramic inlays. Clin Oral Investig. 2003 Mar;7(1):8-19. • Soares CJ, Martins LR, Fonseca RB, Correr-Sobrinho L, Fernandes Neto AJ. Influence of cavity preparation design on fracture resistance of posterior Leucite-reinforced ceramic restorations. J Prosthet Dent. 2006 Jun;95(6):421-9. • Soares CJ, Soares PV, Pereira JC, Fonseca RB. Surface treatment protocols in the cementation process of ceramic and laboratory-processed composite restorations: a literature review. J Esthet Restor Dent. 2005;17(4):224-35. • Soares CJ, Martins LR, Pfeifer JM, Giannini M. Fracture resistance of teeth restored with indirect-composite and ceramic inlay systems. • Quintessence Int. 2004 Apr;35(4):281-6. • Soares CJ, Martins LR, Fernandes Neto AJ, Giannini M. Marginal adaptation of indirect composites and ceramic inlay systems. Oper Dent. 2003 Nov-Dec;28(6):689-94.
Dual-Cure Resin Cement	Textbooks: • Sturdevant's Art and Science of Operative Dentistry, 3e • Craig's Restorative Dental Materials, 10e • Journal Articles: • Frankenberger R, Lohbauer U, Schaible RB, Nikolaenko SA, Naumann M. Luting of ceramic inlays in vitro: marginal quality of self-etch and etch-and-rinse adhesives versus self-etch cements. Dent Mater. 2008 Feb;24(2):185-91. • Foxton RM, Pereira PN, Masatoshi N, Tagami J, Miura H. Long-term durability of the dual-cure resin cement/silicon oxide ceramic bond. J Adhes Dent. 2002 Summer;4(2):125-35. • Foxton RM, Pereira PN, Nakajima M, Tagami J, Miura H. Effect of light source direction and restoration thickness on tensile strength of a dual-curable resin cement to copy-milled ceramic. Am J Dent. 2003 Apr;16(2):129-34. • Eisenburger M, Addy M, Rossbach A. Acidic solubility of luting cements. J Dent. 2003 Feb;31(2):137-42. • Rocca GT, Krejci I. Bonded indirect restorations for posterior teeth: the luting appointment. Quintessence Int. 2007 Jul-Aug;38(7):543-53. • Krämer N, Lohbauer U, Frankenberger R. Adhesive luting of indirect restorations. Am J Dent. 2000 Nov;13(Spec No):60D-76D.

Indirect Gold Alloy Inlays/Onlays	Textbooks: • Sturdevant's Art and Science of Operative Dentistry, 3e • Craig's Restorative Dental Materials, 10e • Journal Articles: • al-Hiyasat AS, Saunders WP, Sharkey SW, Smith GM, Gilmour WH. Investigation of human enamel wear against four dental ceramics and gold. J Dent. 1998 Jul-Aug;26(5-6):487-95. • Farrell CV, Johnson GH, Oswald MT, Tucker RD. Effect of cement selection and finishing technique on marginal opening of cast gold inlays. J Prosthet Dent. 2008 Apr;99(4):287-92. • Donovan T, Simonsen RJ, Guertin G, Tucker RV. Retrospective clinical evaluation of 1,314 cast gold restorations in service from 1 to 52 years. J Esthet Restor Dent. 2004;16(3):194-204. • Erpenstein H, Kerschbaum T, Halfin T. Long-term survival of cast-gold inlays in a specialized dental practice. Clin Oral Investig. 2001 Sep;5(3):162-6.

enrolled in by the candidate.

2.All restorative work must have been performed by the candidate individually and independently as the operator. Supporting laboratory work may be performed by a technician.

3.All documentation required by the Board must be submitted as outlined below.

4.It is preferred that each case submitted have had at least a six month post- treatment follow-up. Exemptions to this requirement may be petitioned in writing to the Chair of the Examination and Certification Committee.

CASE REQUIREMENTS

The cases submitted to the Board shall meet certain requirements. At least two cases must be submitted although up to four may be submitted by the candidate as needed to demonstrate the desired level of proficiency. Successful completion of this examination requires that you successfully defend your clinic decisions making and choose of final restorative dental materials. From the below guidelines and reading between the lines, the board is encouraging only two total cases. The following requirements for each case shall apply:

1.Each case should be primarily single tooth restorations; although, each case may include fixed and removable prosthesis involving natural teeth and/or implant fixtures.

2.Each case should restore at least 12 teeth not including pontics and artificial replacement thereof.

3.One case should be restored primarily with gold castings of any design and esthetic restorations involving occlusion.

4.One case should be primarily amalgam restorations and minor esthetic restorations.

5.Included in either case should be an appropriate demonstration of the use of direct compacted gold as a restoration.

There are specific guidelines set by the board to judge your operator ability and knowledge of current dental materials and their physical properties (mechanical, thermal, electrical, color and optical properties). Of specific importance is the understanding of retention and resistance forms of all direct and indirect restorative materials in enamel and dentin (preparation design; adhesive bonding; ionic bonding, etc.). Understanding physical property nomenclature and fracture characteristics of all restorative dental materials is extremely important as well. With these concepts in mind, I would like to present the two cases used for my ABOD oral case defense.

DIRECT RESTORATIVE CASE

Medical history

Patient denies medical history of cardiovascular, neurological, neuromuscular, respiratory, endocrine, hepatic, or renal problems. Patient denies family history of cancer. Patient is a ½ pack per day cigarette smoker in the process of trying to quit. Patient drinks a lot of coffee and tea throughout the day. Otherwise, patient is in good general health.

Dental history

Patient has a history of anterior composite restorations, of which all are failing. Several generalized cavitated carious lesions on occlusal and smooth surfaces. CC: "The fillings are turning dark in the front and my lower right tooth is hurting all the time" (Figure 1).

Patient exhibits ***severe*** extrinsic and intrinsic staining from excessive smoking in conjunction with excessive coffee and tea consumption.

Caries/ fissures needing attention:

#2:OF Caries

#3:O-OF Caries

#4:O Dark Fissure

#5:O Dark Fissure

#7:MF Composite resin failing

#8:MFL Caries

#9:MFL Caries

#10:Mesial and Facial Caries/ F composite failing

#11:Mesial and Facial Caries

#12:O Dark Fissure

#14:OF-OL Caries

#15:OF Caries

Figure 1 Charting.

#18:O Caries

#19:OL Caries

#20:O Dark Fissure

#21:O Dark Fissure

#30:MO Caries (emergency treatment before pics)

#31:O Caries (emergency treatment before pics)

Existing restorations not replaced:

#13:MO Resin composite (Placed 1 month ago)

#29:DO Amalgam (Placed 1 year ago)

CLINICAL DIAGNOSES

TMJ: evaluation of the TMJ revealed no discomfort by the patient in all movements. Maximum opening was approximately 45mm with no clicking or popping of the disc. There was no significant deviation of the mandible during condylar rotation in the fossa or translation down the articular eminence.

In maximum intercuspation (MI), the complete intercuspation of the opposing teeth independent of condylar position, revealed the patient has an Angle Class I first molar relationship. There is no posterior crossbite; however the molars and premolars on the mandible are tipped towards the lingual. Additionally, the anterior overjet was 3mm and overbite was 8mm with mandibular anterior crowding.

Protrusive Movement: With 3mm of overjet and 8mm overbite, the anterior teeth disocclude the posterior teeth in protrusive movements without posterior interferences. No need to alter cuspal or marginal ridge heights from existing conditions.

Excursive Movements: The patient exhibits a unilateral balanced occlusion both right and left excursive movements. Meaning there is contact between as many teeth as possible on the working or laterotrusive side, but no contacts on the non-working or mediotrusive side. The idea is to share the load as much as possible (Figure 2).

Patient exhibits CR independent from CO (no contacts in CR). The patient's maxillary arch from an occlusal view is constricted in the premolar and canine area producing the pointed shape. The mandibular molars and premolars from the occlusal view are tipped lingual constricting the space needed for proper anterior alignment. Patient needs orthodontic consultation if desired.

Periodontal risk

Patient has generalized gingivitis with localized areas of gingival edema and erythemia. All periodontal probing's were 4mm or less with no detectable subgingival calculus. Suspect resolution of gingivitis with proper oral hygiene home care. Discussed purchasing a mechanical rotary or ultra-sonic toothbrush to help with plaque and stain removal.

Figure 2 Occlusion.

Caries risk

Patient is classified in a high caries risk category. Dietary evaluation performed to determine caries etiology. Diet was contributory to caries risk as reported by the patient using natural sugar all day long in his coffee. Patient reported a positive history of ½ pack of cigarette smoking per day X 15 years and exhibited poor oral home care. Patient has extensive extrinsic staining from daily coffee and tea consumption (table sugar). Informed patient of caries risk status and recommended for the patient to consider quitting smoking, use sugar alcohol substitutes, and reinforced oral hygiene maintenance. Patient otherwise has a non-contributory dietary caries influence. Saliva-check™ (GC America) determined that the patient exhibited normal stimulated and unstimulated salivary flow, pH, buffering, and consistency. Dentocult SM™ and Dentocult LB™ (Orion Diagnostica) revealed < 10,000 colony forming units. This is considered below normal levels of cariogenic bacteria. Decreasing smoking together with effective plaque removal and sugar alcohol substitutes will decrease both future caries and periodontal disease risk. 5% Sodium Fluoride varnish will be placed at every appointment. Patient informed:

Missing teeth: Upper 3rd molars. Patient needs 17-32 extracted due to partial eruption and high caries risk. Patient very hesitant to have them removed. Discuss options at a later date.

Esthetic concerns: Patient wanted the failing (dark) anterior composite restorations replaced and the extrinsic staining and caries removed from his teeth. Patient is realistic to the expected outcome for his treatment. It was explained to patient that some of the staining may not be removed.

Soft tissue: Soft tissue examination revealed no obvious gross oral pathological conditions except the generalized gingival inflammation. Additionally, digital palpation of the muscles of mastication did not elicit an uncomfortable response from the patient.

PRE OPERATIVE RADIOGRAPHIC INTERPRETATION

Osseous evaluation

Maxilla: From the pre-operative FMX, there is no evidence to suggest an early generalized periodontitis. The sinus architecture is normal with no visible sinus pathology.

Mandible: From the pre-operative FMX, there is no evidence to suggest an early generalized periodontitis. Impacted 3rd molars 17-32 need extraction.

Maxilla: Carious lesions evident on 7-8-9-10-11-12. Existing MO (Figure 3) resin #13 placed 1 month ago. Asymptomatic; no need to replace at this time.

Mandible: 17-32 need to be extracted. Large mesial carious lesion #30; possible NSRCT. Existing

DO amalgam #29 placed 1 year ago. Asymptomatic; no need to replace at this time (Figure 4)

#2:Amalgam OF SSC Amalgam

#3:Amalgam O-OL SSC Amalgam

#4:PRR O Kerr .4 Flowable Resin Vita A3

#5:PRR O Kerr .4 Flowable Resin Vita A3

#7:Resin Composite MFL Kerr .4 Resin Vita A2/A3

#8:Resin Composite MFL Kerr .4 Resin Vita A2/A3

#9:Resin Composite MFL Kerr .4 Resin Vita A2/A3

#10:Resin Composite MFDLI Kerr .4 Resin Vita A2/A3

#11:Glass Ionomer MF(Class V) Photac-fil RMGI Vita A3

#12:Glass Ionomer MF(Class V) Photac-fil RMGI Vita A3

#12:PRR O Kerr .4 Flowable Resin Vita A3

#14:Amalgam OFL SSC Amalgam

#15:Amalgam OF SSC Amalgam

#18:Amalgam O SSC Amalgam

#19:Amalgam OL SSC Amalgam Direct Gold O-O Gold Foil

#20: PRR O Kerr Flowable Resin Vita A3

#21:PRR O Kerr Flowable Resin Vita A3

#30: Amalgam MO SSC Amalgam (Vitrebond RMGI base)

#31: Amalgam O SSC Amalgam

#17: Extraction

#32: Extraction

RESTORATIVE MATERIAL SELECTION

Direct composite resin

Point 4™: Point 4 (Kerr Dental) was chosen as a light-cured, resin-based. Composite dental restorative that contains approximately 77% by weight (59% by volume) inorganic filler with an average particle size of 0.4 microns. Point 4 aimed to bridge the gap between microfill and hybrid composite materials. A specific grinding process combined with rheological modifiers allow Point 4 to polish to a very high, long-lasting luster similar to microfills, while providing strength equivalent to the microhybrids.

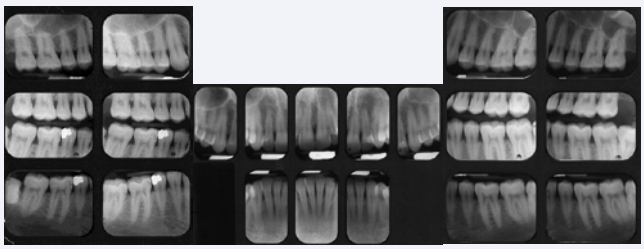

Figure 3 Dental Evaluation.

Figure 4 Final Restorative Treatment.

Point 4™ Flow able : Point 4 Flowable (Kerr Dental) was chosen as a low- viscosity, flowable lighted-cured, resin-based composite with ultra-small particle filler that is 70% loaded. This results in an esthetic material that wears uniformly, retains its esthetics and performs well over time.

Composite bonding agent

OptiBond® Solo Plus™: OptiBond Solo Plus (Kerr Dental) was chosen as a unidose, ethanol based traditional etch and rinse adhesive. It is 15% filled with the same 0.4 micron filler found in the Kerr Point 4 composite. According to published literature, it provides the highest level of protection against microleakage, while sustaining high bond strengths to a variety of surfaces. The filler not only reinforces the hybrid zone but also penetrates the dentin tubules, creating a true "structured bond" not found in unfilled or even "nano" filled adhesive systems.

Dental amalgam

Tytin®: (Kerr Dental) was chosen as a dental amalgam alloy with a high silver content (low copper) and 100% spherical particle formula. According to published literature, spherical dental amalgam has delivered excellent clinical performance for decades. It is extremely smooth, easy to place and carve, and accepts immediate polishing (3 minutes) in Class I restorations. Tytin capsules are self-activating with no special activation device is required. (59% Ag, 13% Cu, 28% Sn, 42.5% Hg). High early compressive strength allows occlusal adjustment without amalgam fracture.

Direct gold foil

E-Z Gold: (Lloyd Baum) was chosen as a direct gold application for class I restorations. Direct gold or gold foil, is the oldest dental restorative material and continues to be used by many dentists today. Although not in general use due to many factors, it is the only dental material that if carefully placed and finished can approximate the cavosurface margin with zero marginal gap and last longer than any other dental material.

Direct glass ionomer

Photac fil restorative: (3M™ ESPE™) Resin modified glass ionomers are glass ionomer cements that contain a small quantity of a polymerizable resin component. These materials have most of the advantages of glass ionomer materials with the added advantage of water insolubility while setting and the ability to light cure some brands to reduce the likelihood of cement and marginal washout during placement. The ability to light cure the excess material makes for reduced chair time as well. They chemically bond to the calcium component of the dental structure allowing bonding to enamel, dentin and cementum. This was advantageous on teeth numbers 11-12 cervically because the

caries extended below the CEJ onto cementum where resin adhesive would not perform as well.

In this capacity they leach fluoride into the tooth throughout their service life thus reducing the likelihood of recurrent decay.

Vitrebond liner: (3M™ ESPE™) was selected as a base under amalgam restoration #30. They lack the ability to resist occlusal wear, but their major virtue is that they shrink very little while setting and thus reduce post operative sensitivity while reducing compressive stresses on the tooth. The physical barrier will assist in thermal conduction through the amalgam to the thin remaining dentin covering the pulpal tissue. The operator must be cognizant of the low compressive strength while condensing the amalgam to ensure that the material does not fracture.

Post Operative Radiograph Series are displayed in the Figure 5.

TREATMENT PLAN SEQUENCE

1. HIPPA forms completed. FMX radiographic series taken by dental hygienist.
2. #13 MO resin restored 2 weeks previous.
3. Patient transferred to Dr. Michael Metz for restorative treatment planning and pain LR.
4. Addressed emergency #30 E&E.
5. Restored #31-O while under anesthesia. Reinforced oral hygiene.
6. Pre-op pictures and impressions. Face bow transfer.
7. Mounted pre-op models in MI on Whip-mix semi-adjustable Articulator.
8. Med History, Den History, hard and soft tissue charting, dietary analysis, O'Leary plaque index, salivary evaluation, cariogenic bacterial evaluation and caries risk assessment.

   Rx: Prevident 5000+ X 5 refills
9. Scale and polish X 4 quadrants over 2 appointments due to heavy extrinsic staining. Verified hard tissue charting after extrinsic stain removal. Occlusal evaluation. Delivered ultra-sonic toothbrush and direction. 5% sodium fluoride varnish application.
10. Restored 2-3-4-5. 5% sodium fluoride varnish application.
11. Restored 12-14-15. 5% sodium fluoride varnish application.
12. Restored 18-19-20-21. 5% sodium fluoride varnish application.
13. Restored 7-8-9-10-11-12. 5% sodium fluoride varnish application.
14. O'Leary plaque index. Polished Restorations and teeth X 4 quadrants over two separate appointments.

    Reinforced Oral Hygiene. Alginate impressions for fluoride tray fabrication. Post operative hard and soft tissue charting. 5% sodium fluoride varnish application.
15. Post-op pictures, impressions, and FMX.
16. Mounted post-op models in MI on Whip-mix semi-adjustable Articulator.
17. Referred to orthodontics for consultation.
18. Referred to Oral Surgery for removal of 17-32.
19. Six month recall. Reinforce oral hygiene.

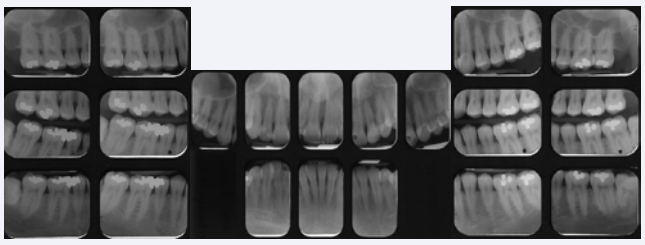

Figure 5 Post Operative Radiograph Series.

INDIRECT RESTORATIVE CASE

Medical history

Patient denies medical history of cardiovascular, neurological, neuromuscular, respiratory, endocrine, hepatic, or renal problems. Patient denies family history of cancer. Patient reports only seasonal allergies. Patient is in good general health and participates in daily exercise activity.

Dental history

Patient has a history of amalgam and direct composite restorations placed in Turkey approximately 8 years ago. Patient supplied no family dental history information. Patient denies family history of cancer. CC: "The fillings I have are old and they need to be replaced. I want to replace them all with white fillings."

Charting

Caries/ marginal discrepancies (Figure 6):

#2: Mesial pit and DF DL amalgam margins

#3: Transverse ridge between MO OL amalgam and MF amalgam

#4: MF DL amalgam margins

#5: DF ML composite margins

#12: Occlusal gap at composite-amalgam interface

#13: DF amalgam margin

#14: Transverse ridge between MO OL amalgams/ class V lingual caries

#15: Mesial pit and DF and DL amalgam margins

#18: DL amalgam margins undermining DL cusps/ class V facial/lingual caries

#19: Mesial pit/ DL amalgam margins undermining DL cusps

#31: DL amalgam margins undermining DL cusps/ class V facial/lingual caries

Existing Restorations Not Replaced (Figure 7):

#6:DL Composite Resin

#14:Lingual class V Glass ionomer

#18:Buccal class V Glass ionomer

#20:O sealant/ PRR

#21:O sealant/ PRR

#28:O sealant/ PRR

#29:O sealant/ PRR

#30:NSRCT/ parapost + core/ PFM crown (endodontic referral)

#31:Buccal class V Glass ionomer

DIAGNOSIS

Occlusion TMJ

evaluation of the TMJ revealed no discomfort by the patient in all movements. Maximum opening was approximately 42mm with no clicking or popping of the disc. There was no significant deviation of the mandible during condylar rotation in the fossa or translation down the articular eminence (Figure 8).

Figure 6 Caries/ marginal discrepancies.

Figure 7 Existing Restorations Not Replaced.

Figure 8 Evaluation of the TMJ.

In maximum intercuspation (MI), the complete intercuspation of the opposing teeth independent of condylar position, revealed the patient has an Angle Class I first molar relationship. There is no posterior crossbite. Additionally, the anterior overjet was 1mm and overbite was 4mm. Also, #10 and # 23 exhibit an end to end relationship.

Protrusive movement

With 1mm of overjet and 4mm overbite, the anterior teeth disocclude the posterior teeth in protrusive movements without posterior interferences. No need to alter cuspal or marginal ridge heights from existing conditions.

Excursive movements

The patient exhibits a unilateral balanced occlusion both right and left excursive movements without the cuspids. Meaning there is contact between as many teeth as possible on the working or laterotrusive side, but no contacts on the non-working or mediotrusive side. The idea is to share the load as much as possible.

Patient exhibits CR independent from CO (no contacts in CR). The patients maxillary and mandibular arched from the occlusal view are in an ovoid shape allowing adequate space and no anterior crowding.

Patient has no evidence of bruxism or aggressive parafunctional habits.

Periodontal risk: Patient has generalized gingivitis with localized areas of gingival edema and erythemia. Suspect resolution of gingivitis with proper oral hygiene home care. Discussed purchasing a rotary or ultra-sonic toothbrush to help with plaque and stain removal.

Caries Risk: Patient is classified in a moderate caries risk category. Dietary evaluation performed to determine caries etiology. Patient reported a positive history of Starbuck's daily caramel coffees in the morning and afternoon with table sugar X 4 years. Informed patient of caries risk status and recommended for the patient to use sugar substitutes. Patient otherwise has a non-contributory dietary caries influence. Saliva-check™ (GC America) determined that the patient exhibited normal stimulated and unstimulated salivary flow, pH, buffering, and consistency. Dentocult SM™ and Dentocult LB™ (Orion Diagnostica) revealed < 10,000 colony forming units. This is considered below normal levels of cariogenic bacteria. Modifying the sugar drink together with effective plaque removal will decrease both future caries and periodontal disease risk. Patient informed.

MISSING TEETH

3rd molars secondary to reported pericornitis # 17 at age 18.

Esthetic concerns

MF line angles of 4-5-12-13 all show when the patient smiles. Patient had esthetic concerns originally and did not want to see silver or gold period. After thorough consultation of porcelain advantages and disadvantages with the patient, it was agreed to use gold inlays and onlays on the posterior molars and pressed porcelain on the maxillary premolars and #19.

Soft tissue

Soft tissue examination revealed no obvious gross oral pathological conditions except the generalized gingival inflammation. Additionally, digital palpation of the muscles of mastication did not elicit an uncomfortable response from the patient.

PRE OPERATIVE RADIOGRAPHIC INTERPRETATION

Osseous evaluation

Maxilla: From the pre-operative FMX, there is no osseous pathology noted. The sinus architecture is normal with no visible sinus pathology. The height of alveolar bone is normal with no signs of periodontal destruction.

Mandible: From the pre-operative FMX, there is osseous PARL noted around the apices of #30 mesial and distal roots. Patient reports history of NSRCT secondary to advanced caries and draining fistula. NSRCT/ parapost + amalgam core/ PFM crown X 2 years ago. No pre or post endo radiographs for healing comparison. Asymptomatic X 2 years following endo. Endo referral recommended 12 month follow-up to assess healing of periapical bone and symptomology. Recommended apicoectomy if any treatment needed. The height of alveolar bone is normal with no signs of periodontal destruction except for a slight vertical defect mesial #31.

Dental evaluation (Figure 9, Figure 10, Figure 11)

Maxilla:	#2: #3: #4: #5: #6: #7-11: #12: #13: #14: #15:	DO Amalgam MO OL Amalgam MOD Amalgam MOD Resin Composite DL Resin Composite Virgin Teeth MO Resin Composite/ DO Amalgam MOD Amalgam MO OL Amalgam DO Amalgam
Mandible:	#18: #19: #20-21: #22-27: #28-29: #30: #31:	MO Amalgam DO Amalgam O sealant/ PRR Virgin Teeth O Sealant/ PRR NSRCT- Core-PFM Crown MOD Amalgam

Final restorative treatment

#2:	Gold Inlay-DO	JB Type II Gold
#3:	Gold Inlay- MOL	JB Type II Gold
#4:	Porcelain Inlay- MOD	OPC Ceramic Vita A2***
#5:	Porcelain Inlay- MOD	OPC Ceramic Vita A2***
12:	Porcelain Inlay- MOD	OPC Ceramic Vita A2
#13:	Porcelain Inlay- MOD	OPC Ceramic Vita A2
#14:	Gold Inlay- MOL	JB Type II Gold
#15:	Gold Inlay-DO	JB Type II Gold
#18:	Gold Onlay- MODL	JB Type II Gold
#19:	Porcelain Onlay- MODL	OPC Ceramic Vita A2

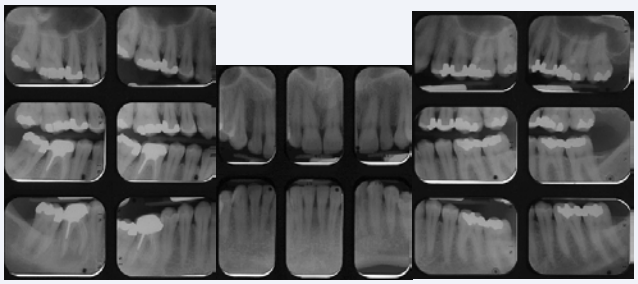

Figure 9 Dental Evaluation.

Figure 10 Final Restorative Treatment.

Figure 11 Direct Restorations Placed.

#31:	Gold Onlay- MODL	JB Type II Gold

Direct restorations placed

#4:	Gingival Floor/ Axial Wall	Photac Fill (RMGI)
#5:	Gingival Floor/ Axial Wall	Photac Fill (RMGI)

***The final distal gingival margins on 4-5 OPC porcelain inlays were finished on resin modified glass ionomer due to lack of adequate enamel for bonding

Referral:PARL apices #30. NS Endo/ parapost with core/ PFM crown. Asymptomatic.

RESTORATIVE MATERIAL SELECTION

Indirect ceramic inlays/onlays

Optimal pressable ceramic®: OPC (Pentron Laboratory Technologies) features smaller and more evenly distributed leucite crystals that favorably impact the strength and reliability of the restorations. A Vita A2 shade was selected with light opacity to allow the underlying resin cement to dictate the final clinical shade. Because the core and powders are made of similar color coordinated ceramic materials there is considerably more control over the translucency levels throughout the restoration. That esthetic control coupled with high flexural and compressive

strength make OPC materials a good choice for posterior inlays and onlays. Pressed porcelain opposing enamel has improved significantly in terms of two body wear in excursive mandibular movements.

Ceramic adhesive bonding: leucite reinforced glass ceramic restorations remain, at base, fortified glass bodies. This means that the internal surfaces can be acid etched using hydrofluoric acid. Thus they can be luted directly to the teeth using standard bonding procedures. The crystalline inclusions in these glasses act to reduce the tendency for microcracks to form on the internal surfaces of these restorations, and the bonding technique turns the tooth structure itself into a sort of unbreakable core. This further reduces the likelihood that any relatively minor cracks that may be present on the internal surface of the ceramic body will actually cause a catastrophic fracture.

Mechanical bonding: The inside of the restorations are sandblasted with 50 micron silica particles to roughen the porcelain and to increase the surface area for bonding. Then a solution of 9.6% hydrofluoric acid gel is applied to the sandblasted area. The hydrofluoric acid dissolves the surface of the glass in uneven patterns creating even tinier microscopic mountain ranges over the surface of the sandblasted hills and valleys.

Chemical bonding: Chemical adhesion of the resin to the etched porcelain is done by the application of silane to the prepared porcelain surface.

CERAMIC LUTING AGENT

Mirage vision 2 resin adhesive

(Myron International, Inc.) Vita A2 dual-cured low viscosity resin adhesive was used for all inlays and onlays for maximum wear on margins. The ceramic restorations were fabricated with light opacity to allow the resin adhesive to opaque the underlying dentin color. Dentin primer includedto prevent sensitivity and stop marginal leakage and unfilled resin to access asperities. Silane included for chemical bond of resin to the etched porcelain interface.

Indirect gold inlays/onlays

JB casting alloy: (Jensen Dental) classic Type II crown and bridge alloy for the clinician who knows the value of a soft, burnishable gold. It was designed for multi-surface inlay and onlay restorations. Because JB is a softer alloy, it is kindto opposing dentition in two and three body wear and burnishes quickly and easily so margins can be tightly sealed. Plus, because of its high gold content, JB offers a luminous yellow color as a precious metal alloy (Gold 75%, Palladium 3%, Silver 15%).

GOLD CEMENTATION AGENT

Ketac cem

(3M™ ESPE™) glass ionomer cement was used and has become the standard material used to cement metal alloy castings and porcelain fused to metal crowns. They reduce post operative sensitivity and reduce the likelihood of cement washout. They chemically bond to both the metal and the tooth structure. They are also easy to use and simple to mix, unlike zinc phosphate cement which was the industry standard up until the introduction of these cements.

Direct glass ionomer

Photac fil restorative: (3M™ ESPE™) Resin modified glass ionomers are glass ionomer cements that contain a small quantity of a polymerizable resin component. These materials have most of the advantages of glass ionomer materials with the added advantage of water insolubility while setting and the ability to light cure some brands to reduce the likelihood of cement and marginal washout during placement. The ability to light cure the excess material makes for reduced chair time as well. They chemically bond to the calcium component of the dental structure allowing bonding to enamel, dentin and cementum. This was advantageous on teeth numbers 4-5 distal gingival margins because the caries extended below the CEJ onto cementum where resin adhesive would not perform as well. In this capacity they leach fluoride into the tooth throughout their service life thus reducing the likelihood of recurrent decay and provide a stable margin for resin adhesive bonding of the porcelain inlays.

Post operative radiographic series (Figure 12):

TREATMENT PLAN SEQUENCE

1.HIPPA Forms completed. Pre-op pictures, impressions, and FM radiographic series.

2.Med History, Den History, hard and soft tissue charting, dietary analysis, O'Leary plaque index,

salivary evaluation, cariogenic bacterial evaluation and caries risk assessment. Endo referral #30**.

3.Scale and polish X 4 quads. OHI. Face bow transfer and occlusal analysis.

Rx: Prevident 5000+ X 5 refills. 4. Mount pre-op models in MI on class III semi-adjustable articulator with face bow transfer.

5. Fabricate custom impression maxillary and mandibular trays to initiate treatment.

6.Remove old amalgams and caries from 18-19 and prepare for gold and porcelain onlays. Impress preps

18-19 with custom tray. Bite registration.

7.Evaluate and cement gold onlay #18 and bond ceramic onlay #19.

8.Remove old amalgams, composites, and caries from 12-13-

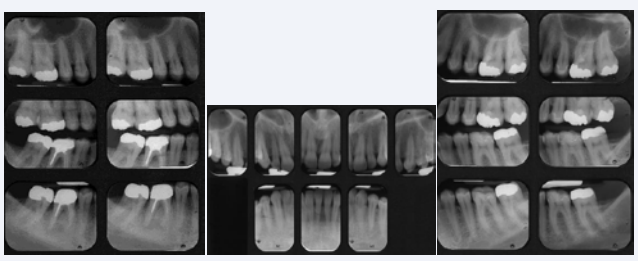

Figure 12 DPost Operative Radiograph Series: Gold Cementation Agent.

14-15. Prepare 14-15 for gold inlays and

12-13 porcelain inlays. Impress 12-13-14-15 with custom tray and new impression of lower arch with custom tray. Bite registration.

9.Evaluate and cement gold inlays 14-15 and bond porcelain inlays 12-13.

10. Remove old amalgams, composites, and caries from 2-3-31. Prepare 2-3 for gold inlays and 31 for gold onlay. Impress with custom trays. Bite registration.

11. Evaluate and cement gold inlays 2-3 and gold onlay 31.

12. Removed existing restorations 4-5. Restored distal boxes of 4-5 due to lack of adequate enamel and undercuts from previous restorations. Impress 2-3 with custom trays. Bite registration.

13. Evaluate and bond porcelain inlays 4-5.

14. O'Leary plaque index. Polish restorations and teeth X 4 quads. Post-op pictures, impressions, and FM radiographic series.

15. Hard and soft tissue charting.

16. Face bow transfer and reevaluation of occlusion.

17. Mount post-op models on class III semi-adjustable articulator with face bow transfer.

18. Six month recall. Reinforce oral hygiene.

**Endodontic referral determined that since #31 was asymptomatic and healing was WNL, there is no need to retreat the Endo at this time. Re-evaluation X one year.

Cite this article

Metz MJ, Miller CJ (2013) Clinical Case Presentation: Challenging the American Board of Operative Dentistry Certification Examination. JSM Dent 1: 1007.