

1. Commentary on Question 1 & 2: Occlusal 1 & 2

The patient is a 30-year old female with no relevant medical history. She has no complaints and is in your office today for a routine visit. She has been attending your practice on a regular basis for the past 6 years.

Indicate how you would treat the tooth shown if the patient has no other teeth with dental restorations or dental caries and is not missing any teeth.

If treatment code “other” is used, please specify. You may check more than one treatment code per case.

Q1. How would you treat the tooth shown at the left?



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Q2. How would you treat the tooth shown at the left?



Reprinted from Espelid et al, 1997

Both Q1 and Q2 were related to treatment strategies for discolored enamel or primary caries on occlusal surfaces. Question 1 presented a scenario in which the occlusal fissure was discolored, and Question 2 presented a scenario in which caries was assumed to be confined to the enamel.

Recently, the concept of Minimal Intervention Dentistry (MID) has been proposed by the FDI World Dental Federation (Table 1)^{1,2,3}. The principle of MID is to maintain as much healthy tooth structure as possible and keep teeth functional for life. The concept of MID dental caries management is to conserve remineralisable and intact tooth tissue to help retain teeth throughout life. It is suggested that tooth tissue should not be removed unnecessarily.

Table 1. The major MID components (FDI, 2016)²

- (i) Early detection of carious lesions and assessment of caries risk and activity
- (ii) Remineralisation of demineralised enamel and dentine
- (iii) Optimal measurements to keep sound teeth sound
- (iv) Tailor-made dental recalls
- (v) Minimally invasive operative interventions to ensure tooth survival
- (vi) Repairing rather than replacing defective restorations

The clinical guidelines for treating caries by the Japanese Society of Conservative Dentistry⁴, based on above MID concept, issued the following recommendations in response to the clinical question, “How far must caries progress before cavity preparation is indicated?”

<Clinical question> How far must caries progress before cavity preparation is indicated?

<Recommendation> A restoration is indicated whenever the following findings are noted.

Intervention should be done immediately where more than one of findings is evident.

- (1) A cavity is visually detected after cleaning and drying the tooth.
- (2) There is pain or discomfort from cold water or food impaction.
- (3) There is unacceptable appearance.
- (4) X-rays reveal lesions penetration of more than one-third of the dentine.
- (5) The patient is at high risk of caries.

Considering the MID concept and the above guidelines (1) through (5), as well as the fact that the patient's caries risk is assumed to be low in this case scenario, it is desirable to avoid restorative treatment and to observe progress with preventive measures and regular dental checkups, unless there are special reasons such as esthetic disturbance, in the stage of discoloration and enamel caries seen in Q1 and Q2.

2. Results in Japan

Based on the aforementioned commentary and previous U.S. studies^{5,6}, the present study considered the options other than "restorative procedures (amalgam, composite resin, indirect restorations)" for Q1 and Q2 to be consistent with the evidence. The results are shown in the table below.

	Japan Concordance
Q1	97% (200/206)
Q2	82% (168/206)

Since 97% of the participants were in concordance with Q1 and 82% in concordance with Q2, the results were generally consistent with the evidence for the participants in Japan.

3. Results of an international comparison between the US and Japan

Results compared to previous studies^{5,6} conducted in the U.S. are shown in the table below.

	Japan Concordance (2017)	US (National Dental PBRN, practitioners) Concordance (2009)	US (Virginia Commonwealth University School of Dentistry, faculty members) Concordance (2014)	US (Virginia Commonwealth University School of Dentistry, students) Concordance (2014)
Q1	97% (200/206)	88% (515/586)	100% (35/35)	89% (73/82)
Q2	82% (168/206)	67% (392/588)	72% (26/36)	62% (51/82)

The results of previous studies by the National Dental PBRN (2009) and Virginia Commonwealth University (2014) in the U.S. were conducted before the current Japanese survey (2017), respectively, so there may be certain timing differences, but the results show that Japan has a relatively high concordance between evidence and practice.

【References】

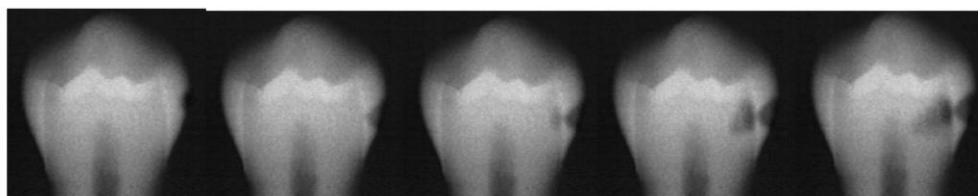
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1. Commentary on Question 3: Proximal caries

For question 3 , please circle the one number that corresponds to the lesion depth at which you think it is best to do a permanent restoration (composite, amalgam, etc.) instead of only doing preventive therapy.

For question 3 : The patient is a 30-year old female with no relevant medical history. She has no complaints and is in your office today for a routine visit. She has been attending your practice on a regular basis for the past 6 years.

Q3 The patient has no dental restorations, no dental caries, and is not missing any teeth.



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1

2

3

4

5

This question asks you to choose, among the 5 X-ray photographs that indicate stepwise progression of a proximal carious lesion, the one that corresponds to the lesion depth at which you think it best to do a permanent restoration, such as composite resin. The X-ray photographs of Cases 1 and 2 in this Question indicate caries confined to the enamel.

In the 6 items for caries management by Minimal Intervention Dentistry (MID) (FDI, 2016)¹ (Table 1), it is recommended to try to re-calcify the decalcified enamel. The clinical guidelines for treating caries by the Japanese Society of Conservative Dentistry² issued recommendations in response to the following clinical question.

<Clinical question> How far must caries progress before cavity preparation is indicated?
 <Recommendation> A restoration is indicated whenever the following findings are noted. Intervention should be done immediately where more than one of findings is evident.

- (1) A cavity is visually detected after cleaning and drying the tooth.
- (2) There is pain or discomfort from cold water or food impaction.
- (3) There is unacceptable appearance.
- (4) X-rays reveal lesions penetration of more than one-third of the dentine.
- (5) The patient is at high risk of caries.

Finding (4) in the above recommendation indicates that cavity preparation should be performed when “X-rays reveal lesions penetrating more than one-third of the dentine.” In addition, it is presumed that the patient in this scenario may be at low risk of caries. In the stage of enamel caries seen in Cases 1 and 2 of this question, the desirable treatment strategy may be not to perform a restorative intervention but to observe progress through the use of preventive measures and regular dental checkups, unless there exists a special reason such as esthetic disorder requiring intervention.

2. Results in Japan

Based on the aforementioned commentary and previous U.S. studies^{3,4}, the present study considered the options other than "Cases 1 and 2" in Q3 to be consistent with the evidence. The results are shown in the table below.

Japan
Concordance
Q3 53% (109/206)

In Japan, 53% of the participants were in concordance, but nearly half were not in concordance with the evidence.

3. Results of an international comparison between the US and Japan

Results of a comparison of previous studies^{3,4} conducted in the US and Japan are described in the table below.

	Japan	US (National Dental PBRN, practitioners)	US (Virginia Commonwealth University School of Dentistry, faculty members)	US (Virginia Commonwealth University School of Dentistry, students)
	Concordance (2017)	Concordance (2009)	Concordance (2014)	Concordance (2014)
Q3	53% (109/206)	51% (297/588)	72% (28/39)	35% (27/77)

These results suggest that in both the US and Japan, an EPG exists in treatment strategies for enamel caries, indicating that there is room for improvement.

Innes et al.⁵ conducted a meta-analysis in 2017 by integrating the results of previous studies in 17 countries and reported that the proportion of dentists who chose restorative interventions was 21% for proximal carious lesions confined to the enamel and 48% for proximal lesions extending up to the enamel-dentin junction. The authors therefore concluded that restorative interventions are carried out internationally in the treatment of early carious lesions and suggest that excessive treatment needs to be reduced.

【References】

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1. Commentary on Question 4: Defective composite restoration with enamel margins



The patient is a 30-year old female with no relevant medical history. She has no complaints and is in your office today for a routine visit. She has been attending your practice on a regular basis for the past 6 years.

Q4. Now imagine the patient has no other dental restorations than the one shown, no dental caries, and is not missing any teeth. Indicate what treatment you would provide to the restoration in the picture.

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This question assumes a clinical case wherein discoloration is observed around the restoration and asks which should be chosen, replacement of the restoration (whole replacement), repair of the restoration, or follow-up by regular dental checkups.

First, given that this case involves no aesthetic demand of the patient as a major complaint, it appears an appropriate option to follow the marginal discoloration by regular dental checkups. Second, if the discolored region in the scenario photograph is treated, it may be difficult to decide which should be chosen, repair or replacement. The concept of minimal intervention (MID) proposed by the FDI¹ includes the six strategies below, with the sixth being “Repairing rather than replacing defective restorations”.

The major MID components (FDI, 2016)¹

- (i) Early detection of carious lesions and assessment of caries risk and activity
- (ii) Remineralisation of demineralised enamel and dentine
- (iii) Optimal measurements to keep sound teeth sound
- (iv) Tailor-made dental recalls
- (v) Minimally invasive operative interventions to ensure tooth survival
- (vi) Repairing rather than replacing defective restorations

In a previous study in which patients were randomly assigned to either of two treatment groups (replacement or repair) and followed after treatment for a decade,² the incidence of secondary caries in the two groups was reported to be comparable, suggesting the effectiveness of repairing defective restorations.

The clinical guidelines for treating caries by the Japanese Society of Conservative Dentistry³ has made the following recommendation in response to the clinical question, “In cases of resin composite restorations where marginal discolorations or defects are observed, is repair as effective as replacement?”

<Clinical question>

In cases of resin composite restorations where marginal discolorations or defects are observed, is repair as effective as replacement?

<Recommendation>

In cases of resin composite restorations where marginal discolorations or defects are observed, repairing or using sealant offers comparable effectiveness to replacement. Accordingly, repair is recommended as a procedure that encourages preservation of sound tooth structure.

According to the MID concept and the above guideline, repairing the restoration rather than replacing the restoration is preferable in the case in this question.

2. Results in Japan

Based on the aforementioned commentary and previous US studies^{4,5}, this study considered the options other than "replace the entire restoration" in Q4 to be consistent with the evidence. The results are shown in the table below.

Japan Concordance
Q4 60% (119/200)

The Japanese survey results showed that 60% of participants were in concordance with the evidence. Since 40% of the participants were not in concordance, there may be room for improvement.

3. Results of an international comparison between the US and Japan

Results of a comparison of previous studies^{4,5} conducted in the US and Japan are described in the table below.

Japan Concordance (2017)	US (National Dental PBRN, practitioners) Concordance (2009)	US (Virginia Commonwealth University School of Dentistry, faculty members) Concordance (2014)	US (Virginia Commonwealth University School of Dentistry, students) Concordance (2014)
Q4 60% (119/200)	42% (246/589)	57% (21/37)	53% (40/76)

There is an evidence-practice gap in the treatment of composite resin restorations with marginal discoloration in both Japan and the United States.

【References】

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1. Commentary on Question 5: Deep caries

Deep Caries Patient Scenario

Patient Edwards is a 25 year-old male with a visible cavitation into the dentin in the central fossa of tooth #30 (right mandibular first molar according to the ADA coding system). Overall patient Edwards has just two enamel lesions on smooth surfaces, in addition to the lesion on #30, which the bitewing radiograph indicates is deep. The tooth responds to cold and the pain lasts < 3 seconds.

Bitewing radiograph of patient Edward's tooth #30:



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Q5. Upon opening the tooth and during excavation of the caries you realize that the lesion is deeper than anticipated and may involve the mesial buccal pulp horn. You would usually:

This question asks you to choose one of the following options, i.e., “stepwise caries removal,” “nonselective caries removal,” or “endodontics,” when the carious lesion is so deep that its removal by a single intervention could result in pulp exposure.

This patient suffers from mild pulpitis and the symptoms of the pulp may be reversible. On the basis of the policy of MID (Minimal Intervention Dentistry) proposed by the FDI¹, it is not appropriate to choose “endodontics” as the first-line treatment.

Next, let us discuss “stepwise removal” and “nonselective removal”. An article on randomized controlled trials by Bjørndal et al.² in 2017 compared clinical success between “stepwise removal” and “nonselective removal” in radiographically identified carious lesions extending into three-quarters or more of the dentin. “Stepwise removal” was associated with a lower probability of pulp exposure, and in addition provided an approximately 14% higher rate of success (as evaluated by radiolucency at the apex and by the presence or absence of pulpal reaction).

In a Cochrane Database Systematic Review³ published in 2013, a meta-analysis comparing the “stepwise removal” and “nonselective removal” of permanent teeth demonstrated that the risk of pulp exposure was lower by 49% in “stepwise removal” than in “nonselective removal.” In cases without pulp exposure, no significant difference was noted between the two techniques in terms of incidence rates of postoperative pulpal symptoms.

The clinical guidelines for treating caries by the Japanese Society of Conservative Dentistry⁴ states the following regarding the treatment of deep caries with a high possibility of pulp exposure.

<Clinical Question 1>

Can pulp exposure be avoided by using step-wise excavation?

<Recommendation>

In cases where deep caries have penetrated the pulp, pulp exposure can nevertheless be avoided by step-wise excavation, if the pulp is clinically healthy or shows symptoms of reversible pulpitis.

Accordingly, step-wise excavation is recommended.

<Clinical Question 2>

In cases where step-wise excavation is performed, are pulpal symptoms the same as in the case of complete removal of caries?

<Recommendation>

Where deep caries have penetrated the pulp, provided the pulp is clinically healthy or shows symptoms of reversible pulpitis, step-wise excavation maintains the same pulpal conditions as in cases of complete caries removal where the pulp is not exposed. Accordingly, step-wise excavation is recommended.

The guideline recommends stepwise caries removal for the purpose of pulp preservation, as this therapy has been covered by the Japanese national health insurance system since 2008, which provides support in terms of treatment cost.

Therefore, it is desirable to perform stepwise caries removal for patients in whom caries removal may lead to pulp exposure.

2. Results in Japan

Based on the aforementioned commentary and previous U.S. studies^{5,6}, the present study considered the option of "Stop removing decay near the pulp horn and remove it elsewhere" in Q5 to be consistent with the evidence. The results are shown in the table below.

	Japan Concordance
Q5	54% (112/206)

The Japanese survey results showed that 54%, approximately half of the participants, were consistent with the evidence. The results indicated that there is room for improvement in this situation.

3. Results of an international comparison between the US and Japan

Results of a comparison of previous studies^{5,6} conducted in the US and Japan are described in the table below.

	Japan	US (National Dental PBRN, practitioners)	US (Virginia Commonwealth University School of Dentistry, faculty members)	US (Virginia Commonwealth University School of Dentistry, students)
	Concordance (2017)	Concordance (2009)	Concordance (2014)	Concordance (2014)
Q5	54% (112/206)	33% (190/578)	53% (20/38)	32% (26/81)

These results indicate that the evidence-practice gap exists in treatment strategies for deep caries in both the US and Japan.

【References】

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1. Commentary on Questions 6: Assessment of caries risk

Q6. Do you assess caries risk for individual patients in any way?

- Yes
 No

This question asks you to determine if you assess caries risk. The assessment of caries risk not only means saliva testing but also comprehensive evaluation of caries in individual patients. As an example, the American Dental Association (ADA) has proposed the 19 items listed below for caries risk assessment¹.

1. Active caries in previous 12 months	11. Active orthodontic treatment
2. High titers of cariogenic bacteria	12. Irregular dental care
3. Poor oral hygiene	13. Suboptimal fluoride exposure
4. Drug/alcohol abuse	14. Developmental or acquired enamel defects
5. Poor family dental health	15. Prolonged nursing (bottle or breast)
6. Cariogenic diet	16. Presence of exposed root surfaces
7. Genetic abnormality of teeth	17. Restoration overhangs and open margins
8. Many multi-surface restorations	18. Physical or mental disability with inability or unavailability of performing proper oral health care
9. Chemo or Head and Neck radiation therapy	19. Xerostomia
10. Eating disorders	

Previous studies regarding caries risk²⁻⁴ have demonstrated that caries risk assessment in individual patients is effective in predicting “future occurrence of caries” or “progression of existing caries.” Furthermore, caries risk assessment has been reported to be effective in predicting not only crown caries in children and adults, but also root caries in the elderly⁵.

For reference, the major comprehensive assessment tools for caries risk that are internationally available are listed below².

- 1) Caries Risk Assessment Form (American Dental Association: ADA)
 - 2) CAT (Caries-risk Assessment Tool) (American Academy of Pediatric Dentistry: AAPD)
 - 3) CAMBRA (Caries Management By Risk Assessment)
 - 4) Cariogram
 - 5) Dundee Caries Risk Assessment Model
- etc.

In addition, the clinical guidelines for treating caries by the Japanese Society of Conservative Dentistry⁶ establishes "high caries risk" as one of the criteria for restorative intervention for caries (see Commentary on Question 1 & 2).

Therefore, it is considered desirable to perform some form of comprehensive caries risk assessment in individual patients in the diagnosis and treatment of caries.

2. Results in Japan

Based on the above commentary and previous U.S. studies^{7,8}, the present study considered the option "assess caries risk per patient" for Q6 to be consistent with the evidence. The results are shown in the table below.

	Japan Concordance
Q6	51% (106/206)

The results of surveys in Japan show a 51% concordance with the evidence for assessing caries risk, suggesting that there is potential for improvement.

3. Results of an international comparison between the US and Japan

Results of previous comparisons^{7,8} conducted in the US and Japan are described in the table below.

	Japan	US (National Dental PBRN, practitioners)	US (Virginia Commonwealth University School of Dentistry, members)	US (Virginia Commonwealth University School of Dentistry, students)
	Concordance (2017)	Concordance (2009)	Concordance (2014)	Concordance (2014)
Q6	51% (106/206)	85% (463/545)	90% (35/39)	96% (80/83)

These comparison results between the US and Japan indicate that concordance regarding caries risk assessment is higher in the US than in Japan. It is therefore suggested that caries risk assessment is highly likely to require improvement in Japan.

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