RADIOLOGY LESSON PLAN AND TEST QUESTIONS

Course: Radiology DH 104

Topic: Interpretation of Dental Caries

Audience: Adult Learners (Freshman Level Dental Hygiene Students)

Instructional Objectives:
Upon completion of the lecture, the student should be able to:

1. Define dental caries.
2. Explain why dental caries appear radiolucent on a dental image.
3. Determine factors that may influence the image interpretation of dental caries.
4. Critique the different classifications of dental caries.
5. Share the importance of detecting caries on a dental x-ray.

Materials: PowerPoint, computer equipment, Handout

References:

Iannucci, J. M., & Howerton, L. J. (2017). Interpretation of Dental Caries. In *Dental radiography: Principles and techniques* (pp. 403–411). essay, Elsevier/Saunders.

Moran, Maira, Marcelo Faria, Gilson Giraldi, Luciana Bastos, Larissa Oliveira, and Aura Conci. "Classification of Approximal Caries in Bitewing Radiographs Using Convolutional Neural Networks." Sensors (Basel, Switzerland) 21.15 (2021): 5192. Web.

Rathee, M. (2021), *Dental caries.* StatPearls [Internet]. Retrieved March 1, 2022, from https://www.ncbi.nlm.nih.gov/books/NBK551699/

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Young, D. A., Novy, B. B., Harle, R., Hart, T. C., Truelove, E. L., Ekstrand, K. R., Featherstone, J. D. B., Fontana, M., Ismail, A., Kuehne, J., Longbottom, C., Pitts, N., Sarrett, D. C., Wright, T., Mark, A. M., & Beltran-Aguilar, E. (2015). The American dental association caries classification system for clinical practice. The Journal of the American Dental Association, 146(2), 70-86. https://doi.org/10.1016/j.adaj.2014.11.018

Personnel: None needed

Time: 50 minutes

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
5 minutes	**I. INSTRUCTIONAL SET** A. Introduction Dental hygienists should be able to describe detect dental caries. To have a complete dental exam to detect caries, dental x-rays are performed. Periapical dental x-rays along with a dental exam can confirm if a patient has dental decay. B. Established Mood By attending today's lecture, you show your willingness to play an important role in detecting dental caries. Learning how to interpret decay on a dental x-ray will lead you to provide optimal dental care to the patients you treat. C. Gain Attention/Motivate Have you ever looked at an x-ray and were curious at what you were looking at. What questions did you ask the professional? Today you will become the professional that can interpret caries. D. Established Rational By understanding what decay looks like on a dental x-ray, the dental hygienist can interpret and describe what they are viewing. E. Established Knowledge Base Has anyone worked in a dental office? Have you had a dental appointment where the doctor showed you that you had a cavity on a dental x-ray? Dental x-rays are needed to diagnose dental caries. F. Instructional Objective	**Slide #1** Interpretation of Dental Caries title **Slide #2** Picture of an FMX **Q:** How does decay appear on a dental x-ray. **A:** Decay appears radiolucent on a dental x-ray. **Note:** Decay appears radiolucent in a radiograph because the demineralized area of the tooth does not absorb as much radiation. **Slide #3** Objectives

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	After today's lecture, you should be able to define dental caries, explain why dental caries appear radiolucent on a dental image, determine factors that may influence the image interpretation of dental caries, critique the different classifications of dental caries, and share the importance of detecting caries on a dental x-ray.	
3 minutes	**I. Dental Caries Definition** A. **Caries**: The localized destruction of teeth by microorganisms B. **Cavitation:** In dentistry, cavity refers to cavitation, or hole, in a tooth that is the result of a caries process.	**Slide #4 Caries defined**
	II. Detection of Caries A. Clinical examination 1. Looking in the mouth 2. Appearance of teeth B. Dental images	**Slide #5** Detection of caries **Note:** A clinical examination and a dental x-ray are needed to diagnose. **Slide #6** Clinical examination
2 minutes	**III. Classification on Dental Images** A. Interproximal B. Occlusal C. Buccal and lingual D. Root surface E. Recurrent F. Rampant	**Slide #7** Classification of Caries Introduction
4 minutes	1. Interproximal Caries a. Location b. Appearance c. Classification 1. Incipient 2. Moderate 3. Advanced 4. Severe	**Slide #8** Interproximal Caries **Q:** Where are interproximal caries located? **A:** In-between the teeth, mesial or distal surface. **Slide #9** Interproximal Caries Classification **Slide #10** Incipient Caries **Slide #11** Moderate Caries **Slide #12** Advanced Caries

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
		Slide #13 Severe Caries picture **Note:** Incipient and moderate decay does not extend through the DEJ, whereas advanced and severe caries do.
3 minutes	2. Occlusal Caries a. Location b. Appearance c. Classification 1. Incipient 2. Moderate 3. Severe	**Slide #14-15** Occlusal Caries **Note:** Incipient decay may not be seen on the occlusal surface. **Slide #16** Picture incipient decay **Slide #17** Picture moderate decay **Slide #18** Picture severe decay
2 minutes	3. Buccal and Lingual Caries a. Location b. Appearance	**Slide #19** Buccal and Lingual Caries **Slide #20** Picture & x-ray showing extensive caries **Note:** "meth mouth" will have extensive oral damage.
2 minutes	4. Root Surface Caries a. Location b. Appearance	**Slide #21** Root surface Caries
2 minutes	5. Recurrent Caries a. Location b. Appearance	**Slide #22** Recurrent Caries **Slide #23** Recurrent Caries picture
2 minutes	6. Rampant Caries a. Location b. Association	**Slide #24** Rampant Caries **Q:** What is the difference between rampant caries and caries? **A:** Rampant caries is a widespread term used to describe caries in more than 10 teeth.
	IV. Conditions Resembling Caries A. Cervical Burnout	**Slide #25** Conditions Resembling Caries

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
5 minutes	B. Restorative Materials C. Attrition D. Abrasion/Abfraction 1. Cervical Burnout a. Definition b. Location c. Appearance	**Slide #26** Cervical Burnout **Slide #27-28** Cervical Burnout picture **Q:** Why do you think these conditions resemble caries? **A:** They appear radiolucent on a dental image
	2. Restorative Materials a. Definition b. Appearance	**Slide #29** Restorative Materials **Note:** Composite restorations can appear radiolucent and resemble decay.
	3. Attrition Appearance a. Definition b. Appearance	**Slide #30** Attrition
	4. Abrasion/Abfraction a. Definition b. Appearance	**Slide #31** Abrasion/Abfraction **Slide #32** Abrasion and Abfraction picture **Q:** What could be a cause of abrasion? **A:** Answers will vary, but examples include brushing with a hard toothbrush (toothbrush abrasion) or brushing aggressively.
5 minutes	**V. CLOSURE** A. <u>Summary of Major Points-Relate Back to Objectives</u> I hope you now have a better understanding of dental caries and how they appear on a dental x-ray. Remember there are different conditions that may resemble dental caries. Also, caries has different classifications. I hope you are more comfortable sharing the importance of detecting caries on a dental x-ray.	**Slide #33** *Summary Slide **Q:** What is the cause of a caries lesion? **A:** The localized destruction of teeth by microorganisms.

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	B. <u>Provide a sense of accomplishment</u> I hope you will be more comfortable and able to distinguish dental caries on dental x-rays.	
5 minutes	C. <u>Assignment</u> To expand on what you have learned today, it is encouraged that you: 1. Review the handout provided. 2. Practice case studies on www.dentalcare.com 3. Explore scholarly articles.	**Slide #34** Reference and Website to Explore **Note:** Give time to write down resources.
10 minutes	**CRITICAL THINKING ACTIVITY** **Case:** A 40-year-old male presents in the office and states he has not seen a dentist in 5 years. He has tooth pain sometimes. He brushes with a hard toothbrush every morning but does not floss. As the hygienist, the doctor will have you take x-rays on the patient and interpret them before he comes and give the patient a diagnosis.	**Slide #35** Critical Thinking Activity: Case for Analysis
	1. Based on what you learned today, what recommendations would you tell the patient about his at-home care? **Answer:** The patient should not use a hard toothbrush because it may cause toothbrush abrasion, which can appear radiolucent as a cavity at the gumline of an x-ray.	**Slide #36** Case study question
	2. Based on the x-ray, classify the decay on tooth #13. **Answer:** Tooth #13 has moderate interproximal decay. The decay extends more than halfway through the thickness	**Slide #37** Picture of x-ray **Q:** How are interproximal cavities classified? **A:** Depth of penetration.

TIME	LESSON CONTENT	NOTES-MEDIA-Q/A
	of the enamel but does not involve the DEJ. 3. Based on the x-ray, interpret what you see? **Answer:** Tooth #29 and 30 have severe recurrent decay. The decay is around restorations, and it extends through the enamel and dentin more than half the distance toward the pulp. 4. In order to diagnose decay, what must the patient have? **Answer:** A patient must have an exam and x-rays to determine decay.	**Slide #38** Picture of x-ray **Q:** What dental instruments are usually used to check for decay? **A:** A dental mirror and explorer. **Note:** Will have students partner and interpret dental caries on x-rays. **Slide #39** Questions **Note:** Ask the class if they have any questions?

Test Questions

1. **Objective #1:** Define dental caries.

   Test Item: Define tooth decay.

   a. The generalized destruction of teeth by microorganisms.
   b. The destruction of the teeth and bone by microorganisms.
   c. The localized destruction of teeth by microorganisms.
   d. The remineralization of teeth by microorganisms.

2. **Objective #2:** Explain why dental caries appear radiolucent on a dental image.

   Test Item: Why do caries appear radiolucent on a dental image?

   a. Decreased density in the tooth allows greater penetration of x-rays?
   b. Increased density in the tooth allows greater penetration of x-rays?
   c. Decreased density in the tooth allows less penetration of x-rays?
   d. Increased density in the tooth allows less penetration of x-rays?

3. **Objective #3:** Determine factors that may influence the image interpretation of dental caries.

   Test Item: Factors that may influence the image interpretation of dental caries include the following **EXCEPT** one. Which one is the **EXCEPTION?**

   a. Cervical burnout
   b. Attrition
   c. Dentin
   d. Restorative Material

4. **Objective #4:** Critique the different classifications of dental caries.

   Test Item: In 4-5 sentences list the classifications of interproximal caries on a dental x-ray.

5. **Objective #5:** Share the importance of detecting caries on a dental x-ray.

Test Item: In one paragraph, 3-4 sentences discuss why it is important to detect dental caries on x-rays.

Correct Answers:

1. C
2. A
3. C
4. Interproximal caries can be classified according to the depth and penetration of the lesion through enamel and dentin. There are 4 classifications incipient, moderate, advanced, and severe. Incipient interproximal caries extends less than halfway through the thickness of the enamel. Moderate interproximal caries extend more than halfway through the thickness of the enamel but do not involve the DEJ. Advanced interproximal caries extend to or through the DEJ and into dentin but do not extend into dentin more than half the distance toward the pulp. Severe interproximal caries extend through enamel and dentin more than half the distance toward the pulp.
5. Dental caries is a destructive process that destroys the enamel and dentin of a tooth. To detect decay, a clinical exam must be completed with dental x-rays to detect decay that is not visible clinically. Also, dental x-rays help to determine the severity of the decay.