Development and Testing of a CBCT Educational Module for Dental Providers in the US Navy

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Abstract

MARTIN E. EVERS, JR.: Development and Testing of a CBCT Educational Module for Dental Providers in the US Navy
(Under the direction of Enrique Platin)

Objectives: This project included the development of an educational module addressing cone beam computed tomography (CBCT) basics, anatomy, and interpretation of CBCT reconstructed multiplanar images containing pathology. The subsequent objective was to test the efficacy of this educational tool.

Methods: 32 Navy dental providers completed a brief online demographic survey and multiple-choice pretest evaluating their knowledge of CBCT. The web based educational module was then made available to the cohort. After completing the module, participants were given the link to the posttest and short feedback questionnaire.

Results: 24 posttests and feedback questionnaires were completed. The data demonstrated an increase in the number of correct responses between the pre and posttests which was not statistically significant when comparing overall scores. (75.2% (pretest) to 77.5% (posttest) [p=.379]). Interestingly, the results limited to sectional scores provided different outcomes. The basics/anatomy sections combined yielded a statistically significant change from 77.4% to 86.6% (p= .010). The interpretation section, however, saw a decrease in performance.

(Pretest=69.7% vs. Posttest=58.6% [p=.400]) 100% of respondents agreed that the module was helpful and met its objective.

Conclusions: The information presented in the CBCT basics and anatomy sections of the module resulted in the participants' increased performance on the posttest. The decrease in performance on the interpretation section could be attributed to the skill set required to interpret CBCT multiplanar images. Image interpretation is a skill set that cannot be developed using a few examples of how disease is manifested radiographically.

Dedication

To Allison, the woman of my dreams, who has made my life a success. Thank you for your love and support. To Tyler and Malia who sometimes had to go without dad, but continue to love me anyway.

Acknowledgments

A special “Thank You” to the members of my thesis committee: Dr. Platin, Dr. Ludlow, and Dr. Noble who’s guidance made possible the completion of this project. The computer expertise of Jeff VanDrimmelen was also instrumental in the web development portion of this project.

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List of Abbreviations

AEGD.....Advanced Education in General Dentistry

CBCT ..... Cone Beam Computed Tomography

CT ..... Computed Tomography

FOV..... Field of View

GPR ..... General Practice Residency

IAN.....Inferior Alveolar Nerve

MPR .....Multi-Planar Reconstructions

MRI.....Magnetic Resonance Imaging

PGY-1..... Post Graduate Year 1

TMJ .....Temporal Mandibular Joint

Introduction/Objectives

In 1998 Mozzo, et al introduced Cone Beam Computed Tomography (CBCT) for dental use, and in May 2001 CBCT it reached the U.S. market.[1] Since that time, this technology has revolutionized oral and maxillofacial imaging. Three dimensional anatomical objects would no longer be limited to two dimensional visualization in the field of dentistry. Previous technologies (e.g. stereoscopy, Tuned Aperture CT[TACT]) had attempted to address this issue[2]; however, their popularity was relatively short lived. Although conventional CT and MRI remain mainstays of medical imaging, issues of dose (CT), cost, and accessibility limit their application in dentistry. Still over a decade after its introduction, CBCT's impact on the field of dentistry continues to grow.[3]

The U.S. Navy has a group of general and specialty trained dental providers educated at various dental schools. Collectively, this group's familiarity with CBCT imaging is very diverse. To improve the usefulness of this modality, an educational module could provide Navy clinicians with some of the necessary basic tools to understand this technology.

The aims of this project are as follows:

1. Development of an educational module addressing the basic principles of CBCT, dental applications of the modality, maxillofacial anatomy as visualized in

CBCT, and an introduction to the interpretation skills required for differentiating normal from abnormal findings.

2. Evaluate the usefulness of the module utilizing a pretest and posttest study design.

A thorough review of the literature revealed only one previous study that tested a web based CBCT educational module. This previous study concluded that additional studies would be beneficial to further evaluate the efficacy of web based modules. However, in contrast to the present study's module, the module tested in the previous study was limited to CBCT anatomy.[5]

The pre and posttest study design was chosen because of its simplicity and according to the I-tech group from the University of Washington, to understand exactly what knowledge can be credited to the training itself, using a pre- and post-test methodology is important. In addition, a well-designed pre- and posttest can help trainers understand which concepts were well taught during the training and which ones need additional time, or need to be covered using alternative methods.[6] It is also anticipated that the module will be modified and retested according to the results of this study.

Use of Surveys

Surveys are excellent tools for acquiring data. They are inexpensive, useful in describing the characteristics of a large population, can be administered from remote locations, can be used on large samples, many questions can be asked about a giving topic giving considerable flexibility to the analysis. In surveys,

standardized questions make measurements more precise by enforcing uniform definitions upon the participants. Also, standardization ensures that similar data can be collected from groups then interpreted comparatively. Usually high reliability is easy to obtain by presenting all subjects with a standardized stimulus and observer subjectivity is greatly eliminated.

A limitation of utilizing surveys is the lack of control over the response rate by the investigator. Despite this limitation it was decided to use a survey in data collection for this study because of its many advantages.

Educational Methods of Presentation

The options considered to convey the desired information for this study were traditional lecture, classroom computer assisted learning, distance education, and a combination of the previously mentioned modalities, E-learning. Advantages to E-learning include the flexibility of schedules and the learning pace. And, there is also no need to travel (i.e. the classroom is brought to the student). Presently there are many calls to move away from the traditional lecture to interactive computer learning systems that allow students access to information when and where they need it.[8] Therefore, online training and education (e-learning) based on information technologies, especially through the Internet, will stimulate the teaching market to the detriment of traditional teaching methods.[9] Due to this trend in educational methods, convenience for both the presenter and the students, accessibility to the material, and the fact that the student population for this study was located at a great

distance from the primary investigator the decision to present the material in a web based module was made.

The Module

Platform

There are multiple software platforms to choose from when considering web page design. The first attempt for this project was using Dreamweaver by Adobe. This is an excellent product, but requires technical expertise beyond the scope of this project's designer. Alternatives include Joomla®, Drupal®, and WordPress® to name a few.

WordPress® is a free, user friendly web publishing software. Using this technology one simply has to cut and paste desired content and the software applies the prescribed themes with the click of a button. Plugins expand the functionality of a variety of thematic templates. The control panel is straightforward and easy to use. (Figure 1) Changes to the developing website are not executed by the software until a proof is reviewed by the designer. The bottom line about the utility of this software is that technical experience is not a prerequisite for its use.

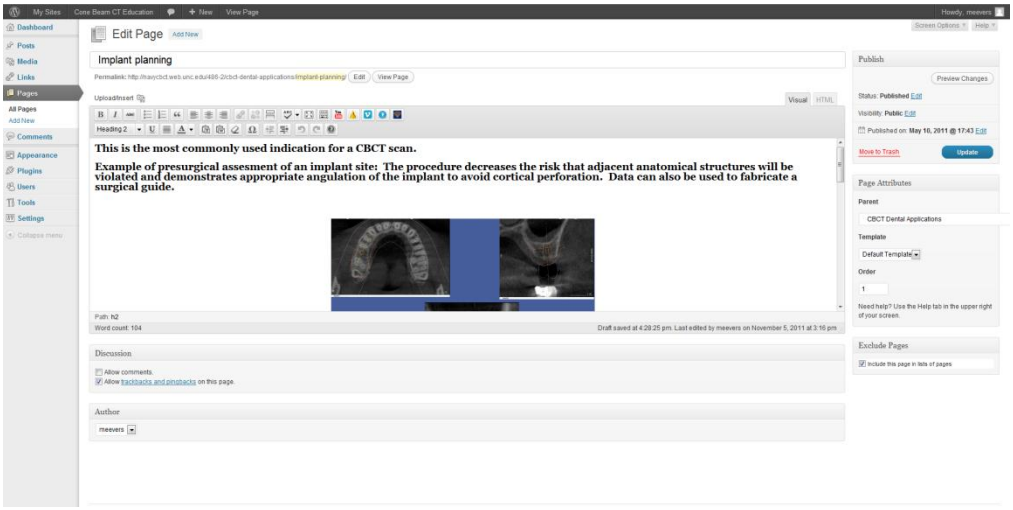


Figure 1. Control panel of WordPress ®

Content

Determining what to include in the module was an issue of concern. If the topic list for the CBCT module was all-inclusive, the model might be considered too lengthy and participants in the study of the module's efficacy would be less likely to participate due to time constraints. After a review of the literature and consideration of the purpose of the module, four topic areas were selected—CBCT Basics, Dental Applications, Normal Anatomy, and Interpretation.

CBCT Basics

When introducing CBCT technology much of the literature compares this modality to that of conventional CT. This gives the reader a fixed reference with which he/she can compare and contrast CBCT. Conventional CT is a more familiar modality due to the relative age of the technology. Patient positioning during image acquisition is also a relevant CBCT topic. Multiple models are available on the

market-- each constructed with one of the various patient position options—seated, standing, or supine. Each of these positions has its advantages and disadvantages. Also specific to the manufacturer's and model's specifications is the field of view or the area of image visualization. These range in size from <5 cm to 22 cm,[2,4] and some models are capable of multiple FOVs with collimation. Different diagnostic tasks require distinct FOVs. The basic views presented in image viewing software are the MPR or Multi-Planar Reconstructions. These include an axial, coronal, and sagittal planar images.

Dental Applications

The purpose of including the dental applications section was to inform the target audience of the many capabilities of the technology. So often we focus on the areas of our specialty. This section demonstrates the versatility of CBCT. From implant treatment planning to TMJ evaluation to orthodontic evaluation, CBCT images can benefit each of these disciplines and many more. This section contained case examples of all the common dental applications for this modality, specifically, implant imaging and treatment planning, evaluation of developmental abnormalities, evaluation of 3rd molar/IAN canal relationship, pathology, trauma, TMJ evaluation, orthodontic evaluation, airway analysis, and periapical and periodontal findings. It should be noted that there are other applications not listed. Nonetheless, it is evident that CBCT is a very useful imaging modality.

Normal Anatomy

As our ability to recognize abnormal findings in diagnostic imaging is dependent upon our knowledge of normal anatomy, this section was emphasized in both the educational module and the tools used to evaluate it. Without this basic knowledge of normal anatomy, interpretation of the images is not possible. While this section did not contain an all-inclusive list of anatomical features of the craniofacial region, the structures presented can serve as landmarks in navigating through a CBCT volume. While viewing each image's highlighted structure, one can also visualize the adjacent anatomy and get an overall sense of normal anatomy as it appears in CBCT volumetric images. In future versions of the module, it is planned to make this section more interactive. This upgrade requires further development.

Interpretation

The basic principles for interpretation were presented in this section of the module with the following guides:

- Know normal anatomy- remembering that normal is a range.
- Symmetry- comparing structures bilaterally
- Radiographic Signs- density, shape, borders, etc.
- Independence of radiographic signs regardless of imaging modality- a well-defined radiolucency in a panoramic radiograph will present similarly in CBCT images.

The systematic image/lesion description methods were also discussed. Being able to communicate with other providers radiographic findings using appropriate

terminology is an asset of great value. This can provide a significant service to the patient and facilitate treatment decisions by the providers.

Also included in this portion of the module were examples of each of the following pathological categories:

- Cyst
- Benign Neoplasia
- Malignant Neoplasia
- Inflammatory Lesion
- Benign Fibro-Osseous Lesion
- Vascular Anomaly
- Systemic Disease
- Trauma
- Developmental Abnormality[4]

Knowledge of specific pathological entities within these categories is also helpful, but not within the scope of this module.

Methods/Materials

For the initial testing of the educational module thirty three individuals associated with various Navy Post Graduate Year (PGY-1) programs were invited to participate. Email was the communication medium selected to correspond with the invitees. This group of potential participants included residents and directors from both the Advanced Education in General Dentistry/General Practice Residency (AEGD/GPR) programs. It was decided to invite these individuals because of their previously expressed interest in the study. Prior to publishing the survey, the pretest was submitted for review to three imaging educational experts. Their feedback resulted in modification of the survey/pretest document. Shortly thereafter, an additional email communication to the study participants provided a link to the demographic survey/pretest. The participating locations included Portsmouth, VA; Great Lakes, IL; and San Diego, CA. Thirty two of the thirty three Navy dental providers completed the brief online demographic survey and multiple-choice pre-test evaluating their knowledge of CBCT. The web based educational module was subsequently made available to them. After completing the module, participants were given the link to the post-test and short feedback questionnaire. After three reminder emails spanning a two month period, the final tally revealed that twenty four of the thirty two respondents had completed the post-test and questionnaire.

All the data collection steps utilized Qualtrics (Provo, UT) software. The demographic survey consisted of ten multiple choice questions encompassing topics of gender, age, previous dental and CBCT training, and CBCT utilization. The pretest contained twenty multiple choice questions regarding CBCT basics, common dental applications, normal anatomy as seen in CBCT images, and interpretation of CBCT images. Cases for interpretation for both the pre and posttest were selected from the teaching files at the University of North Carolina at Chapel Hill School of Dentistry. The posttest included twenty multiple choice questions, which like the pretest questions, were focused on testing the participants' knowledge of the topics presented in the "Learning Objectives" of the module. (Figure 2) While the posttest questions were similar in content and form to the pretest questions, they were a different question set designed to be comparable in level of difficulty. The feedback questionnaire consisted of two 5 point scale questions and two open answer/text input questions. These questions were designed to solicit feedback which will aid in the improvement of the educational module.

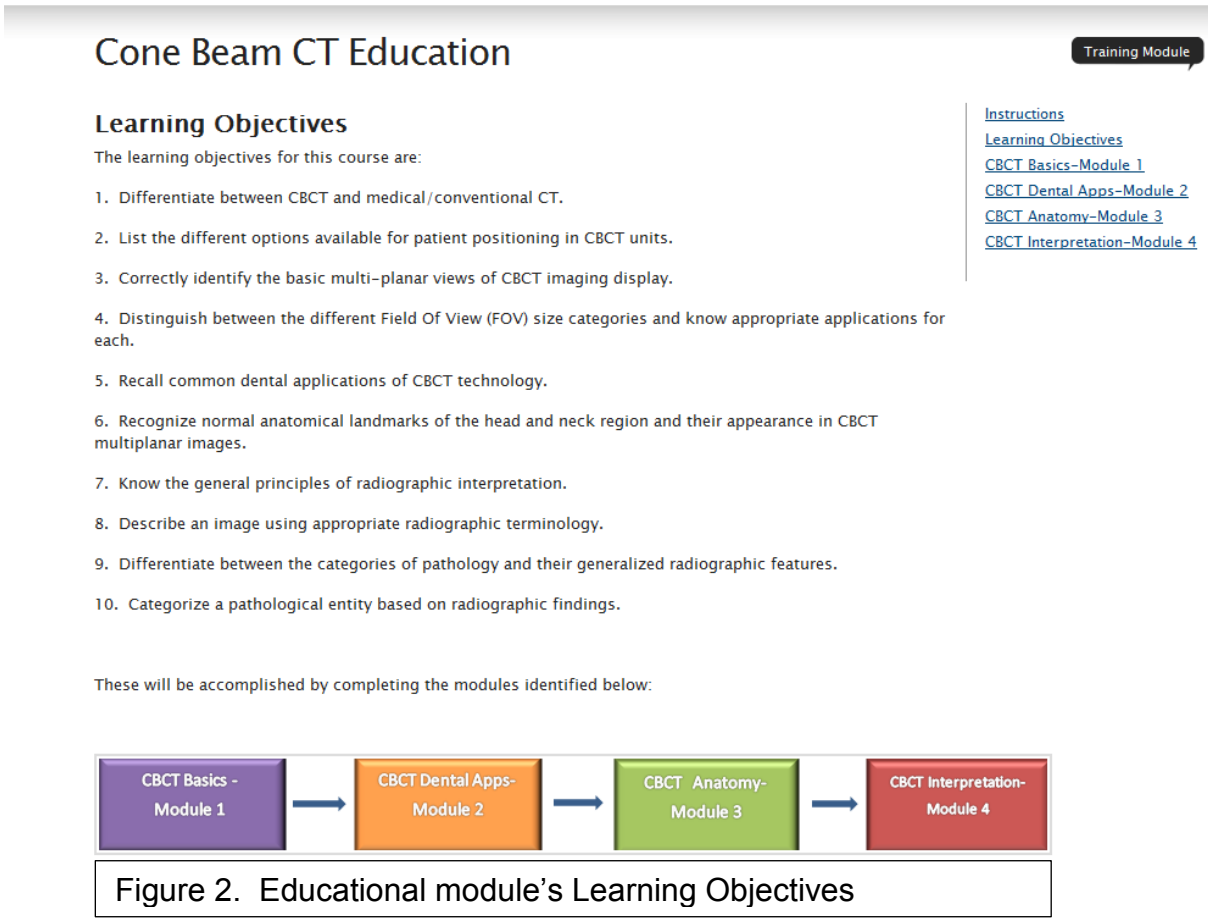


Figure 2. Educational module's Learning Objectives

Group analysis of performance on the pre and posttests was accomplished using SPSS ® software (IBM Corp, Armonk, NY). The purpose of this project was to evaluate the educational module, and according to findings presented at the National Health Science Curriculum Conference, group analysis is able to appropriately identify the strengths and weaknesses of instruction, targeting areas for improvement.[10,11] The paired t-test was used to analyze the data. Significance level was set at .05.

Results

Demographic and CBCT Familiarity Survey

There was a nearly 4:1 male to female ratio of participants in this study. 70% of those surveyed were under the age of 30, and 85% graduated from dental school less than one year prior to participating in the study. The respondents received their dental school training at 22 different dental schools. It was reported that 8 of the 22 dental schools offered some level of CBCT training as part of the dental school curriculum. 100% of those participating are general dentists. 85% of those surveyed currently do not view any CBCT images in their practice/educational program. For those viewing CBCT scans the most reported indication for the imaging procedure was to evaluate pathology. The most reported frequency of viewing scans was 1-5 per week.

Pre and Posttests

The mean pretest score was 75.2. The posttest scores were slightly improved with a mean of 77.5. A paired t-test was used to compare the mean values. While the scores trended upward, the overall difference between the pre and posttests was not statistically significant ($p=.379$).

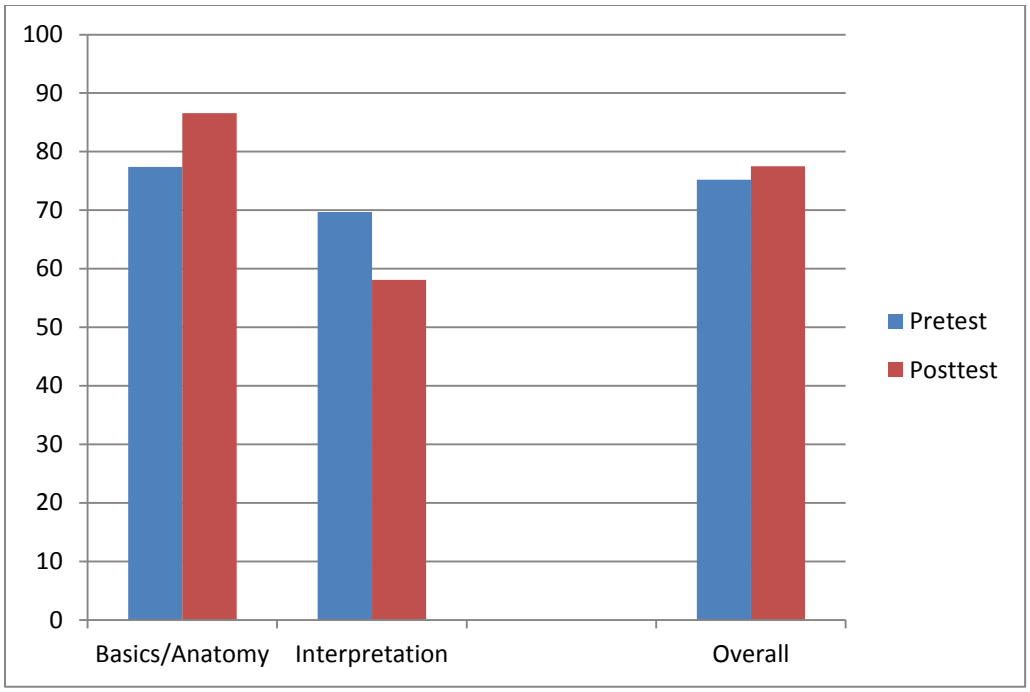


Figure 3. Mean Test Scores

Sorting the results by question type yielded significant results. The CBCT basics and anatomy sections resulted in a statistically significant increase in correct responses comparing the pre vs. posttest scores (77.4% to 86.6% [p= .010]). However, in the interpretation section there was a decrease in performance (p= .400). One possible explanation for the decrease in performance is that the cases selected for the posttest were more difficult.

It was also anticipated that those who reported having received previous training would have scored better on the pretest than their colleagues that had not received previous training in the CBCT imaging modality. While they did score slightly higher on the pretest (76.8 vs. 74.2), this increased level of performance was not statistically significant (p=.305).

As previously noted, the most difficult area of the tests for the study population was the interpretation section. Multiple questions on the posttest exemplified this trend. In Case 1 for example, where the participants were asked to distinguish between neoplasia (both malignant and benign) and another possible etiology for the patient's condition. The majority of respondents concluded that it was a malignancy, although the correct cause was trauma. (Figures 4 and 5) Another example that proved difficult for this cohort is Case 2, also of the posttest, were only 17 percent of the participants answered correctly when asked to identify the most likely pathological category based on the radiographic signs. The majority responded that it was a benign neoplasia. (Figure 6) The correct response was inflammation.

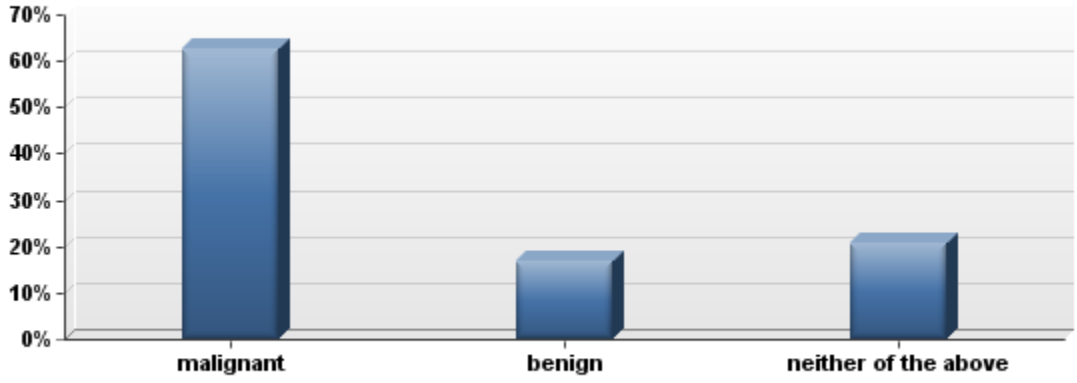


Figure 4. Posttest-Case 1 responses

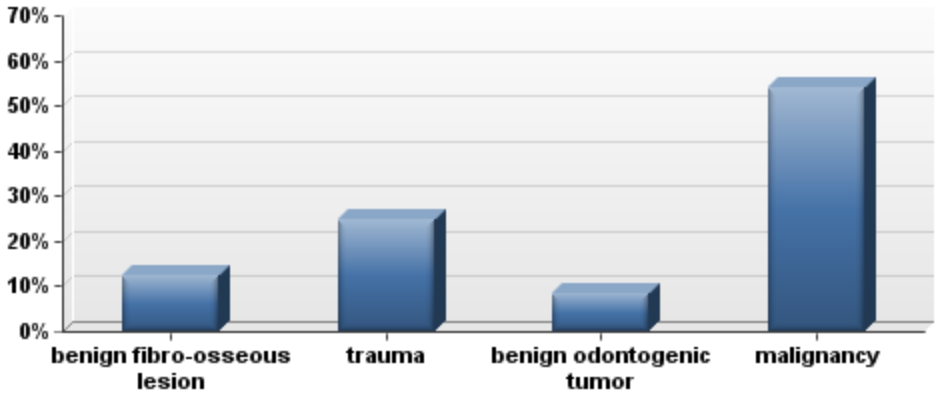


Figure 5. Posttest-Case 1 part 2 responses

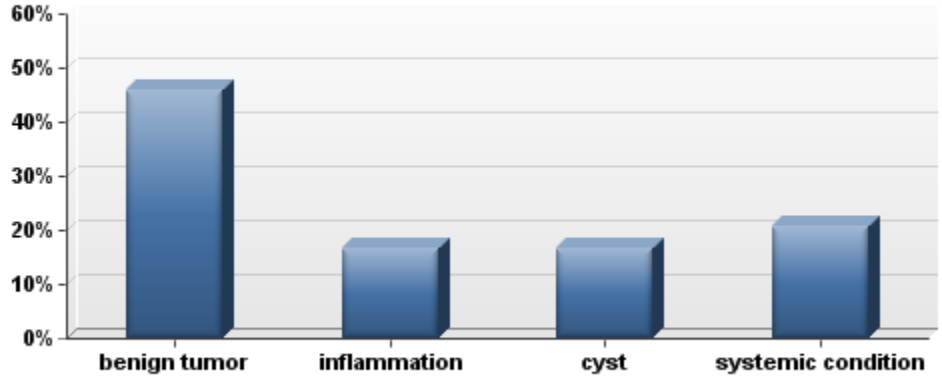


Figure 6. Posttest-Case 2 responses

Feedback

The responses from the participants were unanimously positive. Using a five point scale (1=strongly agree, 2=agree, 3=neither agree or disagree, 4=disagree, 5=strongly disagree), 50% of the participants responded "1" and the other 50% responded "2" when asked if the module was helpful to them. When queried if the module adequately addressed all the learning objectives, the responses were 27% "1" and 63% "2".

Discussion

When asked about additional information to add to the module, responses included more information on anatomy and interpretation and specific dental applications, specifically implant treatment planning, endodontic treatment planning and caries diagnosis. One respondent desired additional information on current CBCT manufacturers and models. Suggestions for improvement of the module were also well received. These responses included such topics as more in depth information and making the module more interactive. There was also a request for a database to include normal and pathologic findings from different imaging modalities to be used as a reference for Navy dentists. While incorporating these ideas into the educational module would be useful, one must consider the resources (e.g. server space) and the purpose of the module which is not to train radiologists but to provide basic information regarding CBCT to Navy providers and give them tools to recognize abnormalities in these images and make the appropriate treatment decisions and/or referrals.

The attrition levels or non-completion rate by location (Table 1) reveal interesting findings. The total (pre and posttest) completion rate for the cohort was 75%. The Midwest group had the highes[illegible]umber of participants completing the pretest (twelve), but only seven individuals completed the posttest. The east coast group had only one individual not complete both tests, and the west coast group had just two individuals that failed to finish the study.

Table 1: Number of Participants

Location	Pretest	Posttest	Change
Portsmouth, VA	11	10	-1
Great Lakes, IL	12	7	-5
San Diego, CA	9	7	-2
Total	**32**	**24**	**-8**

Prior to the last 3 respondents of the posttest, in the anatomy section for example, the entire cohort had responded correctly to 5 of the 8 questions—an overall correct response average of 94%. After the results of the last 3 participants were tabulated, the overall anatomy score dropped to 90%. A possible cause for the abrupt decline in performance by the last of the respondents is that when repeatedly encouraged to complete the posttests, they did so hastily just to be finished with the task. Additional evidence that supports this theory is the fact that in the open ended/text input portion of the feedback survey none of the last 3 respondents had input and their surveys were completed 2 weeks after the rest of the group.

Some observers may conclude that because of the limited variability of the study population's demographics, they do not represent an appropriate sample. That is, all of the participants were general dentists with the majority lacking experience and training, having recently graduated from dental school. An alternative perspective and the position held by the primary investigator of this study is that this is a perfect group with which to perform an initial study on an educational

module. The majority of participants were either AEGD or GPR residents currently involved in the academic process--eager and ready to learn.

Although proven useful, there are limitations to the pre and posttest study design, especially when the tests are administered remotely online and at the leisure of the study population. As the participants are not isolated during the time between tests, there is no guarantee that the intervention is solely responsible for the improvement in performance measured by the posttest.

Conclusions

While it would be difficult to generalize conclusions for this study with such a small sample size, we consider meaningful the following:

- The module did prove useful in the fact that the overall mean scores for the cohort trended upward.
- The CBCT basics and anatomy sections of the module effectively imparted knowledge to the participants.
- According to the feedback of the group, the module was helpful and adequately addressed the learning objectives.
- The Navy will have an educational tool that interested providers will be able to access as a reference. This will allow them to improve their knowledge of this useful imaging modality--CBCT.
- Although not specifically tested, we can infer that the interpretation of CBCT images is not mastered after a single educational intervention.

We look forward to further development and testing of the module. Future experiments will include testing the module--not only comparing the results of pre and posttests but also comparing the test results between groups—traditional lecture vs. web based instruction. This continued effort will ultimately result in an improved educational tool.

Appendix 1-Pretest

Please answer the following survey questions A - J, followed by the Pretest questions 1 - 20. A. By answering yes you are consenting to participate in this study. The module, pre and post tests will be accessible online. The only identifiable information collected will be an email address and will only be viewed by the PI and the electronic survey provider.

A.

- ❍ Yes
- ❍ No

B. Gender

- ❍ Male
- ❍ Female

C. Age

- ❍ <26
- ❍ 26-30
- ❍ 31-35
- ❍ 36-40
- ❍ >40

D. In what year did you graduate from dental school?

- ❍ Prior to 1985
- ❍ 1986-1995
- ❍ 1996-2005
- ❍ 2006-2010
- ❍ 2011

E. From which dental school did you graduate?

F. If you received post doctoral/specialty training, please indicate your specialty/program. Please enter none if appropriate.

G. Have you received previous CBCT education/training?

- ❍ Yes
- ❍ No

H. In what manner did you receive this education/training?

- ❍ Dental School Curriculum
- ❍ CE course
- ❍ Personal Study
- ❍ Residency
- ❍ Not applicable

I. How many CBCT scans do you view per week?

- ❍ None
- ❍ 1-5
- ❍ 6-10
- ❍ More than 10

J. For what purpose are the scans ordered? (check all that apply)

- ❑ Pathology
- ❑ Implant Planning
- ❑ Trauma
- ❑ Pre-surgical extractions
- ❑ Orthodontics
- ❑ Periodontics
- ❑ Endodontics
- ❑ Other Oral Diagnosis
- ❑ Not applicable

PRE TEST:1. Read the following two statements and select the best answer. Statement a: A small field of view CBCT scan is adequate for all patients' comprehensive orthodontic treatment planning. Statement b: A CBCT scan must be acquired on all patients prior to orthodontic treatment planning.

- ❍ Both statements are true
- ❍ Both statements are false
- ❍ Statement a is true; statement b is false
- ❍ Statement b is true; statement a is false

2. Which of the following includes the patient positions utilized in CBCT imaging?

- ❍ supine, prone, seated
- ❍ prone, seated, standing
- ❍ supine, seated, standing
- ❍ prone and seated only

3. Which of the following imaging techniques is most useful in detecting interproximal caries?

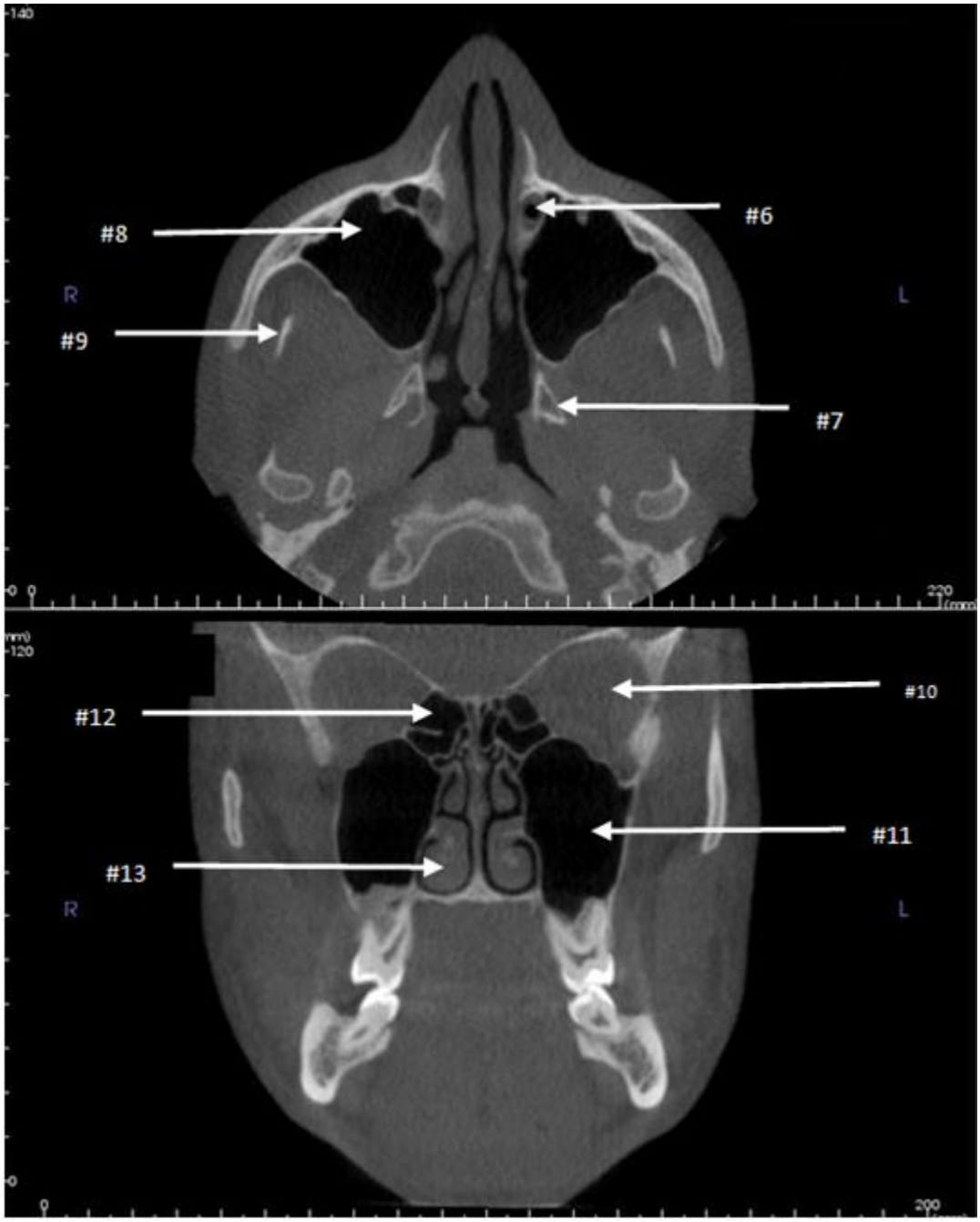
- ❍ CBCT
- ❍ panoramic
- ❍ bitewing
- ❍ occlusal

4. Read the following two statements and select the best answer. Statement a: CBCT is utilized to evaluate impacted teeth. Statement b: CBCT is the imaging modality of choice to distinguish between the various soft tissues of the maxillofacial area.

- ❍ Both statements are true
- ❍ Statement a is true, b is false
- ❍ Statement b is true, a is false
- ❍ Both statements are false

5. All of the following are components of CBCT multi-planar views except

- ❍ saggital
- ❍ coronal
- ❍ axial
- ❍ proximal



Normal Anatomy- Use the images above to answer questions #6 - 13. Please select the anatomic structure indicated by the arrow.

6.

- ethmoid air cell
- frontal sinus
- nasal cavity
- nasolacrimal duct

7.

- nasal septum
- pterygoid plate
- hard palate
- vomer

8.

- maxillary sinus
- sphenoid sinus
- oral cavity
- frontal sinus

9.

- condyle
- malar process
- coronoid process
- ossified stylohyoid ligament

10.

- ❍ cerebellum
- ❍ pons
- ❍ orbit
- ❍ pineal gland

11.

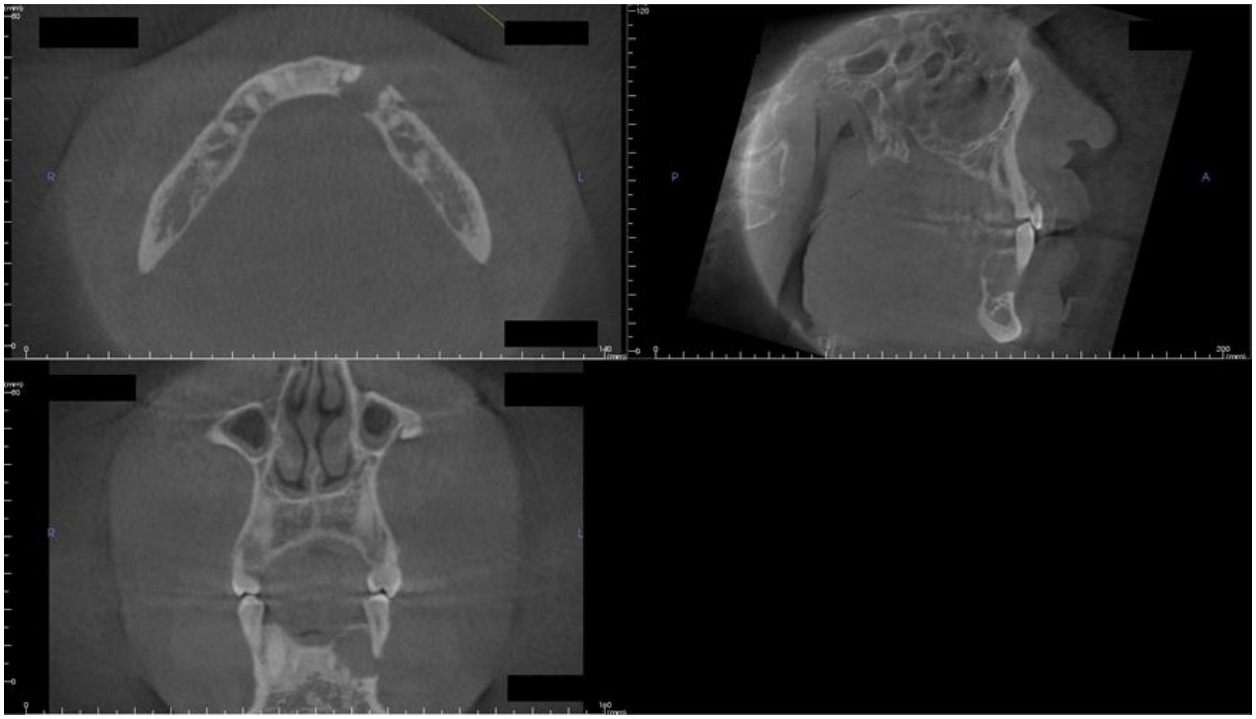
- ❍ maxillary sinus
- ❍ sphenoid sinus
- ❍ ethmoid sinus
- ❍ frontal sinus

12.

- ❍ maxillary sinus
- ❍ sphenoid sinus
- ❍ ethmoid sinus
- ❍ frontal sinus

13.

- ❍ nasopharyngeal tonsil
- ❍ adenoid
- ❍ inferior turbinate
- ❍ nasolacrimal duct



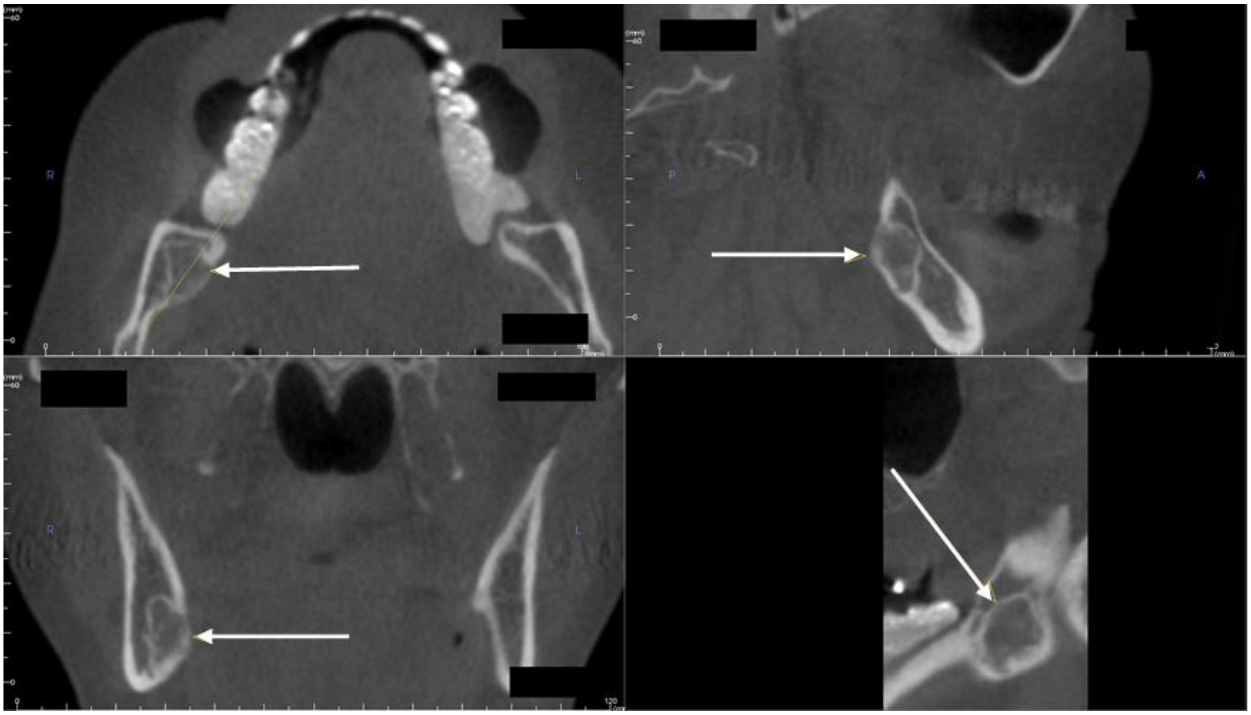
Case 1- Use the images above to answer questions #14 and 15. 54 y/o asymptomatic male, teeth #21 and 22 are vital.

14. The lesion above is most consistent with a _____ process.

- ❍ malignant
- ❍ benign
- ❍ none of the above

15. Which is the category of disease most suggested by the radiographic and clinical findings?

- ❍ benign fibro-osseous lesion
- ❍ cyst
- ❍ benign odontogenic tumor
- ❍ malignancy



Case 2 - Use the image above to answer questions #16 and 17.

16. The lesion indicated be the arrows is found in which bone?

- ❍ maxilla
- ❍ hyoid
- ❍ mandible
- ❍ none of the above

17. This lesion is most likely a _____ process.

- ❍ benign
- ❍ malignant
- ❍ peripheral
- ❍ external

Case 3 - Use the image above to answer questions #18 - 20.

18. This lesion can be described as a _____.

- ❍ well defined, partially corticated radiolucency
- ❍ ill defined, non corticated radiolucency
- ❍ a mixed density lesion
- ❍ none of the above

19. Read the following two statements and select the best answer.Statement a: In accordance with the radiographic findings above, a malignancy would not be expected. Statement b: Inflammation and malignancy often have similar radiographic findings.

- ❍ Both statements are true
- ❍ Both statements are false
- ❍ Statement a is true, b is false
- ❍ Statement b is true, a is false

20. One would anticipate that this disease process would present _____.

- ❍ bilaterally
- ❍ unilaterally
- ❍ as a generalized condition throughout both jaws
- ❍ none of the above

Appendix 2-Posttest

1. A small field of view CBCT scan may be appropriate for all of the following applications except:

- ❍ endodontics
- ❍ periodontics
- ❍ orthodontic treatment planning
- ❍ single unit implant treatment planning

2. Which of the following is not a patient position used in CBCT image acquisition?

- ❍ supine
- ❍ prone
- ❍ seated
- ❍ standing

3. Read the following two statements and select the best answer: a. CBCT is the modality of choice for detecting interproximal caries. b. CBCT scans are frequently utilized for implant treatment planning.

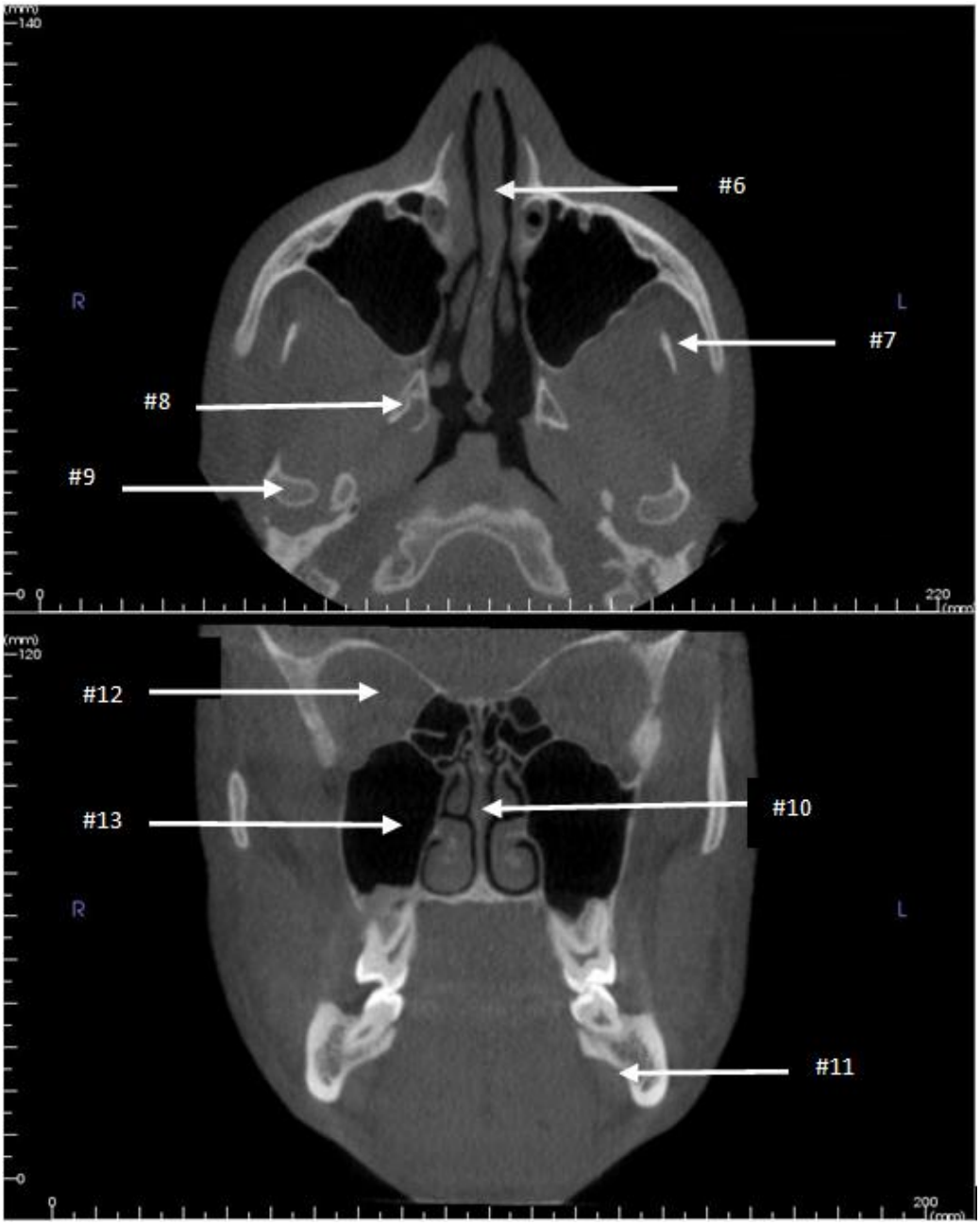
- ❍ Both statements are true
- ❍ Statement a is true, b is false
- ❍ Statement b is true, a is false
- ❍ Both statements are false

4. Read the following two statements and select the best answer: a. Medical CT produces more scatter than CBCT. b. CBCT scans are higher dose than conventional CT.

- ❍ Both statements are true
- ❍ Statement a is true, b is false
- ❍ Statement b is true, a is false
- ❍ Both statements are false

5. Read the following two statements and select the best answer: a. The ethmoid sinuses are located posterior to the sphenoid sinus. b. As evident in traditional panoramic imaging, a patient has two hyoid bones.

- ❍ Both statements are true
- ❍ Statement a is true, b is false
- ❍ Statement b is true, a is false
- ❍ Both statements are false



Normal Anatomy- Use the images above to answer questions #6 - 13. Please select the anatomic structure indicated by the arrow.

6.

- ❍ nasal septum
- ❍ inferior turbinate
- ❍ nasolacrimal gland
- ❍ none of the above

7.

- ❍ condyle
- ❍ malar process
- ❍ coronoid process
- ❍ ossified stylohyoid ligament

8.

- ❍ mastoid process
- ❍ vomer
- ❍ cruciform ligament
- ❍ pterygoid plate

9.

- ❍ mandibular condyle
- ❍ malar process
- ❍ coronoid process
- ❍ ossified stylohyoid ligament

10.

- ❍ nasal septum
- ❍ inferior turbinate
- ❍ nasolacrimal gland
- ❍ ethmoid bone

11.

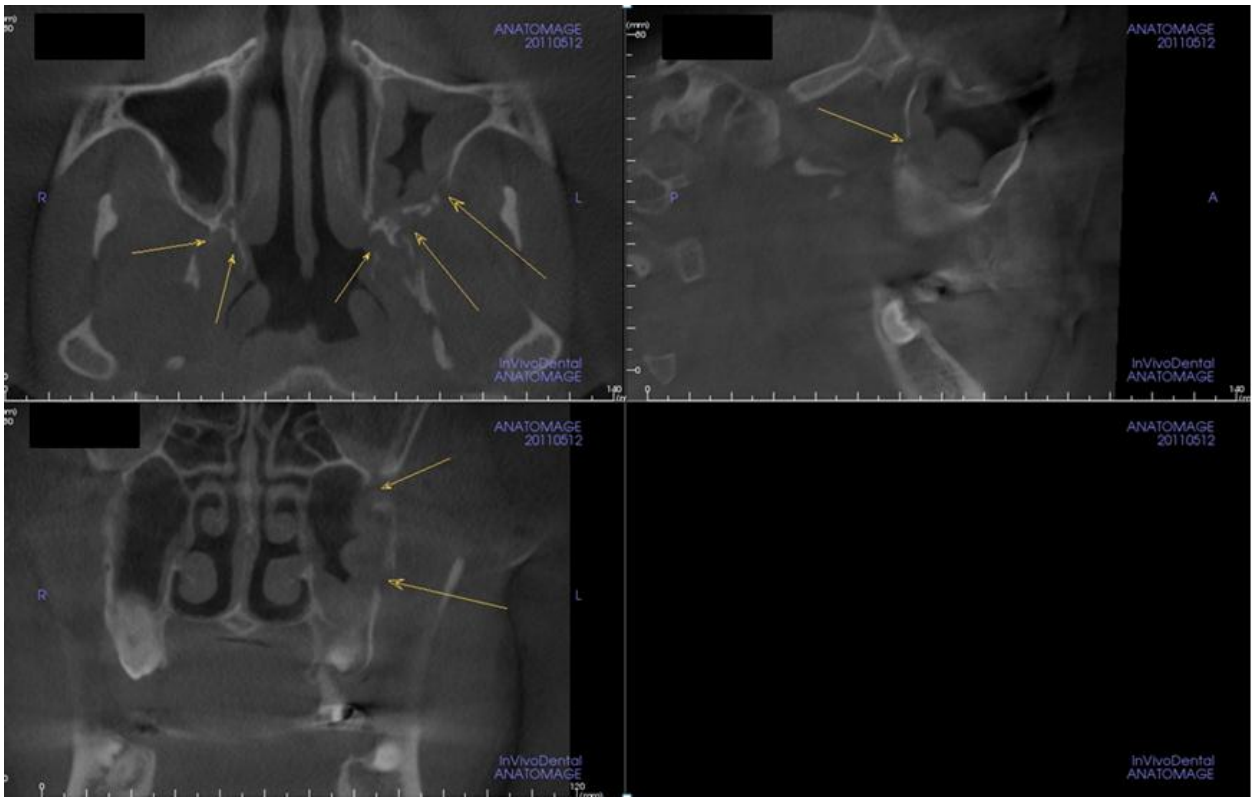
- ❍ sublingual gland
- ❍ submandibular fossa
- ❍ pterygoid plate
- ❍ lingual foramen

12.

- ❍ maxillary sinus
- ❍ sphenoid sinus
- ❍ orbit
- ❍ foramen magnum

13.

- ❍ maxillary sinus
- ❍ sphenoid sinus
- ❍ ethmoid sinus
- ❍ frontal sinus



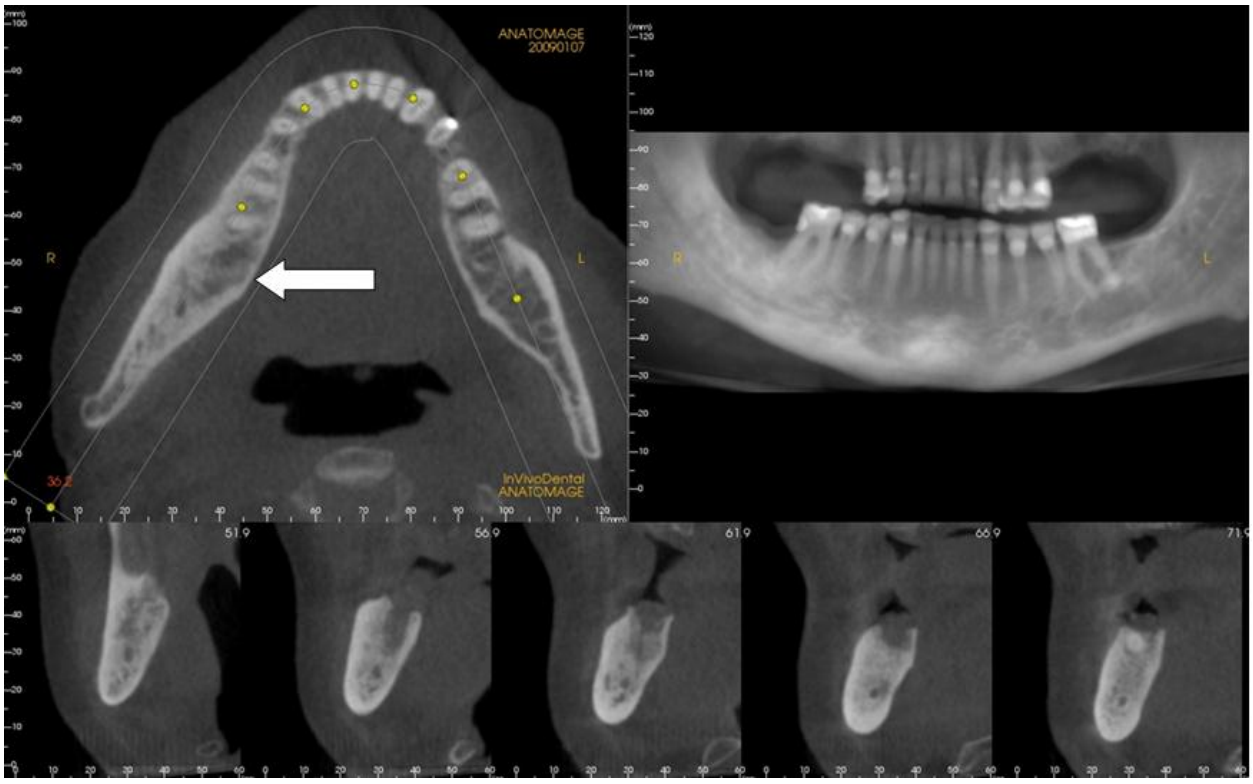
Case 1- Use the image above to answer questions #14 and 15.

14. The lesion above is most consistent with a _____ tumor.

- ❍ malignant
- ❍ benign
- ❍ neither of the above

15. Which is the category of disease most suggested by the radiographic and clinical findings?

- ❍ benign fibro-osseous lesion
- ❍ trauma
- ❍ benign odontogenic tumor
- ❍ malignancy



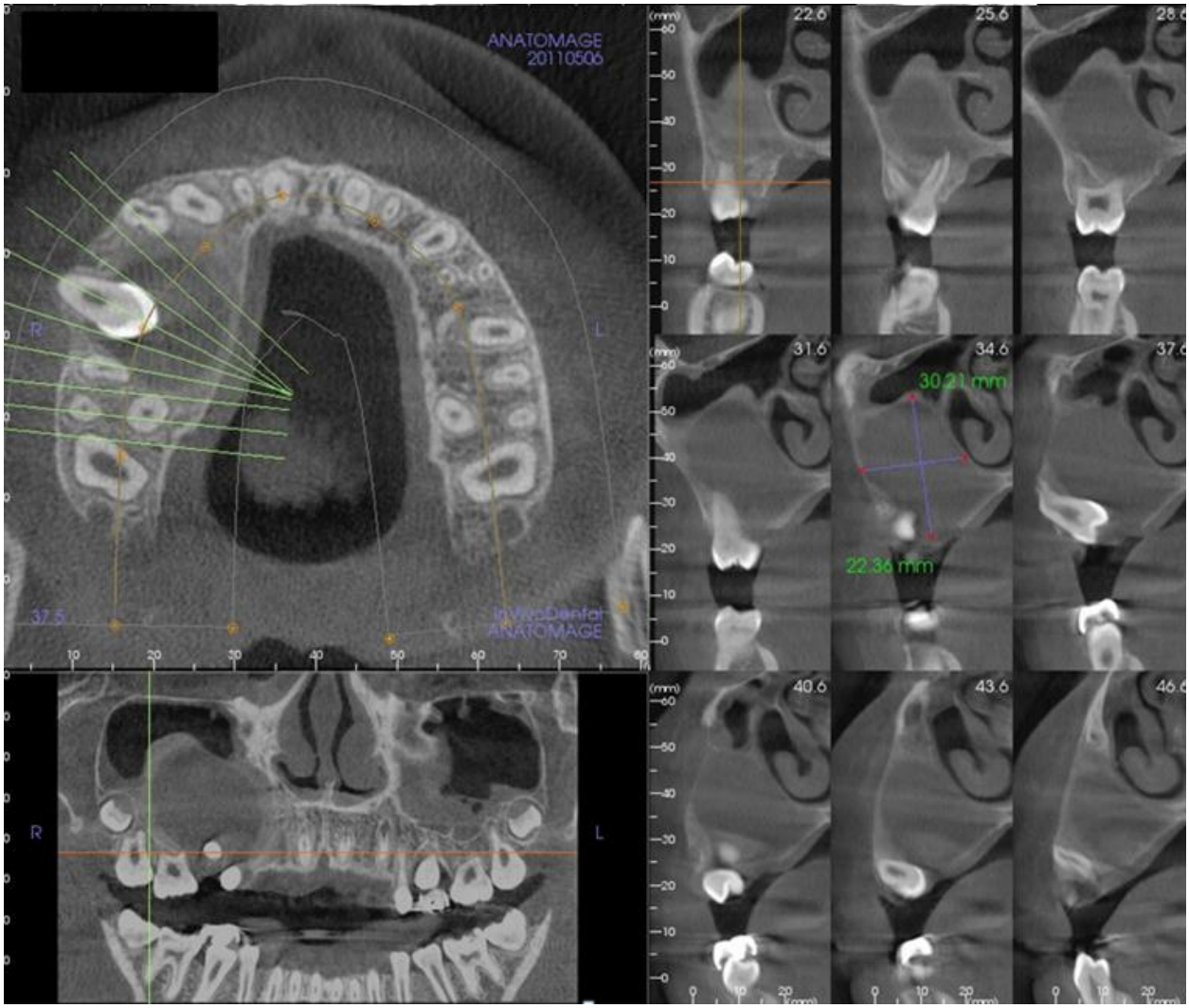
Case 2 - Use the image above to answer questions #16 and 17.

16. The lesion indicated be the arrow is found in which bone?

- ❍ maxilla
- ❍ hyoid
- ❍ mandible
- ❍ none of the above

17. This most appropriate pathologic category is:.

- ❍ benign tumor
- ❍ inflammation
- ❍ cyst
- ❍ systemic condition



Case 3 - Use the images above to answer questions #18 - 20.

18. This lesion can be described as a _____.

- ❍ well defined, partially corticated radiolucency
- ❍ ill defined, non corticated radiolucency
- ❍ a mixed density lesion
- ❍ none of the above

19. Based on the radiographic signs, which pathological category can be ruled out?

- ❍ cyst
- ❍ benign tumor
- ❍ systemic condition
- ❍ all of the above

20. One would anticipate that this disease process would present _____.

- ❍ bilaterally
- ❍ unilaterally
- ❍ as a generalized condition throughout both jaws
- ❍ none of the above

Feedback questions:

A. The CBCT module is helpful.

- ❍ Strongly Agree
- ❍ Agree
- ❍ Neither Agree nor Disagree
- ❍ Disagree
- ❍ Strongly Disagree

B. The module appropriately addressed all of the learning objectives.

- ❍ Strongly Agree
- ❍ Agree
- ❍ Neither Agree nor Disagree
- ❍ Disagree
- ❍ Strongly Disagree

Please list any CBCT subtopics in which you desire additional information:

Suggestions/Comments:

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