SMS

self-study course

course 3 | oct 2023

TWO CREDIT HOURS are issued for successful completion of this self-study course. These credit hours count toward your OSDB 2022-2023 biennium totals.

A NEW ERA

DENTAL IMAGING UPDATES and EXTRAORAL BITEWINGS

about this course...

The purpose of this self-study is to provide the dental professional with a review of necessary information regarding updates in dental imaging. This course will provide review current recommendations related to shielding during dental imaging, and explore the current research related to extraoral bitewings.

Similar to previous SMS self-study courses, this self - study is designed around the idea that there is always something to be be learned! The following content is designed to provide both recent graduates and experienced clinicians with evidence - based information that can be used during patient care. Specifically, this course is designed to aid the clinician in acknowledging and implementing, evidence-based dental imaging within their practice.

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course
03
oct 2023

A NEW ERA

DENTAL IMAGING UPDATES and EXTRAORAL BITEWINGS

learning objectives

Upon completion of this course, the participant will be able to:

- identify current standards for dental imaging
- recognize the importance of patient protection practices regarding dental imaging
- identify the current recommendations for minimizing the risks of cancer induction and heritable effects during dental imaging
- recognize available resources from the American Dental Association related to dental x-rays and exposure guidelines
- review the latest updates from the AAOMR regarding dental shielding
- review key points of evidence related to the current shielding recommendations from the AAOMR
- relate current personal practices to that of the AAOMR's recommended patient protective practices
- identify limitations of intraoral imaging
- examine the current evidence related to extraoral bitewings
- identify the current technology available for aquiring extraoral bitewings
- describe the application of SCARA technology in dental imaging
- identify the possible advantages of extraoral bitewings

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part one

dental imaging shielding updates

DENTAL IMAGING SHIELDING UPDATES

review

The use of x-rays plays a critical role in obtaining images of the oral and maxillofacial region for accurate patient diagnosis.[1,2] As imaging standards change, the dental professional must understand the significance of adopting evidence-based protocols. As long-standing guidelines evolve, acceptance is sometimes met with resistance. However, all areas of healthcare rely on providers to promote change that is driven by research. PART ONE of this self-study will review the newest publication of the American Academy of Oral and Maxillofacial Radiology (AAOMR), highlighting the updates regarding gonadal and thyroid shielding.

The AAOMR supports the use of dental images as a diagnostic tool, but encourages that dentists consider the advantages and limitations of different imaging techniques and customize the radiographic examination to meet the diagnostic needs of each patient.[3] Dental professionals should employ imaging techniques that minimize the patient radiation dose and ensure that the ALARA (as low as reasonably achievable) principle is appropriately applied.[1]

Similarly, in understanding specific effects of radiation exposure, the AAOMR supports radiation protection practices for patient care.[3] In their current recommendations for minimizing the risks of cancer induction and heritable effects, and eliminating the risk of tissue reactions, they detail ---

- ensuring proper selection criteria when prescribing images[2]
- using rectangular collimation during intraoral imaging to reduce 60% of patient dose[4,5]
- using the smallest field of view that encompasses the anatomy of interest during CBCT imaging
- using digital receptors for intraoral, panoramic, and cephalometric imaging

AAOMR *recommendations*

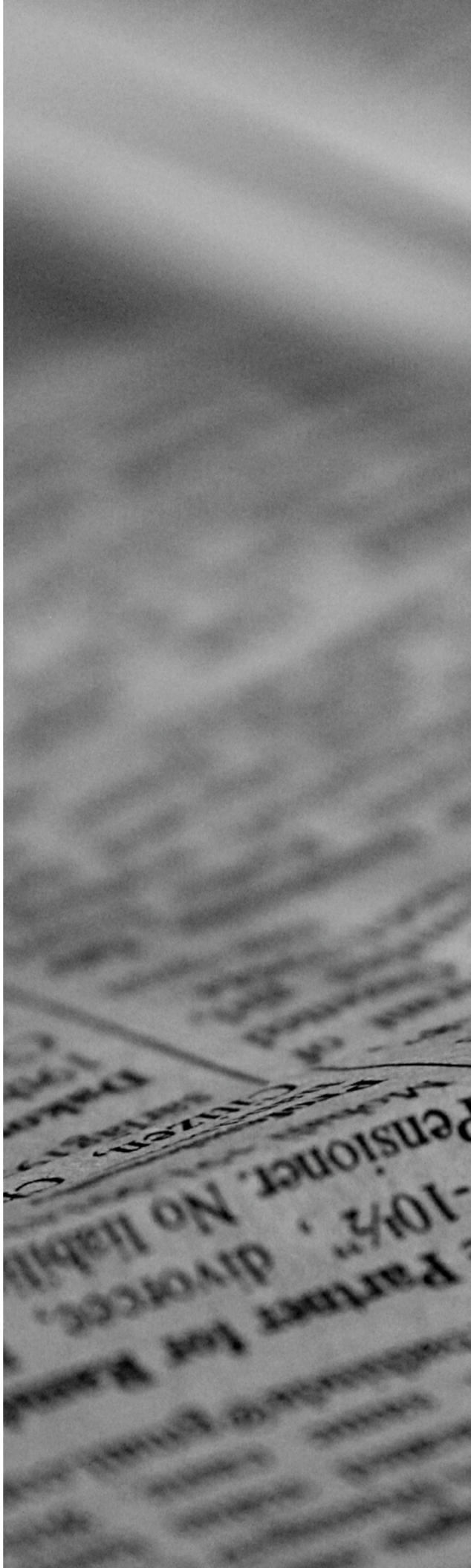
On August 1, 2023, the AAOMR published “Patient Shielding During Dentomaxillofacial Radiography” in the Journal of the American Dental Association, providing important updates related to patient safety during imaging.

An ad hoc committee was created to assess the historical implementation of patient shielding and the efficacy of such practice. Specifically, they aimed to draft evidence-based recommendations and clinical guidance for the application of patient contact shielding during dentomaxillofacial imaging.

The committee reviewed studies regarding dentomaxillofacial imaging to determine that the use of gonadal, pelvic structure, and thyroid shielding is no longer recommended.[3]

They released the following statement ---

“Considering the absence of radiation-induced heritable effects in humans and the negligible dose to the gonads and fetus from dentomaxillofacial imaging, the committee recommends discontinuing shielding of the gonads, pelvic structures, and fetuses during all dentomaxillofacial radiographic imaging procedures. On the basis of radiation doses from contemporaneous maxillofacial imaging, the committee considered that the risks from thyroid cancer are negligible and recommends that thyroid shielding not be used during intraoral, panoramic, cephalometric, and cone-beam computed tomographic imaging.”



SHIELDING *updates*

GONADAL & FETAL SHIELDING

For decades, the standard practice for shielding against x-ray exposure has been the use of lead aprons. However, recent research has prompted updated recommendations regarding this practice across various medical communities. While gonadal and fetal shielding is required by law during radiographic imaging in several US states, many organizations now support the non-use of lead aprons.

The AAOMR is one such organization & in their article, they reference resources from The National Council on Radiation Protection and Measurements (NCRP), the American Association of Physicists in Medicine (AAPM), and The British Institute of Radiology (BIR) to support their statement. The following summarizes each organization's published statements.

NCRP --- Using gonadal shielding during abdominal and pelvic radiography does not significantly reduce exposure risks in most cases. Additionally, it could unintentionally increase exposure when it obscures valuable diagnostic information.[6]

AAPM --- Discontinuing the routine use of gonadal and fetal shielding is recommended. It is noted that shielding may result in obstruction of anatomical information or interfere with automatic exposure control systems.[7]

BIR --- Shielding provides minimal or no benefit and professionals should focus on the effective areas of radiation protection to optimize patient exposure.[8]

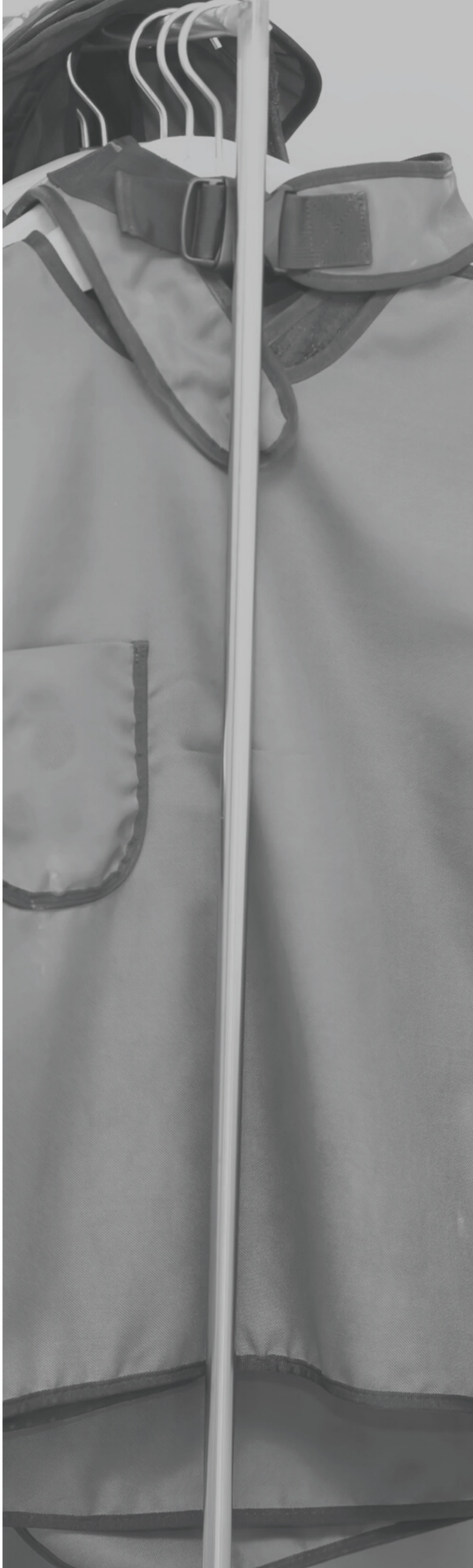
SHIELDING *updates*

GONADAL & FETAL SHIELDING (cont.)

In alignment with these organizations, the AAOMR's position specifically states that patient gonadal, breast, and fetal shielding during diagnostic intraoral, panoramic, cephalometric, and CBCT imaging should be discontinued as routine practice. Further, they support the revision of federal, state, and local dental regulations to reflect these new recommendations and encourage removal of any requirements related to shielding.[3]

Key points of evidence related to this decision include the following:

- There is an absence of heritable effects (genetic effects due to radiation) in humans.
- Image receptors and exposure optimization significantly impact and reduce patient dose.
- Shielding does not protect against internal scatter radiation and has not been shown to significantly decrease organ-absorbed dose.
- Scattered radiation from dental diagnostic images has been reduced to negligible effects.
- Effects on the human embryo and fetus of the pregnant patient are well below the threshold where tissue reactions may occur.
- Dental diagnostic imaging poses no risk of occurrence of prenatal death, growth retardation, microcephaly, and intellectual disability.
- Breast radiation dose and the subsequent risk of breast cancer are negligible, and the added benefit from shielding is insignificant & comparable to that of non-shielding.



SHIELDING *updates*

THYROID SHIELDING

The AAOMR states that patient thyroid shielding during diagnostic intraoral, panoramic, cephalometric, and CBCT imaging should be discontinued as routine practice. Further, they support the revision of federal, state, and local dental regulations to reflect these new recommendations and encourage removal of any requirements related to shielding.[3]

Key points of evidence related to this decision as outlined by the AAOMR in the include the following:

- Current patient protective practices in dentistry provide the best protection to the thyroid.
- Anticipated doses to the thyroid gland from the primary beam and internal scatter radiation are minimal relative to other imaging procedures.
- Digital imaging with CMOS (complementary metal-oxide semiconductor) sensors reduces thyroid dose by 50%.
- Rectangular collimation for intraoral imaging is estimated to reduce thyroid dose by 50% and is more effective than shielding.
- Current technology in extraoral imaging such as panoramic, cephalometric, and CBCT have resulted in negligible effects on the thyroid.
- Shielding may affect diagnostic quality of the panoramic and cephalometric images due to the chance of artifacts.
- Thyroid doses from CBCT imaging is within the range of those from intraoral imaging.

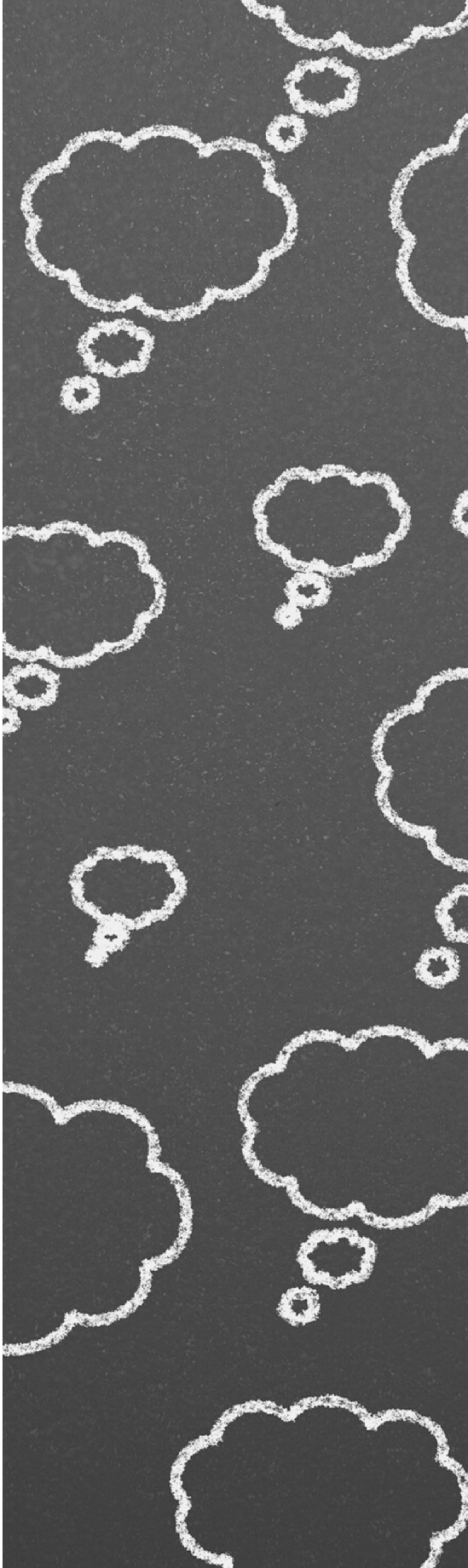
SHIELDING *considerations*

So, where does this information leave us as dental healthcare professionals? Many questions may have come to mind as you read through the evidence above. Maybe you even have concerns with some of the new recommendations. In considering the ALARA principle, one might argue that the simple act of using a shield is supportive of this, even if it only reduces the smallest amount of patient exposure. Another might highlight that shielding may have a psychological impact on patients, helping to reduce anxiety and promote a sense of safety during imaging. Comparatively, one might suggest that the AAOMR article comprehensively details the evidence for non-use of lead aprons. Further, they might impart the importance of aligning one's practice with evidence-based research. The purpose of this section has been to offer each of these thoughts and forward the discussion related to the current evidence available. Similarly, it has been created to highlight the newest evidence as outlined by the AAOMR and educate the reader on the "why." The AAOMR article is one resource, which cites many additional resources available at our fingertips.

As we align our practices with these new recommendations, it is imperative that radiation protection practices are implemented and adhered to. As you reflect on your current implementation of these practices, are you confident that you are providing the best care for the patient?

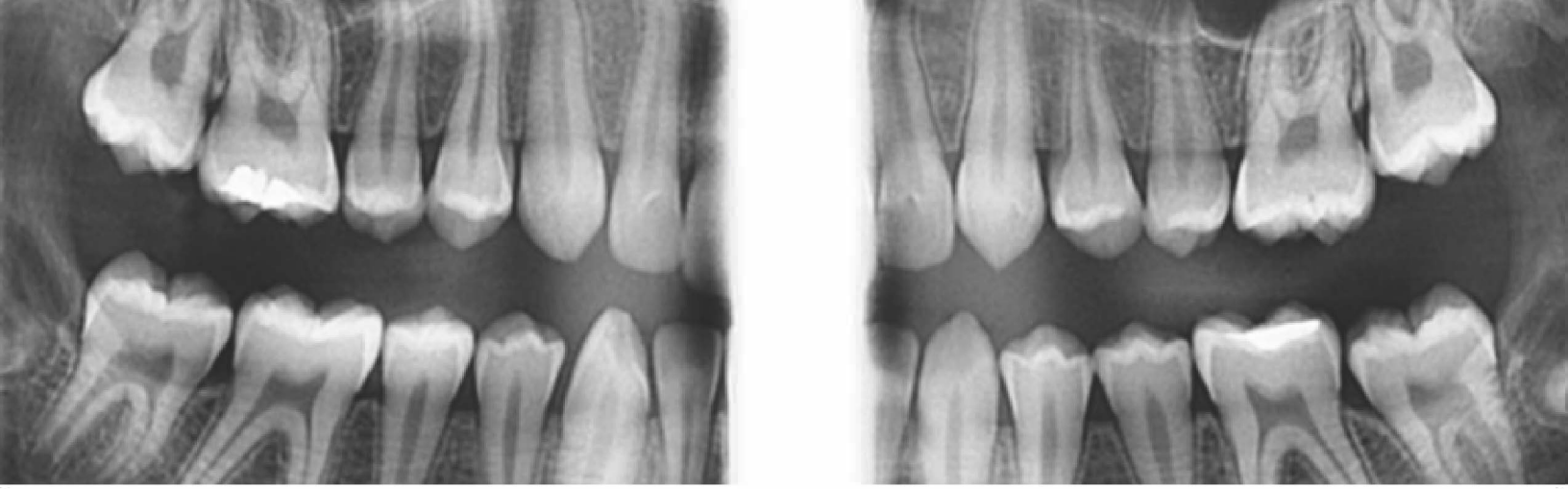
- Are you appropriately prescribing dental images (referencing the ADA/FDA recommendations)?
- Are you using rectangular collimation (especially in knowing that it reduces patient dose by 60%)?
- Are you using direct digital sensors and extraoral equipment with digital receptors (given that this technology offers the highest dose reduction)?

There is significant importance in acknowledging our role as we implement these practices to promote the highest quality of patient care.



part two

extraoral
bitewing imaging



EXTRAORAL
bitewing imaging

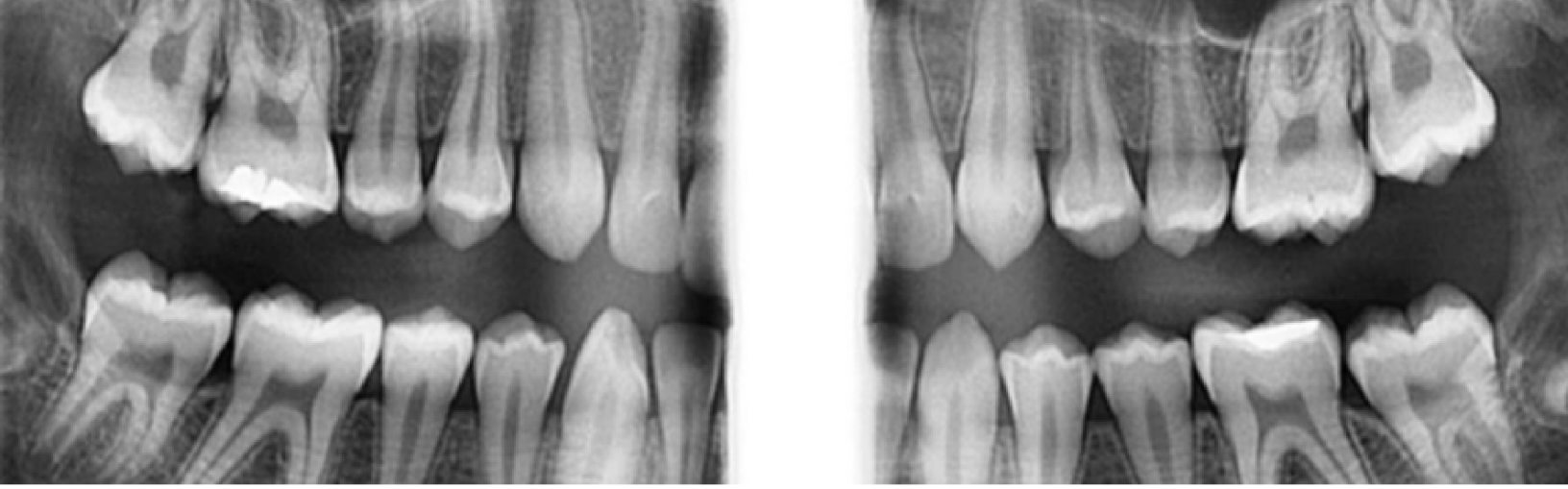
Imagine if capturing bitewing images was as simple as taking a panoramic image – how convenient would that be?

With the advancements in digital imaging, it is no longer wishful thinking! Technology for capturing extraoral bitewings is evolving, and improvements have created opportunity to discuss the current standards of bitewing imaging.

Intraoral bitewing images have been a standard of care for several decades and have been utilized as an adjunctive diagnostic tool.[2] However, in contrast to the benefits, there are some limitations to intraoral bitewing images. For instance, the size of the receptor or sensor used for intraoral bitewings often limits the number of teeth that can be captured in a single image. The placement of the receptor or sensor can cause discomfort for the patient, and/or induce coughing and gagging, which can lead to difficulty obtaining diagnostic images and increase the risk for re-exposing the patient. Additionally, the use and up-keep of recommended beam alignment devices that hold the sensor, as well as the need for proper infection control protocols, may impart additional costs.

Extraoral bitewing images, on the other hand, may offer some solution to these limitations. With the use of an extraoral sensor and the ability to capture multiple teeth in a single image, extraoral bitewings provide a more comprehensive view of the oral cavity --- a large diagnostic area is included that extends from the canine to third molar region and includes the crowns, roots and surrounding areas of bone. The placement of both the sensor and the bite stick outside of the mouth eliminates the discomfort for the patient. Most notably, less exposure time is needed to capture the single extraoral bitewing image as compared to the traditional four intraoral bitewings.

With the advancements in technology, dental professionals now have access to a range of imaging options to deliver quality care to their patients. Is it time to consider a new imaging standard? In PART TWO of this self-study, let's explore!

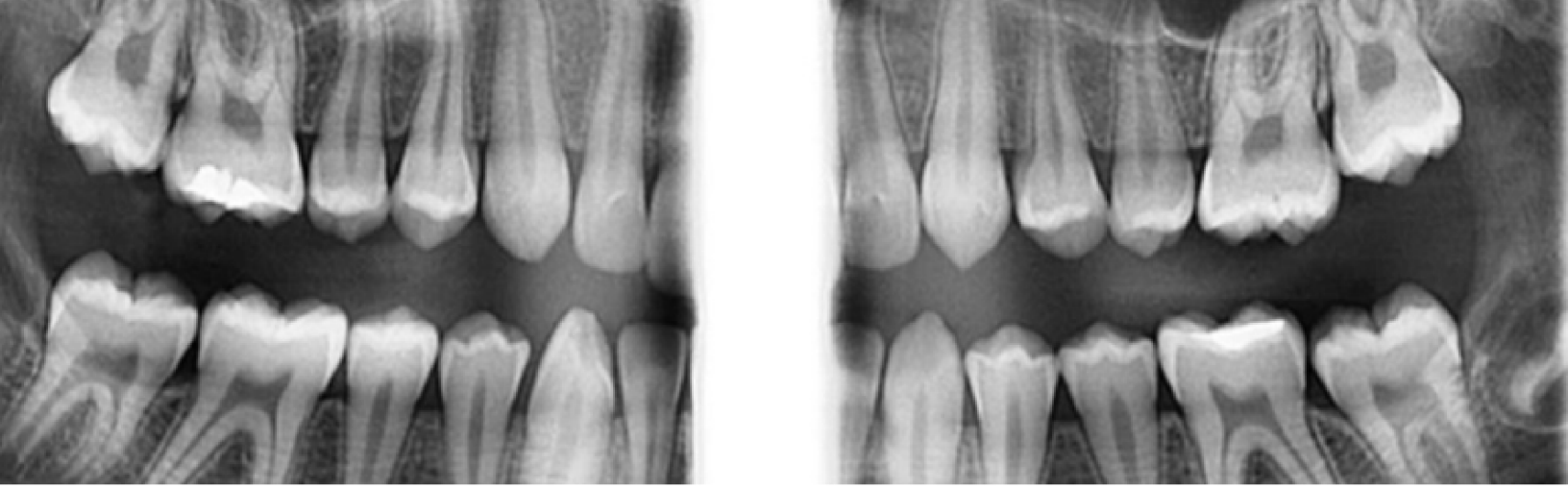


EXTRAORAL *bitewings*

While extraoral bitewings are available in dental imaging, there is still much to learn about their effectiveness. Current research presents some information on the comparison between extraoral images and intraoral images, but much has been focused on older technology. Moreover, there is limited evidence to support the quality and diagnostic efficacy of extraoral bitewing imaging. Currently, there are two available types of extraoral bitewings, which are segmented and diagnostic.[9,10] Segmented bitewing images are derived from a panoramic image, using the same traditional technology as when obtaining a panoramic image. Diagnostic extraoral bitewings are acquired through use of a patented Selectively Compliant Articulated Robot Arm (SCARA) technology which is available from specific manufacturers and ensures open interproximal spaces. This technology utilizes a fully programmable 3-axis robot arm to control the rotation and angles of the x-ray beam aimed perpendicular to the long axis of the patient's teeth.[9]

There is limited discussion regarding the use of extraoral bitewing images in the supported literature from the ADA & FDA. In "The Selection of Patients for Dental Radiographic Examination" the ADA/FDA supports the use of digital imaging but does not specify the use of extraoral bitewings. Rather, there is a more generalized focus on providing appropriate recommendations regarding the prescribing of images and patient protection practices.[2]

Specifically, the ADA supports the use of digital imaging, the reduction of patient exposure, and proper patient care.[2] Considering the SCARA capabilities of some extraoral units, clinicians may replace intraoral bitewings with a single extraoral image, resulting in reduced exposure. An added benefit of this technology may include the ability to ensure open interproximal contacts with each exposure, reducing the risk for exposing non-diagnostic images, ultimately eliminating the need for image 're-takes.' Further, following the COVID-19 pandemic, the opportunity to reduce aerosol exposure may be another benefit for the use of extraoral bitewings.



EXTRAORAL *bitewings*

DIAGNOSIS of CARIES & BONE LOSS

Using extraoral bitewing images may provide valuable evidence that supports caries diagnosis and the detection of crestal bone levels. In a 2018 study, it was found that extraoral bitewings may provide greater identification of caries, as well as better detection of bone loss, as compared to intraoral images. However, it is important to understand the limitations of the associated study. The criterion for comparison included intraoral bitewing images as the reference standard, although there was uncertainty if intraoral images were the appropriate standard to use for this comparison. In using intraoral images as a reference, it was determined that extraoral bitewing images presented with a moderate level of 'false-positives' in regard to caries detection, and a high level of 'false-positives' for bone loss diagnosis.

An ex-vivo study in 2016 explored the detection of enamel proximal caries on extracted teeth, using intraoral and extraoral imaging techniques. The results concluded that there was no significant difference in diagnostic accuracy between the three (PSP, CMOS, extraoral bitewing) radiographic techniques.[10] Evidence supported that extraoral bitewings may be used in the detection of enamel proximal caries with intraoral bitewing technology comparable with PSP (photostimulable phosphor) plates and CMOS (complementary metal oxide semiconductor) sensors. Further evaluation of this study does present with some notable limitations such as it being an in-vitro study, eliminating the reproduction of tight or overlapping contacts, patient positioning errors, and possible soft tissue effects on scatter radiation. Previous ex-vivo studies have evidenced findings that both support and present different findings, adding to the uncertainty of the diagnostic quality of extraoral bitewing imaging.[11,12,13] With each study, these limitations should be acknowledged and considered as future research is conducted.

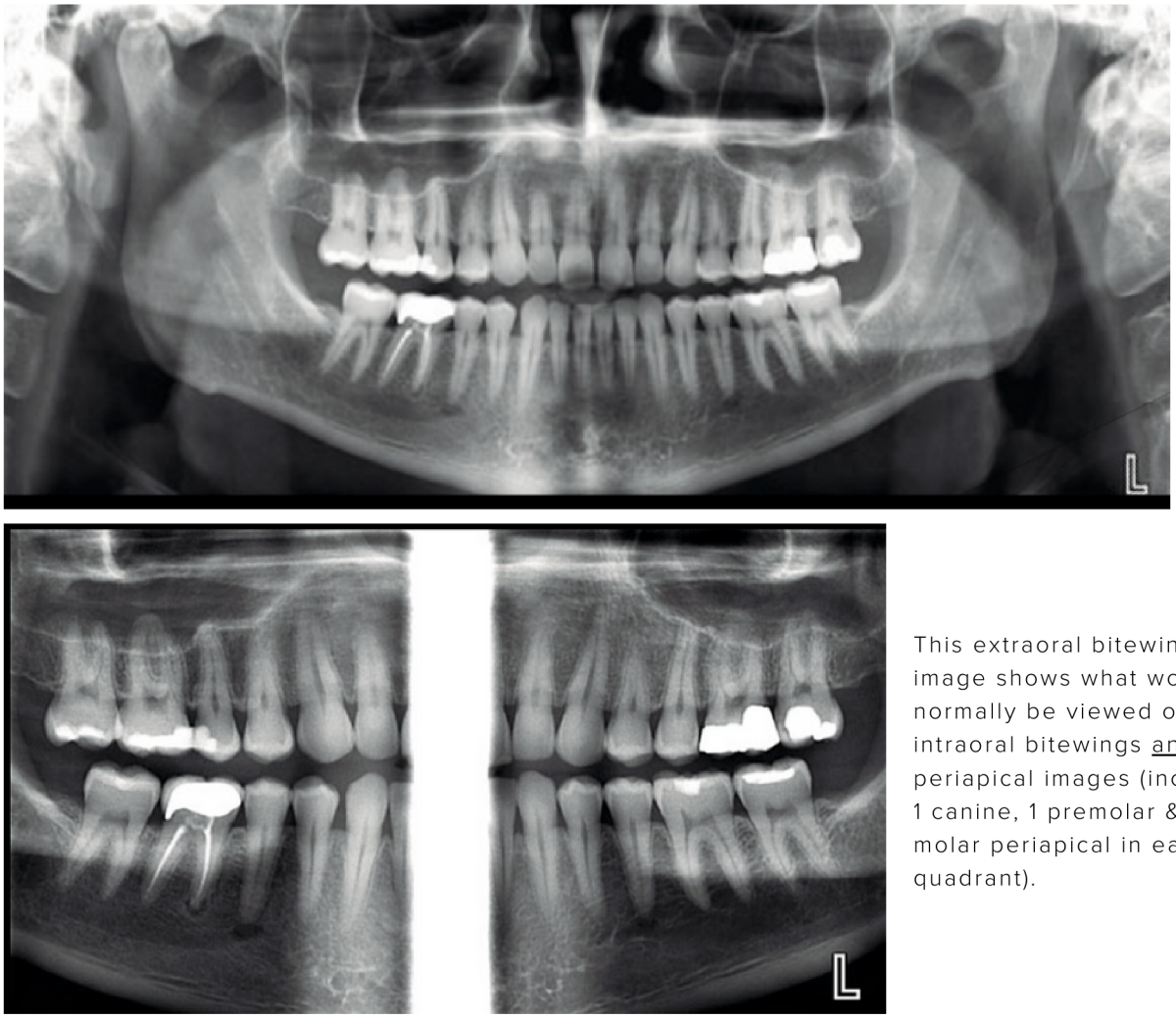
EXTRAORAL *bitewings*

INFECTION CONTROL

The COVID-19 pandemic presented the dental community with several patient and provider considerations.[14] The essential need for dental images as an adjunct to clinical diagnosis prompted decisions related to the prescribing of images. Simply, concerns related to aerosol generation during intraoral imaging were identified. Coughing, gagging, and saliva secretion, are known as possible results of intraoral sensor use, leading to increased risk of aerosols.[15] As such, the ADA recommended avoiding or decreasing the prescribing of intraoral images during the COVID-19 pandemic.[16] The AAOMR recommended similar suggestions, providing a flow chart for determining the necessity of an intraoral image over an extraoral image. In the same study, they highlighted the option for extraoral bitewings, but did not provide a strong case for substituting intraoral imaging with this option.[17]

Implications for dental imaging in the UK at the height of the pandemic were very similar to that of America. A study published in the British Journal of Radiology (BIR) presented evidence that extraoral bitewings were a suitable alternative to sectional panoramic radiographs, when extraoral images were preferred over intraoral images, due to the risk of aerosol generation. It was discovered that they provided high-quality images with a lower radiation dose. Retrospective evaluation of this evidence may provide further understanding of the advantages of extraoral bitewings.[18]

EXTRAORAL *bitewings*



This extraoral bitewing image shows what would normally be viewed on 4 intraoral bitewings and 12 periapical images (includes 1 canine, 1 premolar & 1 molar periapical in each quadrant).

ADVANTAGES

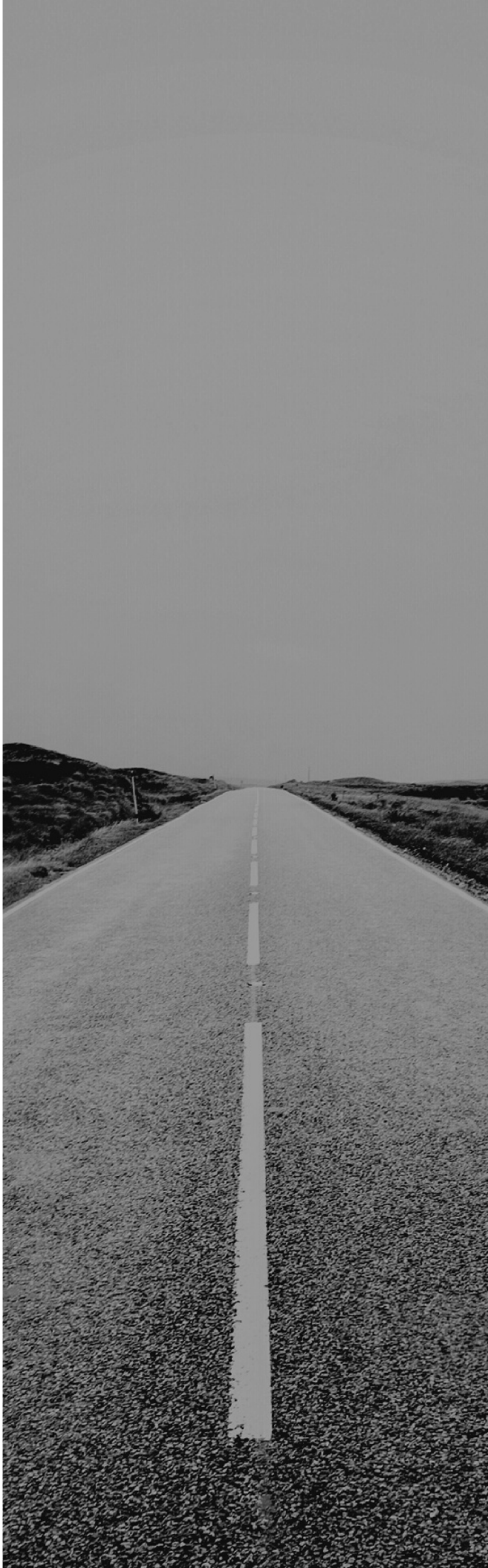
The advantages of diagnostic extraoral bitewings using SCARA technology may include the following:

- no intraoral sensor is used
- an enhanced patient experience results with no gagging or discomfort
- patient receives less radiation exposure than with four intraoral bitewings
- less operator time is needed for exposure than with four intraoral bitewings
- a large diagnostic area is included from the canine to third molar region that includes crowns, roots and surrounding areas of bone

EXTRAORAL *bitewings*

A NEW ERA

Provided that this technology is available for use, there is a significant need for additional research to support its efficacy. There is a further need to examine the quality of the images that are produced, to know if they are valuable for caries and periodontal diagnosis. The opportunity to utilize technology that has the potential to provide better patient care should be at the forefront of research. As you have read through the current evidence surrounding extra oral bitewings, consider how exciting it could be to have this technology available in your everyday practice! Perhaps exploring new research regarding extraoral bitewing imaging may facilitate a new era in dental imaging.



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course

RESOURCES

There are numerous resources on available for patient education on dental imaging and for exploring the recommendations provided by the AAOMR and the ADA. The resources linked on this page include 'just a glimpse' into all that is offered!

by AAOMR

Dental Professionals | Resources

Patient Shielding | Dentomaxillofacial Radiography

by ADA & FDA

Dental Radiograph Recommendations

* additional resources available upon request

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course
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oct 2023

RELEASE DATE
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- **REVIEW COURSE MATERIALS & COMPLETE QUIZ**
  complete 10-question quiz / 75% must be correct to pass
  you will be informed instantly if you pass the course and receive an email with a CE certificate for 2.0 hours and course evaluation
- **FREQUENTLY ASKED QUESTIONS**
  click here for FAQ on how to register, password re-sets, how to access past certificates and course history

questions

- **WHO can EARN FREE CE CREDITS?**
  EVERY dental professional in your office
- **HOW MANY CE CREDITS are EARNED?**
  two CE credits are issued for successful course completion --- credits count toward OSDB 2022-2023 biennium totals
- **WHAT if I MISS THE DEADLINE?**
  submit answers by deadline to receive credits at no charge
  after deadline, course can be purchased until end of biennium
- **WHEN are SMS COURSES OFFERED?**
  Four times per year (totaling 8 free CE credits)
- **HOW do I obtain the CERTIFICATE?**
  certificate is available online following test completion
- **WHAT is my SMS NUMBER?**
  everyone in your office uses the same SMS number (office account number) - number is on label on back of test envelope)

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