

Center for Diagnostic Sciences BULLETIN



March 2005

Issue #10

This bulletin focuses on Digital Imaging. We thank Dr. Parish Sedghizadeh for his contribution to this issue. As always, we invite your comments, questions, and suggested topics for future bulletins. Please forward your comments to Anisa Marino at anisamar@usc.edu.

Lessons learned from history: Digital radiography in the new era.

When ionizing radiation was discovered in 1895, it was touted as a fountain of health. X-rays were being used to photograph bones, and when Mademoiselle Curie discovered radium in 1898 as a source of radiation, it immediately found its way into innumerable drinks, tonics and even crop fertilizers. Dial hands on clocks were painted with the substance so that they would glow. Subsequently, when radon was discovered, it was sold as “radon emanation” inhalers, and an article in Medical Life Magazine in 1925 claimed that radon treatment had cured at least 27 illnesses, ranging from asthma to anemia. As one physician explained, “it is extremely doubtful if there is any counter-part in the history of therapeutics to the foregoing success with a novel remedy.” Even dentistry utilized radiation therapy for the treatment of gingivitis and periodontal disease up until the mid-1900’s. Obviously, none of these practices or products is used today because of the known dangers of radiation. Today in dentistry we drape patients with lead aprons from their thyroid down to their gonads during x-rays in order to prevent radiation from penetrating these tissues. We do this because we know from research that these tissues are highly susceptible to radiation-induced disease. Most skin cancers, for example, are now known to be caused by UV-radiation from the sun; this was not so evident several decades ago. Furthermore, we are naturally exposed to minimal “background” radiation on a daily basis. Interestingly, though, it is the large amount of data from Hiroshima, Nagasaki and Chernobyl that have played the most crucial roles in our understanding of radiation effects (short-term and long-term), and have helped set radiation exposure standards globally. The current philosophy is “less radiation is better,” as compared to the “more is better” attitude that dominated the last century. This is in accordance with

one major advantage of digital radiography...*a significant reduction in radiation exposure.*

What role can I play in reducing patient exposure to radiation?

You play the most important role, because it is the clinician that orders radiographs; as such you significantly affect patient exposure to radiation. For example, you could order a full mouth x-ray series, panoramic x-ray, occlusal x-ray, lateral cephalometric x-ray, and a head and neck computerized tomography (CT) scan for every patient you see here at USCSD without question; but why would you do that for all patients other than for billing them and exposing them to unnecessary radiation? When prescribing radiographs, clinicians follow an important radiography principle: balance harm to the patient from radiation exposure on the one hand, with the health benefit achieved from radiographic diagnosis, evaluation or therapy on the other hand. One way this is taught is with the acronym ALARA: As Low As Reasonably Achievable. For dentists specifically, there are guidelines and recommendations by the American Dental Association (ADA) and the Food and Drug Administration (FDA) for prescribing dental radiographs. It is these guidelines that set the standard of care.

So what do I need to know before ordering radiographs in order to be at the standard of care?

There are a few questions you should ask yourself before ordering a radiograph or any other imaging study for your patient for that matter. They are as follows and will be discussed in more detail to follow:

- 1) What am I looking for in this patient?
- 2) What are the available imaging studies to evaluate potential disease?
- 3) Which imaging study do I want?

1) What am I looking for in this patient?

This is basically a clinical assessment of disease, or the risk for disease, that should be performed before any imaging study is ordered. Radiographs are only indicated when there is *clinical evidence* of abnormality, or when the probability or prevalence of disease is high enough to justify the study, such as the recommendation by the National Cancer Institute that women over age 40 have yearly mammograms because of their increased risk for developing breast cancer, even without evidence of a clinically palpable mass. Radiographs may also be necessary in cases where a clinician needs to plan a procedure, such as surgical extraction of teeth near a sinus, that may be associated with complications that can be better anticipated and understood through the use of an imaging study for surgical planning and informed consent. In each case, a clinical assessment should be made as to what study to perform based on factors such as patient age, medical and dental history, general health, oral health (diet/hygiene), clinical examination findings, and, sometimes, the procedure or therapy to be performed. Imaging studies should not be performed to look for occult disease (conditions with no signs or symptoms). Also, an assumption is made that the interproximal surfaces of anterior teeth, or even posterior teeth with sufficiently open contacts for visualization, can be adequately evaluated using transillumination in many cases instead of x-rays. Therefore, a full mouth series (FMX) and panoramic x-ray (PAN) for every patient is inappropriate and does not take into account individual clinical findings in each patient that radiographic decision-making should be based on.

2) What are the available imaging studies to evaluate potential disease?

Today, ordering a radiograph is in some respects similar to prescribing antibiotics for a patient. Almost any clinician can write a prescription for almost any imaging study, including conventional radiographs (FMX, PAN, lateral ceph, etc.) and advanced imaging studies (CT, MRI, PET, etc.). A patient can go with a prescription from a clinician to most radiology clinics or centers, have the imaging study performed, and then return to the prescribing clinician with copies of the images and a report from a radiologist interpreting the study. So why don't we order head and neck CT scans for every patient?

We have the Redmond Imaging Center here in the building which has a CT machine, and it would be almost as easy as taking an FMX. Needless to say, this is inappropriate for every patient. The radiation exposure is greater from a CT scan as compared to a conventional radiograph. Remember that the goal is to maximize diagnostic potential but minimize patient exposure, so a CT scan for every patient is overkill and is not based on individualized clinical assessment.

3) Which imaging study do I want for my patient?

Below is a table summarizing some of the recommendations by the ADA and FDA for taking conventional dental radiographs. Recommendations for evaluation of growth and development have been excluded. Please keep in mind that the recommendations are subject to clinical judgment and may not apply to every patient, especially in cases requiring advanced imaging, again reinforcing the individualized nature of radiographic decision-making.

GUIDELINES FOR DENTAL RADIOGRAPHS

The recommendations in this chart are subject to clinical judgment and may not apply to every patient. They are to be used by dentists only after reviewing the patient's health history and completing a clinical examination. Because every precaution should be taken to minimize radiation exposure, protective thyroid collars and aprons should be used whenever possible. This practice is strongly recommended for children, women of childbearing age and pregnant women.

TYPE OF ENCOUNTER	PATIENT AGE AND DENTAL DEVELOPMENTAL STAGE				
	Child with Primary Dentition (prior to eruption of first permanent tooth)	Child with Transitional Dentition (after eruption of first permanent tooth)	Adolescent with Permanent Dentition (prior to eruption of third molars)	Adult, Dentate or Partially Edentulous	Adult, Edentulous
New Patient * being evaluated for dental diseases and dental development	Individualized radiographic exam consisting of selected periapical/occlusal views and/or posterior bitewings if proximal surfaces cannot be visualized or probed. Patients without evidence of disease and with open proximal contacts may not require a radiographic exam at this time.	Individualized radiographic exam consisting of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images.	Individualized radiographic exam consisting of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images. A full mouth intraoral radiographic exam is preferred when the patient has clinical evidence of generalized dental disease or a history of extensive dental treatment.	Individualized radiographic exam, based on clinical signs and symptoms.	
Recall patient* with clinical caries or at increased risk for caries**	Posterior bitewing exam at 6-12 month intervals if proximal surfaces cannot be examined visually or with a probe			Posterior bitewing exam at 6-18 month intervals	Not applicable
Recall patient* with no clinical caries or at increased risk for caries**	Posterior bitewing exam at 12-24 month intervals if proximal surfaces cannot be examined visually or with a probe		Posterior bitewing exam at 18-36 month intervals	Posterior bitewing exam at 24-36 month intervals	Not applicable
Recall patient* with periodontal disease	Clinical judgment as to the need for and type of radiographic images for the evaluation of periodontal disease. Imaging may consist of, but is not limited to, selected bitewing and/or periapical images of areas where periodontal disease (other than nonspecific gingivitis) can be identified clinically.				Not applicable
Patient for monitoring of growth and development	Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development		Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development. Panoramic or periapical exam to assess developing third molars	Usually not indicated	
Patient with other circumstances including, but not limited to, proposed or existing implants, pathology, restorative/endodontic needs, treated periodontal disease and caries remineralization	Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring in these circumstances				

*Clinical situations for which radiographs may be indicated but are not limited to:

A. Positive Historical Findings

1. Previous periodontal or endodontic treatment
2. History of pain or trauma
3. Familial history of dental anomalies
4. Postoperative evaluation of healing
5. Remineralization monitoring
6. Presence of implants or evaluation for implant placement

B. Positive Clinical Signs/Symptoms

1. Clinical evidence of periodontal diseases
2. Large or deep restorations
3. Deep carious lesions
4. Malposed or clinically impacted teeth
5. Swelling
6. Evidence of dental/facial trauma
7. Mobility of teeth
8. Sinus Tract (“fistula”)
9. Clinically suspected sinus pathology
10. Growth abnormalities
11. Oral involvement in known or suspected systemic disease
12. Positive neurologic findings in the head and neck
13. Evidence of foreign objects
14. Pain and/or dysfunction of the temporomandibular joint
15. Facial asymmetry
16. Abutment teeth for fixed or removable partial prosthesis
17. Unexplained bleeding
18. Unexplained sensitivity of teeth
19. Unusual eruption, spacing or migration of teeth
20. Unusual tooth morphology, calcification or color
21. Unexplained absence of teeth
22. Clinical erosion

**Factors increasing risk for caries may include but are not limited to:

1. High level of caries experience or demineralization
2. History of recurrent caries
3. High titers of cariogenic bacteria
4. Existing restoration(s) of poor quality
5. Poor oral hygiene
6. Inadequate fluoride exposure
7. Prolonged nursing (bottle or breast)
8. Frequent high sucrose content in diet
9. Poor family dental health
10. Developmental or acquired enamel defects
11. Developmental or acquired disability
12. Xerostomia
13. Genetic abnormality of teeth
14. Many multisurface restorations
15. Chemo/radiation therapy
16. Eating disorders
17. Drug/alcohol abuse
18. Irregular dental care

Did you know?

UPCOMING EVENTS

Division of *Diagnostic Sciences & Division of Health Promotion, Disease Prevention and Epidemiology*
Training/Presentations

Oral Cancer Awareness Training

Presented by: Dr. David Crowe, BS, DDS, DMSc
Associate Professor, Division of Diagnostic Sciences
USC, School of Dentistry

&

Dr. Parish Sedghizadeh, BS, DDS, MS
Asst Prof, Division of Diagnostic Sciences
USC, School of Dentistry

Friday, March 18

12pm-1:30pm

Allman Room

Tuesday, March 22

12pm-1:30pm

Grading Room

Monday, March 28

12pm-1:30pm

Grading Room

Smoking Cessation

Presented by: Dr. Kimberly Hiroshige-Okumura, DDS

Clin Assistant Professor, Division of Health Promotion, Disease Prevention and Epidemiology
USC, School Of Dentistry

Friday, March 25

12pm-1:30pm

Guggenheim

Smoking Cessation

Presented by: Dr. Alexander Cao, Pharm.D., CDM

Adjunct Assistant Professor of Pharmacy Practice Clinical Pharmacist/Clinical Coordinator USC Community Pharmacies

Wednesday, April 27

12pm-1:30pm

Guggenheim

Faculty Development-ADA Guidelines for Prescribing Dental Radiographs

Presented by: Dr. Parish Sedghizadeh, BS, DDS, MS

Asst Prof, Division of Diagnostic Sciences
USC, School of Dentistry

Wednesday, March 9

12pm-1:30pm

Rutherford

Wednesday, April 13

12pm-1:30pm

Rutherford

Did you also know?

**Number of Patients *Screened, Accepted, Rejected & Redirected* in the Center for Diagnostic Sciences
from January 1, 2005-February 24, 2005**

