

CBCT: Patient Preparation and Safety



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Lecture Objectives:



Manitoba's Faculty of Dentistry

Patient Protection and Safety:

- UNDERSTAND THE PURPOSES OF PATIENT SAFETY AND PROTECTION
- APPLY PATIENT SAFETY MECHANISMS IN YOUR PRACTICE:
 - patient safety
 - patient positioning
 - patient preparation
 - patient alignment
 - imaging stents
- CBCT ROOM STANDARDS



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Presenter Disclosure

- **Faculty Member:** Dr. Meredith Brownlee
- **Relationships with commercial interests:**
 - None to report



Importance of Radiation Safety and Protection

- Individual level of radiation reduction:
 - patient
 - radiation worker (dentist or staff member)
 - member of the public
- Effects of ionizing radiation are cumulative throughout life, so each dose adds up
- Goal to protect all tissues from ionizing radiation, but even more so the radiosensitive tissues including eyes, salivary glands, gonads, thyroid



Background Radiation Sources

Fig. 3-1 White and Pharoah,
from NCRP Report 160



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External Radiation Sources:

Fig. 3-2, White and Pharoah,
from the NCRP Report 160



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Tissue Weighting Factors	W_T
Red bone marrow, breast, colon, lung, stomach	0.12
Gonads	0.08
Bladder, esophagus, liver, thyroid	0.04
Bone surface, brain, salivary glands, skin	0.01



Radiosensitivity Review

- Laws of Bergonié and Tribondeau:
- Radiosensitive cells are:
 - rapidly dividing
 - have the longest mitotic potential
 - undifferentiated cells
- EXCEPTIONS:
 - oocytes and lymphocytes



Medical Imaging

- MSCT used on children and juveniles for justified diagnostic indicated purposes resulted in 25% of them developing neoplasms within 10 years (Pearce et. al. 2012)
- There is a call out for similar studies worldwide to help in documenting the effects of diagnostic radiation doses on the increase in stochastic effects (cancer and heritable defects)



Dental Imaging

- Although dental imaging comprises only 0.26% of external radiation exposure to the average US citizen, the increased utilization of CBCT will show an increase in this percentage the next few years at an alarming rate
 - this is particularly of concern regarding the inappropriate use of CBCT for orthodontic patients
 - even a small increase in the dental use of CBCT increases the risk of radiation-induced cancers in the pediatric population 2-3 times greater than in a patient that is 35 years of age, and 10-15 times greater than an adult aged 70 years (Peck and Samei)



Population Level

- Now, take all of the individuals in the population
 - public
 - radiation workers
 - patients
- Total all of the X-radiation exposures
- By making better clinical decisions on imaging decreases the individual dose, but once tallied, can make a dramatic decrease in the population dose, thus decreasing stochastic effects that may be passed on to future generations
 - e.g. antibiotic therapy abuse leading to antibiotic resistant bacteria



Patient Safety

- Use lead apron for every patient to cover the shoulders and torso
- Use a thyroid shield if it does not interfere with the imaging of the region of interest
 - MUST be a minimum of 1 inch below inferior border of FOV, otherwise results in artifacts and decreased image quality
- Instruct the patient to close their eyes when utilizing the laser positioning



Patient Positioning

- CBCT machine parts:
 - bite block or chin rest
 - head rest
 - head restraints
 - additional seat heights (props)
- Apply appropriate infection control protocols (Universal precautions)
- Select acquisition settings on the CBCT machine



Patient Preparation

- “Top Down” Technique:
 - hair pins, barrettes, elastics, etc.
 - eye glasses
 - piercings, as best as possible
 - removable dentures out, unless being utilized as a radiographic guide
 - removable orthodontic appliances
 - necklaces
- Insert any radiographic guide or stent for image acquisition purposes



Documentation

- Review the imaging prescription/referral
- Record in CBCT exposure log:
 - acquisition settings
 - date
 - name
 - chart number
 - age, gender
 - DAP
- Record any retakes made



Patient Alignment

- Align the patient's head in the neutral anatomical position or adjust to Frankfort horizontal plane
 - this can pose a challenge in older patients with exaggerated cervical curvature or DJD of the neck
- Utilize the radiographic scout mode to select the ideal size and position of FOV prior to exposing a volumetric acquisition
 - Scout mode produced a PA and a lateral cephalometric images





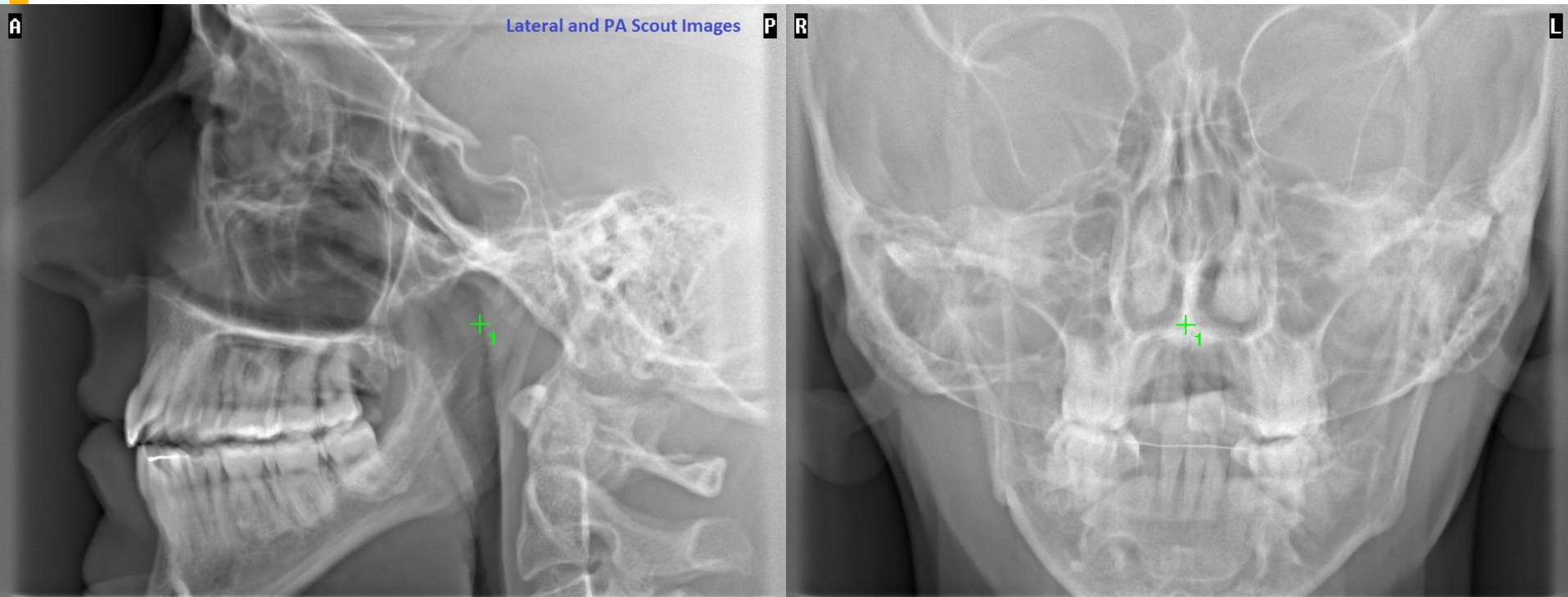
Source: Dr. M. Brownlee



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Radiographic Scout Images



Source: Dr. M. Brownlee



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Patient Alignment Common Issues

- Malocclusions (Class II and III)
- Edentulous patients:
 - holding steady without dentures in
 - dentures used for imaging (acrylic only)
- Surgical guides/stents can alter the VDO and relationship to the center of rotation (ensure these are in place prior to taking scout images)
- Excessive Curve of Spee
- Rotational clearance of gantry/sensor/source
- Accessibility for wheelchairs



A Few Words on Stents

- There are many shapes and forms of radiographic stents/guides
- All of them should be tried in clinically by the referring dentist prior to the imaging appointment to ensure that it is fully seatable
- Some prop the patient open more than others, which may result in retakes or needless acquisition of a larger FOV (decreasing spatial resolution)
- Should include definitive radiopaque material to allow assessment of the implant site



CBCT Room Standards

- You must be able to visualize the patient during acquisition of the CBCT volume
- Walls must meet provincial regulation of adequate shielding from the X-ray radiation
- Must be an enclosed space due to the CBCT rotating the beam 180-360 degrees
- May require additional shielding than a Pan/Ceph machine, so if replacing an older machine, ensure that Radiation Safety and Protection has come to assess the space adequately



Quality Assurance

- QA and QC testing ensure that the CBCT images acquired are of the utmost caliber for diagnostic purposes
- Each machine will vary in the manufacturer's requirements for QA testing
- Various tasks are required daily, weekly, monthly and annually
- These are detailed in the owner's manual



Questions?

- All images in this lecture are sourced and/or credited to Dr. Meredith Brownlee, unless otherwise noted



References

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