Cone Beam Imaging in Patients with Temporomandibular Disorders.

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3D CBCT vs Traditional 2D
Resolution

Pixel  Voxel
Types of CT Scanners

Based on X-Ray Beam Geometry

• Fan Beam
• Cone Beam
Traditional Fan Beam CT Technology

- Fan Shaped Beam
- Rotating Gantry
- Intrascan Dynamic Patient Positioning
- Multiple Axial Slices
- Axial Reconstruction
- Helical
- Multi Arrays of Detectors
Cone Beam Technology
Advantages of CBCT vs Traditional MDCT

• Entire Volume with One Scan
• True Orthogonal Image
• Significant Reduction in Radiation
• Rapid Scan Time
• No Overlap of Slices
• Reduced Motion Artifact
• In-Office Convenience
• Display Modes Unique to Maxillofacial Imaging
for 3-D Views
MPR and Slices
I Have TMJ
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Anatomy

TMJ: The temporal and the mandible, the maxillary and mandibular dental arches (teeth) are supporting units.
The joints are attached by ligaments.
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Intermediate Zone

Posterior Border

Anterior Border
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TMJ Disorders:
Soft Tissue: Intracapsular disorders:
Internal derangement with reduction without reduction reduction (Closed lock)
Soft Tissue imaging: MRI
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TMJ Disorders:
Hard Issue Findings
Different Imaging Techniques:
- Panoramic,
- Transcranial,
- Tomography,
- Arthrography,
- Cone Beam Scan
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Cone beam technology:

The images that were reviewed were taking by i-CAT scanner
Effective Dose Comparison

- i-CAT 8.5 second scan: \(68\) uSv
  
  *Exposure is in “Pulsed” mode, actual exposure time is about 3.5 seconds for a 20 second scan*

- i-CAT 5 second scan: \(34\) uSv

- Daily background: \(8\) uSv

- Panoramic (Average): \(10-15\) uSv
  
  Digital Panoramic \(4.7 – 14.9\) uSv
  
  Highest Film Pan \(26\) uSv

- Full mouth series: \(150\) uSv

- Medical CT \(1200-3300\) uSv*

Dr. Sharon Brooks, Dept. of Radiology, University of Michigan

*Dr. Stuart White, Dept. of Radiology, UCLA
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TMJ Complex: Normal

Noun

convention, normal, pattern, rule, formula (something regarded as a normative example) "the convention of not naming the main character"; "violence is the rule not the exception"; "his formula for impressing visitors"

Adjective

(adj) normal (conforming with or constituting a norm or standard or level or type or social norm; not abnormal)
(adj) normal (being approximately average or within certain limits in e.g. intelligence and development) "a perfectly normal child"; "of normal intelligence"; "the most normal person I've ever met"
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TMJ Disorders:
Abnormal TM joint

Adjective

(adj) abnormal, unnatural (not normal; not typical or usual or regular or conforming to a norm) "abnormal powers of concentration"; "abnormal amounts of rain"; "abnormal circumstances"; "an abnormal interest in food"

(adj) abnormal (departing from the normal in e.g. intelligence and development) "they were heartbroken when they learned their child was abnormal"; "an abnormal personality"

(adj) abnormal (much greater than the normal) "abnormal profits"; "abnormal ambition"
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TMJ Disorders:
Condylar morphology: Anomaly
Noun
(n) anomaly, anomalousness (deviation from the normal or common order or form or rule)
(n) anomaly, unusual person (a person who is unusual)
(n) anomaly ((astronomy) position of a planet as defined by its angular distance from its perihelion (as observed from the sun)
ABNORMAL TMJ:
Abnormal in shape or Diseased joint
Condylar Position

CO   CR ?

How important is the Condylar Position in the Fossa?
Surface of the condyle (should be smooth and convexly rounded)

Rough R Where

L Where
Surface of the condyle (should be smooth and convexly rounded)

Rough R L Where
Condyle in CO CR

Surface of the condyle (should be smooth and convexly rounded)

Flattened

R Where

L Where
Surface of the condyle (should be smooth and convexly rounded)

Osteophytes  R  Where

L  Where
Surface of the eminence (should be smooth and rounded, convex)

Rough R Where

L Where
Surface of the eminence  (should be smooth and rounded, convex)

Rough  R  Where
L  Where
Surface of the eminence (should be smooth and rounded, convex)

Flattened/Shallow  R

L
Size /Volume of the condyle (the larger is desirable excluding hyperplasia) is desirable to better distribute forces over tissues.

Nearly fills the fossa

Clearly smaller than the fossa

Very small
Condyle in CO  CR
Bony Integrity of the condyle
Normal Cortex?
Break in the Cortex
Erosion
Cyst
Sclerotic?
Condyle in CO  CR
Positioning of the Condyle
Centered
Down in the Eminence
Down/back
Up and Back
Condyle in CO   CR
Joint Spaces
   Even
   Spaces Thinned
   Spaces Thickened
Condylar Height
The posterior height of the condyle in close to Condylion
The angle between the neck and head acute
Normal Straight Obtuse
General Position
Condyle at the crest of the eminence
Short to the crest
Beyond the crest
General Impression

Overall Grade

1 = Good

2 = Questionable

3 = Poor

4 = Bad