Radiographic Interpretation of Temporomandibular Joint

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ABSTRACT

This article is intended as a guide to the investigations, relevant findings and proper interpretation of radiography of the temporomandibular joints.

Keywords: Radiographic, Temporomandibular, Radiology

1. INTRODUCTION

Temporomandibular joint (TMJ) is an atypical synovial joint located between the condylar process of the mandible and the mandibular fossa and articular eminence of the temporal bone.(Fig.1)

Fig 1. Anatomy of the temporomandibular joint.

A = bone; B = articular fibrocartilage; C = joint space; Joint capsule; E = fibrous disc.

The function of the temporomandibular (TM) Joints is to allow movement of the mandible, especially during mastication when both joints work in harmony and within limits dictated by the dental occlusion. The TM joints are hinge, and sliding joints elongated transversely and angled posteriorly, with the long axes forming an angle of approximately 150° to each other. The working surfaces are the articular eminences of the temporal bones and the condyloid processes of the mandible, between which discs are interposed, forming part of the insertions of the lateral
Pterygoid muscles. The muscles acting on the joints are the masticatory muscles and numerous accessory muscles belonging to the hyoid and cervical kinetic chain of musculature.

The shape of the condyle varies considerably. Superior aspect maybe Heart shaped round, flat and large medial and lateral poles. Mediolateral contour is usually slightly convex. This variation in shape may cause difficulty with radiographic interpretation (Fig.2).

Fig.2 shows the shapes of the condyle; Heart shaped, round, flat and large medial and lateral poles

X-ray techniques should include a minimum of two views at right angles projecting through the articular surfaces. Closed, at rest and open jaw, positions should be included. Routine views should be the standard transcranial oblique views, lateral tomographs, occipitomental and Townes’s projections. Other techniques may be employed to deal with specific conditions.

2. DISCUSSION

X-Ray Technique
The basic principle is the same as applies to any joint, i.e. a minimum of two views at right angles to one another with the beam directed through the articulating surfaces. It is astonishing, however, how often one is presented only with the lateral oblique views by a radiographer who is unaware of any additional projections.

Panoramic Radiography
This shows the entire maxillomandibular region on a single film, gives a very good view of the ascending rami with their condyloid and coronoid processes, and is of particular value in fractures of the condylar necks and for showing cysts and osteomas of the mandible and maxilla as well as generalized disorders of bone and malformation of teeth. The disadvantages are high cost and greater space requirements, and the unit must be purchased in addition to existing equipment. A big advantage is that tomography is carried out with the patient Tube and turning the patient's head around a vertical axis with the film moving in another rotational axis or, as is more common now, the patient remains stationary while the tube head and film holder assembly move. The diagnostic information that we can get from panoramic radiograph are 1) the shape of the condylar head and condition of the articular surface from the lateral aspect. 2) A direct comparison of both condylar heads. (Fig.3)

Fig.3 shows both the right and left condyle.

Townes’s Anteroposterior Projections
This is another method of showing both Joints simultaneously. A 30° Townes's projection of the skull is taken, centering between the TM joints with the patient supine. Films are taken with the jaw open, using the mouth prop. This projection can also be combined with an anteroposterior tomogram, but here the mouth should be closed and at rest. Large mastoid tips may sometimes obscure the joints in this view. The diagnostic information that we can get from Townes view are 1) the shape of the condylar head and condition of the articular surface from the lateral aspect. 2) A direct comparison of both condylar heads.

Angled Transcranio-Oblique View of Each Side
The head is placed in the true lateral position with the side to be examined in contact with the cassette. Views are taken with the mouth open and closed. A small localizing cone is used and directed 25° caudally. For the closed position, the patient clenches the molar teeth together. Modifications may include an additional film at rest, with the lips together but the incisor teeth separated by 2 - 3 mm; and an extra film with the jaw protruded, i.e. the lower teeth in front of the upper. Short-distance techniques using a special cephalostat have also been devised with the film focus.
distance at 30 cm. The advantage is the erect position simulating natural posture and the blurring of overlying structures. There are gravitational effects on the mandible with the head in a lateral position, and this explains the necessity of the patient being erect in order to record accurate rest films. These films show the normal bone structure of the mandible and temporal bones and their articulating surfaces, the position and anatomy of the molar teeth, the laminae durae of the mandible, the pituitary fossa, the mastoids and soft tissue of the neck.

**Sobmentovertical Projection**
This should preferably be taken with a film focus distance of 1.8 m to avoid magnification, but 1 m FFD is still acceptable. The posterior rami of the mandible should be perpendicular to the film. Differences of symmetry of the mandible, additional fractures, and the anatomy of both condyles will be demonstrated.

**Anteroposterior Transorbital Technique**
This is valuable if the patient can open his mouth and if fractures of the necks of the condyles are suspected. The patient is examined while erect, with a wedge in a position to open the mouth widely. The baseline is parallel to the floor, and the head is rotated 20° towards the side being examined. The chin is tucked well in. With a long cone, the beam is directed 35° towards the feet through the orbit and perpendicular to the film on the horizontal plane. The examination is then repeated on the opposite side. (Fig. 4)

*Fig. 4 Anteroposterior radiograph of transorbital view of condylar neck.*

**Interpretation of Radiographs**
The interpretation of radiographs is difficult because of the wide variation in the normal anatomy as well as in the width of the normal joint space. There is also considerable asymmetry and variation in the broad functional range of normal joints. One must guard against tailoring the radiographic evidence to fit the clinical symptoms. Women normally have shallower joints than men. The fossa deepens with age and then becomes shallower again with senility (regressive remodeling). The condyle at rest is located in a well-centred position in the fossa, and the articular surfaces are smooth. The normal head is well mineralised with a continuous white cortical line. Ricketts has given average dimensions of the temporomandibular joint space, based on an analysis of laminograms of normal subjects, as follows: anterior surface of condyle to articular eminence: 1.5 mm; top of condyle to floor of fossa: 2.5 mm; and posterior surface of condyle to a vertical line through the middle of the external auditory canal: 7.5 mm. There is a great variation in the shape of the condyles in the inferosuperior and anteroposterior planes. Yale has classified basic mandibular shapes as convex angled flat or round (Fig. 5).

*Fig. 5 Basic mandibular shapes.*

Superior view: A = concave; B = convex; C = flat. Posterior view: a = flat; b = convex; c = angled; d = round.
3. CONCLUSION

Though the radiographic technique helps do diagnosis innumerable orofacial disease. Solid knowledge about the anatomical landmark and radiographic methods used to investigate TMJ would make a change in the diagnosis and the treatment.

REFERENCES