

DEVELOPMENT OF TMJ

OUTLINE-

The temporomandibular joint (TMJ) is a complex joint located in the jaw that connects the mandible (lower jaw) to the temporal bone of the skull. The development of the TMJ is a complex process that occurs during embryonic development and continues into early childhood.

INTRODUCTION

- The temporomandibular joint acts like a sliding hinge, connecting the jaw bone to the skull.
- It is a only synovial joint of skull formed between head of the mandible and articular fossa of temporal bone.
- The TMJ is a ginglymoarthrodial joint, a term that is derived from ginglymus,(meaning a hinge joint, allowing motion only backward and forward in one plane) and arthrodial,(meaning a joint of which permits a gliding motion of the surfaces.

Description

Embryology

- Develops late in embryonic life compared with large joints of extremities.
- Associated with its late evolutionary development.
- During the 7th prenatal week, the jaw joint lacks:
 - Condylar growth cartilage.
 - Joint cavities.
 - Synovial tissues
 - Articular capsule.
- 2 Skeletal elements: mandible and temporal bone are not yet in contact with each other.

Embryology

- 7-week-old embryo
 - Meckel's cartilage extends all the way from chin to base of the skull.
 - Serves as a scaffolding or strut against which the mandible develops.
 - Provides a temporary articulation between mandible and base of the skull until TMJ takes over.

➤ Near end of fetal life Meckel's cartilage completes its transformation:

-Incus

-Malleus

-Anterior ligament of malleus

-Sphenomandibular ligament

➤ Meckel's cartilage plays a basic role in setting the evolutionary stage for the emergence of this joint.

Development

➤ The TMJ develops from two mesenchymal condensations, and is composed of the glenoid fossa that originates from the otic capsule by intramembranous ossification, the mandibular condyle of the temporal bone and a fibrocartilagenous articular disc derived from a secondary cartilaginous joint by endochondral ossification

Development

➤ Articular Disc:

-Earliest appearance in 6-week-old embryo.

-Muscular derivative of 1st branchial arch. -Disc anlage

-Vague layer of mesenchyme stretching across upper end of mandibular ramus.

-No capsule.

-No condyle.

Development

Articular disc:

➤ At its anterior end, mesenchymal anlage extends laterally from superior border of LPM, to medial side of masseter muscle.

➤ At the end of 6th week, lateral pterygoid inserts not on the mandibular but on the posterior end of Meckel's cartilage.

➤ During 7th week – (LPM) joins upper end of mandibular ramus; also continues posteriorly beyond this point with mesenchyme anlage; these 2 structures insert in common part of Meckel's cartilage which becomes the malleus.

Development

- At 7 weeks: the future condyle is still only a condensation of mesenchyme resting on osseous lamella, which forms the mandibular ramus.
- 12 week: Condylar growth cartilage makes its 1st appearance and begins to develop a hemi-spherical articular surface.
- By 13th week: condyle and articular disc having moved up into contact with temporal bone. Only when such articular contact has been made, joint cavities develop. Inferior space appearing first. Disc begins to get compressed. When central portion of disc is compressed, this part becomes avascular.

Development

The articular capsule: -

- Becomes recognizable during twelfth week as a faint cellular condensation along the medial and lateral sides of joint connecting mandible with temporal bone.
- Articular disc merges peripherally with these condensations.
- Formation of capsule posterior to joint does not occur until twenty-second week; when the Glaswegian fissure; becomes narrow; encroaching upon Meckel's cartilage as it passes into middle ear.
- Articular disc becomes intercepted at the Glaswegian fissure, loses its continuity with malleus and develops definitive attachment to anterior lip of GF.
- Joint cavities are now lined by synovial tissue and according to Symons (1952), temporal bone now shows area of secondary cartilage in medial part of the joint.

Development

- By 26th week: All components of TMJ present except articular eminence. Meckel's cartilage still extends through GF, but by thirty- first week is transformed into sphenomandibular ligament.
- By 39th week: Ossification of bones in this region has proceeded to the point where; ligament gains its apparent attachment to spine of sphenoid.

Development

- At birth, the mandible as a whole continues the exuberant, but progressively diminishes period of overall growth that was begun during the last trimester in utero.

