TEMPORO MANDIBULAR JOINT

The TMJ is a synovial bilateral joint that permits the mandible to move as a unit with 2 functional patterns of movements (gliding- anteroposterior - and hinge, open & close).

Four anatomical parts concerned with mandibular articulation:

1. Mandibular condyle
2. Mandibular fossa(glenoid) and articular eminence
3. The articular disc
4. The articular capsule

The mandibular condyle articulates with the glenoid fossa and articular eminence of the temporal bone.

An articular disc separates the articular surfaces so that two cavities are present:

A: Upper compartment between the disc and temporal bone.

B: Lower compartment between the condyle and the disc.

THE MANDIBULAR CONDYLE:

It's the articulating surface of the mandible. It is convex in all directions but wider latero-medially than antero-posteriorly. The head of the condyle composed of cancellous bone covered by a thin layer of compact bone. the bone trabeculae of the cancellous bone is arranged in a radiating manner from the neck to reach the surface of the condyle at a right angle to give maximum strength and the bone marrow between them is of myeloid or cellular type and becomes fatty with age.

FIBROUS COVERING OF CONDYLE:

Outer layer of compact bone is covered by thick layers of fibrous tissues composed of:

Superficial layer: network of strong collagen fibers, chondrocytes and fibroblasts.

Deep layer: composed of thin collagen fibers rich in chondroid cells during growth period (hyaline cartilage).

Growth occur by apposition from the deepest layer of the cartilaginous plate that replaced by bone with growth and growth continues till 21 years of age but sometimes remnants of cartilage may persist in old age.

MANDIBULAR (GLENOID) FOSSA AND ARTICULAR EMINENCE:

Glenoid fossa: Posteriorly limited by the squamotympanic fissure and anterioly bounded by the articular eminence and the roof of it composed of thin layer of compact bone separating the middle cranial fossa.

Articular eminence: Composed of spongy bone covered by thin layer of compact bone but the chondroid (hyaline cartilage) tissues commonly seen in the eminence.

Fibrous layer covering the articulating surface of temporal bone: it is thin on the articular fossa and thickens on the posterior slope of the eminence.

The fibrous tissues are arranged in 3 zones:

Inner zone: fibers arranged at right angle to surface

Outer zone: fibers run parallel to the bone surface

Intermediate zone: transitional zone. Fibers are interlaced.

INTERARTICULAR DISC (MENISCUS):

The TMJ Disc is fibrous, avascular and non-inverted plate. It is oval in shape and biconcave in sagittal section. It is thin in central part and thick at posterior borders. It attach medial and lateral poles of the condyle by medial and lateral ligaments. Anterior border divides into upper and lower lamellae that run forward. The upper lamella fuses with the anterior slope of the articular eminence. The lower lamella attaches to the front of the neck of the condyle. Fibers of the superior head of the lateral pterygoid muscle are attached to the anterior border. Posterior border divides into upper and lower lamellae. The upper lamella is fibrous and elastic and fuses with the capsule and is inserted in the squamotympanic fissure. The lower lamella non elastic and attaches to the back of the condyle. The disc divides the synovial space into upper (larger) compartment and lower (smaller) compartment.

HISTOLOGICAL STRUCTURES OF TMJ DISC:

It composed of dense fibrous tissue containing straight and tightly packed collagenous fibers with few elastic fibers and some chondroid cells appear with age also chondrocytes may be seen.

ARTICULATING CAPSULE, LIGAMENTS AND SYNOVIAL MEMBRANE:

The whole TMJ is enclosed in a fibrous capsule. It is attached to:

I. Articular tubercle (in front)
II. Lips of squamous tympanic fissure(posteriorly)
III. Borders of articulating glenoid fossa(upper boundary)
IV. Neck of the mandible. (below)
V. It is lined by synovial membrane(internally)
VI. Laterally, the capsule is reinforced by TMJ ligaments.

HISTOLOGICAL STRUCTURES OF CAPSULE:

The fibrous capsule consists of 2 layers:

- Outer fibrous capsule: strengthen laterally by the temporomandibular ligament.
- Inner synovial layer: composed of thin connective tissue layer lined with synovial cells. These cells have two types

Type A : secretes hyaluronic acid

Type B : produces protein rich secretion.

The synovial layer has synovial folds and villi protrude from the surface into the joint cavity and these villi lined by synovial layer of cells that lined the entire capsule of both upper and lower joint spaces. The synovial membrane is very rich in blood supply and contains lymphatic vessels.

SYNOVIAL FLUID:

It is clear, straw-colored viscous fluid that diffuses out the rich capillary network of the synovial membrane composed mainly of Hyaluronic acid which is highly viscous also contain some free cells mostly macrophages.

Functions:

- Lubricant for articulating surfaces.
- Carry nutrients to the avascular tissue of the joint.
- Clear the tissue debris caused by normal wear and tear of the articulating surfaces.

BLOOD SUPPLY:

four arteries supply the joint:

1. Superficial temporal
2. Deep auricular
3. Anterior tympanic
4. Ascending pharyngeal

Branches from the four arteries approach the joint and penetrate the capsule.

NERVE SUPPLY

1. Branches from the mandibular nerve
2. Auriculotemporal nerve
3. Masseteric nerve
4. Deep temporal nerves

These branches supply all surfaces of the head of condyle, temporomandiular fossa, capsule and part of the disk.

AGE CHANGES

Condyle:

1. Becomes more flattened
2. Fibrous capsule becomes thicker.
3. Osteoporosis of underlying bone.
4. Thinning or absence of cartilaginous zone.

Disk:

1. Becomes thinner.
2. Shows hyalinization and chondroid changes.

Synovial fold:

Become fibrotic with thick basement membrane.