Skeletal system

- Hard structures that support the body constitute the **skeleton**. If the skeletal structures are present out side the body, they constitute **exo-skeleton** (e.g., scales in fishes) and those present inside the body constitute **endoskeleton** (e.g., bones).
- Endoskeleton of rabbit can be described under two heads, 1) **axial skeleton** comprising of skull, vertebral column and sternum 2) **appendicular skeleton** consisting of pectoral and pelvic girdles and limb bones.
- Study of bone is **osteology**

I. Joints

1. Axial skeleton

Skull:

Skull of rabbit is dicondylic

Skull is divisible in to **cranium, sense capsule, upper jaw, lower jaw, and hyoid apparatus**.

Cranium:

Lodges and protects the head

Three regions of cranium are occipital, parietal and frontal

Occipital region of skull has **foramen magnum**

Cranium surrounded by **basioccipital, supraoccipital and exoocipittal bones**

Roof is formed by a pair of **anterior** and **posterior parietals**

Floor is formed by a **presphenoid** and a **basisphenoid**

Sides are formed by **alisphenoids** and **orbitosphenoids**

Anterior margin of the cranium is formed by **cribriform plate**

Sense capsule:

Olfactory, optic and auditory are the three pairs of sense capsules that lodge and protect the sense oprgans

Olfactory capsule encloses the organ of the smell

Mesethmoid separates right and left olfactory capsules internally

Optic capsule encloses the eyes

Externally bound by zygomantic arch

Auditory capsules enclose the organs of hearing

Each auditory capsule consist of single auditory bone called **preotic**

It has two aperture called **fenestra ovalis** and **fenestra rotunda**

Middle ear bone **are malleus, incus and stapes**

The lower swollen portion of periodic bone is called tympanic bulla

Modified articular of lower jaw is **malleus**

Modified quadrate of upper jaw is **incus**

Modified hyomandibular is **stapes**

- Bones of endoskeleton, that form the frame work is made up of many separate, skeletal parts articulated with one another either movably or immovably. The junction between the ends or edges of two bones is called a **joint**. The joints are either movable or immovable.
- In a typical movable joint, the ends of articulating bones are covered by a layer of hyaline cartilage. The two bones are separated from each other by a narrow space. The entire joint is enclosed by a joint capsule or **synovial capsule** formed by strong, but elastic ligaments, which are continuous with the periostea of both bones. The capsule is internally lined by a thin synovial membrane. The cavity of synovial capsule is filled with **synovial fluid**, secreted by the **synovial membrane**. It acts as lubricant and prevents the friction and allows free movement of bones.

Types of joint :

- Joints are classified into movable and immovable joints.

1. Movable joints (Diarthroid joints) : These joints allow movements freely. They are classified into perfect movable joints and imperfect movable joints :

Freely movable joints : (Diarthroses)

- There are five types of perfect movable joints.

i) Ball and socket joint (enarthroses joint) :

- In this type of joint, the head of one bone is ball like and fits into a socket or concavity of other.
- This joint allows free movement in more than one plane.
- e.g., **a) Shoulder joint** between head of humerus (bone of upper arm) and glenoid cavity (concavity in pectoral girdle) at shoulder.
- **b) Hip joint** between head of femur (thigh bone) and acetabulum (concavity in pelvic gridle) at hip.

ii) Hinge joint (Ginglymi joint) :

- In this type of joint, a protruberance (e.g., a condyle) at the end of one bone fits into a corresponding depression of the other.
- This joint allows angular movement in only one plane, which may be flexion or extension involving increase or decrease of the angle.
- e.g., **a) Eibow joint** - between radius-ulna of fore arm and humerus of upper arm at elbow.
- **b) Knee joint** - between tibia-fibula of shank and femur of thigh at knee
- **c) Joints** of phanlanges of digits (i.e., fingers and toes).

iii) Pivotal joint (Rotatoria joint) :

- In this type of joint, one of the bones is fixed in its place and has a peg like elevation called pivot.
- The other bone fits over the pivot by a concavity and rotates freely around.
- e.g., In neck, the joint between the atlas (first vertebra) and axis (second vertebra).
- Axis has a peg like odontoid process on which atlas (carrying skull) rotates freely.

iv) Saddle joint :

- These are almost like ball and socket joints. But ball and socket are poorly developed. The ball bearing bone can be rotated around inefficiently.
- *e.g.,* Joint between carpal and meta carpal of thumb. Hence the thumb enjoys greater freedom of movement that the other fingers.

v) Gliding joint (Arthrodial joint) :

- In this type of joint, the articulating bones can slide upon one another at the joint. This joint allows restricted movement in different planes.
- e.g., a) Joints between carpals (wrist bones).
- b) Joints between tarsals (ankle bones).
- c) Joints between the zygapophyses of successive vertebrae.

B) Imperfect movable joints : (Amphiarthroses)

- In this type of joints, synovial capsule and synovial fluid are absent. The cartilage tipped adjacent bones are directly articulated with one another. These joints allow very little movements.
- *e.g.,* Pubic sympysis of pelic girdle of mammals (females).

2. Immovable joints (Synarthroses) :

- In this type of joints the articulating bones does not allow movements. They include :
- **a) Sutures** : These are the zig zag lines of the junctions of edges of flat bones, *e.g.,* joints between the bones of cranium of skull.
- **b) Gomphoses** : In this case, a bony projection of one bone fits into a socket of other, *e.g.,* teeth on maxilla and premaxilla of jaw.
- **c) Shindylases** : In this case, one bone fits into a slit in another bone. *e.g.,* articulation of ethmoid bone with the vomer.