

# Development of MSS

## 1-The human skeleton develops from?

- 1-Somitomes and somites (Paraxial mesoderm)
- 2-Lateral plate ( parietal layer ) of mesoderm
- 3-Neural crest

## 2- At the end of the fourth week the sclerotome cells differentiate into mesenchymal tissue ( embryonic loose connective tissue); cells of this tissue can migrate and differentiate into?

- fibroblasts,
- chondroblasts or
- osteoblasts

## 3-Parietal layer of the lateral plate of mesoderm of the body wall can differentiate into osteoblasts giving rise to the osteoblast ?

- bones of pelvic girdle,
- shoulder girdles,
- limbs
- and sternum

## 4-Neural crest cells in the head region can also differentiate into mesenchymal cells and give rise to?

- bones of the skull
- and face

## 5-Somitomes and occipital somites (paraxial mesoderm) gives rise to ?

- cranial vault
- and base of the skull

## 6-Mesenchyme of the dermis can also differentiate into ?

- flat bones of the skull (the process is known as intramembranous ossification)

In most bones Mesenchymal cells first giving rise to hyaline cartilage models which later on become ossified by endochondral ossification

## 7-The skull is formed of two parts ?

- **Neurocranium that forms a protective case?**
  - , which surrounds the brain
  - and special sensory organs (optic, auditory, and olfactory)
- **Viscerocranium that includes the?**
  - facial skeleton, the ear ossicles, hyoid bone, laryngeal and tracheal cartilages, and certain processes of the skull.

## 8-Neurocranium develops from two sources

- Membranous neurocranium which forms the flat bones of the vault of skull
- Cartilaginous neurocranium (Chondrocranium) which forms the bones of the base of skull

## 9-Membranous neurocranium: (flat bones of the vault of skull) are derived from?

- the neural crest cells,
- somites and somitomes

**10-Sagittal suture is derived from ?**

- the mesenchyme of the neural crest

**12-Coronal suture is derived from ?**

- mesenchyme of paraxial mesoderm (somites and somitomeres).

**13- Meeting of more than two skull bones, gives rise to a wide sutures called Fontanelles.**

- There are Anterior, Posterior,
- Posterolateral (mastoid) and
- Anterolateral (Sphenoid) fontanelles

**14-The anterior fontanelle is closed by the age of 18 months.**

**The posterior fontanelle closes at 1- 2 months after birth**

**15-Cartilaginous neurocranium (Chondrocranium)It gives rise to the bones of the base of skull.**

- Cartilages that lie in front of the rostral end of notochord (prechordal chondrocranium) are derived from?
  - neural crest; these cartilages end at the level of the pituitary gland in the center of the sella turcica.
- Cartilages that lie posterior to the pituitary gland (chordal chondrocranium) arise from ?
  - occipital somites

**17- Viscerocranium ?**

- These are the bones of the face.

**18-Bones of the face are formed mainly ?**

- from the 1<sup>st</sup> and 2<sup>nd</sup> Pharyngeal arches
- and from mesenchyme derived from the Neural crest cells

**19-The dorsal portion of the first pharyngeal arch (maxillary process) gives rise to**

- the maxilla,
- zygomatic bone, and
- part of the temporal bone.

**20- The ventral portion of the first pharyngeal arch (mandibular process) contains ?**

- the Meckel cartilage.

**21-Mesenchyme around the Meckel cartilage gives rise to**

- the mandible through membrane ossification.
- Meckel cartilage gives rise to shenomandibular ligament and disappears

**22-The dorsal tip of mandibular process with the 2<sup>nd</sup> pharyngeal arch give rise to**

- the ear ossicles, the Malleus, incus and stapes.
- These are the first bones to become fully ossified

**22-Mesenchyme derived from Neural crest cells gives rise to?**

- the Nasal and
- Lacrimal bones

**23-At the beginning of neonatal life the face is small in comparison with that of the neurocranium.**

- This is caused by the absence of the paranasal air sinuses and the small size of the bones.

**24-During the 4<sup>th</sup> week, cells of sclerotomes migrate in 3 directions (retaining their segmental arrangement), as follows:**

- Cells passing ventro-medially around the notochord to form the bodies of vertebrae
- Body of each vertebra develops from the adjacent halves (caudal and cranial) of each two sclerotomes
- the caudal dense part joins the cranial less dense part of the sclerotome below. This process is called resegmentation
- The notochord form the nucleus pulposus of the disc; that later is surrounded by circular fibres of the annulus fibrosus forming the intervertebral disc.
- Resegmentation cause the myotomes to bridge the intervertebral discs; this alteration gives them the capacity to move the spine.
- For the same reason, intersegmental arteries, which were lying between the sclerotomes, now pass midway over the vertebral bodies.
- Spinal nerves, come to lie near the intervertebral discs and leave the vertebral column through the intervertebral foramina

**25-Cells of the sclerotome passing dorsally behind the neural tube; they surround the developing spinal cord to?**

- form the vertebral arch.

**26-Cells passing ventro-laterally to form the costal elements of vertebrae?**

- , which develop into ribs in the thoracic region.

**27-The sternum develops ?**

- in the parietal layer of lateral plate mesoderm in the ventral body wall.

## **Development of MSS pt 2**

**1-Muscles of the head are derived from ?**

- seven somitomeres.

**2-Somitomeres: are partially segmented spirals of mesenchymal cells derived from paraxial mesoderm.**

**3-Muscles of the axial skeleton, body wall and limbs are derived?**

- from somites (derived from paraxial mesoderm).

**4-Somites extend from the occipital region to the tail bud. In humans there are ?**

- 42-44 somite pairs

**5-Some muscle cells come from the Ventrolateral edge of the myotome, cross the lateral somitic frontier, and enter the lateral plate mesoderm forming ?**

- the abaxial muscle cell precursors.

**6-Cells that remain in the paraxial mesoderm and do not cross the frontier (the remaining Ventrolateral edge of the myotome cells and all of the Dorsomedial edge of myotome cells) comprise?**

- the primaxial muscle cell precursors

**7-abaxial muscle cell precursors) form**

- the limb muscles,
- infrahyoid, and
- abdominal wall (rectus abdominis, internal and external oblique and transversus abdominis).

**8-The remaining non migrated cells of the myotome (primaxial muscle cell precursors ) form**

- muscles of the back,
- shoulder girdle
- and intercostal muscles.

**9-Limb musculature appears in ?**

- the seventh week of fetal life.

**10-Cells (mesenchyme) from the lateral plate mesoderm also migrate to the limb field and proliferate to ?**

- share the creation of bones of the limb bud

**11-Upper limb bud appears opposite?**

- the lower four cervical (C5-C8) and
- the first thoracic (T1) spinal cord segments

**12-The lower limb bud lies opposite?**

- the lower four lumbar (L2-L5) and
- upper three sacral (S1-S3) spinal cord segments

**13-Tendons for the attachment of muscles to the bones are derived from ?**

- sclerotome cells.

**14-BRANCHIAL ARCH MUSCLES:**

- myoblasts from the arches migrate to form
- the muscles of mastication nerves V
- , of facial expression, VII
- , and muscles of the pharynx and larynx IX, and X, respectively

**15-OCULAR MUSCLES are probably derived from ?**

- mesenchymal cells around the prechordal plate (mesodermal cells) which gives rise to 3 preoptic myotomes.
- Groups of myoblasts with cranial nerves III, IV, and VI form the extrinsic muscles of the eyeball

**16-TONGUE MUSCLES:**

- 4 pairs occipital myotomes are seen first, but the first pair disappears.
- The last 3 pairs form the tongue muscles, innervated by cranial nerve XII

**17-LIMB MUSCLES develop in situ from?**

- mesenchyme (of Ventrolateral edge of the myotome) around the developing limb bones which come from the lateral plate mesoderm

**18- Pharyngeal Arches contribute to ?**

- the formation of the Neck and Face.
- At the end of the fourth week, the centre of the face is formed by Stomodeum surrounded by the first pair of pharyngeal arches

**19- Development of the Smooth Muscle**

**Smooth muscle for the dorsal aorta and large arteries is derived from ?**

- lateral plate mesoderm
- and neural crest cells.

**Coronary arteries smooth muscle originates from**

- proepicardial cells
- and neural crest cells.

***Smooth muscle in the wall of the gut derivatives is derived from?***

- *the splanchnic layer of lateral plate mesoderm that surrounds these structures.*

***The sphincter and dilator muscles of the pupil and muscle tissue in mammary and sweat glands ?***

- *are derived from ectoderm*

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