Primitive segments

Somites or primitive segments are sections of the middle germ leaf arranged in pairs. The basis for all types of connective tissues of the skeletal system is mesenchyme arising from mesoderm.

Primitive segments

They arise from the segmentation of the mesoderm paraxial, which passes into the mesoderm of the lateral plate. The disc further divides into the unsegmented somatopleure and splanchnopleure. The first pair of primitive segments is in the cranial region below the cranial end of the chorda (day 20). Further segmentation proceeds craniocaudally at a rate of 3 segments per day. Thanks to this fact, it is possible to determine the age of the embryo → end of 5T = 42–44 pairs of primitive segments (4 occipital, 8 cervical, 12 thoracic, 4 lumbar, 5 sacral and 8–10 coccygeal).

Intermediate mesoderm

Connects the paraaxial mesoderm with the mesoderm of the lateral plate. After segmentation of the paraxial mesoderm, the intermediate mesoderm is also segmented in the so-called petioles of the primary segments - nephrotomes. Nephrotomes connect the first segments to the unsegmented mesoderm of the somatopleura and splanchnopleura and are the basis of the urogenital system.

Head mesenchyme

Arises from the cells of the ganglionic bar and is thus of neuroectoderm origin.

- It is the basis for the differentiation of the cartilages of the gill arches and for some bones and muscles of the face.
- It is unsegmented and arises from the early disintegration of the most cranial first segments and the disintegration of the 1st occipital primitive segment.

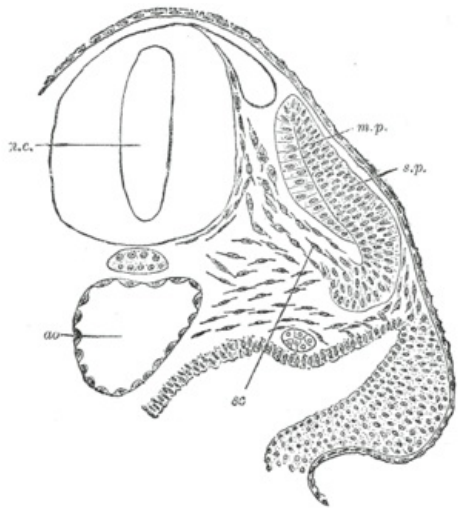
Axial skeleton is made up of mesenchyme of sclerotomes and unsegmented head mesenchyme.

Conversion of primitive segments (somites)

Somite differentiation is controlled by the interaction of genes from the chorda, medulla tube, lateral plate mesoderm, and epidermis. Each primitive segment is divided into 3 parts, in the fourth week:

1. **dermatoma = dorsolateral** → Loses its epithelial arrangement after the formation of myotomes and turns into mesenchyme for the differentiation of dermis and subcutaneous tissue.
2. **myotome = medial** → They retain epithelial and segmental organization and give rise to skeletal muscle.
3. **sclerotome = ventromedial** → Maintains a segmental arrangement for some time and turns into mesenchyme moving to the chorda and medullary tube.

A segmental spinal nerve is established for each dermatome and myotome. The first 3 occipital and the last 5–7 coccygeal primitive segments disintegrate in the mesenchyme without forming "toms". Due to this, the number of vertebrae is lower than the number of primitive segments.



sc - *sclerotome*; m.p. - *myotome*; s.p. - *dermatome;* and ao - *aorta;* n.c. - *neural tube channel*

Development of the muscular system

- Somites are the basis for skeletal muscle development;
- dorsolateral no. of the somite → differentiation into the hypaxial region of progenitor cells for limb and body wall muscles;
- dorsomedial no. of somite → for epaxial back muscles;
- skeletal muscles – striated muscles;
  - composed of striated, syncytially arranged muscle fibers;
  - muscle fibers → arise from myoblasts that differentiate from blastema somites;
    - myoblasts → group into myotubes → these merge into multinucleated syncytia → muscle fibers;
    - annealed myofibrils, composed of actin and myosin, differentiate in the cytoplasm of muscle fibers.

Dorsal trunk musculature

- They have different origins and development in their individual layers:
- Epaxial musculature has deep muscles of the back – i.e. the erector trunci, all its layers and components;
  - develops from epaxial divisions of myotomes;

    - innervated from dorsal branches of spinal nerves.
- Segmentation is preserved in the deepest layers, in the surface layers → fusion of material from 2 or more segments;
    - spinocostal muscles = m. serratus post. vulture and information;
        - on the surface of the deep back muscles, originate from the ventral processes of the myotomes, which subsequently moved dorsally.

Ventral trunk musculature

It is from the ventral, i.e. hypoaxial projections of the myotomes;

- originally a segmental layout;
- remains preserved in the thoracic region (mm. intercostales);
- in other muscles, fusion and relocation of some myomeres from a ventral position to another, mainly epaxial (dorsal) → m. serratus post. vulture and information;
- receive innervation from the ventral branches of the spinal nerves.

In the neck region, the development of all the lateral and prevertebral muscles of the neck is from the ventral processes of the myotomes;

- original segmental arrangement → has only small muscle bundles belonging to the deep neck muscles;
- most of the neck muscles → formed by the fusion of a larger number of ventral myomeres → have a pluripotent origin.

Abdominal region → early and extensive fusion of myomeres;

- myomeres merge into a single layer → it is gradually divided into 3 layers of muscles;
- lumbar myotomies 2.–5. segment → ventral processes merge to form m. quadratus lumborum.

Limb musculature

- Arises independently from hypaxial myotomes that have traveled from the ventrolateral margin of the myotome to the mesenchymal limb bud at early stages;
- a blastema is then formed in the limb bud → two bases are differentiated from it → one for the dorsal musculature, the other for the ventral musculature;
- all limb muscles are innervated from the ventral branches of the spinal nerves;
- some muscles of limb origin → spread to the trunk (spinohumeral and thoracohumeral muscles).

Head area

- in this area 2 separate muscle groups arise from myotomes:
    - oculomotor muscles → from prootic myotomes that differentiate independently of somites in the region of the base of the eye;
    - intraglossal muscle → arises from 4 occipital myotomes that migrate in a ventral direction.

Links

Related articles

- Development of the muscular system
- Third week of embryo development
- Notogenesis

External links

- Somites of various types

Used literature

- VACEK, Zdeněk. *Embryologie pro pediatry.* 2. edition. Praha : Nakladatelství a vydavatelství JP, 1992. 313 pp. ISBN 80-7066-562-9.
- SADLER, Thomas, W. *Langmanova lékařská embryologie.* 1. české edition. Praha. 2011. 414 pp. ISBN 978-80-247-2640-3.