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DEVELOPMENT OF HUMAN RIBS

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Resume. Human ribs are developed in 3 stages: mesenchymal, cartilage and bone. Each vertebra has 2 costal processes, but only thoracic vertebrae extend ventrolaterally to form ribs. Accessory ribs, usually rudimentary, result from the development of the costal processes of cervical or lumbar vertebrae.

Keywords: development of ribs, mesenchymal stage, cartilage stage, ossification, anomalies of ribs.

Relevance. The ribs develop from the mesenchymal costal processes of the thoracic vertebrae. They become cartilaginous during the embryonic period and ossify during the fetal period. The original site of union of the costal processes with the vertebra is replaced by costovertebral joints these are the plane type of synovial joint. Accessory ribs, usually rudimentary, result from the development of the costal processes of cervical or lumbar vertebrae. These processes form ribs in the thoracic region, the most common type of accessory rib is a lumbar rib, but it usually cause no problems. Cervical ribs occur in 0.5 to 1% of people. A cervical rib is attached to the seventh cervical vertebra and may be unilateral or bilateral. Pressure of a cervical rib on the brachial plexus or the subclavian artery often produces symptoms.

Aim: to study the development of ribs in embryos and human fetuses

Tasks:

1. To study the stage of ribs development on the enlightened and histological preparations of human embryos.
2. To study abnormalities of the ribs according to the literature.

Material and methods.

12 human embryo in the gestational ages of 8 to 12 weeks of embryogenesis from "Minsk City Gynecology Hospital". The embryos after fixation in 96% alcohol and dehydration in acetone was stained by Alcian Blue/Alizarin Red, 36 serial histological sections of embryos from 8 to 130 mm parietal-coccygeal length.

Results and discussion. Ribs develop from the costal elements of the primitive vertebrae, as follows: in cervical vertebrae: the costal element fails to fuse with the transverse process, due to presence of vertebral vessels in- between them. It forms the anterior and lateral boundary of foramen transversarium (figure 1a). The conditional border between them can be the posterior branch of the spinal nerve (figure 1b).

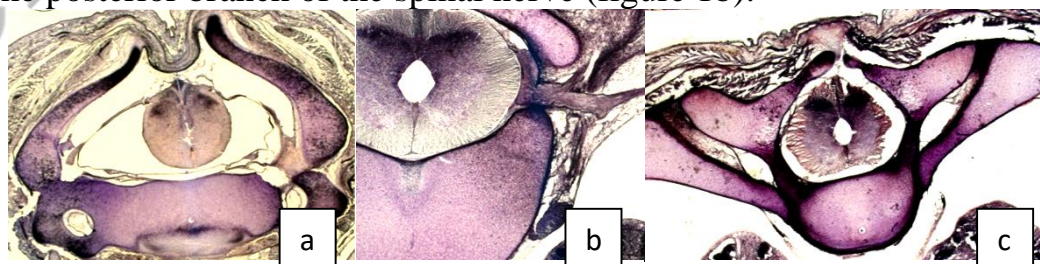


Figure 1 – Transverse section through the vertebral column of a 8 week-old human embryo.
a – cervical vertebra; b – lumbar vertebra; c – thoracic vertebrae

In thoracic vertebrae: the costal element elongates to form the rib. In lumbar and sacral vertebrae: the costal element fuses with the transverse process (figure 1c).

Chondrification of the ribs begin at about 6.5 weeks. Ossifications begins at 8th week of fetal life and ends at 25 years. Four centers appear; one primary center appears at 8th week and 3 secondary centers appear at puberty. They fuse at 25 years of age. The ribs initially develop as part of the cartilage model for each vertebra, but in the thorax region, the rib portion separates from the vertebra by the eighth week.

Of all the congenital malformations of human development, more than half falls to the share of impairments musculoskeletal. About a quarter of them – abnormalities of formation of the vertebral column, one of the reasons which is a anomalies of the processes of bone formation of vertebra.

In the study of human embryos, we found one of them there is a pair of cervical ribs, and the other embryos found a pair of extra lumbar ribs. This confirms the fact that the presence of extra ribs is not a rare anomaly (figure 2).

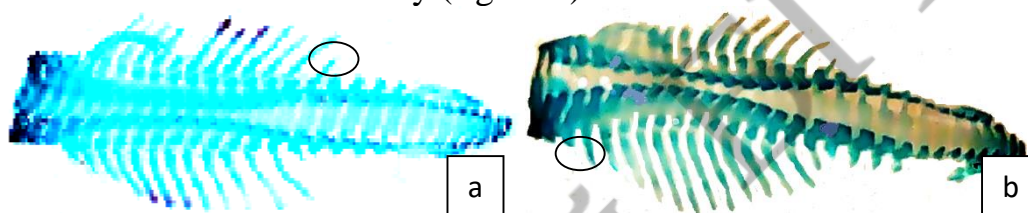


Figure 2 – Congenital anomalies of ribs. 8 week-old human embryo.
a – lumbar ribs; b – cervical ribs

Conclusion:

1. The ribs develop from the mesenchymal costal process of the thoracic vertebrae. Although each vertebra has 2 costal processes, but only thoracic vertebrae extend ventrolaterally to form ribs. Chondrification of the ribs begin at about 6.5 weeks. Primary ossification begins at 8th week of fetal life near the angle of the rib.

2. Accessory ribs, usually rudimentary, result from the development of the costal processes of cervical or lumbar vertebrae. Cervical and lumbar ribs occur in 0.5 to 1% of people.

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