

Banul B.Yu.

Associate Professor, Candidate of Medical Sciences, M.H.Turkevych Department of Human Anatomy, Higher State Educational Establishment of Ukraine "Bukovinian State Medical University", Chernivtsi, Ukraine

DEVELOPMENT OF PARAMESONEPHRIC DUCTS AND THEIR DERIVATIVES AT THE BEGINNING OF PRE-FETAL PERIOD OF HUMAN ONTOGENESIS

Abstract. *The article deals with developmental peculiarities and critical periods of the paramesonephric ducts and their derivatives at the beginning of pre-fetal period of human ontogenesis. Dissociation of the reproductive glands from mesonephroses at this stage is found to result in the formation of paramesonephric and mesonephric ducts.*

Key words: *pre-fetuses, mesonephric ducts, paramesonephric ducts, primary kidenys.*

Introduction. The derivatives of paramesonephric ducts are not studied completely, although they are of great theoretical and practical value. The knowledge concerning development and formation of topography of the uterine (fallopian) tubes, uterus and vagina is of special interest.

Objective: to determine further development of mesonephric and paramesonephric ducts and their derivatives at the beginning of the pre-fetal period of human ontogenesis.

Materials and methods. The study was performed on 6 human pre-fetuses. Morphological and histological methods are applied.

Results and discussion. In pre-fetuses 14,0-14,5 mm of parietococcygeal length (PCL) due to irregular proliferation of the coelomic epithelium the lumen of the paramesonephric ducts near the urogenital sinus is practically absent which is the stage of physiological atresia. The diameter of the lumen of the paramesonephric ducts on the level of the upper third of the mesonephros or mid-kidney is 4-0,1 mcm, and closer to the caudal level – 2-0,05 mcm. Delay or lack of recanalization of the ducts can cause their underdevelopment or absence, which should be considered as one of critical periods in the development of these structures. Reproductive glands and mid-kidneys is a single complex of an oval shape where the mid-kidney occupies lateral position. Due to enlargement of the gonads in size, longitudinal depressions in the form of lateral and middle sulci

appear between them and –mid-kidneys. The lateral sulci are deeper than those of the middle ones. Emergence of the sulci is indicative of the beginning of the dissociation of the gonads from the mid-kidneys. It is a special period in the formation of the urogenital system. The rudiment of the hind-kidney is located in the middle concerning the gonadomesonephric complex. Upper poles of the hind-kidneys are on the dorsal levels from the poles of the mid-kidneys. The size of the mid-kidneys increases considerably. The vertical size of the left kidney is 2,6-0,2 mm, the right one – 2,4-0,1 mm. The cranial extremity of the left mid-kidney corresponds to the level of the first thoracic segment, and the cranial extremity of the right mid-kidney – to the level of the second thoracic segment. The lower extremities of the mid-kidneys are on the level of the first sacral segment. The rudiments of the adrenals adjoin to the middle surface of the mid-kidneys, and the rudiment of the pancreas and umbilical vein touch their frontal surface. Mid-kidneys or mesonephros are characterized by the appearance of larger mesonephric bodies and tubules in the caudal portion. 24 pairs of arterial vessels pass from the dorsal aorta to the mid-kidneys. At this stage of development the habenula of the gonads is seen clearly. The hind-kidney is located between the posterior coelom wall and caudal portion of the mid-kidney. In the point of adjoining to the gonad the mid-kidney is thickened, its cranial and caudal extremities are thinned. The diameter of the lumen of the mesonephric ducts is 8-0,2 mcm, the

diameter of the lument of the paramesonephric ducts – 10-0,2 mcm. Cranial portions of the urogenital complexes are located lower from the pleural-peritoneal folds. Caudal portions of the above mentioned complexes reach the pelvic portion of the coelom. In cranial portions the rudiments of the gonads are located on the frontal surfaces of the mid-kidneys. The gonads gradually descend and adjoin the middle surface of the mid-kidneys. Dissociation of the gonads from the mid-kidneys is characterized by more expressed lateral and middle sulci. The lateral sulci are from 40 to 42 mcm wide, and the middle sulci – from 30 to 34 mcm. The process of reduction of the mid-kidneys occurs in the cranial direction in pre-fetuses 14,5 mm of PCL.

In pre-fetuses 15,0-16,0 mm of PCL cranial portions of the urogenital complexes are located on the level of the lower margin of the lungs, and caudal ones – on the level of entrance to the pelvic cavity. Urogenital chordae begin to protrude over the internal coelom surface going into the medial direction. The process of their dissociation starts. Caudal extremities of the paramesonephric ducts are determined on the border between the middle and lower thirds of the mid-kidneys. The mesonephric diaphragmatic ligament is located posteriorly from the cranial portion of the paramesonephric duct. The paramesonephric duct on the level of the upper third of the mid-kidney is located laterally concerning the mesonephric duct. Enlargement of the adrenal size is associated with lateral dislocation of the gonads. The habenula of gonads passes to the anterior coelom wall and becomes 420-6 mcm long.

In pre-fetuses 18,0-19,0 mm of PCL due to reduction longitudinal size of the kidneys is 2,1-0,1 mm, caudal poles are thicker than those of cranial ones. The lower extremities of the gonads are located lower from the same portions of the mid-kidneys. The enlargement of the lateral and middle sulci results in the process of formation of the gonad mesentery. Urogenital chordae pass in the vertical direction and are separated from the mid-kidneys by a slit 40-2 mcm thick. Paramesonephric ducts are determined along the vertical portions of the urogenital chordae. Lower

from the caudal poles of the mid-kidneys the urogenital chordae gradually change their direction from the vertical to oblique one. The location of paramesonephric ducts in the urogenital chordae changes as well: from the lateral location in the vertical portion of the chorda to the ventral location concerning the mesonephric ducts.

In pre-fetuses 20,0-21,0 mm of PCL urogenital complexes start to dissociate from the diaphragmatic rudiment. Cranial portions of the urogenital complexes are located on the level of the 9th thoracic segment, and their cranial portions – on the level of the 5th lumbar segment. Different vertical sizes of the mid-kidneys and adrenal glands result in inconsiderable asymmetry of the urogenital complexes. The hind-kidneys enlarge in their size and become of a lobular structure, their cranial portions are located backward and on the level of the middle third of the mid-kidneys, and caudal portions – on the level of crests of the iliac bones. Paramesonephric and mesonephric ducts are located in the cranial portion. Paramesonephric duct in the caudal portion is located ventrally from the mesonephric one. Inconsiderable thickening of the mesenchimal cells is indicative of the origin of the muscular layer of the duct. The process of recanalization of caudal portion lumen of the paramesonephric ducts starts, which is a critical period of their development. The gonads become thicker and they become equal to the width of the mid-kidneys. The right gonad is 560-10 mcm thick, and the left one – 520-10 mcm. The gonads are located in the oblique direction on the anterior-middle surface of the mid-kidneys. Vertical portions of the urogenital chordae are located from the side of the mid-kidneys. They are separated from the kidneys by wide slits where lateral portions of gonads are determined. Paramesonephric ducts occupy the ventral position in the urogenital chordae.

In pre-fetuses 22,0-23,0 mm of PCL cranial poles of the mid-kidneys are located on the level of the 10th thoracic segment. The reduction process of the upper portion of the mid-kidney continues resulting in changes of the topographic-anatomical relations between the parts of the

urogenital complexes. Certain morphological signs of sexual differentiation in the gonads are found. Predominantly in the central portion of the gonads mesenchymal cells become thicker in the shape of small round islets. The lumen of the paramesonephric duct is larger than that of the mesonephric one - 30-2 to 28-2 mcm respectively. The right paramesonephric duct becomes 1,05-0,01 mcm long, and the left one -1,1-0,01 mcm.

Mesenchymal layer surrounding paramesonephric and mesonephric ducts is connected by the mesenchymal chorda with the lower extremity of the gonad and internal surface of the anterior abdominal wall. Later mesenchymal chordae transform into mesovarium proper and round ligament of the uterus. Upper poles of the hind-kidneys are located on the level of the lower border of the first lumbar segment. Adrenals are detected over the hind-kidneys. Urogenital complexes partially adjoin to the posterior surface of the abdominal cavity and visceral liver surface, where depression is determined. The diaphragmatic ligaments are 260-4 mcm long. Caudal mesenteric portions of the mid-kidneys transform into the mesenteries of the gonads. The gonads are dissociated from the mid-kidneys due to the fact that lateral and middle sulci become deeper.

At this stage of development the mesenteries of the gonads are formed having descending direction. Longitudinal size of the mesenteries is 640-6 mcm, and their width – 40-4 mcm. Caudal portions of the gonad mesentery attach the gonad habenula. The habenula of the gonad is closely located to the urogenital chorda, that is, on its middle surface. The longitudinal size of the habenula is 580-10 mcm, thickness – 80-2 mcm.

Conclusion. Beginning of the pre-fetal period is characterized by the process of dissociation of the gonads from mesonephros resulting in the formation of paramesonephric and mesonephric ducts.

Prospects of further studies: to investigate the development of meso- and paramesonephric ducts and their derivatives at the end of the pre-fetal period of human ontogenesis.

References:

1. *Moldavskaya AA. Development of paramesonephric channels in early human ontogenesis. Astrakhan: AGMA; 2000. 345 p.*
2. *Kozub MM. Development and formation of mesonephric and paramesonephric ducts in human early ontogeny. Bucovinian Medical Herald. 2001;5(1-2):88-90.*
3. *Sadler TV. Medical Embryology behind Langman. Lviv: Nautilus; 2001. 550 p.*
4. *Akhtemiychuk YuT. Development of the genitourinary complex in the embryonic period of human ontogenesis. In Abstract of reports Allukr sciences conference Actual questions of age anatomy and embryotography. Clin anat and operat surgery. 2006;5(2):72.*
5. *The structure of the primary kidney in human embryos. Morphology. 2000;117(3):143.*
6. *Guioli S. The origin of the Mullerian duct in chick and mouse. Dev. Boil. 2007; 302(2):389-98.*
7. *Ting TC. Coexistence of gonadal dysgenesis and Mullerian agenesis with two mosaic lines 45, X/46, X, del (X) (p 22.2). Zhonghua Yi Xue Za Zhi (Taipei). 2002;65(9):450-52.*
8. *Gustafson ML, Lee MM, Asmundson L. Mullerian inhibiting substance in the diagnosis and management of intersex and gonadal abnormalities. J. Pediatr. Surg. 1993; 28: 439-44.*