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MORPHOGENESIS OF THE HEPATIC-DUODENAL LIGAMENT IN HUMAN FETUSES AND NEWBORNS

Abstract. *Morphogenesis of the hepatic-duodenal ligament is studied by means of a complex of morphological methods of examination, topographic-anatomical interrelations of the above ligament elements during fetal period of the human intrauterine development and newborns are described.*

Key words: *hepatic-duodenal ligament, portal hepatic vein, hepatic artery, bile ducts, human fetuses and newborns.*

Introduction. Modern opportunities and prospects of intrauterine examination of human fetuses and new information about the major methods of prenatal diagnostics induce scientists to elaborate new concepts of giving aid to newborns with developmental defects [1].

Anatomical changes in the hepatic artery, bile ducts and portal hepatic vein as constituents of the hepatic-duodenal ligament (HDL) are found rather frequently [2].

Accurately determined dissection of HDL in a recipient is vitally important for successful surgery on liver transplantation [2, 3]. It is also essential for having possibility to predict the most common anatomical differences and possible variants in order to make safe and accurate cut in the hepatic portal system [2, 3, 4].

On the basis of the above prenatal anatomy as a direction of scientific studies to diagnose and elaborate new methods of treatment of congenital developmental defects is extremely important on the modern stage of development of medical science [5, 6].

Objective: to determine general regularities of HDL development during fetal and neonatal periods of human ontogenesis; to find correlation interrelations of the ligament elements with the aim to determine the time and morphological preconditions promoting occurrence of structural variants and congenital developmental defects of HDL elements during intrauterine development.

Materials and methods.

General regularities of HDL development during the fetal and neonatal periods of human ontogenesis were examined by means of the methods of macro- and microscopy, common and thin dissection, corrosion, preparing plastic and graphic reconstructive models.

The study was conducted according to the methodological recommendations «Keeping to ethical and legal standards and requirements when performing scientific morphological

studies», the major principles of the *Declaration of Helsinki* as a statement of *ethical principles for medical research involving human subjects* (1964-2000) and the Order of the Ministry of Public Health of Ukraine №690 dated 23.09.2009.

Results. In fetuses of 3-months intrauterine development the length of the hepatic-duodenal ligament ranges from 3,5 to 4,5 mm, width – from 4,0 to 5,0 mm. Clear outlines of the bile ducts and blood vessels are seen through its anterior layer surrounded by a thin layer of the cellular tissue.

Cystic and common hepatic ducts, proper hepatic artery with branches originating from it to the liver and gallbladder, and portal hepatic vein are located in the cranial portion of the ligament.

The common bile duct, portal hepatic vein, common hepatic artery with vessels originating from it to the stomach, duodenum and pancreatic head are found in the caudal portion of the ligament.

In fetuses of 4-5 months of intrauterine development (fetuses with 79,0 – 185,0 mm of PCL) HDL is well-formed, trapezoid in shape, turned to the hepatic portal area by its wide base. The length of the ligament is from 3,0 to 9,0 mm, width - from 3,0 to 7,0 mm. It should be noted that at the beginning of the fetal period the largest formation among the tubular structures of the above ligament is the portal hepatic vein. The length of the trunk of the vessel ranges from 4,0 to 6,0 mm, in 5-month fetuses – from 5,0 to 8,0 mm. The diameter of the vessel is from 1,0 to 1,4 mm.

In the middle of the fetal period (6-7 months of the intrauterine development) in fetuses of 188,0-268 mm of PCL the ligament continues to grow in size, and its diameter is practically equal with its length: the length is from 5,0 mm to 10,0 mm, the width – from 4,0 mm to 10,0 mm.

The branches of the proper hepatic artery are located most superficially near the hepatic portal

area, anteriorly from the branches of the portal hepatic vein. The branch of the common hepatic duct is located deeper from the branches of the portal hepatic vein.

Topographic-anatomical interrelations of HDL elements in fetuses of the late months of intrauterine development were examined.

Thus, in fetuses of 8-10 months of development (fetuses of 270 – 375 mm of PCL) the length of the ligament is 6 – 10 mm, the width – 9 – 12 mm.

In its upper portion between the peritoneal layers there are cystic and common hepatic ducts, proper hepatic artery and portal hepatic vein. The latter is located behind the common hepatic artery.

The common bile duct is located in the inferior portion of the ligament, to the left from it on the distance of 0,7-0,9 mm – the common hepatic artery with its branches is located. Backward from the above structures directly close to the common bile duct on the distance of 0,2-0,3 mm to the left the portal hepatic vein is located.

HDL in neonates is of a trapezoid shape, turned to the hepatic portal area by its wide base. The length is from 8,0-16,0 mm, the width – 12-18 mm.

The cystic duct is located in the upper portion of the ligament close to its right border, the common hepatic ducts – to the left. The branch of the proper hepatic artery occupies the outside left position. The portal hepatic vein is located backwards from the common hepatic duct.

In the lower portion of the ligament the following structures are located: the common bile duct, and the common hepatic artery on the distance of 8,0-9,0 mm from it. The portal hepatic vein passes backwards from the duct and artery.

Discussion. At the beginning of the fetal period of human ontogenesis (fetuses of 4-5 months of intrauterine development) HDL is well-formed, of a trapezoid shape, turned to the hepatic portal area by its wide base. In the middle of the fetal period (fetuses of 6-7 months of intrauterine development) HDL continues to grow in size, and the diameter of the ligament is practically equal to its length. In fetuses of the late months of development and neonates the ligament is of a trapezoid shape, turned to the hepatic portal area by its wide base, and its width prevails over the length.

Topographic development of HDL elements during the fetal period of human ontogenesis is investigated. The cystic duct occupies the rightmost position in the upper portion of the

ligament, to the left from it – the common hepatic duct. The proper hepatic artery occupies the leftmost position. The portal hepatic vein is located backwards from the above structures.

The common bile duct and common hepatic artery are located in the lower portion of HDL; the portal hepatic vein – backwards.

Conclusions. 1. HDL in fetuses is well-formed. During the fetal period the ratio between the width and length of HDL changes.

2. HDL structure in neonates does not differ in fetuses of the late months of intrauterine period of development.

Prospects of further studies. Systematized data concerning individualization of the norm, dynamic peculiarities of morphological changes in the HDL elements in human fetuses, will promote improvement of the early diagnostic methods and elaboration of new techniques of surgical correction of congenital defects in this area.

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