COMPARATIVE MORPHOLOGY OF THE AMPULLA OF THE PHATERNAL PAPILLA IN MAMMALS WITH AND WITHOUT GALLBLADDER

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Purpose of the study. *To study comparative morphology of ampulla of the phaternal papilla in animals with and without gallbladder.*

Material and methods of research. *Morphological features of the ampulla of the phaternal papilla of rats as representatives of animals without gallbladder and rabbits - animals with gallbladder were studied. The picture of internal relief of the ampulla mucosa was reconstructed by the method of obtaining serial histotopographic slices from the level of formation of the ampulla of the phaternal papilla up to its mouth with the following consecutive morphological and morphometric analysis. Paraffin sections of the material were stained with hematoxylin and eosin, Van Gieson, Mallory and Grimelius methods.*

Results. *It was found that the relief of the mucous membrane of the ampulla of the phaternal papilla of rats and rabbits differs significantly. In rats the ampulla cavity is smooth and has small depressions. The mucous membrane of the ampulla of the faternal papilla of rabbits forms folds, which forming anastomoses among themselves form a trabecular network.*

Key words: *ampulla of the phaternal papilla, comparative morphology.*

The gallbladder is an organ that is missing in some mammalian animals. It is absent in rats, hamsters, horses, camels, rhinoceroses, elephants. Consequently, in these animals the biliary system should have its own morphological features, because according to literature sources the gallbladder is not only a simple accumulator of bile, but influences pressure regulation in the whole biliary system

(2). It exerts an interoceptive influence on almost all organs of the digestive tract and perceives the same influence from them. It is also known that vesicular bile is more concentrated compared to hepatic bile, hence evacuation of vesicular bile through the common bile duct requires a change in its turbulence. This is especially true for the end section of the common bile duct, i.e. the place of localisation of the sphincter of Oddi and the ampulla of the phater papilla, where bile and pancreatic juice are mixed and these digestive juices are released into the duodenum in portions depending on the digestive activity of the latter (4). Some researchers attribute the absence of the gallbladder to the nature of the diet (1,5), and others to the structure of the gastrointestinal tract (6). Consequently, to date, there is no unanimous opinion of researchers on this issue. To solve this large not only biological but also medical problem, it is necessary to study the peculiarities of the structure of the biliary excretory system in objects having and not having a gallbladder. Taking into account the above-mentioned, we studied the features of the structure of the ampulla of the phaternal papilla in mammals having (rabbits) and not having (rats) a gallbladder.

Material and methods of research. To study the peculiarities of the structure of the ampulla of the phaternal papilla we used a duodenal flap cut from the upper edge (the place where the common bile and pancreatic ducts enter the wall of the duodenum) to the lower edge (a little away from the mouth of the ampulla of the phaternal papilla) of the longitudinal fold in 7 rats, 5 rabbits. The material was fixed in 12% neutral formalin. Casting in paraffin was carried out by the conventional method. Each whole flap was ‘planted’ on one block. The whole block was cut, and consecutive histotopographic sections were mounted on numbered slides. Sections were stained with haematoxylin and eosin, Van Gieson and Mallory methods, and impregnated with silver nitrate according to Grimelius. Consecutively studying the slices under the microscope, their photographs and computer printouts and using the method of mounting reconstruction (proposed by us), we studied the internal relief and structures of the mucous membrane formations of the ampulla of the phaternal papilla throughout its entire length. The

ratio of mucosal masses to its free space was determined using the point method on computer printouts and photographs according to our proposed modification.

Results of the study. The ampulla of the phaternal papilla of laboratory animals, having and not having a gallbladder, differs both in volume, and in internal relief and form of internal cavity. In rats the ampulla of the phaternal papilla has a primitive form in comparison with other laboratory animals. It is represented by a cavity having a triangular shape on the section. The acute angle of this triangle is directed towards the mouth of the ampulla, i.e. towards the duodenal cavity. The edges of the lips of the orifice are somewhat thickened. The wall of the ampulla cavity is covered with prismatic epithelium and in some places has crypt-like depressions. On the muscular side of the duodenum, the secretory sections of the glands are located in the intrinsic lamina. Both lips of the orifice contain a muscular sheath, but it, not reaching the edge of the lips, ends in a wedge-shaped thinning.

The ampulla of the phaternal papilla of the duodenum of rabbits differs from that of rats not only by its large volume, but by the presence of valve-like flaps, which are of various designs and configurations. They sprout into the cavity of the ampulla and have the appearance of a trabecular network on a transverse section. The relative density of the folds is different at different levels of the ampulla transverse section. In the proximal part of the ampulla they are short and loosely arranged and have no anastomoses between them. In the distal direction the ampulla cavity widens, the folds become high, anastomoses between them appear and the ampulla cavity on the cross section seems to consist of many small chambers of different configuration. In the vicinity of the ampulla mouth, the folds are long and multistoreyed.

The free ends of the folds hang down into the exit canal of the orifice and resemble the petals of an unopened rosebud. The study of the ratio of the ampulla free space to the area of the folds on the transverse section showed that it gradually increases in the proximal-distal direction towards the area of the folds. While in

the proximal part of the ampulla the ratio of folds to free space is 0.7 : 1.2, in the middle part this ratio is 1:1, and in the distal part of the ampulla this ratio averages 0.9:1.4. Consequently, the area occupied by the folds on the transverse section of the ampulla increases in the distal direction.

Discussion. The structure of the ampulla of the phaternal papilla has not escaped the attention of researchers (6,7 and others). However, until today such important general biological questions as why not all animals have a gallbladder, what functions the organism of these animals loses due to the absence of the gallbladder have not received a definitive answer. Some authors attribute it to the nature of nutrition (1), and others to the condition of existence (3,5). However, there is no great difference in the nature of nutrition between cattle and horses. The former have a gall bladder and the latter do not have one. Rats, hamsters and mice do not differ fundamentally in the nature of nutrition. However, rats and hamsters have no gall bladder, while mice have one. If it is connected with the condition of existence, the question also arises why pigeons and doves do not have gall bladder, and other birds have it, though the conditions of existence of these birds, which constantly live in our regions, are the same. Consequently, this question is still far from its final solution. Hence another not less important medical question arises, what happens to the organism of those patients who have had their gall bladder removed for one reason or another, how their organism reacts to the removal of the whole organ. And finally, intensive growth of endoscopic technique and its application in medicine contributed to the lag of morphological substantiation of some methods of diagnostic and therapeutic manipulations, including in biliary system (retrograde cholecystography, cholecystopancreatography, etc.). This has led to an increase in the number of their complications. All this requires the study of morphology and comparative morphology of the biliary system in animals with and without gallbladder, and this is what our school has been doing for the last thirty years.

Conclusions. The obtained results of our studies, first of all, indicate that the structure of the ampulla of the phaternal papilla in these animals differs significantly. The ampulla of the phaternal papilla of rats has no folds and flaps, and in rabbits it has complex anastomosing folds, which as if divide the ampulla cavity into several chambers of different volume and configuration. Consequently, it can be assumed that in those creatures that have a gallbladder (which includes humans) the ampulla cavity of the phaternal papilla contains complex folds and flaps. Perhaps the complications of retrograde diagnostic and therapeutic manipulations of the ampulla of the phaternal papilla are related to this. Hopefully, our results will be a small help for clinicians in choosing one or another methods of diagnostic and therapeutic instrumental manipulations in the ampulla of the phaternal papilla.

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