STANDARD ANATOMY A LIVER'S PORTO-CAVAL CANAL AMONG MEN WITH DIFFERENT TYPES OF CONSTITUTION (CONSTITUTIONAL PECULIARITIES MALE LIVER'S PORTO-CAVAL CANAL)

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It was received information about constitution's variations of male liver porto-caval canal somatotype-dependent. It was revealed that liver's portal system is more developed among men of andromorphic somatotype (according to J.M. Tannery) when the least development the caval system's hepatic veins in comparison with other somatotypes. It is established that in case of histologic proved liver cirrhosis age- and somatotype-independent the portal system is more developed. Individual and typological peculiarities sizes' change of number, length and diameter the caval- and portal systems' vessels are revealed when contrastive analyzing the liver's organometric parameters among men with and without cirrhosis. It is proved that men of andromorphic somatotype age- independent have the least values of indexes the liver's caval system but bigger indexes of the portal system; it causes a high risk to irreversible changes' development in the liver's structure in view of the fact of hereditary predisposition of this somatotype to cirrhosis.

Keywords: somatotype, the liver's porto-caval system, cirrhosis

Liver is a kind of chemical laboratory in case of breakdown of which different pathologic processes develop in the organ and in organism. For example, in case of cirrotic liver injury complicated with portal hypertension structural changes occur in intra- and anhepatic porto-caval systems having an effect on organism's condition of human being (Eramishantsev A., 1991; Lebezev V., 1994; Kitsenko E., co-authorship 2005; Nazyrov F., 2005; Colapinto R. et al., 1983; Bilbao J. et al., 2002). In Eramishantsev A. opinion, changes in system of intrahepatic porto-caval system are the cause of an irreversible process of replacement connective tissue to liver cells regeneration of which is possible if intrahepatic blood flow is normal. There is a question why one has liver's irreversible changes and other people do not have them, although influence's force, number and method of affected factor (viral, toxic, autoimmune hepatitis etc.) are equal. As is known the liver's vascular architectonics is quite well researched in normal state (Loginov A., 1990; Cejna M., 2001) but at the same time a successful development of surgery in different liver condition including cirrhosis is not possible without a detailed research of bloodstream in comparative topographico-anatomical aspect. Anatomico-topographic, histilogic peculiarities of bloodstream were described in the last century (Gugushvili L., 1972; Burgener R., 1988). In what follows, peculiarities of anatomy the liver's blood-vascular system were being researched on sex-, life-style-, and different diseases of therapeutic and surgical specificity- dependent including cirrhosis (Blyuger A., 1989; Nazyrov F., 2005; Osipenko O., 2006; Chuklin S., 2007; Haskal et al., 1994; La Berge J., 1995; Banares R. et al., 1998). All systems were researched separately and it is inadmissible because both venous systems work as incorporated in pathogenesis of liver cirrhosis (Eramishantsev A., 2003). Besides, these works have more descriptive character based on clinical observation, roentgenologic and ultrasound investigations. An analysis of domestic and foreign manuals shows the absence of information about constitutional peculiarities of constitution the liver's porto-caval bloodstream. There is no information about a degree of development of one or another venous system in different liver's parts male somamtotype-dependent. A high level of cirrhosis disease among men pathogenesis of whom is still unclear forces to look for new approaches to research the constitution of liver porto-caval canal including constitution's variants on male constitution-dependent. A clinical anthropology researching individual typological variability of phenotype is capable to estimate age and constitutional changes situated in ideas of biomedical anthropology (Khrisanfova E., Perevozchikov I., 1991; Gorbunov N., 2001; Nikolayev V., 2007). To sum up, one can assert that when quite detailed describing of anatomy the liver blood canal's histology there is no much information about constitutional peculiarities of liver porto-caval blood flow among men. In this situation anthropological approach is more reasonable which allows explaining constitution's variants of porto-caval system by the use of constitutional peculiarities of male organism.

The researching aim: To detect peculiarities the liver porto-caval system's constitution somatotype-dependent.

Researching tasks:

1. To run anthropomorphic measurements and somatotyping of male corpses of the second mature and elderly age dead in the issue of accidents with quickly dying pace with following researching liver's porto-caval canal.

2. To detect organ metric peculiarities and peculiarities the porto-caval canal's constitution among men of different somatotypes with histological proved liver cirrhosis and without.

3. To run comparative analysis the porto-caval system's somatotypical peculiarities and liver's organ metric between groups of men with and without cirrhosis.

Materials and methods of research

176 male corpses dead in issue of accidents with quickly dying pace of the second mature and elderly age (aged from 36 to 74; mean age 58,46 ± 1,54) were researched. Anthropomorphic researching with following somatotyping was run (Bunak V., 1931; Chtetsova V. co-authorship., 1979; Bashkirov P., 1962; Tanner J.M., 1956).

The liver was removed from subcostal bilateral approach after anthropomorphic corpses researching. The liver's organ metric was run with help of measuring tape. The following organ metric characteristics were being determined: liver's weight, length, width and thickness right and left liver's lobes. After this the sampling of autopsy material was run for the following histological researching. In the researching the method of colouring van Gizon was used. These colouring types allowed detecting structural elements of hepatic tissue and to diagnose cirrhosis («nutmeg liver», Avtandilov G., 1990) (Fig. 1, 2).

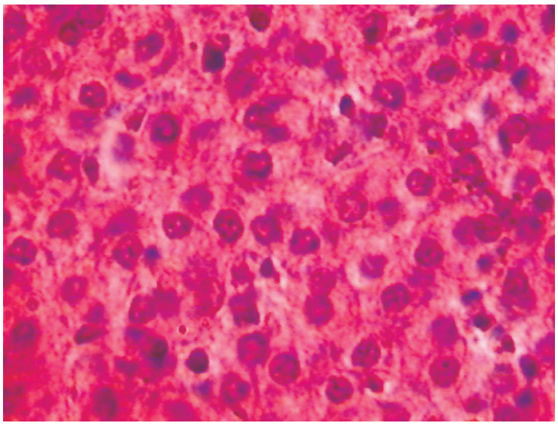

Fig. 1. Male liver histogram aged 48in a normal condition

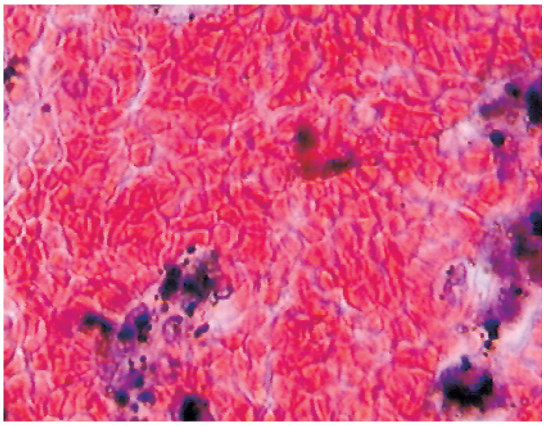

Fig. 2. Male liver histogram aged 56 suffered from cirrhosis (nutmeg liver)

According to histological researching results from 176 researched male corpses a group of 37 men in number was sorted with cirrhosis.

The research the liver porto-caval canal's constitution was run with method of bloodstream reconstruction with help of anatomic corrosion preparations (Fig. 3).

Organ metric researching the liver porto-caval canal's vessels was run on finished corrosion preparation based on method of topographic-anatomic researching offered by Malygin A. (1949) according to which vessels' number, mean diameter and length of portal and caval systems in right and left liver lobes were determined. After this a comparative analysis of male groups with and without liver cirrhosis was run.

Statistic data processing was run based on PC Intel Pentium IV using Ms Excel 9,0, Statistica for Windows 6.0, Primer of Biostatistics Version 4.03 by Stanton (Glants S., 1999; Sergienko V., Bandareva I., 2006).

Results of research and their discussion

Anthropomorphic measurements of male corpses with following somatotyping after preliminary histological researching showed the following somatotypes' distribution in groups (Table 1).

Table 1

Quantitative and percentage somatotypes' distribution among men of different researching groups

Somatotypes	Researching groups (N = 176)	
	Men free of liver cirrhosis (n_1 = 139)	Men with liver cirrhosis (n_2 = 37)
Gynaemorphic	23 (16,5 %)	3 (8,1 %)
Mesomorphic	47 (33,8 %)	14 (37,8 %)
Andromorphic	69 (49,7 %)	21 (54,1 %)

In the course of researching of organ metric indexes of male group's liver without cirrhosis a number of peculiarities was detected (Table 2).

It was detected that objects of gynaemorphic type in contrast to men of mesomorphic and andromorphic types have statistically significant (p < 0,05) smaller value of indexes of liver weight and falciform ligament's length, objects of andromorphic somatotype have bigger value of these indexes, objects of mesomorphic somatotype take an intermediate place. The smaller value of liver weight among men of gynaemorphic somatotype is connected with statistically significant ($p < 0,05$) smaller value of indexes of linear sizes (length, width, thickness) of right and left lobes in comparison with objects of other somatotypes the values of linear indexes of which are not different in the main.

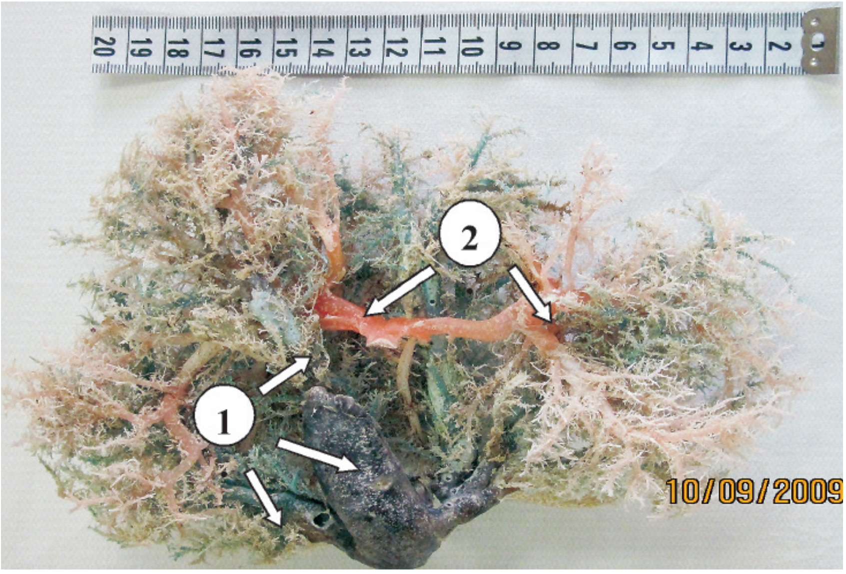

Fig. 3. Corrosion preparation of the liver porto-caval system (1 – green colour – the hepatic veins' system, 2 – pink colour – portal vein's system)

Table 2

Organ metric indexes male corpses' liver without cirrhosis among different somatotypes

Parameters	Somatotypes			
	Gynaemorphic ($n_1 = 23$)	Mesomorphic ($n_2 = 47$)	Andromorphic ($n_3 = 69$)	Significance's level p
Liver weight (kg)	1,33 ± 0,02	1,54 ± 0,04	1,87 ± 0,06	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
Falciform ligament's length (cm)	8,33 ± 0,04	11,41 ± 0,18	13,56 ± 0,39	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
The right lobe's lenght (cm)	17 ± 0,04	17 ± 0,21	18,47 ± 0,25	$p_{2\text{-}4,3\text{-}4} < 0,05$
The right lobe's width (cm)	14 ± 0,07	13,91 ± 0,28	16,41 ± 0,45	$p_{2\text{-}4,3\text{-}4} < 0,05$
The right lobe's thickness (cm)	7 ± 0,04	8,33 ± 0,18	8,93 ± 0,23	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
The left lobe's length (cm)	13 ± 0,07	11,33 ± 0,25	14 ± 0,34	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
The left lobe's width (cm)	10 ± 0,04	10,25 ± 0,15	10,27 ± 0,28	—
The left lobe's thickness (cm)	3 ± 0,01	4,16 ± 0,17	4,64 ± 0,17	$p_{2\text{-}3,2\text{-}4} < 0,05$

Organ metric parameters the liver portal system's vessels gynaemorphic somatotype's objects distinguish for certain ($p < 0,05$) smaller values in comparison with parameters of representatives of mesomorphic and andromorphic somatotypes (Table 3).

It was revealed that for objects of gunaemorphic somatotype from group without cirrhosis smaller organ metric parameters of portal system's vessels (number, length, and diameter) for right and left liver lobes are typical. For objects of andromorphic somatotype bigger indexes of these parameters are typical. Objects of mesomorphic somatotype take an intermediate place.

Somatotypical peculiarities the liver caval system's constitution of objects of gynaemorphic somatotype are cardinal opposite. It is revealed that men of this somatotype have significant ($p < 0,05$) bigger value the indexes vessels' number, length, and diameter. Objects of andromorphic somatotype have smaller value of these indexes. Objects of mesomorphic somatotype take an intermediate place (Tab. 3).

Table 3

Organ metric indexes male corpses' liver free of cirrhosis among different somatotypes

Parameters		Somatotypes (N = 139)			
		Gynaemorphic (n_1 = 23)	Mesomorphic (n_2 = 47)	Andromorphic (n_3 = 69)	Significance's level p
Potal system	Number	3,17 ± 0,09	4,33 ± 0,05	5 ± 0,01	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
	Length (mm)	5 ± 0,02	6,58 ± 0,27	6,28 ± 1,11	$p_{2\text{-}3,2\text{-}4} < 0,05$
	Diameter (mm)	1 ± 0,01	2,03 ± 0,09	3,38 ± 0,08	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
Caval system	Number	4 ± 0,04	3 ± 0,01	2,42 ± 0,07	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
	Length (mm)	15,33 ± 0,23	9 ± 0,01	7,23 ± 0,09	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
	Diameter (mm)	4 ± 0,03	1,83 ± 0,08	2,53 ± 0,15	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$

It is revealed that the value of indexes the liver's organ metric parameters and interhepatic vessels of male porto-caval system without cirrhosis of different age do not distinguish significant.

Thereby, according to the data the liver's organ metric and its porto-caval canal in the group of men without cirrhosis one can draw a preliminary conclusion that objects of gynaemorphic somatotype age-independent with significant smaller value of indexes of organ metric (liver's weight, its lobe's length, width, thickness) venous blood flow in portal system is significantly smaller in comparison with other somatotypes and outflow is more because of more developed system of hepatic veins therefore, the load on hepatocytes decreases. Objects of andromorphic somatotype having a more developed interhepatic system of portal vein have weak developed outflow system (system of hepatic veins) that is it appears an inconformity between volume of outflowing and coming venous blood sideways to the last one therefore, the load on hepatocytes increases which means that objects of this somatotype subject to pathologic influence of damaging factor on hepatocytes (cirrhosis development) and have less chance to regenerate.

While researching of liver organ metric parameters and its porto-caval system of male corpses with histological proved cirrhosis it is revealed that there is an absence of statistically significant differences by indexes of liver weight, length, width, and thickness among objects of different age groups and somatotypes.

Researching showed that interhepatic vesssels in all corrosion preparations of caval and portal systems age- and somatotype-independent are characterized by a small number, sizeable diameter, short and dilated peripheric vessels heels of which are «melt» like «burnt tree» (Tables 4, 5; Fig. 4, 5).

Table 4

Organ metric indexes liver vessels of male corpses with cirrhosis of different somatotypes

Parameters		Somatotypes (N = 37)			
		Gyanemorphic (n_1 = 5)	Mesomorphic (n_2 = 14)	Andromorphic (n_3 = 18)	Significance's level p
Portal system	Number	2,14 ± 0,02	3,2 ± 0,01	3,1 ± 0,02	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
	Length (mm)	8,2 ± 0,3	11,2 ± 0,05	14,12 ± 0,21	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
	Diameter (mm)	4,1 ± 0,02	9,8 ± 0,02	10,3 ± 0,01	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
Caval system	Number	3,5 ± 0,02	3 ± 0,01	2,12 ± 0,05	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
	Length (mm)	5,21 ± 0,03	7,1 ± 0,01	8,13 ± 0,07	$p_{2\text{-}3,2\text{-}4,3\text{-}4} < 0,05$
	Diameter (mm)	3,1 ± 0,02	3,13 ± 0,08	4,51 ± 0,11	$p_{2\text{-}4,3\text{-}4} < 0,05$

Table 5

Organ metric indexes liver vessels of male corpses with cirrhosis of different age groups

Parameters		Age groups (N = 37)		
		Aged 36-60 (n_1 = 16)	Aged 61-74 (n_2 = 21)	Significance's level p
Portal system	Number	3,15 ± 0,02	3,2 ± 0,12	—
	Length (mm)	9,12 ± 0,3	9,14 ± 0,15	—
	Diameter (mm)	4,1 ± 0,02	4,2 ± 0,12	—
Caval system	Number	3,5 ± 0,12	3,1 ± 0,21	—
	Length (mm)	5,21 ± 0,13	5,1 ± 0,11	—
	Diameter (mm)	3,4 ± 0,02	3,3 ± 0,04	—

Fig. 4. Corrosion preparation the caval system's vessels of male liver with histologic proved cirrhocsis aged 68 of andromorphic somatotype

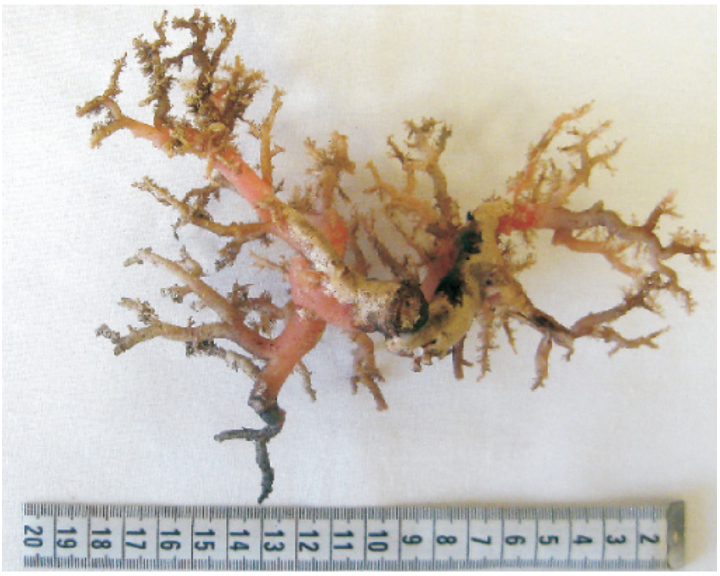

Fig. 5. Corrosion preparation the portal system's vessels of male liver with histologic proved cirrhocsis aged 57 of mesomorphic somatotype

Besides, it is revealed that the value vessels' indexes of portal system of cirrhosis changed liver exceed the value vessels' indexes of caval system somatotype- and age-independent.

In spite of the fact that there is an absence the organ metric parameters' differences of cirrhosis changed liver among men with different somatotypes one can not except a somatotypical predisposition to the liver cirrhosis development because a number of objects of gynaemorphic somatotype taking part in the researching (n_1 = 3 (8,1 %)) is considerable less than a number of objects of mesomorphic somatotype (n_2 = 14 (37,8 %)) and more than andromorphic one (n_3 = 21 (54,1 %)).

Thereby, the researching the liver's organ metric peculiarities and its porto-caval system proves a previously made conclusion that ability of hepatic issue to regenerate depends on maturity degree of intrahepatic caval and portal systems the maturity degree of which depends on constitution.

The comparative analysis of liver organ metric parameters and intrahepatic porto-caval vessels of male groups with and without cirrhosis also proves a constitutional predisposition to liver cirrhosis development. It is established that liver's weight among objects of gynaemorphic somatotype is significant ($p < 0,05$) less than liver's weight among men with liver cirrhosis of the same somatotype (1,33 ± 0,02 and1,66 ± 0,12 kg) considering smaller value of almost all linear parameters of the both lobes.

It is established that indexes of vessels canal of portal system among objects of gynaemorphic somatotype without cirrhosis ($p < 0,05$) are significant less than the same one among representatives of gynaemorphic somatotype with liver cirrhosis; value of indexes of caval system among objects of gynaemorphic somatotype without cirrhosis is significant ($p < 0,05$) bigger than the same one among representatives of gynaemorphic somatotype with cirrhosis. One can not say about representatives of mesomorphic and andromorphic somatotypes of comparison groups because they have minimal differences of researching indexes. Objects of mesomorphic somatotype without liver cirrhosis differ from objects of the same somatotype with liver cirrhosis in smaller indexes of vessels canal of portal system, notably smaller indexes of length (6,58 ± 0,27 and 11,2 ± 0,05 cm) and diameter (2,03 ± 0,09 and 9,8 ± 0,02 cm). While comparison of organ metric indexes of objects of andromorphic somatotype among the comparison groups there are not many differences. There is just small index the vessels' diameter of portal system (3,38 ± 0,08 and 10,3 ± 0,01 cm).

Analysis of received data allows detecting somatotype-dependent male predisposition to liver cirrhosis development. Men of andromorphic somatotype age-independent have smaller value of indexes of outflow (caval system) venous blood from liver but bigger value of indexes of portal system.

Therefore, increase of length and diameter of vessels of portal system can be interpreted as factors proving predisposition to liver cirrhosis.

All in all, researching of changeability of organ metric parameters of liver and intrahepatic vessels of porto-caval system subject to male somatotype allowed determining somatotypical revealed risk factors of liver cirrhosis development. The comparative analysis of organ metric indexes of male liver with and without cirrhosis can serve as a factor of constitutional predisposition to irreversible changes in the liver's structure among men of andromorphic somatotype.

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