



Original Contribution

ANATOMICAL MACROMORPHOLOGICAL FEATURES OF THE LIVER IN DOMESTIC RABBIT (*ORYCTOLAGUS CUNICULUS*)

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ABSTRACT

AIM: To determine some macromorphological characteristics of the normal liver in rabbits.

MATERIALS: We studied 12 mature, clinically healthy, euthanized rabbits, 8 months of age from New Zealand White breed and weighed between 2.8kg and 3.2kg.

METHODS: Following laparotomy and extirpation of the rabbit liver we studied its topography and linear parameters. The results were collected and recorded. The obtained data was processed via variable statistical methods.

RESULTS: The rabbit liver was situated in the epigastric region, between both costal arches. The caudate process touched the right kidney. The rabbit liver was caudally situated to the diaphragm and extended to the left and right abdominal walls. The left medial and lateral hepatic lobes were parallel to the right one. The quadrate lobe was too small. The gall bladder was cylindrical and didn't reach the ventral edge of the organ. The morphometric investigation showed that the left hepatic lobe was longer and bigger than the right one. The smallest structure in length and height was quadrate lobe. The gall bladder's three parts were with different sizes.

CONCLUSION: The rabbit liver was lobated organ, composed of five lobes. The left hepatic lobe with its medial and lateral parts is with the biggest extent in the organ, while the quadrate lobe is the smallest.

Key words: liver, anatomy, macromorphology, rabbit

INTRODUCTION

The rabbit liver is situated in the epigastric region, between both costal arches, reaching the level of the right 7th and left 9th ribs. It is lobated organ, composed of five lobes, as the right hepatic lobe, caudate and quadrate lobes are single, and the left hepatic one is separated in lateral and medial parts. The dorsal edge of the rabbit liver is situated transversally toward the median plane. The left lateral and medial hepatic lobes are parallel to the right one. The medial hepatic lobe covers the left lateral one on diaphragmatic surface. The last is visible only on visceral surface. The quadrate lobe is

narrow and marker for its localization is gall bladder's fossa. The caudate process of the caudate lobe is highly developed and has impressed for the right kidney. The gall bladder has a cylindrical shape and doesn't reach the liver's ventral edge (1).

The dog's liver is composed of six lobes: left lateral and medial hepatic lobes, right lateral and medial hepatic lobes, caudate and quadrate lobes. The parietal surface of the organ is on the diaphragm. The canine liver is in close contact with the left and right abdominal walls, and it covers the lesser curvature of stomach. The gall bladder is situated between the medial hepatic and quadrate lobes, and the caudate lobe touches the right kidney (2).

The macroscopic features of the black-tailed prairie dog's liver are investigated by (3). There are four liver's lobes: left lateral, right lateral, median and caudate. The left hepatic lobe is distinct from the others, and the

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concave surface of the right lobe touches the cranial end of the right kidney. The smallest is the caudate lobe.

Anatomical study of the nutria's liver is performed by (4). These authors proved the presence of six developed lobes: left lateral and medial hepatic lobes, right lateral and medial hepatic lobes, caudate and quadrate lobes. The liver of this animal is situated in the intrathoracic part of the abdominal cavity. Its parietal surface is concave and the visceral one touches the stomach, both kidneys and has porta hepatis.

Many authors (5) study in sexual and intersexual aspect the normal measures of the liver, kidneys and spleen in neonates and children in order to give data, which could be used as a norm for abnormal sizes' alterations in the investigated organs. The mentioned authors find the anteroposterior and transversal (lateromedial) parameters of the organs and correlation between them.

In 2002 (6) study the width and height of the liver and both kidneys in babies and find correlative ratios between the craniocaudal and longitudinal parameters of these organs.

The normal longitudinal parameters of the human left and right lobes are studied statistically by (7) and (8). The longitudinal diameter and mean value of the right hepatic lobe in men and women are higher than those of the left hepatic lobe.

Linear measurements of the liver's width and length in clinically healthy dogs are performed and calculated statistically by (9).

The lack of data about the macromorphological features of the rabbit liver motivated us to make this study. The obtained results for the normal linear parameters could be used as a base for interpretation of many rabbit liver's diseases.

MATERIALS AND METHODS

Object

We studied 12 mature, clinically healthy rabbits, 8 months of age from New Zealand White and weighed between 2.8kg and 3.2kg. The animals were euthanized with 150 mg i. v. Thiopental® (thiopental sodium 1000 mg) Biochemie, Austria (10).

Anatomotopographic study

Right after the euthanasia of the animals was performed laparotomy. The topography and the linear measurements were studied. The results were documented with digital camera Canon Legria HF R16E (Canon Inc. Japan).

Macromorphometric study

Macroscopic linear measurements of the liver in rabbit were studied after extirpation of the organs. For that purpose we used Standard Caliper – MITUTOYO D-2 (USA). The statistical analyses (descriptive statistics) were performed with statistical software (11).

Ethical protocol

The study was approved by the institutional committee of animal care. The experiments were made in strict compliance with European convention for vertebrate animals' protection, used for experimental and other scientific purposes (Strasbourg /16th May, 1986), European convention for companion animals' protection (Strasbourg /13th November, 1987) and animal protection's law in Republic of Bulgaria (section IV-Experiments with animals, art. 26, 27 and 28, received on 24th January 2008 and published in Government Gazette, № 13, 2008).

RESULTS

By performed macromorphological study of the rabbit liver it was found that this organ was situated in the epigastric region, between both costal arches. The caudate process was well developed and there was a contact between the right kidney and this liver structure. The visceral surface was concave and there was an area, which outlined porta hepatis. The rabbit liver touched the left and right abdominal walls and its parietal surface was in close contact with diaphragm. The lesser curvature of stomach was covered by this organ (**Figure 1**).

The left medial and lateral hepatic lobes were parallel to the right one. The left medial hepatic lobe covered the left lateral one, as the last was visible on the visceral surface of the organ. The quadrate lobe was too small. On the visceral liver surface the portal vein was visible. The choledoch duct flew in the beginning part of duodenum. The contact between rabbit liver and stomach was strengthened by hepatogastric ligament (**Figure 2**).

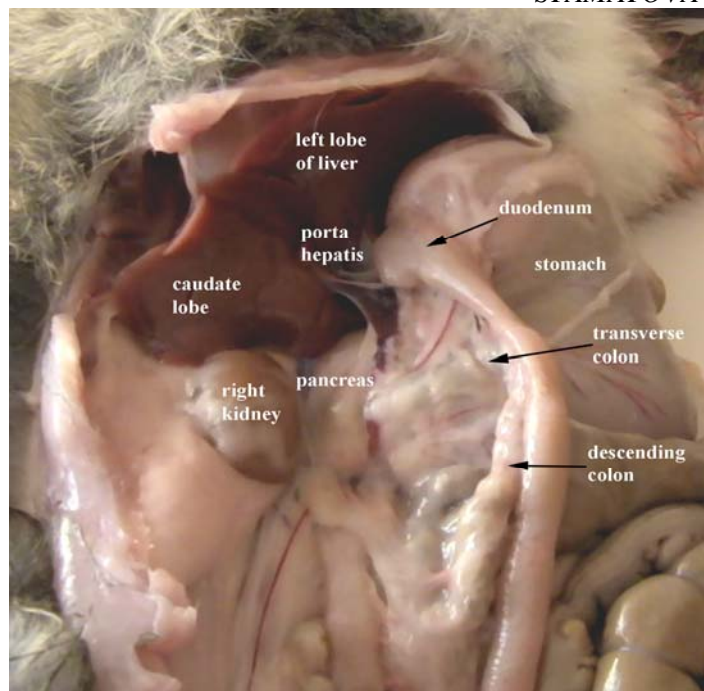


Figure 1. Anatomical topographic localization of the rabbit liver.

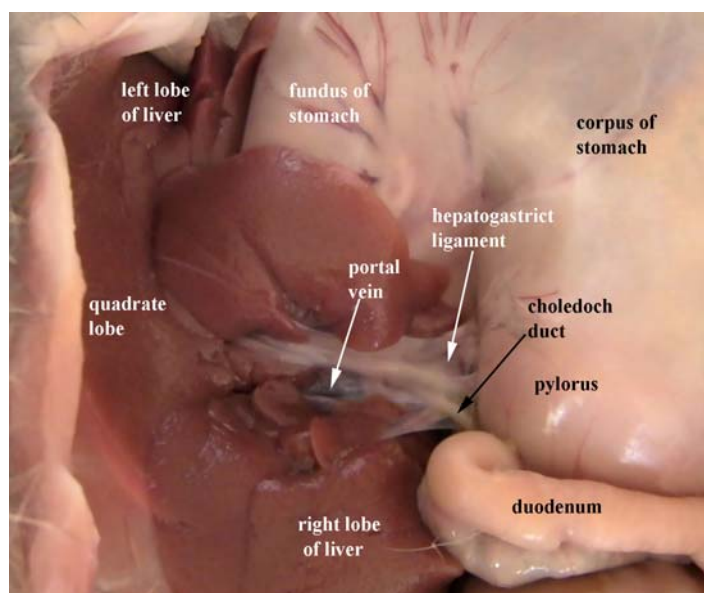


Figure 2. Anatomical topographic localization of the rabbit liver.

Our study demonstrated that the rabbit liver was lobated organ, composed of five lobes. The left hepatic lobe was divided in lateral and medial parts, while the right lobe was single. The quadrate lobe was a small structure, and the gall bladder fossa was a marker for its position. The caudate lobe had a caudate process, which was a massive formation with impress for the right kidney. The papillary process had a round shape. The gall bladder was cylindrical and didn't reach the ventral edge of the organ (**Figure 3**).

The morphometric investigation showed that the left hepatic lobe was longer and bigger than the right one. Its lateral part was wider and longer than the medial one. The extent of the caudate process was bigger than this of the papillary process and the smallest structure in length and height was quadrate lobe. Concerning the gall bladder, its three parts were with different sizes. The widest part was gall bladder fundus and the thinnest structure was its neck. Cystic duct was comparatively long formation (**Table 1**).

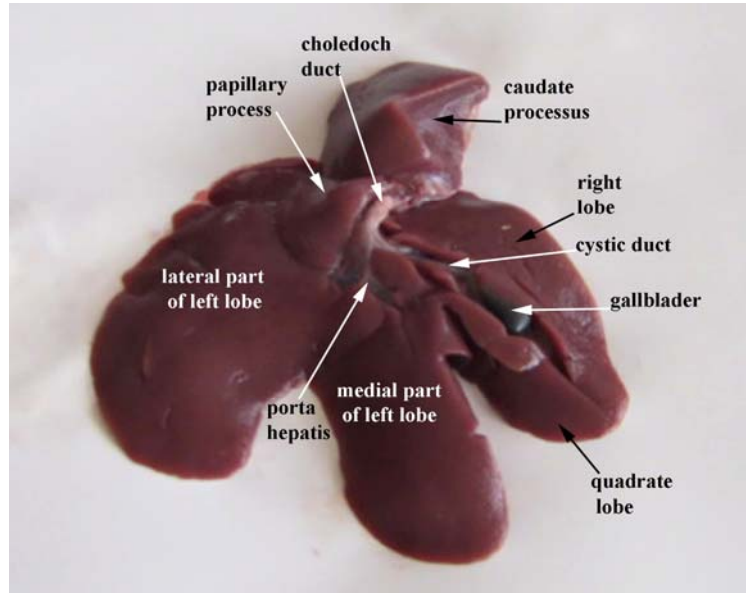


Figure 3. Lobated character of the rabbit liver.

Table 1. Linear macroscopic measurements (in mm) of the rabbit liver.

Parts of liver	N	Parameters	Range	Minimum	Maximum	Mean	Standart Error	Standart Deviation
Whole liver	12	Craniocaudal measurement	1	12	13	12.58	0.15	0.51
	12	Lateral measurement (width)	8	144	152	147	0.63	2.17
	12	Dorsoventral measurement (height)	5	126	131	128.75	0.45	1.54
Caudate lobe	12	Lateral measurement (width)	5	64	69	66.92	0.42	1.44
	12	Dorsoventral measurement (height)	3	47	50	48.58	0.29	0.99
Papillary lobe	12	Lateral measurement (width)	3	40	43	41.08	0.28	0.93
	12	Dorsoventral measurement (height)	4	28	32	30.42	0.31	1.08
Lateral part of left lobe	12	Lateral measurement (width)	2	57	59	58.08	0.23	0.79
	12	Dorsoventral measurement (height)	5	116	121	118.25	0.39	1.36
Medial part of left lobe	12	Lateral measurement (width)	4	40	44	41.33	0.31	1.07
	12	Dorsoventral measurement (height)	4	85	89	86.92	0.31	1.08
Right lobe	12	Lateral measurement (width)	4	34	38	36.54	0.28	0.89
	12	Dorsoventral measurement (height)	6	104	110	107.3	0.41	1.18
Quadrate lobe	12	Lateral measurement (width)	3	17	20	19.08	0.29	0.99
	12	Dorsoventral measurement (height)	4	59	63	60.75	0.35	1.22
Gallblader	12	Dorsoventral measurement (height)	2	17	19	17.58	0.19	0.67
	12	Lateral (width) measurement of fundus	1	9	10	9.5	0.15	0.52
	12	Lateral (width) measurement of corpus	1	5	6	5.58	0.15	0.51
	12	Lateral (width) measurement of gallbladder neck	1	2	3	2.67	0.14	0.49
Cystic duct	12	Lateral (width) measurement	0.2	0.8	1	0.95	0.02	0.07
	12	Dorsoventral measurement	3	12	15	13.17	0.30	1.03

DISCUSSION AND CONCLUSION

The results of our study confirmed the data of (1) about the lobated character of the rabbit liver and its anatomical topographic localization. The extent of the organ's lobes confirmed the attitude of the mentioned author, that the left liver lobes with its both parts is the biggest structure, compared to the right one and the quadrate lobe is too small.

Contrary to (2) about the dog liver the rabbit one is composed of five lobes. Like the assertion of these authors about dog liver localization we confirmed that this organ in the rabbit was in close contact with the same organs and structures, described in the dog. The gall bladder's position corresponded with this, found in the dog. Similarly to canine liver's caudate lobe the rabbit one touched the right kidney.

Compared to the investigation of (3) about liver in the black-tailed prairie dog, we made another classification of rabbit liver's lobes and found that this organ is divided in more parts than the same in the mentioned canine breed. Contrary to the attitude of this author that the black-tailed prairie dog's liver caudate lobe is the smallest, we considered that the smallest lobar structure in the rabbit liver is the quadrate lobe.

Like (4) about nutria's liver we made anatomical investigation of this organ in the rabbit and proved its lobated characters. Like nutria's liver the rabbit one had the same localization in the abdominal cavity and on its visceral surface was found porta hepatis. In comparison with the investigation of these authors that the liver in the nutria touched the both kidneys, the rabbit one was in close contact only with the right kidney.

Similarly to (5) we consider that the normal linear measurements of the rabbit liver could be a source of data, which could be useful to find alterations in the sizes of the investigated organs.

Our investigation corresponded with this of (6). We found the width and length of the rabbit liver's lobe, but didn't compare the linear measurements of the rabbit liver with its both kidneys.

As (7) and (8) we found the normal longitudinal parameters of the left and right hepatic lobes. In comparison with the attitude

of these authors about the human liver, we found that the left hepatic lobe with its both parts was longer than the right one. Our results weren't connected with the sexual features of the investigated animals.

In correspondence with the study of (9) with dogs, we used clinically healthy animals and made linear measurements for length and width of the rabbit liver, which were statistically analysed.

The results of our investigation determined the anatomical and macromorphometric features of the rabbit liver. These data could be used as a base for comparison of another investigations of this organ in other animals and for interpretation of many pathological alterations and lesions concerning the rabbit liver.

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