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Original Contribution

TOPOGRAPHICAL ANATOMY OF SOME ABDOMINAL ORGANS IN RABBITS

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ABSTRACT

The rabbit is among the most widely used animal species, both in animal husbandry and laboratory practice. It is a means of research in the fields of biology, physiology, medicine etc. The data about the topographical anatomy of abdominal organs and their adjacent structures are scarce. The purpose of this study was to determine the boundaries of some visceral organs, their adjacencies and relationships. Also, we aimed at determining the age-related differences in the topographical location of studied organs. Twenty White New Zealand rabbits, weighing between 1.500 and 3.680 kg, aged between 3 months and 2.5 years, divided into 2 groups of young and adults were used. Following dissection, using routine anatomical techniques, the exact positions of the abdominal organs were determined.

The results of the present study are considered to be of assistance in diagnostics and clinical work.

Key words: topography, abdominal organs, rabbit

INTRODUCTION

The rabbit is a widely distributed animal species, commonly used in the laboratory and for economical purposes. It is a model for numerous medical experiments and is extensively used in teaching, especially in fields where laboratory techniques are performed Recently these animals are also preferred for keeping as pets. All these facts place rabbits in the focus of research and require the knowledge of the precise location of internal organs, depending on both species and age. The longitudinal and transverse anatomical planes would contribute to obtaining correct data on the location, boundaries and configurations of intraabdominal and intrathoracal organs. The anatomical data would also assist in obtaining exact data throughout a biopsy and furthermore, from diagnostic and experimental imaging techniques (1-3). The topography of internal organs in the rabbit is scarcely described in available literature and there are no detailed information about anatomical relationships and age-related peculiarities (4-7).

Consequent upon this we proposed to describe some abdominal organs comprising the stomach, liver and kidneys and to specify their exact locations in the abdominal cavity, marking their anatomical boundaries and adjacencies. In parallel we aimed to determine the age-related variations in the topographical location of studied organs.

The strict application of anatomotopographic knowledge would be necessary for veterinary medical diagnostics and medical experimentation.

MATERIAL AND METHODS

Twenty healthy male and female White New Zealand rabbits, divided in two groups, were used: young – 10 animals at the age of 3 months weighing 1.5 – 2.0 kg and adult – 10 animals at the age of 2 – 2.5 years weighing 3.120 – 3.680 kg. The health status of rabbits

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was determined by physical examination and laboratory studies (serum biochemistry and haematology profiles). The animals were housed in a common environment under a predetermined feeding regimen, free access to water and an area of 3 m^2 per animal.

The rabbits were killed with 100 mg/kg intravenous Pentobarbital (Sandoz Gmph, Kundl – Austria).

The dissection was performed via one median and two transverse (behind the rib arc) incisions of the soft abdominal wall to expose at maximum the viscera in the thoracal and extrathoracal parts.

The findings were documented with a digital photocamera Sony-Cyber shot 4.2.

RESULTS AND DISCUSSION

The stomach is located in the intrathoracal part of the abdominal cavity. During the initial anatomical inspection, the identification of the various parts of the stomach was impeded by the specific location of the caecum that occupied a considerable part of the dextroventral half of the abdominal cavity. The longitudinal axis of the stomach was placed under an angle in relation to the body axis, confirmed by the data of (7, 8). The bigger part of the stomach lay to the left of the median plane and on the right side, only the pylorus was located (**Figure 1**). This is in accordance with numerous recognized anatomical data (4-6). The available literature does not however give details about the topographic features and relationships of the various gastric parts. The results of our anatomical study showed that the pylorus was anteriorly extended to the plane that passed through the 7th interrib area. The pylorus was directed dorsolaterally, and contacted the dorsal part of the rib wall. The cardia was situated at the level of the 4th-5th rib and the horizontal line, passing through the coxal tuberosity. We assume that this is due to the specific location of the caecum, that occupies a relatively significant part of the abdominal cavity and displaces the stomach in a craniodorsal direction. In the angle between the cardia and the small gastric curvature, the papillary process of the liver was positioned (**Figure2**).

The great curvature of the stomach was descending ventrocaudally, without touching the soft abdominal wall. There, jejunal loops were inserted as well as the ventral margin of the liver together with the gall bladder. On the left, the stomach was restricted between the transverse planes passing cranially through the 9th interrib space and caudally through the 12th interrib space. Forward, the stomach contacted the visceral surface of the liver and from the 10th to the 12th interrib space, was adjacent to the rib wall. Dorsally, it communicated with the diaphragmatic crura and the proximal part of ribs. The liver was situated on the right of the stomach. Caudally, it was adjacent to jejunal loops and ventrally – with the loops of the colon and the caecum. In a similar study, Perez et al. (2005) state that the anatomy of rabbits is not well known with no consensus on the anatomical nomenclature. The authors had however investigated the abdominal organs from the point of view of peritoneal folds and the topography of organs was not discussed in detail.

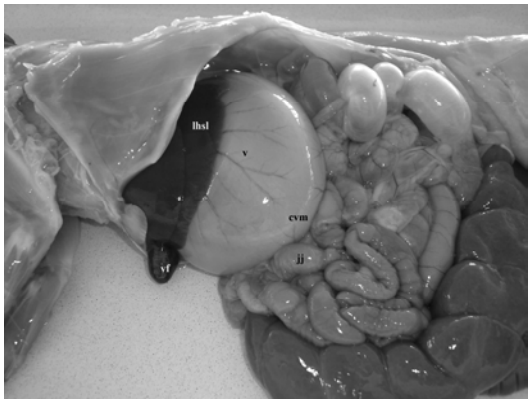

Figure 1 Abdominal organs. Ventrolateral view. *Abbreviations: Lhsl-lobus hepatis sinister lateralis; Vf-vesica fellea; Cvm-curvatura major ventriculi; Jj-jiejunum.*

Figure 2 Location of the stomach and its proximal organs. *Abbreviations: Cvm-curvatura major ventriculi*; *Jj-jiejunum; Rs-ren sinistra; H-hepar; Cc-cecum;L-lien.*

The knowledge of the normal anatomy of rabbit liver is necessary not only for medical experimentation purposes, but also for diagnostic imaging techniques (2, 3). It is commonly accepted that the liver is situated just behind the diaphragm 2/3 on the right and 1/3 on the left of the median plane (4-6). The

topographical features of this organ are not sufficiently studied. Our results showed that the liver was positioned almost perpendicularly to the longitudinal body axis. The right lateral lobe was pushed forward from the gastric pylorus. The most developed liver lobes were the right lateral and the left medial lobes. The quadrate lobe prominated behind the xiphoid cartilage and touched the soft abdominal wall. The gall bladder prominated outside the ventral margin of the liver, being inserted between the stomach on one side and the xiphoid cartilage and the soft abdominal wall, on the other (**Figure 3**).

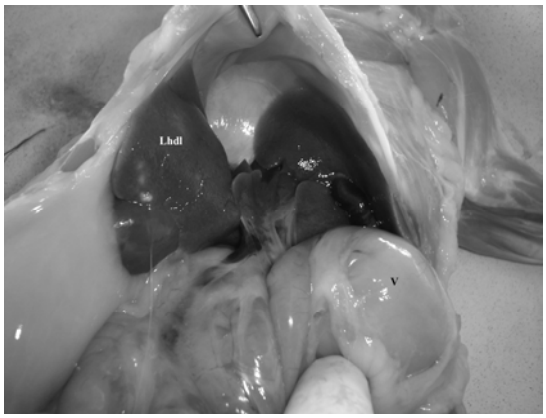

Figure 3. Lobus hepatis dexter and proximal organs. *Abbreviations: L-lien.*

The spleen occupied the middle third of the intrathoracal part of the abdominal cavity. The organ was with an elongated, fusiform body with a length of 4-7 cm and width of 1-3 cm depending on the age and body weight. It was situated on the caudomedial surface of the stomach and this information is adding to that of Gadjev (1995) and Baron (1997). Dorsally, it was extended up to the duodenum and the pancreas without contacting the lumbar musculature. Laterally and ventrally to it, the loops of the jejunum were observed (**Figure 4**).

The kidneys were asymmetrically positioned in the retroperitoneal space. The right kidney lay between the planes through the 10-11 interrib space and through the first lumbar vertebra that was not similar to what Gadjev (1995) and Terentiev et al. (1952) are claiming. The anterior border of the right kidney touched the liver and made the renal impression. Caudally, the organ reached the descending part of the duodenum (**Figure 5**).

The left kidney was more loosely attached than the right one and lay between the 2nd and the 4th lumbar vertebrae, as stated also by Gadjev (1995) and Terentiev (1952). Ventrally it bordered on jejunal loops and ventrocranially – on the descending colon and the body of the pancreas. Medially to both kidneys the aorta, a. renalis sinistra and v. renalis sinistra were positioned, the left kidney being more distant from the median plane than the right one. There were no significant age-related differences in the topography of studied organs.

Figure 4 Ventral view. Specific location of the spleen. *Abbreviations: Lhdl-lobus hepatis dexter lateralis; V-ventriculus.*

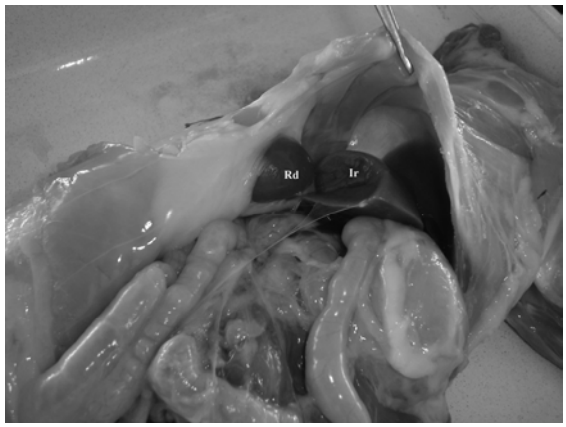

Figure 5 Right kidney with impressio renalis. *Abbreviations: Rd-ren dextra;Ir-impressio renalis*

CONCLUSIONS

The location of the stomach in rabbits is specific for the species. The pylorus is directed dorsolaterally and contacts the dorsal part of the rib wall. The cardia is situated on the level of the 4th-5th rib and the horizontal line passing through the coxal tuberosity. The body of the stomach does not touch the soft abdominal wall. Between, parts of the liver and the gall bladder are inserted.

The spleen is positioned on the caudomedial surface of the stomach.

The kidneys are asymmetrically situated, the right one lying more anteriorly and contacting the liver.

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