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Research Article

Ultrasonographic Characteristics of Rabbit's Pancreas

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ABSTRACT

Aim of the study was to demonstrate some ultrasonography specifications of the normal pancreas in rabbit and their use as model for visual anatomical imaging study of pancreatic lesions in animals and humans. We used 12 clinically healthy 8 months old of New Zealand White rabbits between 2.8 and 3.2 kilos, who were mature and all anesthetized. Our investigation had been done Diagnostic Ultrasound System and micro convex multi frequency transducer. The trial animals were starved before the experiments. Before the study we injected (per os) isotonic solution. The animals were positioned in dorsal recumbency. The ultrasonographic accesses were percutaneus transobdominal epigastric and transgastric. The pancreas was scanned longitudinally, transverse and oblique. In the four of the studied animals the pancreas were extirpirated after their euthanasia. The organs were researched under liquid isotonic medium. We determined three parts of the gland. The pancreas showed similar acoustic density to the liver. The left lobe was more determined and showed more echogenisity. It has been visualized as striped finding in front of the cranial mesenteric vein. Great amount of adipose tissue has been seen in the peripheral part of the gland that gave hyperechogenic structure of the capsule. The glandular parenchyma showed hyperechogenic linear findings. Portal vein was near the cranial mesenteric vein. The caudal vena cava was seen on the right of the aorta. Transabdominal epigastric access is very good method for visualization of pancreas in rabbits. 8 hours after their last meal an isotonic liquid was injected before the study to provide quality visualization of the gland. The placement of the animals in dorsal recumbency is suitable condition for visualization of the gland. Filling liquid of stomach is great acoustic window for the study of the pancreas in rabbits.

Key Words: Pancreas, anatomy, ultrasonography, rabbit

TAVŞAN PANKREASININ ULTRASONOGRAFİK ÖZELLİKLERİ

ÖZET

Bu çalışmanın amacı tavşanlarda normal pankreasın bazı ultrasonografik özellikleri ve pankreatik lezyonların insanlarda ve hayvanlarda görsel anatomik görüntüleme çalışmaları için kullanılmasıdır. Bu amaçla 12 adet sağlıklı, 2,8-3,2 kilo arasındaki 8 aylık Yeni Zelanda beyaz tavşanı kullanılmıştır. Bütün hayvanlar anesteziye alınmıştır. Araştırmamız Diagnostik Ultrasound sistemi ve multikonveks multifrekans transduser kullanılarak yapılmıştır. Denekler deneyden önce aç bırakılmışlardır. Çalışmadan önce per os yolla izotonik solüsyonu verilmiştir. Hayvanlar dorsale doğru yatırılmıştır. Ultrasonografik erişim perkutanöz transabdominal epigastrik ve transgastrik yolları ile

olmuştur. Pankreas longutidinal, transvers ve oblik açılarından incelenmiştir. 4 çalışma hayvanında ötenaziden sonar pankreas çıkarılmıştır. Organlar sıvı izotonik mediumunda incelenmiştir. Bezin üç bölümü olduğunu belirledik. Pankreasın akustik yoğunluğu karaciğerle aynıdır. Sol lob daha belirgindir ve daha ekojeniktir. Kranial mezenterik venanın önünde ince şerit gibi görülür. Kapsülüne hiperekojenik görünümünü veren bezin peripheral kısmında çok miktarda adipoz doku görülür. Glandular paranşim hiperekojenik çizgi şeklinde görülür. Portal vena kranial mezenterik venanın yakınındadır. Kaudal vena cava aortanın sağında görülür. Tavşanlardaki pankreasın görüntülenmesinde en iyi metot transabdominal epigastrik yoldur. Bezin görüntüsünün kalitesini artırmak için çalışma öncesindei son yemeklerinden 8 saat sonra sıvı izotonik enjekte edilmiştir. Bezin görüntülenmesi için hayvanların dorsal pozisyonda yatırılması uygundur. Tavşanlardaki pankreasın çalışması için mideyi sıvı ile doldurmak iyi bir akustik pencere oluşturur.

Anahtar Kelimeler: Pankreas, anatomi, ultrasonografi, tavşan

Introduction

Pancreas does not have particular localization in the rabbit, because the gland is divided on small lobes that are isolated from one to another. They are placed in the adipose tissue of the mesoduodenum. The left lobe is more compact and better shaped than the right one. It is placed in the deep sheet of greater omentum, caudally of stomach fundus and reaches the ventral surface of the left kidney, as it touches the spleen. The pancreas has one channel - ductus pancreaticus accessorius, which opens at 30-40 cm of the pylorus, in the transition of the descending and transverse duodenum (Barone, 1997).

Many authors perform ultrasonographic longitudinal or transverse study of the pancreas in normal human patients. The authors present the reasons for the difficult ultrasonographic visualization of the gland (variable form and localization, presence of many echoes), which makes difficult mapping the organ against the neighboring structures (Haber et al., 1976; Kunzmann et al., 1979). For visualization of the gland the authors use the following echographic markers: liver, spine, caudal vena cava and the aorta. Transducer's frequency is 2.5 MHz. A number of researches have done ultrasonography study of pancreas in humans in three planes: longitudinal, transverse and oblique (Dancygier, 1988; Saunders, 1991; Şirli and Sporea, 2010). Best visualization of pancreas is achieved when the transducer is placed in the epigastrium, because this way the transverse colon is eliminated into which frequently accumulate gases. In order to achieve better visualization of the pancreas, the patients do not eat for 7-8 hours and take 10-15 min before the examination 500-700 ml liquid. The veins of the spleen, which are visualized between its hillius and cranial mesenteric vein, form dorsal border of the pancreas. Mesenteric root is anatomical echographic marker for the transition (neck) between the head and the body of the pancreas. Basic vessel markers in transverse visualization of the pancreas are the veins of the spleen. The echogenisity of the normal pancreas varies between hyperechoic to hypoechoic, but most frequently is similar to the liver. Other researches have conducted in depth ultrasonographic study of pancreas in healthy patients and patients with pancreatitis and neoplasias (Erchinger et al., 2011; Martínez-Noguera and D'Ontorio, 2007). The authors use convex transducer with frequency of 3MHz to 4MHz, as they do longitudinal, transverse and oblique ultrasonographic sections of the pancreas. The patients are placed on back, abdominally, upright and laterally, to achieve better vision. Echogenisity of the normal pancreas is isoechoic or hypoechoic compare to the liver. The gland is situated dorsally and ventrally of the first two parts of the duodenum. The amount adipose tissue, that accumulates in the pancreas and around it grows with the age and is in correlation of increased glandular echogenicity. Portal vein is visualized in front of the neck of the pancreas. The veins of the spleen go through the dorsal surface of the gland. The pancreatic duct is seen as hypoechoic striped finding. Transabdominal ultrasonographic access to the pancreas in humans is obstructed by the retroperitoneal localization, the stomach and transverse colon (Hohl et al., 2007). As an acoustic window for visualization of the pancreas the authors use the stomach filled with liquid and as tissue window

for visualization of the tail of the gland they use the spleen. Dopler-ultrasonographic transabdominal study of pancreas in human is done by group of authors (Bertolotto et al., 2007). They establish correlation between the tissues and vessels findings of the gland, aiming anatomical and diagnostic interpretation of the glandular characteristics. The visualization includes also periglandular vessels findings (portal vein, caudal vena cava, cranial mesenteric vein, splenic veins and aorta) and their connection with the glandular vessels.

Veterinary researches investigate ultrasonographically the pancreas of the dog and the cat and find the following: the normal pancreas is isoechoic with the near mesentery and so is difficult to identify, the proximity of the gland to the stomach and the duodenum is the reason that better visualization is achieved with starvation regimen; dorsal positioning of the animals is frequent method of the study; in small dogs and cats the authors apply linear and convex transducers with frequency of 8 MHz to 15 MHz; the right lobe of the pancreas in dogs is better visualized compare to the left and the body; in cats the left lobe and the body are better observed compare to the right; in dogs as anatomical markers for transverse visualization of the right lobe is the duodenum and the right kidney; the body of the pancreas is seen dorsocaudal to the pillory, in proximity to the portal vein; the left lobe is localized between the stomach and the transverse colon; the pancreatic duct is difficult to be seen in the dog, as in the cat is observed as central anechoic tubular structure (Heicht and Henry, 2007; Linda, 1996; Nyland et al., 2002). The pancreas in cats is visualized as isoechoic finding compare to the surrounding mesenterial structures. It is from isoechoic to hyperechoic compare to the liver and hypoechoic compare to the spleen (Etue et al., 2001; Rademasher et al., 2008). The pancreatic duct is seen in the left lobe of the gland. Duodenum is anatomical marker for the right lobe of the pancreas. Portal vein is anatomical marker for the body and the left lobe of the pancreas. In cats, as in human, hyperechogenicity and dilatation of the pancreatic duct are normal geriatric signs of the gland (Heicht et al., 2006; Larson et al., 2005).

The availability of research data regarding ultrasonographic anatomy of pancreas in human, dogs and cats, and no data for ultrasonographic specifications in rabbits have motivated us to undergo to the present anatomical study.

The aim of this research is to present some ultrasonographic specifications in normal pancreas in rabbit and to be able to use the results as biological experimental model for anatomic and diagnostic investigation of pancreatic lesions of animals and human.

Materials and Methods

Object

We studied 12 clinically healthy New Zealand White rabbits 8 months of age and weight between 2.8 and 3.2 kg. We used anesthetic 15 mg/kg Zoletil® 50 (Tiletamine hydrochloride 125 mg and Zolazepam hydrochloride 125 mg in 5 ml of the solution) Virbac, France.

Transabdominal ultrasonography

The study (B-mode) was performed with ultrasonic apparatus Diagnostic Ultrasound System: model DC-6V Shenzhen Mindray Biomedical, Electrnics Co. Ltd (CHINA) and microconvex, multi frequency transducer: model 6C2 with working frequency 6.5 MHz and radius 20mm. The hair of the abdomen of the animals was removed in the area of the costal arch, xyphoid and the navel with Animal clipper device - Moser Animalline: ARCO, Type 1854, Production: Wahl Gmbh (Germany). For better contact to the skin of the transducer we used contact gel (Ecoultragel Pirrone & Co, Italy). The findings were documented by thermoprinter device Mitsubishi P 93.

The experimental animals (*in vivo*) were left on starvation regimen for 6 to 8 hours prior the experiment with water supply at libitum and then immediately before the observation we applied via esophageal gastric tube 20ml isotonic solution (Natrii chloridum 0.9% - Sodium chloride 9.0 g in 1000 water solution; Balkanpharma, Bulgaria). The animals were positioned in dorsal recumbency. Ultrasono-

graphic access was percutaneous transabdominal epigastric and transgastric. The pancreas was scanned ultrasonographic longitudinal, transverse and oblique. The intensity of the breath movements of the abdomen was decreased with the applied anesthesia. The manipulation was done in order to achieve high quality ultrasonographic images. The experimental settings were taken from the investigation of normal pancreas in human (Şirli and Sporea, 2010).

In four of the studied animals (*ex vivo*) the pancreatic parts were extirpirated after the euthanasia with 150 mg i. v. Thiopental® (thiopental sodium 1000 mg) Biochemie, Austria (Posner and Burns, 2009). The obtained specimens were investigated under isotonic medium (Natrii chloridum 0.9% - Sodium chloride 9.0 g in 1000 water solution; Balkanpharma, Bulgaria), with the aim of comparing ultrosonographic characteristics of the pancreas with the ones with the normal topography (Dimitrov and Russenov, 2006).

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 (Starsbourg /16th May, 1986), European convention for companion animals' protection (Starsbourg /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

The ultrasonographic picture showed that the pancreas in the rabbit is not unified organ. In transverse visualization (*in vivo*) were determined the three portions of the gland (lobus pancratis dexter - head, corpus pancreatic - body, lobus pancreatic sinister - tail), between which we saw hypoechoic border areas. The pancreas showed close or greater acoustic density compare to the liver. The left lobe was better shaped, rounded and homogenic and showed greater echogenicity compare to the right lobe and was visualized caudal to the stomach wall. The body of the pancreas showed greatest echogenicity and was visualized as striped finding in front of the cranial mesenteric vein. It formed cranial directed convex arch. In the peripheral part of the gland was seen abundant amount of adipose tissue that gave the organ capsule hyperechoic type. The glandular parenchyma showed presence of hyperechoic linear findings that were with greatest acoustic density in the body, followed by the left and the right lobe. Between them were formed small hypoechoic spaces. Dorsally of the annular and hyperechoic finding of the cranial mesenteric vein was determined the aorta, which lumen was hyperechoic compare to the lumen of the vein. The portal vein was detected in close proximity to the right wall of the cranial mesenteric vein. The walls of those three vessels were distinguishable and hyperechoic, due to the presence of the adipose tissue around them. To the right of the aortal finding we saw caudal vena cava, which walls were not determined and the lumen was with lower echogenicity compare to the rest of the vessels (Figure 1).

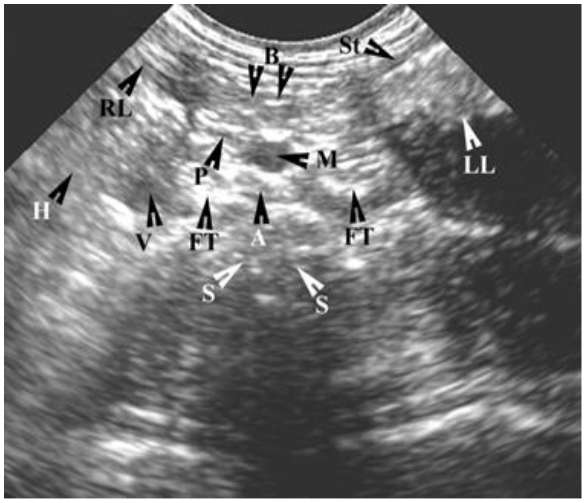

Figure 1. Transversal ultrasonographic image of normal rabbit pancreas (in vivo).

Şekil 1. Normal tavşan pankreasının transversal ultrasonografik görünümü (in vivo).

RL - right lobe, LL - left lobe, B - body, M - cranial mesenteric vein, V – caudal vena cava, A - aorta, P - portal vein, FT - fatty tissue, St - stomach, H - liver, S - spine. (6.5 MHz microconvex probe).

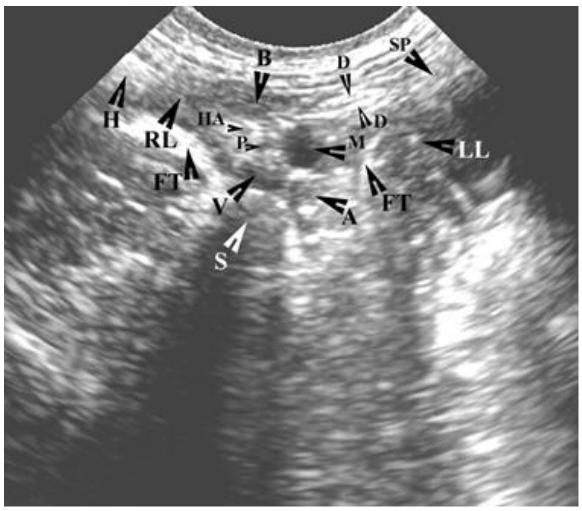

Figure 2. Oblique ultrasonographic image of normal rabbit pancreas (*in vivo*).

Şekil 2. Normal tavşan pankreasının oblik ultrasonografik görüntüsü (*in vivo*).

RL - right lobe, LL - left lobe, B - body, M - cranial mesenteric vein, V - caudal vena cava, A - aorta, P - portal vein, HA - hepatic artery, D - pancreatic duct, FT - fatty tissue, SP – spleen, H - liver, S - spine. (6.5 MHz microconvex probe).

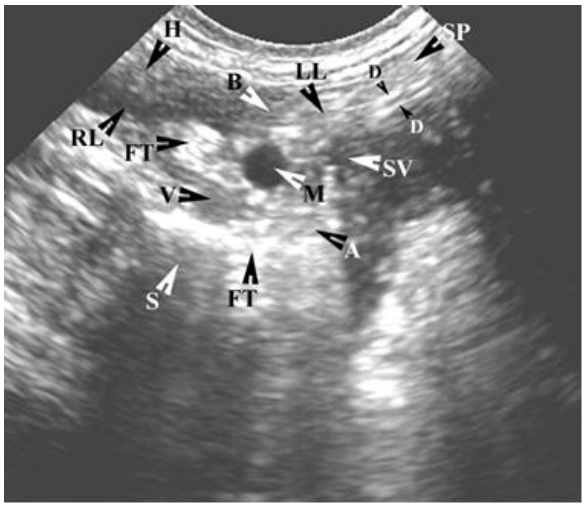

Figure 3. Oblique ultrasonographic image of normal rabbit pancreas (*in vivo*).

Şekil 3. Normal tavşan pankreasının oblik ultrasonografik görüntüsü (*in vivo*).

RL - right lobe, LL - left lobe, B - body, M - cranial mesenteric vein, V - caudal vena cava, A - aorta, D - pancreatic duct, FT - fatty tissue, SV - splenic vein, SP - spleen, H - liver, S - spine. (6.5 MHz microconvex probe).

In observation of the pancreas in longitudinal section we determined only parts of the right lobe and the body of the gland. They showed relatively homogenic echogenicity, which was close or lower compare to the one of the liver and considerably lower to the echogenicity of the spleen. From the vessel structures we saw here only the aorta, which was projected as longitudinal tubular finding. It was with distinct hyperechoic walls and hypoechoic lumen (Figure 4).

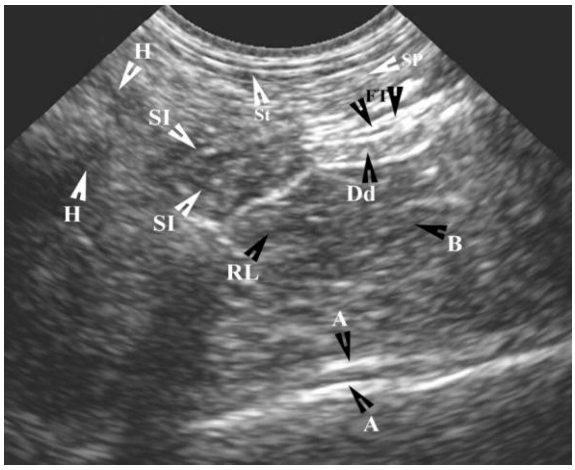

Figure 4. Longitudinal ultrasonographic image of normal rabbit pancreas (*in vivo*).

Şekil 4. Normal tavşan pankreasının longitudinal ultrasonografik görünümü (*in vivo*).

RL - right lobe, B - body, A - aorta, FT - fatty tissue, St - stomach, SP - spleen, H - liver, SI - small intestine, Dd - duodenum. (6.5 MHz microconvex probe).

The transversal ultrasonographic examination of postmortem extirpated pancreas in isotonic medium (*ex vivo*) showed that the gland is echogenic finding without disitngushable capsule in the peripheral part. The transversal image of the pancreas was approximately oval to triangular and showed homogenic echogenicity. In the glandular parenchyma were seen striped hyperechoic linear findings, as between them we saw small hypoechoic spaces (Figure 5).

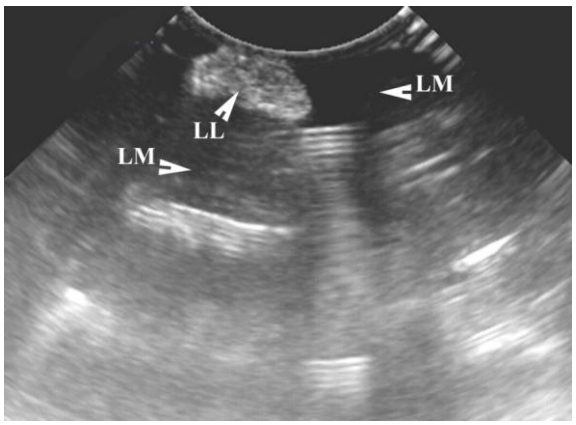

Figure 5. Transversal ultrasonographic image of normal rabbit pancreas (*ex vivo*).

Şekil 5. Normal tavşan pankreasının transversal ultrasonografik görünümü (*ex vivo*).

LM - isotonic liquid medium, LL - left lobe (6.5 MHz microconvex probe).

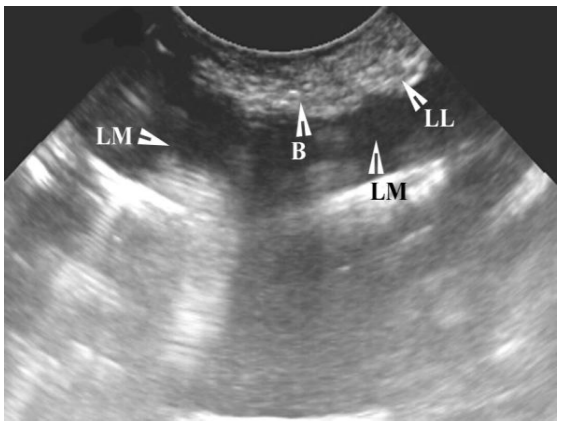

Figure 7. Longitudinal ultrasonographic image of normal rabbit pancreas (*ex vivo*).

Şekil 7. Normal tavşan pankreasının longitudinal ultrasonografik görünümü (*ex vivo).*

LM - isotonic liquid medium, RL - right lobe, B – body (6.5 MHz microconvex probe).

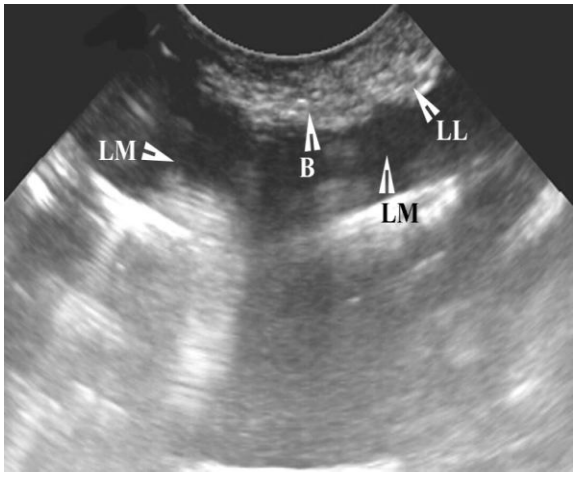

Figure 6. Oblique ultrasonographic image of normal rabbit pancreas (*ex vivo*).

Şekil 6. Normal tavşan pankreasının oblik ultrasonografik görüntüsü (*ex vivo*).

LM - isotonic liquid medium, LL - left lobe, B - body (6.5 MHz microconvex probe).

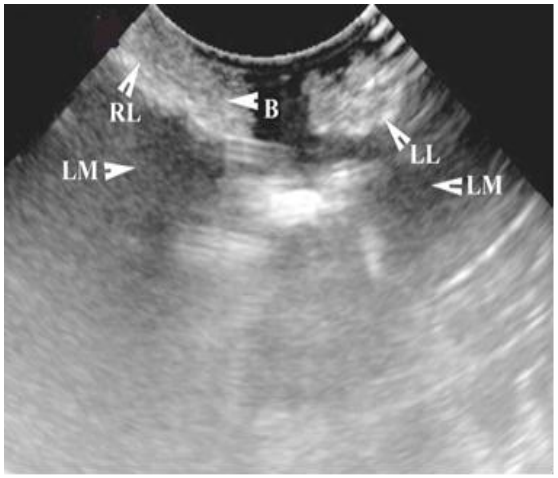

Figure 8. Longitudinal ultrasonographic image of normal rabbit pancreas (*ex vivo*).

Şekil 8. Normal tavşan pankreasının longitudinal ultrasonografik görünümü (*ex vivo*).

LM - isotonic liquid medium, RL - right lobe, B - body, LL - left lobe (6.5 MHz microconvex probe).

The oblique ultrasonographic study (*ex vivo*) presented the pancreas as striped echoic structure with homogenic echogenicity, in which the left lobe and the body dominated. There were seen hyperechoic linear findings and absence of capsular part (Figure 6). The longitudinal ultrasonograpy of the pancreas (*ex vivo*) determined one echogenic finding without clear peripheral contours. The internal hyperechoic linear structures were relatively most intense in the area of the left lobe. There has been seen clear border between the left lobe and the other two parts of the gland (Figures 7, 8).

Discussion

The results of the ultrasonography (*in vivo*) confirm the data from Barone (1997) for the topography and the shape of the pancreas in the rabbit. The left lobe is better developed and has nearly oval shape. The body and the right lobe are striped echogenic findings. Between the three parts of the pancreas there are clear borders, which confirm the determined from Barone (1997) for the disseminated localization of the pancreas in the rabbit. The hyperechogenic character of the peripheral parts of the gland and those in near proximity to the great vessels are due to the localization of the pancreas in the adipose tissue of the mesoduodenum (Barone, 1997).

As per the ultrasonographic studies of Haber et al. (1976) and Kunzmann et al. (1979) for the normal pancreas in human, we show the following facts that obstruct the good visualization ability of the pancreas in rabbit: variable shape and localization of the gland; the borders of the gland are marked with difficulty, due to the presence of the multiple echoes that come from the peripheral adipose tissue (Haber et al., 1976; Kunzmann et al., 1979). Analogous to those authors, we suggest some echographic markers typical for the visualization of the gland in the rabbit: the liver, spine, caudal vena cava and aorta. Due to the small size of the investigated animals in our study we recommend transducer with frequency of 6,5 MHz and greater. In our study the applied compression (by the transducer) on the abdominal wall eliminated the gas collection and increased the quality of the visualization (Haber et al., 1976; Kunzmann et al., 1979). In rabbit, as in human are seen internal hyperechoic linear findings, between which are closed hypoechoic spaces (Haber et al., 1976; Kunzmann et al., 1979).

The result of the study of the pancreas in rabbit in three planes (longitudinal, transverse and oblique) proves that best visualization is achieved when applying the transducer in the epigastrium. That is to eliminate gas collection findings in the transverse colon (Dancygier, 1988; Saunders, 1991; Şirli and Sporea, 2010). Following the similarities to the study of these authors for human, we suggest the animals to be placed on starvation diet for 8h as 10 min prior the experiment to apply per os isotonic liquid. Our results show that the filled with liquid stomach can be recommended acoustic transgastric window when visualizing the pancreas in rabbits (Dancygier, 1988; Saunders, 1991; Şirli and Sporea, 2010). In rabbit the spleen veins take part when marking the dorsal border of the left lobe of the pancreas, with unison to the data of (Dancygier, 1988; Saunders, 1991; Şirli and Sporea, 2010) for human. Cranial mesenterial vein we suggest as echographic marker for the body of the pancreas, in comparison to the typical in human, where mesenteric root is marker for the neck of the gland (Dancygier, 1988; Saunders, 1991; Şirli and Sporea, 2010). Major vessel marker in the oblique visualization of the pancreas is the veins of the spleen. That corresponds to the determined in human (the spleen veins are vessel marker in oblique visualization of the pancreas) (Dancygier, 1988; Saunders, 1991; Şirli and Sporea, 2010). Echogenicity of normal pancreas in the rabbit varies from hypoechoic to hyperechoic, but is similar to the one of the liver. Echogenicity of the gland is increased in some cases, due to the presence of extra and intra glandular adipose tissue (Dancygier, 1988; Saunders, 1991; Şirli and Sporea, 2010). According to our findings, unlike in human, the transverse ultra-sonographic sections are suitable for studying the three parts of the pancreas in rabbit, but the longitudinal – for the body and the right part (Dancygier, 1988; Saunders, 1991; Şirli and Sporea, 2010). The utilized in our research microconvex transducer with high frequency is suggested for studying the pancreas of the rabbit. The result does not correspond with the recommendation from Şirli and Sporea (2010) for ultrasonography of the pancreas in human, for the reason being of bigger body size. As acoustic tissue windows we recommend the liver and spleen, which was taken from the research of Şirli and Sporea (2010).

The experimental animals were examined only in dorsal recumbency. The results of that

positioning allowed great visualization of the pancreas. The data partially corresponds with the settings from Martínez-Noguera and D'Ontorio (2007) as well as Erchinger et al. (2011) in human. Echogenicity of the left lobe of the normal pancreas in rabbit is isoechoic or hypoechoic compare to the liver and hypoechoic compare to the spleen. The body is with higher acoustic density compare to the other two parts. Those ultrasonographic features of the pancreas differ greatly from the results of Martínez-Noguera and D'Ontorio (2007) as well as Erchinger et al. (2011) for human. As for the typical in human, in rabbit the portal vein was distinguished in close proximity to the right lobe of the gland (Erchinger et al., 2011; Martínez-Noguera and D'Ontorio, 2007). The pancreatic duct in rabbit was visualized as tubular striped finding with hyperechoic walls and hypoechoic lumen. Those results correspond to the found of Martínez-Noguera and D'Ontorio (2007) as well as Erchinger et al. (2011) in human.

Our results comply, but differ from the data of Linda (1996), Nyland et al. (2002), and Heicht and Henry (2007) for pancreas in dogs and cats in the following: in the rabbit the pancreas is difficult to access and is hypoechoic compare to the surrounding mesenterium, as with the dog and the cat it is also hard to access, but isoechoic with the surrounding mesenterium; the closeness of the pancreas to the stomach and the duodenum is a reason for application of starvation diet prior examination, which corresponds with the determined results in dogs and cats; the dorsal positioning when investigating the animals is a good method with the rabbits, similar to the data with the dogs and the cats; the left lobe of the pancreas in the rabbit is visualized better than the right, which is in contradiction with the dogs and is in opposite with the cats results; in the rabbits as anatomical marker for the transverse visualization are used annular findings of the portal vein and the caudal vena cava, as in dogs the duodenum is used; the right lobe in the rabbits is striped finding compare to the dogs and the cats and is isoechoic or hypoechoic vs. the surrounding mesenterial adipose tissue; the pancreatic duct in the rabbits is better observed (as with the cats) in longitudinal ultra-sonographic section, whereas in dogs is hardly noticeable; the body of the pancreas in the rabbits is seen in near proximity to the portal vein.

The results of the ultrasonography of the pancreas in the cat (Etue et al., 2001; Rademasher et al., 2008) are in connection to the identification of anatomical markers as the pancreatic duct, duodenum, duodenal papilla, portal vein and the stomach. In comparison with the data of those authors, we identified other anatomical markers for the pancreas and recommend as a sign for the normal parts of the gland in the rabbit (cranial meseneric vein, portal vein, caudal vena cava, the spleen veins, the aorta, liver, spleen, stomach). Our results regarding the comparative acoustic density in the pancreas of the rabbit, compare to the nearing structures correspond to the results in cats (the pancreas is visualized as isoechoic finding compare to the surrounding mesenterial structure, isoechoic or hypoechoic to the liver and hypoechoic to the spleen) (Etue et al., 2001; Rademasher et al., 2008). As in the cat's, in rabbit the pancreatic duct is placed in the left lobe of the gland (Etue et al., 2001; Rademasher et al., 2008). Portal vein is anatomical marker for the body and the right lobe of the pancreas in rabbit, in contrast to cats is marker for the left lobe.

From the comparative analysis of the results we can conclude the following: the applied transabdominal epigastric access is a good method for visualization of normal pancreas of rabbit in transverse and longitudinal section; the study in animals after 8 hours of their last meal and injecting (per os) with isotonic liquid 10 min prior the experiment allow quality visualization of the gland; placement of the animals in dorsal recumbency is suitable condition of the visualization; the utilization of full stomach with fluid as an acoustic window, and spleen as tissue ultrasonographic screens are recommended way in examining of the normal pancreas in rabbit; the anatomic markers, used by our group in the study are

good exographic signs for ultrasonogrraphic topography of the pancreas in rabbit.

The results give us the grounds to propose our data for ultrasonographic characteristics of the pancreas as a model for normal echographic picture of this particular gland in rabbit. After the conducted study we can claim, that in addition to the dog and the cat (Heicht and Henry, 2007; Linda, 1996; Nyland et al., 2002), the rabbit is good biological model for investigation of the pancreatic lesions in human and animals.

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