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Original scientific paper

FREQUENCY OF DETERMINATION OF PARENCHYMAL ORGANS DISTURBANCES DURING ULTRASOUND EXAMINATION OF REPRODUCTIVE TRACT**

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Abstract: Ultrasound *Real time 2D* diagnostics, being an available and non-invasive method, is successfully used in human medicine, veterinary medicine and biology to diagnose both physiological and pathological conditions. In the case of small animals, the ultrasound is often used to diagnose gravidity, number, size and vitality of fetuses as well as to diagnose pathological conditions present in the genital tract, and is also used to examine testicles and prostate of male animals. Today's advanced use of the ultrasound diagnostics provides us with an opportunity to detect numerous pathological conditions of reproductive tract of both female and male animals, and those conditions directly affect health status of other internal organs. The aim of this study is to diagnose primary genital tract disorders using the ultrasound diagnostics, as well as proving its connection to the changes in parenchymal organs. The ultrasound examination was performed on the total of 12 dogs, 6 male and 6 female dogs. Ovaries, uterus and the organs in the abdominal area were examined using a transducer ranging from 5 to 8 MHz. A transducer of 7.5 MHz was used to examine prostates and testicles. The patients were in dorsal position. Three out of six examined male dogs exhibited changes on their prostates, and the remaining one had a tumor on the testicles. Cystitis and hyperplasia of prostate were also found upon the examination of these dogs. One out of six examined female dogs, had cystic endometrial hyperplasia, three of them had pyometra, and one of them was diagnosed with an follicular cyst. In addition to these pathological conditions, changes were noticed in the liver and pancreas. Along with the detection of primary changes in the genital tract of both male and female animals, the ultrasound diagnostics can be used to discover consequent changes in parenchymal organs.

Key words: ultrasound, genital tract, parenchymal organs, dogs

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INTRODUCTION

Ultrasound Real Time 2D Diagnostics, as an available and non-invasive method, is successfully used in medicine, veterinary and biology, for the diagnosis of both physiological and pathological conditions (Marković et al., 2003). The use of this method was pioneering in the early diagnosis of pregnancy in the eighties and then generally accepted in human medicine, which the physicians introduced in experiments and everyday clinical practice. Today, this diagnostic procedure is almost irreplaceable in everyday clinical practice. The best description of this method is that it represents a stethoscope of doctors and veterinarians of the 21st century.
Massive application of ultrasound diagnostics brought about facing very high prices of the device, but massification and technological advancement made this method available in wide practice (Lukač et al, 1994). As for veterinary clinical practice, ultrasound has made revolutionary progress both in large animals and small ones. The use of ultrasound diagnostics in dogs and cats has improved diagnostic reliability, broaden the use of drugs in various pathological conditions and allowed a veterinarian to find out what is happening in the patient's body. Many of the diagnoses that are being made today were once completely concealed and left more to pathologists than clinicians. In small animals, ultrasound is often used in the diagnosis of gravity, number, size and vitality of the fetus, as well as for the diagnosis of pathological conditions occurring in the genital tract, and prostate and testicular examination in males (Vogas et al, 1996). Ultrasound diagnostics also allows us to inspect the functional state of other organs such as the heart, liver, pancreas, kidneys, adrenal glands, thyroid, lungs.

The greatest challenge in ultrasound diagnostics is the huge range in the size of patients who are the subject of research and diagnostics in veterinary practice. The weight of patients in small animal practice varies from 0.5 to 75 kg. This fact itself poses the question of setting up an objective diagnosis. When comparing the use of ultrasound diagnostics in human and veterinary practice, it is noticeable that variations are far greater when examining small animals. In addition, the structure of dog's and cat's bodies in relation to the human body construction is completely different (Marković et al., 2003). Dogs and cats have a narrow, deep trunk, chest and abdomen while humans are more plump with broad abdomen.
Although there is a large difference, one must not forget that the essence of the ultrasound examination is the ability to absorb ultrasound waves from different tissue densities. The collagen on the surface of the capsules of all internal organs plays a key role, which defines the application of ultrasound diagnostics in small animals, and leaves the possibility of high resolution and definition of physiological conditions or changes in internal organs, which are located in a relatively small area (Marković et al, 2003).This diversity in body construction is also crucial when it comes to the selection of adequate ultrasonic probes used in clinical veterinary practice (Lukač et al, 1994).

The probes used in ultrasonic diagnostics have the same circumference as in human medicine. Ultrasonic probes used in clinical practice are electronic and are divided into linear, sectoral and convex probes. In linear probes, the crystal batteries are activated one after the other, the image produced is rectangular in shape, with the dimensions equal to the probe. In electronic sector probes, the activation of crystal batteries is carried out according to a special rule, based on phase delay in order to obtain a characteristic sector image. In covex probes good sides are used and the defects of both types of probes are significantly reduced. A special construction of

this type of probes has increased the angle at the top - the main lack of a sector probe, and the lack of a linear probe which gives only the image of what is directly below it has also been eliminated. The convex probe has a large field of view at the top, and it can also visualize hidden parts.

Fortunately, in today's clinical practice, due to technological advancement, it is not necessary to have multiple probes of different frequencies since today's devices have the ability to regulate the probe frequency in the device itself. The need for different probes consists only in the need of a veterinarian to work with endorectal, cardiological or most often transabdominal, multi-frequency probes that can cover the largest extent of his examination (Skrobonja, 2003).

Ultrasound devices that are used today in clinical veterinary parasites have a wide range depending on the needs and possibilities. Thus, veterinarians generally use devices that are more or less portable and multifunctional. Today, there are devices that, besides 2D Reall Time, have the option of using color doppler ultrasonography (CD), which is a more advanced technological variant. They require continuous learning and training and bring a more advanced and more accurate approach in the diagnostic process. Color Doppler presents a non-invasive evaluation of the flow through blood vessels of the genital organs in a two-dimensional, high-resolution image. Identification or mapping of blood vessels and blood flows is achieved by changes in the direction of wave motion in relation to the probe. The blood flow toward the probe is mapped in red. Blood flow from the probe in blue. Variations in the frequency of the CD waves make a change in the color of the basic colors: Darker color shade is proportional to the lower flow rate and vice versa. The laminar flow is marked with red or blue color. The green color identifies the existence of turbulent movement: lighter shades of green color are concordant with greater turbulence. If it takes place toward the probe, it is visualized in yellow, and in indigo blue after insonated wave. (Đukić, 2003)

Reproductive organs as subjects of ultrasound examination are divided into female and male reproductive organs. The result is more delicate due to to the size of the animal being examined. The examiner very often has to adapt to the size of the animal which dictates the range and the frequency of the probe being used or the depth at which the body is examined. Ultrasound examination is therefore best done by the standard protocol and in the same position of the body, since there is already a delicate number of variations that primarily depend on the patient itself, and if the examiner disrupts the approach during the examination, the adjustment of the eye and the work of the hand can easily lead to confusion and misinterpretation. As many experts in this diagnostic area claim, the device never fails, but those who read and interpret the image on the monitor may be wrong. Examining the animal in the back or standing position provides the greatest commotion during the examination. If some of the abdominal organs are not displayed during the examination, a better position should be provided and work out of these standards, but only after some key elements of diagnosis are set. This primarily refers to kidneys or liver. It is mandatory to note that for the examination of the heart that can be an organ affected by the consequences of primary pathological changes on the reproductive tract, lateral decubitus position is necessary.

In the ultrasound examination of the genital tract, it is best to comply with the examination protocol. Ultrasound examination of the genital tract in small animals is rarely performed under conditions where the patient is prepared, with empty stomach and full bladder (Klein, 1996). These are the conditions anyone would want in order to have urine transparency in the access to the cervical os and bifurcation, and then the uterine horns and ovaries without interfering intestinal gasses. Due to the minimal absorptive power of body fluids and better tissue

transparency obtained when ultrasonic waves pass through tissues of different densities, the echo of the wave received on the monitor screen of the ultrasonic device gets on the quality of resolution even with poorer devices.

The examination itself begins with the preparation, shaving of the hairy covering to prevent creation of air pockets that would disturb the existence of a homogeneous whole of the ultrasound image. For female and male patients it is best to be lying on back during the examination which occurs from the caudal portion of the pelvic cavity and cranially along the linea alba to the sternal bone. For both categories of patients, females and males, bladder fullness makes the examination far more objective. Full bladder is a key landmark for defining the size of the liver and spleen. In dogs and cats, given the very large number of breeds and mixed breeds, there are no standards present in human medicine. Hepatomegaly as a diagnosis is defined when the caudal edges of the liver lobes cross the transversal line of the full bladder to the pelvis. The same applies to splenomegaly.

In everyday clinical practice we perform ultrasound examination of the uterus, uterus horns and ovaries (Diez et al, 1998). The possibility of visualization does not depend on the size of the patient, but on the relaxation of the intestine from the contents and gases or bladder fullness. This is the most basic rule in ultrasound diagnostics. The biggest problem for veterinarians is the fact that almost 90% of patients are unprepared, and that makes examinations almost always in the zone of interventional ultrasound (Marković et al, 2003). Increased or altered prostate and changes in the testicles can be detected by routine ultrasound examination, even in those cases where the characteristic clinical picture does not occur. The advanced application of ultrasound diagnostics has led to the possibility that today many pathological conditions of the reproductive tract of both female and male animals, which directly influence the health condition of other internal organs, can be linked. In some diseases, changes that occur are the result of mechanical or metastatic occurrences, functional disturbances. The consequences are also known to be reflected by changes in the skin, which can often be misled by inexperienced treatment.

Female genital tract

In small animals it is very difficult and delicate to perform an ultrasound examination of the ovaries, since the size of the ovaries varies from 0.5 to 2cm, and the size of the patients is from 0.5 to 75 kilograms (Klein, 1996). Thanks to structures such as follicle, yellow body and corpus luteum cyst, we can identify and examine the ovaries at the stage of proestrus, estrus and metestrus. The ovaries are oval in shape, located caudally and often laterally to the cranial pole of the kidney, which is anatomic landmark for localizing the ovary. The appearance of the ovary varies during the cycle.

A normal, non-gravid uterus is unobtrusive and difficult to visualize in small animals. The best way to recognize the uterus is an examination that begins from the neck of the filled bladder that opens the "window" with its transparency and provides the possibility of visualizing the cervix, the uterine body and bifurcation. There is also the vena cava caudalis. They cannot be mistaken one for another since the uterine walls are recognized by hyperechoic look due to increased absorption of ultrasonic waves. (perimetry, myometrium and endometrium). The regularity of wall continuity is preserved in proestrus and estrus, while during anestrus the walls are more or less irregular. The walls of the vein are uniform and hypoechogenic. The uterus is most easily recognized in the caudal abdomen, where it looks like a tubular structure between the urinary bladder (ventral) and the descending colon (dorsal) (Lukač et al, 1994).
The size of the uterus is variable and depends on

the size of the animal, the number of previous deliveries, and uterine cycle phase. Due to the presence of the gut and their contents, the uterus and uterine horns can be visualized only in segments, never in continuity, but this is enough for a valid examination. The diameter is important for the examiner, as well as the possible presence of purulent contents, which is characterized by the presence of corpuscles of the echogenic or hyperechogenic character. The uterus consists of the following 3 tissue layers: the internal mucosa, the muscularis, and the serosa. Endometrium and myometrium usually can not be separated. The thin echogenic rim is visible peripherally. In non-gravid uterus the body is visible, while the horns of the uterus are lost in the parts of the small intestine and the mesenteric fat tissue. The uterus differs from the small intestine by the absence of peristalsis, the lack of intraluminal gas and the absence of layers characteristic for the small intestine. Pathological conditions that occur on the female genital tract are different kinds of endometriosis:pyometra, hemometra, cystic endometrial hyperplasia with characteristic rosary-like appearance, ovarian tumors and ovarian cysts.(Klein, 1996).

Male genital tract

Normal testicles are echogenic to hypoechogenic and have a fine, homogeneous echo structure. The testis is covered by a thin, hyperechoic tissue layer known as the tunica albuginea. In saggital scans a central hyperechoic line that represents the mediastinum testis is visible, whreas in transverse scanning the mediastinum appeared as a hyperechoic focus. Testicle size is directly related to body weight. The head and tail of the epididymis are located on the cranial and caudal pole of the testis, while the epididymal body is located along the dorsal aspect of the testicle. Compared to the parenchyma of the testis, epididymis are hypoechoic and have coarser structure. The location, size and appearance of the prostate depends on the dog's age and whether the dog is castrated or not. The healthy prostate in young and uncastrated dogs of the middle age builds a homogeneous, medium to fine structure, surrounded by a thin, hyperechogenic capsule (Atalan et al., 1999). The prostate is bordered cranially by the bladder, ventrally by the pelvic floor and ventral abdominal wall, and dorasally by the rectum. In the longitudinal scan the prostate is round to oval. In sexually immature and neutered dogs, the prostate is significantly smaller, with relatively hypoechoic and homogeneous structure. The pathological changes in testis most commonly encountered in male animals are hydrocele, varicocele, tumors and orchitis of different etiologies. The changes that can be identified in the prostate are intraprostatic cysts, hyperplasia, tumors, extra-prostatic cysts.

Abdominal organs

The liver position depends on body built, the breadth of the ribs and the liver size. The contour of the liver is caudally bordered by the right kidney contour, and cranially by the diaphragm. Changes in intrathoracic and intraabdominal pressures can affect the position. Thus, the liver is cranially shifted in case of abdominal cancer, ascites, relaxation or rupture of the diaphragm and atelectasis (Cuccovillo et al., 2002). It is caudally shifted in higher pleural effusion and hepatomegaly. Determining the size of the liver is unreliable because the shape and position of the liver are individually variable. The liver has homogeneous parenchyma. It consists of fine grainy echoes, of medium intensity and the same strength in all parts of the liver. However, attenuation of echoes in deep layers does not have to be pathological. Normal liver echogenicity is somewhat stronger than echogenicity of the kidney, and less than that of the pancreas. In the liver parenchyma there are circular and tubular structures that represent blood vessels. Portal vein branches converge toward liver hilus and their walls are

hyperechoic. Hepatic vein branches converge cranially, their contours are smooth and gentle without the echogenicity of the vein walls. This differentiation is possible only in larger vessels. Intrahepatic bile ducts are not seen if their lumen is not dilated.

Pathological changes are clearly visible in the ultrasound, and are the result of primary diseases (cirrhosis hepatis and focal changes) for which we are unsure of whether they are malignant or benign. They represent limited changes in irregular oval shapes which, by their hyperechogenicity, deviate from normal hepatic parenchyma. Their presence in the liver may be solitary or multiple. With their total surface they reduce the functional activity of the organ and affect the prognosis and further course of treatment. Metastatic changes as tumor changes are clearly limited, irregular structures, containing hyperechogenic structures like the beds between which there are collections of liquid anechoic content (Mattoon et al., 1995). Liver tumors are most commonly localized in the liver hilus and are rarely available during the examination given that they are in the retroperinum. Tumor formation in the liver hilus eventually leads to weakness of the right heart and point to an ultrasound cardiologic examination. The presence of these newly formed changes leads to the enlargement of the liver tissue and the displacement of the left lobe to the celiac trunk which is recognized by the anechoic shadow in the shape of "mustache". Pathological formation in the liver also exerts pressure and shift the left lobe to the pancreas, which can be seen by dilatation of common bile-duct which has the same opening, papilla major, as pancreatic duct. Pancreas is an organ that is extremely difficult to detect in dogs except in the cases of these pathological conditions of the liver or the pancreas.

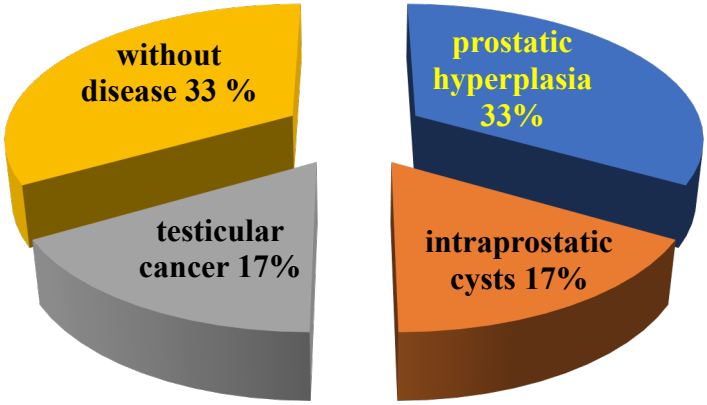
MATERIAL AND METHODS

Ultrasound examination was performed on a total of twelve dogs. The six dogs were male and the other six females. Dogs were between 4 and 8 years old. The ovaries, uterus and abdominal organs were examined with the probes in the range of 5 to 8 Mhz. We used Toshiba color doppler ultrasound, a stationary device with multi-frequency probes, convex and linear type. The patients were placed in dorsal lying position. A probe of 7.5 MHz was used to examine the prostate and the testicles, with the patient placed in dorsal lying position. Position, shape, size, contours, parenchyma, vascularisation and echostructures of the liver were examined with ultrasound. Longitudinal, transverse, oblique and intercostal cross-sections were used for the examination of the liver. Longitudinal cross-section was used for observation of the left and right lobes, diaphragm cupola, for longitudinal diameter measurement and for observation of large blood vessels, bile ducts and gallbladder. This cross-section is made by placing the probe vertically on the costal margin and moving in the medial and lateral direction with slight rotation. The left lobe was examined using cross section, its size was measured and the shape and echostructure of both lobes was observed. The probe was first positioned in the transverse direction below the xiphoid process then it was angulated in a direction parallel to the costal margin, and shifted cranially and caudally with fan-like rotation at each shift. Right oblique scan of the liver was performed vertically on the costal margin and the left one parallel to it. Liver parenchyma of both lobes was examined as well as gallbladder and blood vessels. Intercostal scans were performed in the left lateral decubitus of the patient in a quiet respiration. The probe was placed in any intervertebral space, parallel to the ribs, and the central part of the liver with blood vessels was shown. Pathological changes in the liver parenchyma are divided into diffuse changes, hemangiomas,

and focal liver lesions.

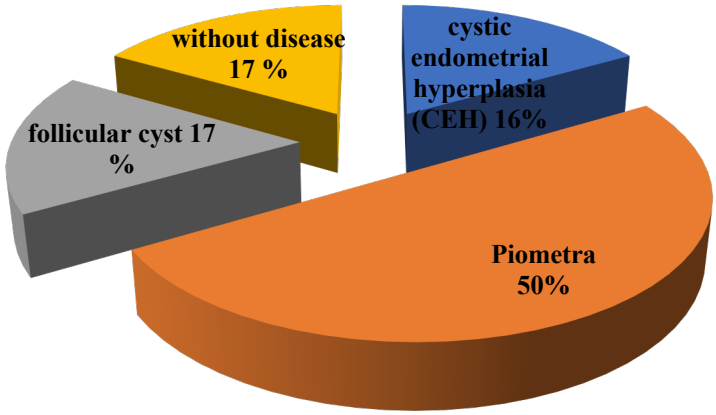
RESULTS

Of the six males examined, three had changes of the prostate. Prostatic hyperplasia is diagnosed in two dogs, while intraprostatic cyst is diagnosed in one dog. Cystitis, hydronephrosis and adrenal gland hypertrophy were also observed in these dogs. Testicular cancer was found in one male. In addition to tumors, prostatic hyperplasia and cystitis are diagnosed. The remaining two males did not have pathological changes in the genital organs.



Graph 1. Results of ultrasound examination of male dogs

Of the six examined females, one had cystic hyperplasia of the endometrium, three were diagnosed with pyometra, while one was diagnosed with follicular cyst of the ovary. In addition to these pathological conditions, changes in the liver and pancreas have been identified. One female had no pathological changes in the genital organs.



Graph 2. Results of ultrasound examination of female dogs

DISCUSSION

Cysts and neoplasms are the two most common pathological conditions of the ovaries (Marković et al., 2003). Cysts produce estrogen, which is deposited in the body and acts as a carcinogenic hormone (Klein, 1996). The target organ for the development of tumors primarily are mammary gland, liver, lung, pancreas and spleen. Tumors can be benign or malignant, but malignant carcinomas, sarcomas, and adenocarcinomas are most common. Primary tumors of the ovaries can be induced by primitive epithelium, stromal cells and surface (coelomic) epithelium (Diez et al., 1998). All stromal tumors of sex glands share a tendency to be hormonal and thus produce signs of hyperestrogenism, masculinisation or persistent anestrous. Physiologically, hemorrhage may occur during ovulation and diagnosing a hemorrhage can be very complicated. At places where haemorrhage has occurred, there may be a formation of adhesions due to the presence of vascular fluid. Adhesions are formed between the ovary (bursa ovarica) and omentum (Cruz-Arambulo et al, 2004). When the adhesion occurs, there is often unilateral occurrence of ovarian tumors. Newborn ovarian tumors compromise omentum and binding to it continues its development. There is usually a spread of micromethastases after cyst rupture within the neoplasm or invasion of the tumor through the ovary capsule (Meuten, 2017). Consequently, ascites and abdominal distension can be caused by lymph blockade. Such processes often develop metastases because they are leaning against large vessels of omentum, which is highly vascularized and connected with the digestive tract. The liver is the most common site of metastatic spread, mainly through a portal system that drains most of the abdominal structures (Nyland et al, 1983).

In dogs, metastatic neoplasms of the liver are approximately three times more likely to occur compared to primary neoplasms. Variable tissue characteristics in primary and metastatic neoplastic processes, including tissue density, vascular pattern, necrosis, fluid, and

calcification, cause a variable ultrasonographic display (Klein, 1996). Focal hypoechoic lesions with hyperechoic center called target lesions, are usually metastases. Early studies show that in the finding of at least one target lesion in the liver or spleen, there is a positive correlation of 74% for malignancy in small animals (Cuccovillo et al., 2002). Other signs indicating malignancy are the size of the lesion (more than 3 cm) and the presence of peritoneal effusion. Additional charachteristics for distinguishing malignant from benign liver neoplasms can be established using CT as well as tumor-markers.

The most common pathological conditions of the uterus are: cystic hyperplasia of the endometrium, mucometra, hematometra, hydrometra, pyometra, segmental pyometra, granulomas and tumors of the uterus (Voges et al., 1996). The cystic hyperplasia of endometrium has hormonal etiology and usually preceds pyometra. Intraluminally there can be sterile mucus which causes hydrometra or a mucometra, depending on the degree of hydration of the mucin. In bitches, cystic hyperplasia of endometrium occurs under the influence of progesterone, but its initiation occurs under the influence of estrogen from the ovary (Klein, 1996). Due to the effect of progesterone, endometrium is susceptible to infection which causes cystic hyperplasia of the endometrium develop into pyometra. Changes outside the genital tract that accompany pyometra are expressed in the form of expressed cahexia, metabolic disorders and glomerulonephritis caused by immune complexes (Klein, 1996). These secondary changes are especially noticed in bitches and can lead to intoxication with fatal consequences.

Leiomyomas are the most common tumors of the bovine uterus. They appear as multiple neoplasms, not only in the uterus, but also in the cervix and vagina. They are often associated with other disorders, such as cystic hyperplasia of the endometrium, follicular cysts and tumors of the mammary glands. Estrogen probably plays a significant role in the development and maintenance of this neoplasm in bitches. Bladder cancer, especially in the bitches older than 8 years, are often malignant and results in metastases to the mammary gland (Mattoon et al., 1995). Mammary gland cancers represent one of the most common tumors in female dogs, and most attention is devoted to the effect of stereoid hormones on tumorigenesis. Receptors for estrogen, progesterone and prolactin have been detected on normal and tumor cells of the mammary gland. About 40 to 60% of benign and malignant mammary tumors are positive for these receptors. Early castration, up to 2 years of age, has a protective effect and reduces the likelihood of mammary gland tumor in female dogs.

Of the pathological conditions on the testicles, neoplasms are the most common ones. In addition, they are often diagnosed with: orchitis, epididymitis, granuloma, abscesses, hematoma, hydrocele, varicocele, cryptorchidism and scrotal hernia (Johnston et al., 1991a). Testicular tumors can originate from the germinal epithelium (seminoma and teratoma) or interstitial cells (Sertoli-Leydig cell tumors) Seminomas often occur in cryptorhide and show local invasiveness, while teratomas are benign and occur predominantly in young animals. Sertoli cells tumor is most commonly found in dogs, giving metastases in the internal iliac lymph node. Tumor cells can produce estrogen and lead to hyperestrogenism that is manifested by gynaecomastia and alopecia in male animals, and bone marrow aplasia develops in some cases (Hart et al, 2013). The picture of orchitis is very similar to neoplasms. Often there is extratesticular fluid and an increase in epididymis. Benign prostatic hyperplasia, prostatitis, abscesses, prostatic and paraprostatic cysts, as well as neoplasms, are the most common pathological conditions of this accessory sex glands (Johnston et al., 2000). Prostatic hyperplasia is often a disease of older dogs resulting from the action of androgenic and estrogenic hormones. Over time, tissue fibrosis develops, which results in compression of the

urethra and difficulty urinating. In the parenchyma, there may be cysts of varying numbers and sizes. Over time, tissue fibrosis develops, which results in compression of the urethra and difficulty in urinating. Cysts of different numbers and sizes may be present within the parenchyma. Solitary cysts can be large enough to lead to ureteral obstruction, and consequently to hydronephrosis (Lukač et al, 1994). Prostatic neoplasms are mostly malignant in nature and in large percentage metastasized to regional lymph nodes, bones, and lungs (Atalan et al., 1999). Unlike with benign hyperplasia, there is capsule destruction and spread into the surrounding tissue. The most common are adenocarcinomas and undifferentiated carcinomas.

Pathological changes in the liver parenchyma are divided into diffuse changes in the liver, hemangiomas and focal liver lesions (Penninck et al, 2013). Diffusive lesions can be inflammatory, metabolic and vascular. Focal liver lesions can be primary and benign tumors. Vascular tumors are the most common primary liver tumors in general. Capillary hemangiomas represent a hyperechoic liver lesion, well-limited from the environment without a hypoechoic halo usually seen in malignant tumors, although it may also be transient in nature, as well as appear in a new location of parenchyma (Cruz-Arambulo et al 2004). They are usually rounded. Sometimes they can be hypoehnogenic with small, numerous internal echoes. Adenomas are round focal changes that can be hyper and hypoechoic. They are often multiples and then they can show the difference in the echostructure. Nodular hyperplasia is usually hyperechoic. These benign tumors are encapsulated and have good limited edges. They are often large and can be multiple. Some of the are isoechoic. Malignant liver tumors include: hepatocellular carcinomas, fibrolamellar hepatocellular carcinoma and cholangiocarcinoma (Marković et al., 2003).

Echogenicity of hepatocarcinoma depends on its tissue structure, whether it is rich in blood vessels, fats or connective tissue. Significant amount of fat gives a hyperechoic look. When it comes to solitary tumor it is usually very large and lobatus. Tumor masses are fairly well-restricted from the environment, with a hypoechoic halo. Hepatocarcinoma has a tendency to invade veins. Hepatocarcinomas are well vascularized and can bleed spontaneously. Metastases in the liver are usually multinodular, numerous, but there are also solitary ones (Cuccovillo et al., 2002). In liver metastases, there are changes in liver contour and tissue abnormalities. In liver metastases, there are changes in liver contour and tissue abnormalities. In metastases, ultrasound can sometimes detect calcification at a time when it is not yet seen on X-rays. Such calcification is most commonly seen in mucinous adenocarcinoma of colon or in ovarian cancer. Necrosis may occur in the metastases. In this case we are talking about necrotic metastases. Necrosis can occur spontaneously when the size of the metastasis exceeds 6-7 cm. dilatation of the intrahepatic bile duct can follow metastases (Lukač et al, 1994). This is due to compression caused by metastases. Hepatic veins can also change the appearance due to metastases. Veins with metastases are altered, deformed or destroyed. There may also be an invasion of the portal vein and its branches. Experimental studies show that the degree of metastatic vascularization affects its appearance (Cuccovillo et al., 2002). In general, hypervascular lesions are echogenic, and hypovascular are anechoic. Most commonly, along with these changes splenomegaly and retroperitoneal lymphadenopathy are also seen.

Cirrhosis develops as a result of intoxication, metabolic disorders, chronic congestion and some infectious agents. In the differentiation of cirrhosis from the metastasis nodus, one must pay attention to attenuation coefficient and contour of the liver. In cirrhosis, attenuation is increased, and contours become biconvex (Stowater et al, 1990). Liver size can be helpful.

In cirrhosis the liver gradually decreases, and in the metastatic changes the liver is rapidly increased. Increased attenuation is seen only in cirrhosis. Splenomegaly and dilated v.lienalis occur only in cirrhosis. Portal hypertension arises as a result of intra and extrahepatic portal vein obstruction due to cirrhosis, fibrosis, steatosis, primary and metastatic tumors (Lukač et al, 1994). The halt in portal circulation leads to a primary enlargement of the liver, a change in the structure of the parenchyma, and the expansion of the portal vein and its branches. Splenomegaly, collateral circulation and ascites develop secondarily. Also, metabolic diseases of the liver are accompanied by changes in the liver size, and sometimes also in parenchymal echostructure.

CONCLUSIONS

Apart from primary changes in the genital tract in both males and females, ultrasound diagnosis can also visualize subsequent changes in parenchymatous organs. Changes in the liver as a consequence of the primary disease of the reproductive tract in females may be cirrhosis hepatis, as well as focal changes which cause hepatomegaly and mechanically endanger pancreas. In males, prostate tumors cause urinary incontinence, the formation of fibrin deposits starting with calcification process in polyps and then with formation of a honeycomb-like unit with residual urine due to dilation of the urinary bladder.

Thanks to ultrasound diagnostics, veterinary knowledge as well as the extent of drug use have expanded. The main challenge for an attending veterinarian is not to cure consequential diseases but to suspect a primary disease using ultrasound.

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