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Ultrasonography
of abdominal and pelvic surgical affections in canine

Thesis Presented

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INTRODUCTION

Ultrasound is rapidly becoming an accepted imaging modality in small animal practice. New and used equipments are available at reasonable prices, and usefulness has increased to include ophthalmic, cardiac, abdominal, and reproductive disease diagnosis.

Ultrasonography was safe noninvasive diagnostic technique that provides information about the internal architecture of organs within the abdomen and thorax. Functional information can also be obtained with echocardiography.

Ultrasound is not meant to replace diagnostic radiology but to complement it. Ultrasound is operator-dependant. The quality of the image and the information gained are directly related to the ability of the person doing the study.

Ultrasonography was performed routinely in human medicine to evaluate lesions or masses in any organs. Ultrasound was used widely as a method for diagnosing early pregnancy and fetal viability in the bitch, although its application for the estimation of fetal age is limited in this species compared with human. This is because of the great viability in dog bread, size, weight which makes the measurements of fetal structures different depending on the females **(Biller and Haider, 1994).**

Ultrasonography has become a valuable tool for the evaluation of renal diseases in small animals. It offers several advantages over radiography for examination of the kidney.

Ultrasound is easy, noninvasive, and requires little patient preparation. It is not associated with adverse effects and, unlike intravenous urography, can be performed regardless of renal function. In the assessment of renomegaly, ultrasound is more specific than contrast radiology because it can differentiate cavitary lesions from solid masses. The major disadvantages of ultrasound are lack of specificity and inability to quantify functional loss in patients with diffuse renal parenchymal disease. For this reason, in the evaluation of renal disease, ultrasound is best use to complement, and not to replace, other diagnostic tools **(Grooters and Biller, 1995).**

The increasing availability of three dimensional (3-D) ultrasound has resulted largely from the rapid advancement in computer technology and the decreasing cost of micro-processor electronics. The benefits that 3-D has bought to ultrasound diagnosis has quickly become a matter for debate medicine and antenatal diagnosis include scanning in the coronal plane, improved assessment of complex anatomic structures, surface analysis of minor defects, volumetric measuring of organs, "plastic" transparent imaging of fetal skeleton, spatial presentation of blood flow arborization and, finally, storage of scanned volumes and images.

The aim of the present study:-

For these reasons, this work was initiated to select of the simplest and accurate methods for diagnoses of surgical affection in abdomen and pelvis and was to determine if ultrasonographic pictures could be used as a first method of diagnoses surgical affections in abdomen and pelvic regions.

REVIEW OF LITERATURE

Topographical Anatomy of the Kidney

Bush (1984), stated that the kidneys of the dog are situated retropretoneally at the roof of the abdominal cavity on either side of the aorta and posterior vina cava. Each is bean shaped and between 2.5 and 3.5 times the length of the second lumber vertebra. The right kidney extends forward to the level of the thirteenth rib. The left kidney is situated half a kidney length behind.

Bjorling (1994), mentioned that the kidneys are normally founding at the retroperitoneal space in the sub lumber location. The renal arteries divide into dorsal and ventral branches after arising from aorta, each branch divides into five to seven intralober arteries. The intralober arteries branch into acute arteries at the corticomedullary junction and ultimately give rise to the intralobular arteries.

Burk and Ackerman (1996), stated that the appearance and location of the kidneys in dogs are affected by the animal age, posture and general body condition. The right kidney extends from T12 to L1, while the left lies in the area from L1 to L3 just medial and caudal to the spleen.

Fossum, Hedlund, Hulse, Johnson, Seim, Willard, and Carrol (1997), described the location of the kidneys which lie in the retroperitoneal space lateral to the aorta and caudal vena cava. They have fibrous capsule and are held in position by sub peritoneal connective tissue. The cranial pole of the right kidney lies at the level of the thirteen rib. The cranial pole of the left kidney lies about 5 centimeter caudal to the upper third of the last rib. The renal pelvis is funnel shaped structure that receives urine and directs it into the ureters. There are generally 5 to 6 diverticula that curve outwards from the renal pelvis.

Radiography and Ultrasonography of normal kidney

Konde, Wrigley, Park, and Lebel (1984), proved that the left kidney was easier to image ultrasonically than the right kidney because the spleen served as an ultrasound window to the left kidney. The right kidney was located dorsal to loops of small bowel that, when gas filled, served as barrier to sound wave passage. Sagittal scans obtained through the medial aspect of the kidney defined the renal pelvis appeared as bright, centrally located echoes, renal cortex was visible as small homogeneous echoes that were hypoechoic relative to the surrounding tissues . The renal medulla was visible as an anechoic region in the cranial and caudal poles, a bright linear echo, due to the fibrous renal capsule, surrounding the cortex. Transverse renal ultrasound scan was appearing as a hypoechoic cortex in peripheral. Two to four sections of an echoic medulla were present and separated by the linear echoes of the pelvic diverticula and vessels. Knowledge of normal anatomic echo patterns was essential to perceive the abnormal patterns present in the renal disease. Differentiation between solid and cystic lesions can be difficult with radiography but is rapidly determined with ultrasound.

Boag, Atelola, and Pennock (1993), recommended that the sonographic examination in case of parasagittal section of normal canine kidney consisted of a cortex, which was hypoechoic in comparison to spleen, had distinct medullary pyramids, hyperechoic sinus and a well delineated capsule. The sonographic mid-sagittal section was denoted by two parallel hyperechoic lines which defined the renal sinus consisting of fat recesses, blood vessels and lymphatic vessels. In central transverse section a hyperechoic renal sinus, encompassing an anechoic medulla was surrounded by hypoechoic renal cortex from each side.

Biller and Haider (1994), stated that the rank of abdominal parenchymal organs were arranged from least echogenic to most echogenic as renal medulla - renal cortex - liver - spleen - prostate and then renal sinus.

Grooters and Biller (1995), recommended that the echogenicity of the normal renal cortex is less than that of the spleen, and less than or equal to that of the liver. The fat within normal renal sinus makes it very echogenic. Hyperechogenicity of renal cortex is the most common ultrasonographic finding in diffuse parenchymal disease.

Burk and Ackerman (1996), reported that the kidneys are usually examining in 3 planes; longitudinal, transverse, and sagittal. The renal cortex, renal medulla, and renal pelvis can be identified consistently. The renal cortex is brighter than the medulla. The renal medulla has a few internal echoic but appear more homogenous and hypoechoic relative to cortex. The renal pelvis diverticula appear as bright evenly spaced, round or liner echoes. Fat within the renal hilus produces hyperechoic region. The spleen may be positioned between left kidney and body wall providing an acoustic for examination of the kidney, the right kidney may be examined through the liver, however the ribs may cast acoustic shadows that obscure positions of the right kidney.

Dibartola (2000), mention that radiography precise information about renal size which is evaluated in reference to surrounding anatomic landmarks, usually the second lumbar vertebra (L2) on the ventrodorsal view. The left kidney normally is will visualized in the dog but the right kidney often cannot be seen as will, especially its cranial pole. The left kidney (near vertebra L2 to L5) is located caudal to the right kidney (near vertebra T13 to L3). Excretory radiographs is performed after intravenous administration of an iodinated organic compound. The contrast medium is filtered and excreted by the kidneys, and the quality of the study is partially dependent on the patient's GFR. Excretory urography should not be performed in dehydrated patient or in those with known hypersensitivity to contrast media. Renal ultrasonography is a non-invasive imaging technique that dose not depend on renal function, has no known adverse effects on the patient and allows characterization of interna! renal architecture. The major advantage of ultrasonography is its ability to discriminate among renal capsule, cortex medulla, pelvis diverticula and renal sinus, normally the kidney less echogenic than the liver or spleen. The renal medulla normally is less echogenic than the renal cortex because of its higher water content. Diverticula and sinus are the most echogenic structures in the kidney because the collagen and fat provide highly reflective acoustic interference.

Radiography and Ultrasonography of diseased kidney

Konde, Wrigley, Park, and Lebel (1985), mention that ultasonography can aid in the diagnosis of renal enlargement and renal mass lesions. The major advantage of ultrasonography is the ability to differentiate hydronephrosis or renal cysts from solid mass. A cyst possesses the following sonographic characteristics: (1) smooth and sharply demarcated near and fare wall; (2) few or no internal echoes, and (3) considerable through transmission deep to the cyst. Hydronephrosis is readily diagnosed sonographically as a large anechoic, fluid-filled structure, with a variable amount of renal cortex visible about the periphery of the kidney, depending on the degree of hydronephrosis. Solid masses were characterized sonographically as homogenous, hyerechoic, or complex, with echo-free areas intermixed with echoes of varying intensity. Solid masses have ill-defined or irregular borders and little or no through transmission deep to the mass. Ultrasonography has limitations in differentiating malignant neoplasia, abscesses or haematomas and ultasonography is performed easily noninvasive and independent of renal function, has no adverse effects and adds valuable information in the determination and treatment planning of renal disease. Abdominal radiography can uncover suspected or unsuspected renal abnormalities which can be characterized further with ultrasonography.

Hager, Nyland, and Fisher (1985), suggested that a focal anechoic kidney lesion was abnormal finding on the ultrasound examination of kidney- under ultrasound guidance, the renal lesion was aspirated, and clear fluid was removed. Rinografin (water-soluble contrast medium) was injected into the renal lesion: it was found to have a smooth, thin inner wall that did not communicate with renal pelvis. A diagnosis of a renal cyst was made.

Konde, Wrigley, Park, and Lebel (1986), found that survey abdominal radiography contrast radiography, and ultrasonography are complementary diagnostic modalities in the evaluation of renal masses and renal enlargement. Radiography allows delineation of renal size, shape and to some extent. Radiography may not differentiate between cystic and solid renal masses sonography defined the masses as solid. The cyst will not opacify on excretory urography but may be a thin rime of contrast enhancement about the cyst. The masses may not be determined to originate from the kidney on the bases of sonograms alone but conjugation with radiographic examination renal neoplasia was diagnosed. Therefore any conclusion concerning the ability of ultrasound to differentiate benign and malignant masses is speculative. It seems unlikely that aggressive characteristics of a solid mass can be determined by the echo pattern.

Barr, Holt, and Gibbs (1990), reported that renal disease in the dog may be associated with changes in renal size. For example, chronic interstitial nephritis often results in a decrease in kidney size, while a conditions such as acute pyelonephritis, polycystic disease and hydronephrosis may lead to kidney enlargement. Alternation in size may in some cases precede other radiographic and ultrasonographic changes. Therefore, estimation of renal size in the dog may provide useful clinical information. They also stated that there was a small, but significant difference between the mean lengths of the right and left kidneys, and no such difference was detected between the mean volumes of the right and left kidneys. There was small but statistically significant difference between the mean renal lengths of the male and female dogs, and there was a tendency for dogs of low body weight to have larger total renal volume / Kg than dogs of high body weight and there was marked variation in renal volume among dogs of similar body weights.

Biller, Schenkman and Bortnowski (1991), stated that not all tumors of the kidney are hyperechoic and not all hyperechoic lesions of the kidney are tumor. Hypervascular renal tumors commonly display increased echogenesity. Although the most common differential for echogenic masses in the kidney is neoplasia, the classic appearance of wedge shape lesion located in the cortex lead the authors to diagnosis of infarct. Multiple hyper echoic lesions within the cortex and these lesions were border at the periphery and narrowed toward cortecomedullary junction.

Biller, Bradley, and Partington (1992), mentioned that an echogenic line in the outer zone of renal medulla, paralleling the corticomeduallary junction is described as the renal medullary rim sign. This renal ultrasonographic change was identified in animals with variety of pathologic renal lesion but this rim may appear and persist even through the animals' clinical status improves. The medullary rim singe provides an additional ultrasonographic change indicating primary renal damage in some patients.

Miles and Jergens (1992), stated that cystic disorders of the kidney represent heterogeneous group, which includes, polycystic disease, cortical cysts, medullar cysts miscellaneous intrarenal cysts, and extraparanchymal cysts. Fluid filled cavities containing epithelium are true cysts. Prenephric (perirenal) pseudocysts properly denote fluid accumulation by fibrous cystic structures, which lack an epithelial lining. Prenephric cyst classified on the nature of their fluid content including (1) perinephric extravasations of urine, (2) perinephric hematoma, (3) prenephric lymphocele, and (4) perinephric pseudocyst of undetermined origin. A clinical diagnosis of perinephric pseudocyst was based on survey and contrast radiographic findings, the presence of unilateral or bilateral renomegaly is a characteristic finding on other hand renal sonography provide useful in further characterizing the renal mass prior to laparotomy which appear as anechoic fluid accumulation around the kidney.

Forrester and Lees (1994), reported that in animal with renal failure, excretory urography often is of limited value, because the kidneys cannot excreted contrast material well enough to produce diagnostically useful radiographic images. Ultrasonography may detect the presence and location of uroliths as well as evaluate renal parenchymal diseases. Dilatation of renal pelvis can be detected in case of pyelonephritis. Ultrasonography is quite useful for detection and characterization of fluid-filled renal lesion. Their number, size, and anatomic relationships can be assessed ultrasonography help to confirm the presence and location of urolithsand assess the degree of obstruction. Ultrasonography helps confirm renal mass lesion survey abdominal radiography may reveal unilateral or bilateral rinomegaly.

Birchard and Sherding (1994), stated that pyelonephritis is a term that implies inflammation of the renal parenchyma and its pelvis; however, the term often used to describe bacterial infection of the kidney. Ultrasonography can be used to identify dilatation of the renal pelvis. Dilatation of ureters and renal pelvis and decreased opacity of contrast media in the collecting system may be observed in radiography of pyelonephritis. Excretory urography confirms renomegaly in animals with polycystic renal disease and may show the cysts as multiple radiolucent areas in the renal parenchyma. In the animals with perinephric pseudocyst, the kidney was demonstrated within the fluid-filled structure. Ultrasonography is the procedure of choice for reliable diagnosis of polycystic kidneys and perinephric pseudocyst. Their number, size, and anatomic relationships can be assessed.

Grooters and Biller (1995), classified the focal renal parenchymal abnormalities into cyst, neoplasia, infarcts, hematoma, abscesses, and nephrocalcinosis. Cyst are round, sharply marginated, anechoic structures that cause considerable through transmission. Single or multiple renal cysts are a common incidental sonographic finding in small animals. However, renal cysts may also be a manifestation of polycystic kidney disease (PKD), which is characterized by progressive displacement of functional renal tissue by multiple enlarging cysts. The echogenicity of renal masses is usually heterogenous, reflecting secondary necrosis, edema, and hemorrhage within the neoplastic tissue. Renal infarcets appear sonographically as wedge-shaped lesions in the cortex that are initially hypoechoic, but become hyperechoic after approximately 7 days. Nephrocalcinosis can be detected using ultrasonography as multifocal hyperechoic areas in the renal parenchyma that typically produce an anechoic acoustic shadow.Hydronephrosis is characterized sonographically by dilatation of renal pelvis, which appears as an anechoic area at the center of the medulla. A severely hydronephrotic kidney appears as an anechoic sac surrounded by a rim of cortical tissue.

Burk and Ackerman (1996), mentioned that the kidney is normally hypoechoic relative to the spleen and liver, but comparison is only useful if the liver and spleen are normal. Ultrasound can detect mild degree of hydronephrosis with minimal renal pelvis or proximal uretheral dilataion. The transverse view is more useful than the longitudinal view for this purpose. The ureter forms an anechoic Y shape, which is centered on the renal crest and can be distinguished from the renal vein. As the ureter and renal pelvis dilate, they will appear progressively larger and will gradually replace the renal medulla and finally the entire renal cortex. The dilated renal pelvis loss its Y shape and become wider, taking the shape of renal pelvis recesses and eventually becoming a large oval. Ultrasonography is more sensitive than excretory urography in detecting acute pyelonephritis. Renal pelvis and proximal uretheral dilatation, and hyperechoic line along the renal crest have been described as the major findings. A uniformly echogenic renal cortex, focal hyperechoic or hypoechoic areas within the renal cortex and hypoechoic focal lesion within the medulla have been observed. The author added that the intrarenal cysts are anechoic, usually round, vary in size, may be septated, and are located within the renal parenchyma away from the renal pelvis. The cysts may be single or multiple, large or small, and may protrude from the renal cortex or be located completely within the renal parenchyma. Some tumors and abscesses appear cystic, while some cysts contain echogenic material that may create the illusion that they are solid. Aspiration or biopsy may be required for definitive diagnosis. The renal masses and masses that displace the kidney can be identified using ultrasound but the kidneys may be displaced from there normal position by the pressure that the operator exerts on the ultrasound transducer. This displacement should not be interpreted as appositional abnormality. Ultrasound patterns and echo intensity are more specific for focal or multifocal renal abnormalities and less specific for diffuse renal disease. Ultrasound has limited use in discriminating between benign lesions, such as hemorrhage, abscess and malignant lesion such as adenocarcinoma. Renal tumors, hemorrhage, abscess, or infarct may produce hyperechoic, hypoechoic or heteroechoic focal abnormalities depending on their duration but acute infarcts are hyperechoic and wedge shaped.

DiBartola (2000), found that renal ultrasonography was useful for differentiating solid from fluid-filled lesions and for determining the distribution of lesions within the kidney (focal, multifocal, and diffuse). A pattern of multiple anechoic cavitations was highly suggestive of polycystic kidney disease. Cysts were smooth, sharply demarcated, anechoic lesions that demonstrated through transmission. Focal or diffuse lesions of mixed echogenicity that disrupt normal anatomy often were tumors. oorly vascularized tumors of homogenous cell type (e.g. lymphosarcoma) may produce hypoechoic lesions that may be misinterpreted as cysts. The renal pelvis is dilated with anechoic fluid in hydronephrosis. He also stated that familial renal disease has been reported in many breeds of dogs and may occur sporadically in mixed breed animals. German shepherds with bilateral multifocal renal cystadenocarsenomas are presented between 5 and 11 years of age. The renal lesions were accompanied by cutaneous and subcutaneous nodules (dermatofibrosis). Polycystic kidney disease also has been reported in young (5-years-old) West highland white terriers, Bull terrier and Cairn terrier.

Topographical Anatomy of Urinary Bladder

Fingland (1994), divided the urinary bladder into three regions (1) the cranial portion is the apex, (2) the caudal portion that joins to the urethra is the neck, and (3) the segment between the apex and the neck is the body. The uretral opining and the urethral orifice form the triangular area in the dorsal aspect of the bladder called trigone.

Burk and Ackerman (1996), stated that the urinary bladder was a tear-shaped tissue dense organ was relatively firmly anchored by its ligaments. Normally, the bladder is seen immediately cranial to the pelvic brim and prostate in the male and vary in size depending on amount of urine it contains. It rarely extends cranially to umbilicus. The bladder should be uniformly tissue-dense however, air bubbles may be observed in the bladder of normal dog.

Fossum et al (1997), mentioned that the bladder location was varies depending on the amount of urine it currently contains. When empty it was lie entirely within the pelvic cavity. The bladder was divided into a neck, which connects it to the urethra and a body. The bladder received it blood supply from the cranial and caudal vesicular arteries. The urethra in male dogs was divided into a prostatic and penile portion.

Radiography and Ultrasonography of normal urinary bladder

Adams and Dibartola (1983), stated that the neck of the dog's bladder should be cranial to the pectin of the pubic bone. Regardless of degree of distention, the bladder neck was located caudal to the pectin in some cases. The portion of the bladder within the pelvic canal varied considerably, perhaps because of variation in the amount of bladder filling or in the degree of wall distensibility. The remarkable abnormality of shape was the consistence abrupt blunting of the caudal pole of the pelvic bladder. Urinary tract infection with increased urgency to empty an inflamed bladder might predispose to caudal displacement of the bladder from straining. An abnormally blunted bladder neck displaced within the pelvic canal was observed on excretory urography and double contrast cystography.

Billar Kantrowitz, Partington, and Miyabyashi (1990), mentioned that the urinary bladder is an organ ideally suited for ultra sonographic examination. Cystosonography provides a rapid safe noninvasive imaging technique to diagnose or verify cystic calculi, mass lesions, or inflammatory conditions and as a sonographic window for evaluation of sublumber lymph nodes, uterine body, and other intrapelvic structure. Cystosonography should be conducted on an animal in dorsal recumbency with a fully distended urinary bladder. The normal urinary bladder usually appears round or pear shaped. Variation in contour can occurs depending up on degree of bladder distention, patient position, pressure of adjacent intra abdominal structures and disease processes. The urinary bladder when distended appears as an echo free (anechoic) structure surrounded by a smooth regular outline of an echo-dense (echogenic) wall. Advantages of cystosonography versus urinary contrast radiographic studies include 1) no radiation exposure, 2) evaluation not dependant upon renal function, 3) relative ease and rapidly performance, 4) absence of complication, 5) ability to do guided biopsies and aspiration, and 6) good acceptance in the non sedated patient.

Burk and Ackerman (1996), reported that the evaluation of the cystogram should be performed by paying special attention to the location, shape, and integrity of the bladder; the thickness and regularity of the bladder wall; and the presence or absence of material within the urinary bladder in case of double contrast cystogram. Bladder wall changes and intraluminal abnormalities were the most common changes detected radiographically. Ultrasound works best when the bladder is distended with urine, and is not obscure by intestinal contents. The bladder can be differentiated easily from other caudal abdominal masses such as the prostate, a retained testicle, lymph node, or uterus. On the other hand, it may difficult to distinguish between the urinary bladder and a paraprostatic cyst.

A careful ultrasound examination, however, usually identified the cyst as a distinct structure separate from the urinary bladder. A uterus filled with fluid may also mimic a urinary bladder; however, identifying both uterine horns, multiple fluid-filled loops, or recognizing the tubular shape of the uterus will help discriminate between these structures. Ultrasound is ideally suited for examination of urinary bladder even a small bladder not detected by abdominal palpation or radiographs can be identified using ultrasound. The anechoic urine contrasted well with the echogenic bladder wall. Ultrasound artifacts, such as slice thickness and reverberation can create the appearance of cellular material within the bladder.

Lulich et al (2000), recorded that radiology is a valuable technique in the diagnoses of lower urinary tract disorders. Although survey radiography is adequate for a diagnosis of radiodense uroliths or for assessment of bladder position, contrast medium-enhanced procedures are needed for evaluation of mucosal irregularities, diverticula, urine leakage, and radiolucent uroliths. Double- contrast cystography is the preferred technique because it provides the best evaluation of mucosal surface. Superimposition of the vertebral column over the urinary bladder reduces the value of the ventro-dorsal view. Therefore, either the right or left oblique view is preferred. Mucosal proliferation and blood clots are best evaluated by ultasonography. Uroliths less than 3 mm in size may not be visualized by radiography or ultrasonography.

Radiography and Ultrasonography of diseased urinary bladder

Biller et al. (1990), described a variety of urinary bladder disorder that can be diagnosed with ultrasound as cystic calculi, bacterial cystitis, urinary bladder tumors and other disorders. Cystic calculi have a characteristic highly echogenic appearance. They cause an acoustic shadow and fall to the most dependant portion of the urinary bladder when the patient is repositioned. Calculi can be differentiated from bladder tumor which are fixed and lack of acoustic shadow or from blood clots that also lack an acoustic shadow but may move to dependant portion of the bladder. Bacterial cystitis has been detected as diffuse or focal bladder wall thickening, in sever and chronic case of cystitis, diffuse or bladder wall thickening with irregularity of the urinary bladder may be visualized. Urinary bladder tumors usually appear as echogenic structures protruding into bladder lumen. Accuracy of diagnosis of urinary bladder tumors by ultrasound depends up on size and location of the mass. Bladder tumors less than 5 mm in diameter, regardless of location, as well as those located in the bladder neck are difficult to detect. There are cystosonographic patterns of urinary bladder tumors: 1) exophytic bladder tumors are seen as echogenic or complex focal filling defects arising from the inner surface of urinary bladder, 2) massive tumor obliterating the bladder lumen, 3) infiltrating wall lesions producing thickening of the bladder wall with loss of concave inner borders with little intraluminer mass. Tumors also may be observed involving the urinary bladder from direct extension of prostatic or urethral neoplasia.

Leveille et al. (1992), reported that ultrasonographic examination of the abdomen has proven to be a valuable diagnostic tool. The use of ultrasound for evaluation of the urinary bladder is an accepted procedure than intravenous urography and double contrast cystography; because the ultrasonography was the only imaging modality which detected bladder masses in all patients. Tumors of urinary bladder comprise about 1% of all canine tumors. Transitional cell carcinoma is the most common malignant tumor of the urinary bladder in the dog. Squamous cell carcinoma, adenocarcenoma, and undifferentiated carcinoma have also been reported but occur less frequently. Sonographically the normal urinary bladder is an-echo free structure in the pelvis surrounded by an echogenic structure that represents an acoustic interface of urine, bladder wall and serosal fat. Ultrasonography can provide information relative to the capacity of the bladder, change in the bladder outline, and changes in wall thickness, identification of mural and luminal masses, and identification of extrinsic lesions, which may displace the bladder wall causing changes in its shape. The size of the lesion is an important factor in the rate of detection in ultrasonography, lesions 3mm or greater could be identified within moderately distended urinary bladder. Several entities may mimic the ultrasonographic appearance of urinary bladder tumors. These include blood clots, cystitis and calculi. Blood clots usually move when bladder is agitated. In cystitis, there is usually decreased echogenicity of the urinary bladder wall. Bladder calculi have a characteristic sonographic appearance consisting of a bright echogenic structure in the urinary bladder with acoustic shadowing. Calculi also often change position as the animal position is changed, regardless of whether the stone is calcified. Tumor of the ventral wall can be missed or more difficult to image because they may lie outside the focal zone of the transducer, ultrasound also failed to demonstrate the extent of the lesion within the urethra. Both intravenous urography and double-contrast cystography may be necessary to evaluate the extent of the disease. Disadvantages of intravenous urography and double contrast cystography include patient and operator exposure to ionizing radiation, possible adverse reaction to contrast media, poor renal function, air embolism, risk of infection, and the increased time and expense of doing two diagnostic studies. The accuracy of ultrasound in detecting space-occupying lesion appears high, and should be considered as a valuable, non-invasive, first line diagnostic imaging modality for evaluation of possible lower urinary tract malignancy.

Nyland, Fisher, Doverspike, Hornof, and Olander (1993), recommended that ultrasonography is routinely used to detect dilatation of the renal collecting system in the dog. Dilatation as a result uretral obstruction can be identified ultasonographically. The cause of the obstruction from small inflammatory or neoplastic masses, calculi, or strictures of the ureters may be overlooked during the ultrasound examination because of poor visualization of the ureters due to their small size and overlying bowel gas.

Fox, Ackerman, and Buergelt (1993), reported that the excretory urography is the most often used to determine the extent and/or origin of ureteral obstruction and hydronephrosis. Excretory urography was not performed because of the renal insufficiency. Percutineous pyelonephrography was selected to avoid exacerbating renal failure in the patient. Ultrasound guidance could also be used.

Osborne, Klausner, and Lulich (1995), recommended that radiographic and ultrasonographic evaluation is useful in identifying and localizing uroliths within the urinary tract and may be of some benefit in helping to differentiate between urolith types. Uroliths containing calcium are much more radiodense than cystine or ammonium urate uroliths of comparable size. All forms of calcium phosphate uroliths tend to be multiple, and vary in size, with smaller sizes being more common.

Burk and Ackerman (1996), stated that ultrasound works best when the bladder is distended with urine. Cystitis and tumors produce similar bladder wall abnormalities. The wall is usually thickened and irregular and the anechoic urine helps to define the defect. Usually tumor can be detected easily as heteroechoic structures protruding into the bladder lumen. The attachment of the mass to the bladder wall is often abrupt and thickening of the bladder wall at the site of attachment can usually be recognized. A focal area of bladder wall thickening may be observed at the trigone of the bladder. This is uretral papellae should not be mistaken with a focal mass or polyp. Differentiating between an attached blood clot and a bladder tumor may be impossible. Crystalline material, cells, air bubbles and fat globules can be observed floating within the usually anechoic urine. Agitation of the bladder will increase the movement of this structure. Air bubbles may produce reverberation artifacts (comet tail) that help to distinguish them from other floating objects. Blood clots settled to the dependent portion of the urinary bladder, and it will move with changes in the patient's position.

Blood clots are heteroechoic and may be confused with bladder tumor. Movement of patient and resulting change in position of heteroechoic mass helps determine that the lesion is a blood clot rather than neoplasm. Urinary bladder calculi are hyperechoic and often shadow. Calculi settle to the dependent portion of the bladder and move with agitation of the bladder or changes in patient position. Bladder wall mineralization can be identified as a hyperechoic area within the bladder, which also shadows. The lesion will be fixed in location when the patient is moved or bladder is agitated. They also stated that a double contrast cystogram is generally the recommended contrast procedure for evaluating the bladder. The most cystic calculi are radiopaque, have irregular shape, and are located in the most dependent portion of the bladder. The density of the calculi depends upon their size and their composition. The most common tumor of the bladder is transitional cell carcinoma. This is usually diffused focal masses protruding into the lumen of the bladder. Occasionally, a focal tumor may cause bladder wall thickening and the mucosal surface thrown up into folds with masses protruding into the lumen of the bladder.

O'Brien, and Wood (1998), mentioned that the normal urinary bladder wall was reported to be 1.2 to 1.7 mm thick when moderately distended and 1.6 to 3.5 mm thick when mildly distended. Urinary bladder wall thickening in dogs is most commonly caused by infiltration with neoplasia or inflammation. Transitional cell carcinoma, the most common neoplasia of the urinary bladder, may result in focal wall thickening with an irregular, sessile mass extending into the urinary bladder lumen, or one of three sonographic patterns: 1) focal exophytic masses, 2) regional irregular shaped masses, and 3) poorly marginated smooth infiltrative lesions casing loss of normal concave inner border. A more recent report listed 4 sonographic patterns: 1) single sessile mass 2) multiple sessile mass. 3) pedunculated mass, and 4) irregular bladder wall in trigone. Differential diagnosis for a focal or rigonal mass include adherent blood clots, inflammatory lesions and thickening associated with an incompletely distended bladder. Inflammatory lesion of the urinary bladder may cause wall thickening and chronic cystitis results in wall thickening. When severe, the bladder wall becomes hyperechoic and irregularly thickened. Trauma or bleeding disorders may cause hematuria resulting in luminal blood clots. Clots are usually hyperechoic none shadowing, irregularly shape luminal lesion that are often located in the dependant portion of urinary bladder. In addition to neoplasia and inflammation, mural hemorrhage should be considered in dogs with diffuse or regional thickening of the urinary bladder wall. Testing for an underlying bleeding disorder should be considered if clinically indicated. Prompt resolution of the thickening approximately 1 mm/ day , after the underlying disorder is corrected appear to be characteristic for bleeding disorder-induced urinary bladder mural hemorrhage.

Lulich et al. (2000), stated that calculus size, number, location, and mineral composition influence the radiographic or ultrasonographic appearance of uroliths. Most uroliths greater than 3 mm have varying degrees of radio-density and therefore can be detected by survey abdominal radiography or ultrasonography. Uroliths less than 3 mm in size may not be visualized by these techniques. Compared with soft tissue density, uroliths composed of magnesium ammonium phosphate, calcium oxalate, calcium phosphate, silica and cystine are often radiodense; those composed of urate salts may be radiolucent. It is possible for a urolith to be larger than that depicted by its radio-density if only a portion of it contains radiodense minerals. This phenomenon is most likely to occur with rapidly growing struvite uroliths.

Lulich and Polzin (2001), mentions that approximately 25% of dogs and cats with lower urinary tract diseases have urolithiasis; 90% of uroliths formed are composed of mineral salts that are easily detected by survey radiography. A lateral survey radiograph is an excellent screening tool to rule out urolithiasis as a cause of hematuria and dysuria of the lower urinary tract. Ventrodorsal views provide the best view to detect nephroliths

Topographical Anatomy of Prostate Gland

Allen (1984), reported that before puberty the prostate is a pelvic organ, but as the dog becomes older it increases in size and becomes more abdominal, so that after the age of 10 years it can be considered to be an abdominal organ.

Boothe (1994), stated that the prostate gland completely encompasses the proximal portion of male urethra at the neck of the bladder. The craniocaudal portion of the prostate is age-dependent; the prostate is confined to the pelvic cavity until about 4 years of age and is essentially totally within the abdomen by 10 years of age. The dorsal prostatic surface is flattened and has a mid-dorsal sulcus. The gland have relatively thick capsule and is divided into right and left lobes by a prominent medium septum. The two deferent ducts enter the craniodorsal surface of the prostate. The blood supply is closely allied to the nerve supply, with both being located in the lateral pedicles. The prostatic artery gives off branches to the ductus deferens, urethra urinary bladder, ureters, and rectum. The hypogastric and pelvic nerves follow the vasculature. The prostatic lymph vessels empty into iliac lymph node.

Weichselbaum, Johnston, Feeney, and Walter (1995), found that the location of the prostate gland varies. Factors affecting the position of the prostate gland are bladder distention, age, other contiguous organs, intrapelvic diseases. When the bladder is fully distended, the prostate gland may tack on partially or totally intra-abdominal location, cranioventral to the pubis. With the urinary bladder empty, the prostate gland may assume a partially or totally intrapelvic location.

Burk and Ackerman (1996), mentioned that the prostate is a bilobed ovoid or round tissue-dense structure with a smooth regular margin and it is immediately caudal to the urinary bladder and completely surrounds the urethra. Normally, the prostate dose not extends cranial to the pelvic brim. When the bladder is distended, it may pull the prostate cranially. In medium size dog (15-25 kg), the prostate is approximately 1.5 to 3.0 cm in diameter.

Fossum et al (1997), stated that the prostate gland completely surrounds the neck of the bladder and beginning of the urethra. In dogs less than 4 years of age, the prostate is usually located in the pelvic cavity at the brim of pubis. The prostate begins to enlarge at puberty, becoming intra-abdominal in location. It varies greatly in size at maturity. The prostate is encapsulated by fibro-muscular tissue and is bilobated with a prominent mid-dorsal sulcus. The dorsal sulcus continues into the prostatic parenchyma as the median septum. A fat pad covers the ventrolateral surfaces of the prostate. The parenchyma is lobulated with tubuloalveolar glands that empty through small ducts (12 to 20) into the prostatic urethra. The ductus deferens enters the craniodorsal surface of the prostate and courses caudoventrally to enter the urethra at the colliculus seminalis.

Atalan, Barr, and Holt (1999), mentioned that the canine prostate gland produces a fluid which will transport and support the survival of sperm and which is delivered to the urethra during the terminal phase of ejaculation. The prostate is differentiated into external and internal portions. The external portion is particularly well developed and separated into two distinct bilateral lobes which completely surround the proximal portion of the pelvic urethra. It is bound cranially by the urinary bladder, ventrally by the floor of the pelvis and abdominal wall, and dorsally by the rectum, from which it is separated by two layers of folded peritoneum. The normal canine prostate is symmetrical with a smooth contour, located near the cranial brim of the pelvic floor and does not displace the colon and/ or bladder from their normal positions. It varies in shape from almost spherical to bilobed or pear-shaped. The normal size and weight of the canine prostate are varying depending on age, breed, and body weight. From two months of age until sexual maturity, the prostate gland lies in the pelvic canal. With increasing age, the prostate moves cranially so that, in intact dogs over five years of age, most the prostate gland is abdominal in location. A full bladder may, however, pull the prostate gland cranially, resulting in intra-abdominal prostate which could be misinterpreted as an enlarged gland.

Kustritz and Klausner (2000), recommended that the prostate, is the only accessory sex gland of the male dog, is a retroperitoneal organ with only the craniodorsal surface covered by peritoneum. It is bounded by the rectum dorsally and the symphysis pubis ventrally and completely encircles the urethra at the bladder neck. It is surrounded by fibromascular capsule and is divided into two lobes by a median raphe, which is palpable on the dorsal surface per rectum. Its position is abdominal until the urachal remnant breaks down at about 2 months of age; it then is pelvis until it becomes enlarged with advancing age or disease, at which time it may pull the bladder cranially and be palpable abdominally. The normal prostate gland is symmetric, has smooth border, and is located just cranial to the pelvis and caudal to the urinary bladder.

Radiography and Ultasonography of normal Prostate

Zohil and Castellano (1995), reported that the prepubic and transrectal ultrasonography is a useful non invasive technique to assess the canine prostate. It is also an excellent means for guiding prostatic biopsies. They concluded that prepubic and transrectal ultrasonography provide different information about the prostate gland; therefore, it could be considered a complementary procedures for some patients. Transrectal ultrasonography is particularly recommended whenever the caudal prostatic margin could not be visualized with prepubic ultrasonography or when an accurate examination of the prostatic capsule and overall glandular echogenicity are mandatory. The higher resolution of images of the prostate gland, obtained with transrectal ultrasonography can be explained as follows: (a) the sound beam passes only through the rectal wall and therefore, it suffers less attenuation than that occurring with prepubic ultrasonography, (b) the transducer can be positioned in close proximity to the prostate gland which allows the utilization of higher frequency transducers resulting in higher image resolution. When using prepubic ultrasonography, the presence of the pubic symphysis makes it difficult to visualize the entire pelvic cavity and the caudal prostatic margin.

Burk and Ackerman (1996), mentioned that the prostate can be examined and measured by using ultrasonography. Usually, it is easiest to identify the prostate by locating the urinary bladder in a transverse plane and then moving the transducer caudally following the bladder until the bladder narrows at the neck and then disappears. The prostate can then be identified as a uniformly heteroechoic, round or bilobed structure surrounding the bladder neck or urethra.

Ruel, Borthez, Moilles, and Begon (1998), noticed that most prostatic diseases in dogs were associated with prostatomegaly. Assessment of prostatic size is an important part of the evaluation of dogs with prostatic disease, and is usually performed by rectal palpation, abdominal radiographs, and ultrasonography. Prostatic measurements from ultrasonographic images are more accurate and reliable because the contours of the prostate are better outlined and there is no magnification effect as opposed to radiology and they are clearly indicated that the size of the prostate gland in healthy intact adult dogs increases with the size and the age of the dog.

Atalan et al. (1999), recommended that ultrasonographically, the prostatic parenchyma was normally moderately echoic. Linear echogenic streaks may be detected running longitudinally through the middle of the prostate. Radiographic techniques are useful in determining the size, shape, and location of the prostate gland. Abdominal radiography allows a limited assessment of prostatic diseases because it is of soft tissue opacity and it is normally intrapelvic and may be difficult to see radiographically estimation of canine prostate gland size may provide important information in the clinical evaluation of benign prostatic disease and in monitoring the response to medical therapy. The prostate gland is said to large if the prostatic dimensions exceed 70% of the pubic brim-sacral promontory dimension in survey lateral radiography. The size of normal prostate gland has been defined as not exceeding 50% of the width of the pelvic inlet in ventrodorsal radiograph. Transabdominal ultrasound has been found to be a simple and quick method for estimating prostate size in the dog. In conclusion, there is a significant difference in prostatic depth measurements between ultrasonography and radiography and depth appears to be poor indicator of prostate size. They also recommended that prostate length, rather than depth, is compared with the pubic brim-sacral promontory distance this measurements appears to be reliable, whether measured radiographically or ultrasonographically.

Atalan, et al (1999), demonstrated that there was no relationship between prostate measurements, weight or volume and body weight and age. A good image of the normal prostate was achieved using a 7.5 MHz mechanical sector scanner by angulations of the transducer 35 to 40 degree during the transverse scan to view dorsal to the symphysis pubis. Transrectal ultrasonography might be useful for assessment of prostatic size.

Kustritz and Klausner (2000) stated that ultrasonography was more sensitive than survey radiography for detecting intraparechymal prostatic disease and was especially useful for guiding a biopsy needle into parenchymal lesion. The prostate can be evaluated for shape, size, symmetry, echogenicity, and cavitations. The normal prostatic sonogram has a uniform, homogeneous background echogenicity. The coarsely hyperechoic echotexture is distributed uniformly throughout the parenchyma. The urethra can be traced throughout the prostate. The normal prostate appears symmetric with smooth borders. Abnormal findings include the presence of cavitations; focal, multifocal or diffuse echotexture changes; change in prostatic size; and an irregular margin.

Radiography and Ultrasonography of Diseased Prostate

Feeney et al. (1987), concluded that survey radiography used for evaluating dogs with clinical signs consistent with prostatic disease. They observed that prostatomegaly was detected in 50% or more of the patients afflicted with prostatic disease. Radiographic evidence of multifocal, irregularly shaped mineral density in the prostate gland was observed prostatic carcinoma and bacterial prostatitis. Narrowing of the prostatic portion of the urethra was observed in prostatic abscess, paraprostatic cyst, and prostatic carcinoma. Asymmetric prostatic shape and irregular prostatic outline were observed in-patient with neoplasia, abscesses and paraprostatic cyst. The determination of prostatic size by actual volume or dimensions, rather than relative dimensions, is not clinically applicable. Based on this premise, we proposed the radiographic comparison of the prostate gland dimensions with the pubic-promontory dimension (because the pubic-promontory distance is easily measured on the lateral view). For survey radiography, if any prostatic dimension is larger than 90% of the pubic-promontory dimension, consider neoplasia, abscess, or paraprostatic cysts most likely. Use clinical signs, urethrocystography, and ultrasonography to further characterize the disorder. Also, if focal/multifocal areas of irregularly shaped mineralization are observed in the area of the prostate gland, rule out prostatic carcinoma, before initiating treatment for chronic prostatitis, and if hypertrophic osteopathy-like reaction of the lumbar spine or pelvis is observed, rule out prostatic or urethral neoplasia regardless of prostatic size.

Feeney et al. (1987), stated that focal to multifocal areas of increased echogenicity within prostate were observed with bacterial prostatitis and carcinoma. Intraparenchymal anechoic foci (cavities) were observed in prostatic abscess. The size of the cavities was not specific to differentiate among these types of prostatic disease, because cavities up to 4 cm in one dimension were observed in all prostatic diseases. Paraprostatic cysts also were hypoechoic or anechoic, but were not confined to the volume of the prostatic parenchyma. Asymmetric glandular shape was seen only in dogs affected with prostatic abscess or less commonly in dogs with prostatic carcinoma. The subjective assessment of an irregular outline of the prostate gland was less specific for abscess or neoplasia than was glandular asymmetry, but was more commonly seen in patients affected with abscess or neoplasia. They were anticipated that ultrasonography would play an increasingly important role in the assessment of canine prostatic disease. This will depend on acceptance of ultrasonography as a nonionizing, noninvasive method of characterizing prostatic disease.

Stowater and Lamb (1989), recommended that canine prostatic cysts are relatively uncommon compared with other prostatic diseases. Incidence rates of paraprostatic cyst vary from 2.6% to 5.3% of dogs presented with clinical prostatic disease. The radiographic appearance of canine paraprostatic cysts is nonspecific. Ultrasonography paraprostatic cysts have been described as large ovoid structures with hypoechoic or anechoic contents and smooth internal margins. Most cysts were located cranial and or dorsal to the prostate gland or bladder trigone. There are some variety of ultrasonographic appearances of the cyst and prostatic parenchyma, as the following; 1- some cysts had anechoic spaces within the prostatic parenchyma that appeared to communicate directly with the prostatic cyst. 2- some cysts had hyperechoic septa extened from the cyst wall into the lumen and small anechoic spaces. 3- cyst walls having a smooth inner margin in some dogs and an irregular margin in other dogs. This variation may be due to; (1) retention of prostatic secretion with possible secondary infection seems a likely etiology in some instances based on the broad attachment to the prostatic gland and pathological evidence of suppurative changes within the prostatic parenchyma, (2) other cysts contain bloody fluid and hade pathological evidence of a hemorrhagic origin. Ultrasound is beneficial in suspected paraprostatic cysts as it offers noninvasive means of evaluating the cyst contents and prostatic parenchyma that cannot be achieved by radiography. Ultrasound may also demonstrate direct extension from or communication with the prostate gland. Some cases hade anechoic spaces within the prostatic parenchyma that appeared to communicate directly with the paraprostatic cyst.

Krawiec and Heflin (1992), mentioned that the most common prostatic diseases was bacterial prostatitis, followed by prostatic cyst, prostatic adenocarcinoma and benign hyperplasia. The most common prostatic disease identified in neutered dogs was prostatic adenocarcinoma. Mean age at onset of the prostatic disease was 8 or 9 years; statistically significant difference was not observed between age at onset of the various types of prostatic disease identified. Doberman pinscher was the most common breed with prostate diseases. The most prostatic disorders can be prevented by neutering except prostatic neoplasia.

Kay (1994), stated that positive contrast retrograde urethrography may help to localize the disease process. Ultrasonograhpy can be used to evaluate the prostate and to guide percutaneous needle aspiration or needle core biopsy. Intraprostatic cyst or abscess was appeared as focally hypoechoic or anechoic areas. Focal or multifocal areas of increased echogenicity with shadowing may represent bacterial prostatitis or neoplasia.

Klausner, Johnston, and Bell (1995), reported that prostatomegaly was the most frequent abnormality noted on survey abdominal radiographs.

Ultrasonographic evaluation revealed prostatic enlargement with uniform parenchymal echogenicity. Small fluid-filled cysts may be noted. They also recommended prostatic ultrasonograhpy for all dogs with prostatic disease because this procedure can detect more than one type of prostatic disease in a single prostate, and because presence of cyst/abscesses may indicate surgical drainage.

Ramirez and Homco (1995), found that the sonographic appearance of the normal canine prostate gland is a smooth well-circumscribed spherical to bilobate structure. The prostatic parenchyma is moderately echoic with a coarse but uniform texture throughout. The most common focal lesions identified on ultrasonographic examination of the prostate gland are intraprostatic cysts. Cavitations are identified with ultrasonography, but these findings are not necessarily indicative of pathology. Prostatic abscesses and tumors may appear quit similar sonographically and must be differentiated cytologically.

Weichselbaum et al. (1995), found that the ultrasound allows discrimination between solid masses and fluid filled cavitations by the far enhancement characteristic of the latter. Mineralization and gas within the prostate gland cause acoustic shadowing.

Kincaied et al. (1996), suggested that the high-intensity focused ultrasound (H.I.F.U) can be used for subtotal ablation of the prostate gland in dogs without causing damage to the surrounding tissues.

Burk and Ackerman (1996), mentioned that urinary tract contrast studies offer little specific information regarding the etiology of prostatic disease. When there is doubt as to the identity of a caudal abdominal mass, radiographs with a radiopaque urinary catheter in the bladder, cystogram, or urethrogrames may be helpful. Extension of the prostate cranial to the pelvic brim usually indicates enlargement. The most common cause of prostatic enlargement is benign prostatic hyperplasia. Paraprostatic cyst may be visible as round, oval or tubular soft tissue-dense structures in the caudal ventral abdomen. These masses my be present between the colon and bladder, may be cranial or lateral to the bladder. They are always attached by a stalk to the prostate gland and may have a calcified wall. Ultrasound is well suited for evaluation of the prostate. Prostatic hyperplasia usually produces a uniformly textured enlarged prostate. The echo intensity of the prostate is normal. Small hyperechoic or anechoic cysts may be identified. Prostatitis and prostatic carcinoma can create single or multiple foci or increased echo intensity. Differentiation of these two conditions is difficult. Prostatitis may produce multifocal anechoic and or hypoechoic areas with smooth or irregular margins. Asymmetric enlargement may be seen more often with prostatic tumors. Prostatic carcinomegaly characterized by multifocal hyperechoic areas, round or oval hypoechoic masses, which represent sublumber lymph node enlargement, may be identified. Prostatic abscess and intraprostatic cysts produce solitary or multiple hypoechoic or anechoic lesions. Cysts may be more smoothly marginated, however either lesion may have irregular margins. Paraprostatic cysts are anechoic or hypoechoic structures that may be tubular or septated. Mineralization within the wall of the cyst may produce hyperechoic areas, which shadow. Communication of the paraprostatic cyst with the prostate may be identified.

Cyst or abscess drainage may be performed using ultrasound guidance and may eliminate the need of surgery.

Welsh et al. (2000), reported that a variety of diseases may cause perineal swelling in dogs, including uncomplicated perineal hernia, retroflexion of urinary bladder, abscesses, and neoplasia. Although prostatic cysts may be found in the herneal sac in perineal region, this is an unusual location for these cysts. Paraprostatic cysts are commonly located intra-abdominally but may be extending through the pelvic canal to the perineum. Abdominal ultrasonography confirmed symmetrical prostatomegaly and multiple small fluid-filled cavities within the prostatic parenchyma. Perineal Ultrasonography revealed a well-encapsulated, multiloculated, fluid-filled structure separate from the rectum. Ultrasonography was a useful diagnostic aid in differentiating perineal paraprostatic cysts from other causes of perineal swelling.

Kustritz and Klausner (2000), stated that prostatitis, prostatic abscess appears radiographically as prostatomegaly, and prostatic mineralization may be evident. In chronic prostatitis, ultrasonography revealed a diffuse increase in prostatic parenchymal echogenicity. Abscesses are visible as hypoechoic to anechoic lesions with distant enhancement and cannot be differentiated from cysts or hematomas. Ultrasonographic findings of prostatic tumor included coalescing areas of focal to multifocal increased echogenicity; mineralization and cavitary lesions also may be noted. Lesions may be difficult to distinguish from chronic bacterial prostatitis.

Topographical Anatomy of Uterus

Ackerman (1981), recommended that in the 20 – 30 pound non-pregnant bitches the uterine horns are approximately 0.5 to 1cm in diameter. They diverge from the uterine body 4 to 5 cm cranial to the pelvic brim. The uterus is in contact with the colon and psoas muscles dorsally and with the omentum, small intestine, and bladder ventrally. It is supported by suspensory and round ligaments. However, when enlarged, the uterine horns easily move, bending the uterus back on itself and producing a convoluted appearance.

Fingland (1994), stated that the uterus consists of the cervix, body, and two uterine horns. The oviducts connect the uterine horns and ovaries. The uterus is attached to the dorsolateral wall of the abdominal cavity and the lateral wall of the pelvic cavity by paired double folds of peritoneum called broad ligaments. The round ligament is the caudal continuation of the proper ligament. The round ligament extends caudally and ventrally in the broad ligament and, in most bitches, passes through the inguinal canal terminating subcutaneously near the vulva. The uterine branch of internal iliac artery is the main artery to the uterus. The uterine branch of the urogenital artery supplies the caudal portion of the uterus, the cervix and part of vagina. The uterine branch of the ovarian artery supplies the cranial part of uterine horns.

Yeager and Concannon (1995), reported that the uterus is most reliably located dorsal or lateral to the urinary bladder. The caudal poles of the kidneys and the ovaries can also be landmarks for the detection of the uterus because the cranial parts of the uterine horns are located immediately caudal to the ovaries. Segments of the midportions of the uterine horns appear along a "V"-shaped line drawn between the caudal poles of the kidneys and the midline of the caudal abdomen.

Burk and Ackerman (1996), recommended that the body of the uterus is located between the urinary bladder and the colon. In a fatty dog, the uterine body may be visible dorsal to or superimposed upon the bladder and ventral to the colon in lateral radiograph. When enlarged, the uterus becomes visible as a tubular-shaped soft tissue structure that displaces small intestine cranially, dorsally, and toward midline.

Fossum et al. (1997), mentioned that the uterus has a short body and long narrow horns, the blood supply to the uterus arises from the uterine arteries and veins. The cervix is constricted caudal part of the uterus and is thicker than the uterine body and vagina. It is oriented in a nearly vertical position with the uterine opening dorsal. The broad ligament (mesometrium) is the peritoneal fold that suspends the uterus.

Radiography and Ultrasonography of Normal Uterus

Ackerman (1981), recommended that the normal non gravid uterus was difficult to identify radiographically because of its small diameter and fluid opacity which is similar to adjacent intestinal loops. When the uterus becomes larger than or displaces adjacent intestinal loops, it may be visible in the caudal ventral abdomen as a tubular or convoluted soft tissue structure.

Poffenbarger and Feeney (1986), stated that the normal non-gravid uterus could not be imaged by ultrasonography because of its small size and similar echogenicity to bowel loops. The uterus appeared as a will-defined tubular structure, with a hypoechoic to anechoic lumen. The lack of an echogenic center and peristalsis during real-time scanning aided the differentiation of uterus from bowel. Ultrasonography can be a useful adjunct to radiography in patient assessment.

Grooters (1994), mentioned that a normal non-gravid uterus cannot be detected on abdominal radiographs. In addition, open-cervix pyometra may allow enough drainage to prevent radiographically detectable uterine enlargement; therefore, the inability to visualize the uterus on abdominal radiographs dose not rule out the possibility of pyometra.

Yeager and Concannon (1995), recommended that during late diestrus and anestrus, the uterus was uniformly hypoechoic compared to background fat. It had neither a layered wall nor a luminal echo. In bitches, uterine diameter ranges from 3 mm in toy and miniature breeds to 8 mm in large and giant breeds. During anestrus, the uterus is difficult to detect, except at the level of the bladder, and the vagina and cervix are difficult to distinguish from the uterine body. Through proestrus, estrus, and early diestrus a 1 mm hyperechoic luminal echo and a hypoechoic inner layer of the uterine wall are variably present. Detection of the uterus is easier at these times compared to anestrus because it is turgid and 1to 3 mm larger in diameter. There was also obvious, focal enlargement of canine cervix. It has multiple layers that give it a "bull's-eye" appearance in cross-section. The uterus may appear coiled during the first and second week of diestrus.

Burk and Ackerman (1996), reported that the uterus was not readily visualized unless it becomes enlarged. In fatty dog, the uterine body may be visible dorsal to or superimposed upon the bladder and ventral to the colon in lateral radiograph. When enlarged, the uterus becomes visible as a tubular-shaped soft tissue structure that displaces the small intestine cranially, dorsally, and toward the midline. The uterus folds upon itself and appear oval or sausage shaped. The uterine body may be identified during an ultrasound examination. It can be identified either dorsal or dorsolateral to the urinary bladder. It is usually easier to detect it when examining the bladder in a transverse plain. It appears as a round heteroechoic structure with a very small hyperechoic lumen. The uterus must be distinguished from adjacent loops of intestine and this is difficult anterior to the urinary bladder.

Radiography and Ultrasonography of Abnormal Uterus

Poffenbarger and Feeney (1986), stated that ultrasonography was considered diagnostic in 72% of uterine enlargement, assisted in identification of cystic ovarian diseases, and was important in helping identify a congenital abnormality. The increased uterine size allowed sonographic imaging. The uterine horns were liner or convoluted, its variable in diameter ranging from 1cm to 6 cm. The ultrasonographic appearance of uterus in case of pyometra is a 5cm diameter anechoic tubular mass display in far enhancement can be seen. Consistent with a large uterus, the structure appears to fold back on itself. Postpartum metritis had a slightly different sonographic pattern than pyometra. The uterus appeared as a 2 to 3 cm diameter anechoic to hypoechoic tubular structure with far enhancement. The uterine liomyoma had a homogenous ultrasonographic pattern that was isoechoic to normal uterine wall. The mass projected into the uterine lumen and appeared to be attached to the uterine wall. Uterine stump granulomas appeared ultrasonographically as poorly defined structures of mixed to increased echogenicity. The mixed pattern may have been caused by variations in the architecture of the mass, which may have included areas of necrosis, abscessation, fibrosis, and granulomatous inflammation.

Fayrer-Hosken et al. (1991), reported that ultrasonography allowed the detection of pathologic changes before any clinical changes were detectable. The use of ultrasonography for post-partum or post-estral checks will allow the differentiation of 1) uterine cysts [focal fluid filled areas], 2) pyometra [fluid with an increased echogenicity], 3) dead foeti [no heart beat], 4) resorbing foeti [poorly delineated gestational sacs with or without fetal remains], and 5) premature placental separation [fluid between the uterine wall and placental tissue]. In case of pyometra the uterus was enlarged and filled with hypoechoic fluid, circular echogenic masses were identified. These were thought to be the sites of resorbing placental tissue. They also suggested that regular ultrasonographic examinations should be scheduled at 1-month post estrus and 1-week pre and post expected day of parturition. Ultrasound will allow the prompt diagnosis of gestational, post-parturition and post-estral problems and improve our management of canine reproductive disorders.

Pharr and Post (1992), recommended that a valvovaginal discharge following parturition in a bitch is often a cause of concern to owners and clinicians, especially if whelping was complicated in any way; ultrasonography could potentially distinguish between normal and abnormal postpartum uterine states because the uterine wall and luminal contents can be imaged in detail. In the early post-partum state (1- 4 days) the uterus was large and its contents were generally of mixed echogenicity. Uterine diameter was moderately variable in intraplacentation zones. In the longitudinal plain, placentation sites were ovoid. There were both hypoechoic fluid and moderately echoic luminal components. The uterine wall were thick, moderately irregular, moderately echogenic, and blood vessels were sometimes visible within the uterine walls. Later postpartum (8-24 days), uterine wall gradually become thinner and less irregular in thickness, the uterine contents were hypoechoic. The hypoechoic fluid filled lumen was surrounded by a moderately echogenic ring of endometrium, which in turn was surrounded by a hypoechoic ring of myometrium. The hyperechoic endometrial layer varied in thickness, being thin and distinct in intraplacentation zones, but thicker and more irregular at placentation sites. The uterus (horn and body) could be seen by ultrasonography, even when the uterine horns had shrunk to less than 1.0 cm in diameter. It was not difficult to distinguish the uterine horns from loops of small bowel by the absence of peristaltic motion of bowel loops.

Grooters (1994), performed abdominal radiography to confirm the presence of an enlarged uterus and to evaluate the possibility of uterine rupture and peritonitis. A normal non gravid uterus cannot be detected on abdominal radiographs. Pyometra results in a fluid-dense tubular structure in the caudal abdomen that often displaces bowel loops cranially and dorsally. However, this is also the appearance of a gravid uterus before fetal skeletal calcification. Performing abdominal ultrasonography to differentiate pyometra from pregnancy is very important. Ultrasonography was performed in case of endometeritis to conferm uterine enlargement and to check for the presence of retained fetuses or identified retained placenta.

Yeager and Concannon (1995) recorded that in case of pyometra the uterus appears as a tubular viscus with a fluid in the lumen. Uterine shape varies from straight to convoluted and the fluid is either anechoic to echogenic. Ultrasonographic diagnosis of pyometra is very accurate because easy to detect small accumulation of fluid. Ultrasonographic diagnosis of meteritis and endometrial hyperplasia is not very accurate because the changes caused by these conditions are often subtle and inconsistent. During diestrus, some bitches with presumptive endometrial hyperplasia may accumulate small amounts of anechoic or hypoechoic fluid in the lumen of the uterus. They also observed that immediately postpartum, the endometrium appears as a thick hyperechoic inner layer. Placental sites appear as focal hypoechoic enlargements in the endometrial layer. At 1 week postpartum, the placental sites are generally no longer than 2 to 3 cm in diameter. By 5 to 6 week postpartum, placental sites are minimally larger than the rest of uterine horn, which is 1cm or less in diameter.

Ultrasonography may be useful for the detection of retained placenta, postpartum meteritis and subinvolution of placental sites.

Voges and Neuwrith (1996), mentioned that the sonographic appearance of pyometra was usually a convoluted tubulalar structure with anechoic to hypoechoic luminal contents. Canine cystic endometrial hyperplasia, part of pyometra complex, was the pathologic result of progesterone induced endometrial hyperplasia which has become cystic. Sonographically, the uterus was enlarged with a diameter of approximately 1.5 cm. multiple irregularly shaped anechoic to hypoechoic cyst like areas, ranging in size from 3 to14 mm in diameter, were present throughout the uterine walls. This would appear as a thickening of the uterine wall with or without luminal fluid. Endometrial glands increase in size and number as a result of prolonged progesterone stimulus.

Burk and Ackerman (1996), stated that pyometra can be recognized when the uterus is enlarged, thin walled, and filled with echogenic fluid. When the uterus enlarged with a thick wall, a specific diagnosis is not possible and endometeritis, endometrial hyperplasia, hydrometra, pyometra, or hematometra may be present. Uterine stump pyometra may appear as heteroechoic or hypoechoic oval or elongated mass located between colon and bladder. Hyperechoic areas that may represent fibrous tissue or anechoic areas that represent fluid accumulation may be seen. The location of the mass rather than its echo intensity is usually diagnostic. Uterine body, vaginal, or cervical tumors are usually more uniform in architecture. They can range from hypoechoic to hyperechoic. The anestrous uterus may be identified as a tubular structure with hypoechoic walls and hyperechoic lumen. It may be identified dorsal to the urinary bladder but can rarely be traced cranially because overlying small intestines well obscure it. Radiography the uterus folds upon itself and appears oval or sausage shaped. The presence of gas within the intestine is an important feature that helps to distinguish between an enlarged uterus and distended small intestines. Enlargement of the uterus may be due to several causes as pregnancy, infection, postpartum hemorrhages or neoplasia. The differentiation of these conditions may be difficult based on radiographic signs.

Fossum et al. (1997), reported that radiography and ultrasonography may show a mass in the uterine area. The echogenicity of uterine masses is variable. Ultrasound guided-biopsies may provide information regarding tumor type. Abdominal radiographs should be evaluated for evidence of lymph node enlargement or visceral metastases. A fluid-filled uterus should be detected on abdominal radiographs and/or ultrasonography. The enlarged uterus is located in the caudal abdomen and may displace the intestine cranially and dorsally. The uterus is identified sonographically as a will-defined liner or convoluted tubular structure with hypoechoic to anechoic lumen and thin echogenic walls.

Feldman (2000), concluded that abdominal radiography should be assessed in a bitch suspected pyometra to confirm the diagnoses and to identify any unexpected problems such as peritonitis or retained fetal tissue. With pyometra, a fluid dense tubular structure, larger than small intestinal loops, was typically seen in the ventral and caudal abdomen. Ultrasound allowed determination of the size of the uterus, thickening of the uterine wall, and presence of fluid accumulation within the lumen. More importantly, ultrasonography easily identifies fetal remnants or placental tissue. Endometeritis or pyometra can be distinguished from a gravid uterus, and stump pyometra can be visualized dorsal and caudal to the bladder.

MATERIALS AND METHODS

Animals:

This study was conducting on 91 dogs divided into two groups; First group, included 61 dogs admitted to small animal section, Department of veterinary surgery, Ludwig-Maximilians university, Munich, Germany, from 1/6/2003 to 1/10 /2003. The second group, included 30 dogs collected from police dogs (General Department for Training Guarding and Security dogs) admitted to department of surgery, Faculty of Veterinary Medicine, Alexandria University.

The breed, gender, age, and body weight of each animal were recorded. General symptoms, case history and clinical examination (temperature, plus, rate, respiratory rate) were recorded for each case. Special examination for uorogenital system was performed for each patient.

Animal control:

Radiographic and Ultrasonographic examination were performed under the effect of sedation analgesic and muscle relaxant. xylazin Hcl (rompun)* was given in dose of 1mg/kg body weight.

General anesthesia was indicated in some instances using atropine sulphate** (0.02 – 0.04 mg/ kg SC or IM) and diazepam*** (0.2 mg /kg IV)

*	Rompun	(Bayer) GmpH, Leverkusen.	Germany
**	Atropine	Elkins – Sinn, Inc.	Cherry Hill, N.J.
***	Diazepam	Elkins – Sinn, Inc.	Cherry Hill, N.J.

as a pre-anesthetic, followed by propofol* (4 – 5 mg/kg IV) for induction of anesthesia. Maintenance was performed by isoflurane** inhalation anesthesia.

Preparation of the patient :-

The hair was clipped and shaving at the area of the ventral abdominal wall between the cranial aspect of the prepuce and the pubic bone from the midline to the inguinal fold in case of sonographic examination of urinary bladder and prostate. In case of kidney ultrasonography the hair was clipped from the caudal part of the abdomen to the xiphoid and laterally to the mid ribs section. A wider arc was clipped on the right side, to include the last few intercostal spaces, since it was occasionally necessary to scan intercostally to visualize the right kidney. In case of urinary bladder disorders an area of hair was clipped between the pubic prim and the umbilicus, extending at least several centimeters on each side of midline.

The examined doges were not fed for 24 hours prior to time of radiography or ultrasonography and were given rectal enema 1to 2 hours before the radiographic procedures.

Ultrasonic couplant-gel (ultra/phonic SG scanning gel)*** was applied to the skin to assure good acoustic transmission.

* Propofol	Abbott Laboratories	North Chicago.
** Isoflurane	Anaquest. Inc.	Liberty corner. N.J
*** Ultraphonic SG scaning gel		Janssen-Cilag GmbH

Ultrasonographic pictures:-

The ultrasonographic examinations were performed using a sonoline prema siemens* diagnostic ultrasound system, brightness mode (B mode), real time (RT), sector scanner, multiple phased array transducers was found to be adequate for all examinations (Fig., 1).

Ultrasound diagnosis is a multi-steps process. In some cases, the radiographic examination precedes the ultrasound examination. The size, shape, location, echo intensity, homogenecity of the ultrasound images were evaluated. Specific diagnosis may be determined. In many cases, differential diagnosis will be developed based on the ultrasound findings.

Kidney:

Kidneys were scanned in a sagittal plane and transverse plane. Sagittal images were obtained by scanning the kidney from medial to lateral; transverse images were obtained by scanning the kidney from cranial to caudal. Images were displayed on the screen in a consistent manner. Sagittally, the cranial pole of the kidney was viewed to the left of the screen caudal pole to the right. Transversally, the medial and lateral borders were viewed to the left and right of the screen, respectively.

For all scans, the ventral border was seen in the near field (at the top of the screen) and the dorsal border beneath it. Transducer used mechanical sector scanner 3.5:5 MHz was positioned to image the kidney in sagittal and transverse plane.

*** Sonoline Prema Siemens corp.**

Urinary bladder;

Cystosonography generally was performed with a patient in dorsal recumbency using (5.0MHz and /or 7.5MHz) depending on size of animal, depth of penetration needed, and resolution required.

Transverse, Sagittal (longitudinal) and oblique images were obtained from caudal abdominal wall with complete or moderate distention of the urinary bladder by imaging early in the morning or by catheterization and infusion of sterile saline into the bladder.

Prostatic ultrasonography;

Ultrasonographic examinations were performed using multiple sector scanner transducers with convex transabdominal array (3.5:5MHz). Sagittal and transverse planes of the prostate were obtained. Dogs were placed in dorsal recumbency; the transducer was placed against the ventral abdominal wall cranial to the pubis. Sagittal ultrasonograms were displayed with the dogs head to the left and ventral abdominal wall at the top, and transverse images were displayed with the dog's right on the reader's left and the ventral abdominal wall at the top. Each dog was positioned in dorsal recumbency, and the transducer was placed on the abdominal wall and positioned for longitudinal and transverse images through the prostate.

Ultrasound of uterus;

Animals were placed in dorsal recumbence position and a small stripe of hair was clipped on the ventral mid line from the pubis to just cranial to umbilicus. Ultrasonic copulant gel was applied to the skin to assure good acoustic transmission.

The abdomen was scanned subsequently in multiple longitudinal sections starting from the mid line and moving laterally. The amplitude of the returning echoes was described as increased (hyperechoic), normal (isoechoic), decreased (hypoechoic), or absent (anechoic), compared with normal echo amplitude for that organ.

Interpretation was performed to each radiographic or ultrasonographic picture to reach the accurate medical diagnoses.

Radiographic pictures:-

Survey abdominal radiography and urethrocystography were performed using multix UH*(Fig., 2).

Survey abdominal radiography and urethrocystography technique required that food be withheld for at least 24 hours and cleansing enema be given at least 2 hours before radiography to allow sufficient time to colon to empty.

Positive contrast urethrocystography was made after survey abdominal radiography. The urinary bladder was evacuated from urine. The penile urethra was catheterized with a uretheral catheter. Infusion of water-soluble, ionic iodinated contrast medium (Renografin**) was performed by moderate pressure, hand injection using a 50 ml syringe with dog in right lateral recumbency,

* Multix UH — Siemens corp.
**Renografin — New Bruswick, NJ

Double contrast cystogram was performed by the bladder is catheterized, all urine was evacuated and the bladder is distended with gas (Co2 or No2). After insufflations with gas, a small amount of radiopaque contrast media Renografin (from 0.5 to 3 cc) was instilled through the urinary catheter. Lateral and ventrodorsal views were performed.

Ultrasound equipment:-

The major components of the diagnostic ultrasound imaging system are pulser, transducer, receiver, memory, and display. Electrical pulses are produced by the pulser and these drive the transducer. The transducer produces ultrasound pulses for each electrical pulse it receives. The transducer also produces electrical pulses for each ultrasound pulse (reflection) it receives from tissues. The electrical pulses go to the receiver, where they are converted to information that the memory can utilize. Information from the memory drives the display, which produces an image. . **(Biller and Haider, 1994)**

Machines:

Two types of real-time scanners

(1) Linear array produces a rectangular image and can be utilized to evaluate broad areas, where no bony or gas-filled structures interfere.

(2) Sector scanner produces a pie-shaped image. Smaller contact zone is used, which makes inter-costal and sub-costal imaging less difficult.

A- Mechanical-The sound wave is focused a certain distance from the transducer (focal point). The sound wave is within focus for some distance on both sides of the focal point (focal zone). Resolution is best within this fixed focal zone. Scanner contains moving parts.

B-Phased (annular) array- no moving parts, therefore, more durable than mechanical scanners. The beam is formed by adding together many small beams from an array of small crystals. Scanner has variable (dynamic) focusing. The focal zone therefore can be placed anywhere in the image depth **(Biller and Haider, 1994).**

Image display

M-Mode (Motion-Mode): Documents motion, especially that of the heart (echocardiography). A thin ultrasound beam is directed into the heart, is reflected back, and then is shown on the screen as numerous moving lines. Motion is indicated along the side, and time along the bottom of the screen.

B-Mode (Brightness-Mode): Echoes are displayed as dots. The brightness of the dot changes with the amplitude of reflection. The larger the reflection, the brighter the dot-no reflection, black dot. The location of the dot corresponds to the location of the reflector in the body.

Real time: The image is continually updated during the entire examination. This permits direct observation of moving structures (heart, bowel peristalsis) **(Biller and Haider, 1994).**

Types of transducers

Transducers are available in a variety of frequencies (2 to 10 MHz). Low-frequency transducers provide greater depth of penetration, but because of large wavelength, resolution is poorer. High-frequency transducers provide excellent resolution, but the beam is rapidly attenuated in tissue.

They are therefore utilized to evaluate superficial tissues. Use as high a frequency transducer as possible to maximize resolution but still allow penetration to the depth needed **(Biller and Haider, 1994).**

How ultrasound working

Ultrasonography is based on the pulse echo principle. A pulse of high frequency sound (ultrasound) is transmitted into the body. This pulse travels through the body until it reaches a reflecting surface at which time a portion of the ultrasound pulse (the echo) is reflected back toward the source of the pulse. The transmitter keeps track of the time that elapses from the beginning of the pulse to the time the echo is received. This time is proportional to the distance the pulse traveled and allows for the determination of the reflecting surface's position and display of the position as a point on a cathode ray tube (CRT). The amount of ultrasound pulse that is reflected determines the brightness of the point produced on the CRT. If an adequate number of points can be transmitted and received, an image of the reflecting surfaces can be displayed on the CRT. This image is updating by sending multiple pulses and receiving multiple echoes in a relatively short period of time. The data are stored in a computer and transmitted to the CRT at a rate of 15 to 30 images per second. This produces a moving, flicker-free image on the CRT. This image is then recorded on video tape or on photographic film. The transducer, which is used to both transmit and receive the ultrasound pulse, can vary in frequency. The higher the transducer frequency the greater the resolution and the lower the penetration of the sound beam. For most small animals, transducers in the 3 MHz to 7 MHz rang are used **(Biller and Haider, 1994).**

Ultrasound terminology:

Anechoic – area void of echoes (see as black).

Hypoechoic – lower level of echogenicity (darker) than adjacent structures.

Hyperechoic - higher level of echogenicity (brighter) than adjacent structures.

Isoechoic – level of echogenicity similar to adjacent structures.

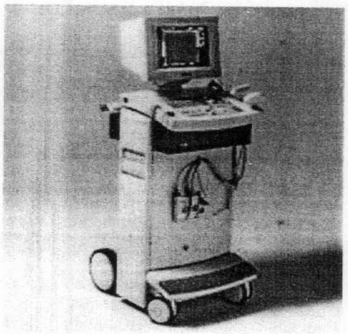
Complex echogenicity – area of multiple echogenicities

Ultrasonographic barriers – highly reflective or absorptive interfaces within the body that cause an almost complete attenuation of the sound beam. Example - bone, mineral, and air.

Ultrasonographic windows – soft tissue organs adjacent to the body wall used to help avoid gas or bone to facilitate deeper imaging. Ex. Imaging through the spleen on the left lateral abdominal wall to visualize the left kidney.

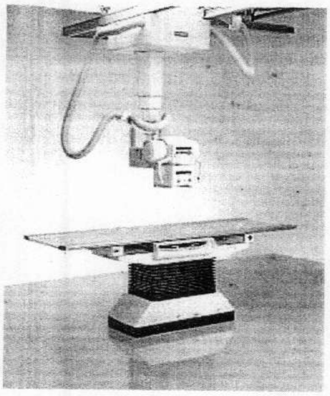
Acoustic enhancement (through transmission) – sound passes through an anechoic structure with little attenuation and emerges with more intensity than expected in surrounded echogenic areas. This occurrence is expected deep to fluid- filled structures (gallbladder, cyst)

Organ echogenicity - rank of abdominal parenchymal organs from least to most echogenic: renal medulla, renal cortex, liver, spleen, prostate and renal sinus **(Biller and Haider, 1994).**



(Fig., 1) ***SONOLINE Prima*** ***SIEMENS Corp.***

1. **Digital black and white system targeted for use in OB/GYN, Abdominal, Small Parts, Urology**
2. **Frequency range: 2.6MHz to 7.5MHz**



(Fig., 2) ***MULTIX*** ***SIEMENS Corp.***

800 MA	by 63 KV / 50 KW
700 MA	by 70 KV / 50 KW
500 MA	by 120 KV / 50 KW

RESULTS

KIDNEY

There were 24 doges (21 males and 3 females) presented for kidney disorder. The age of the affected dogs was ranged from 8 years to 13 years. Dogs breeds described here were German shepherd, Schnauzer, cocker spaniel, white terrier, and mixed breed.

Types of surgical affections, numbers, sex, and breeds of animals, radiographic finding, and Ultrasonographic finding were illustrated in table (1).

The duration of clinical signs reported by the owners ranged from 3 days to two weeks. The most clinical signs reported were polyuria, anorexia, lumber pain, abdominal distention, weight loss, weakness, diarrhea, vomiting, and fever. One case was admitted without clinical history

Ultrasonography of the kidney of the affected dog revealed that there were 6 cases of kidney cyst, 2 cases of cystadenocarsenoma, 10 cases of pyelonephritis, and 6 cases of hydronephrosis (Table 1).

Ultrasonographic findings; revealed anechoic lesion within renal parenchyma indicative **parenchymal kidney cyst.** The lesion was oval in shape (Fig.,3 and 4) or rounded in shape (Fig., 5). Kidney cyst was located within the renal parenchyma. The cyst had regular borders with thin inner wall.

In case of the **cystadenocarcinoma** an anechoic to hypoechoic, large mass was extended caudally in great expansions. The cyst was large size, rounded with smooth demarcation, protruded from renal cortex and extending caudally in great expansion (Fig., 6 and 7). The cystadenocarsenoma was found in both right and left kidney. The cyst was (5cmx5cm) large with hypoechoic septated lumen (Fig., 8).

In case of **pyelonephritis,** the kidney was enlarged with irregular borders. A hyperechoic line along the renal crest with poor cortecomedullary distinction was present (Fig., 9). Echogenic renal cortex with hypoechoic focal lesions within the medulla also was detected.

In case of **hydronephrosis** anechoic area in renal pelvis which loss its Y shape and become wide, oval and large (Fig., 10). A dilatation of renal pelvis with large anechoic fluid-filled structure was visible about periphery of the kidney. Hyperechoic focal area in renal cortex was present in small amount indicative pyelonephritis.

Radiographic findings; Lateral abdominal radiography that showed asymmetrical renal enlargement with irregular borders was indicative parenchymal kidney cyst (Fig., 11). In case of renal cystadenocarsenoma, the left kidney had smooth irregular enlargement. A large smooth-bordered mass of undetermined origin was visible attached to the left kidney (Fig., 12).

Table1- showing different surgical affections in the kidney of dogs

	Surgical affections	No.	Kidney	X-ray	Ultrasonographic picture	Sex	Breed
1	**Parenchymal kidney cyst**	6	L	Enlarged kidney with irregular borders	Anechoic lesion within renal parenchyma	M 1-F	German shepherd (2) White terrier (4)
2	**Cystoadeno-Carcinoma**	2	L & R	Irregular enlargement with large mass attached with kidney	Anechoic mass extending outside kidney	M	Mixed breed (1) German shepherd (1)
3	**Pyelonephritis**	10	L & R	–	Hyperechoic kidney	M 2-F	German shepherd (7) Schnauzer (2) Cocker Spaniel (1)
4	**Hydronephrosis**	6	L	–	Hypoechoic area in renal pelvis	M	Mixed breed (3) German shepherd (3)

Parenchymal kidney cyst

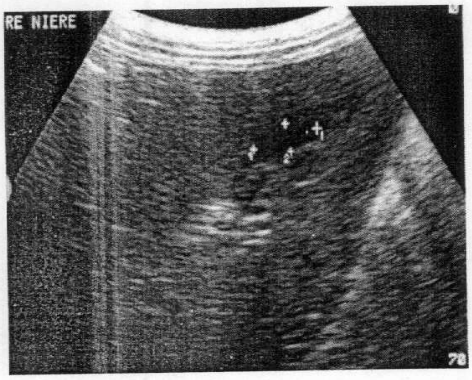


Fig. (3): Transverse sonogram of left kidney showing anechoic lesion within the renal parenchyma

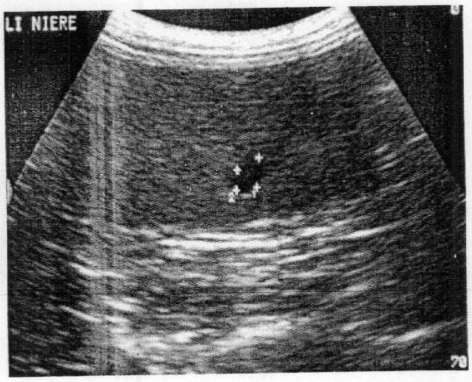


Fig. (4): Transverse sonogram of left kidney showing anechoic lesion within the renal parenchyma

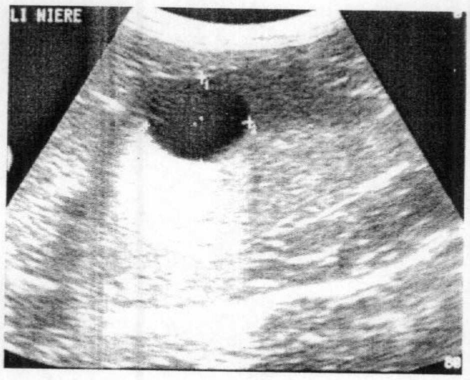


Fig. (5): Transverse sonogram of left kidney showing rounded anechoic lesion within the renal parenchyma

Cystadenocarcinoma

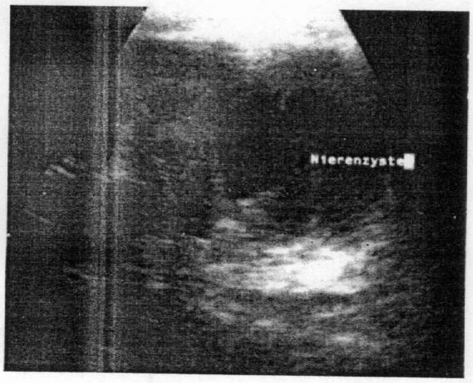


Fig. (6): Transverse sonogram showing anechoic cyst protruded from the renal parenchyma

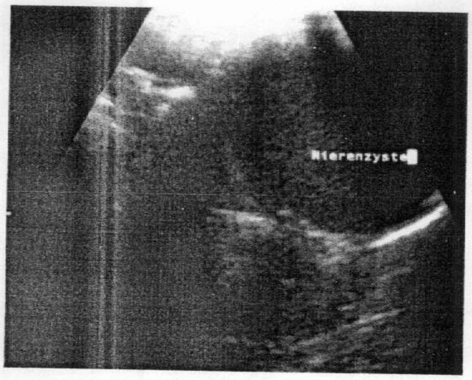


Fig. (7): Transverse sonogram showing anechoic cyst protruded from the renal parenchyma

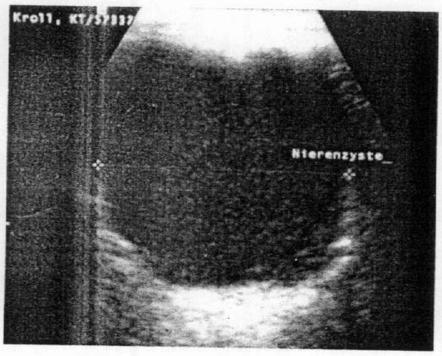


Fig. (8): Transverse sonogram showing anechoic cyst protruded from the renal parenchyma

Pyelonephritis

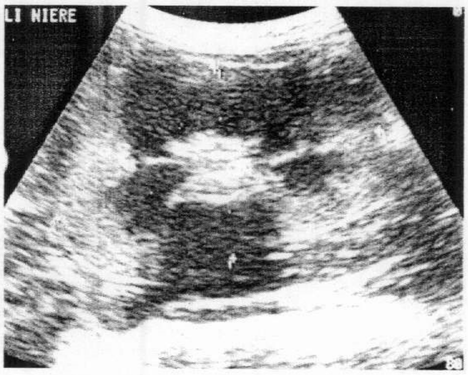


Fig. (9): Longitudinal sonogram of left kidney showing hyperechoic line along the renal crest and echogenic renal cortex

Hydronephrosis

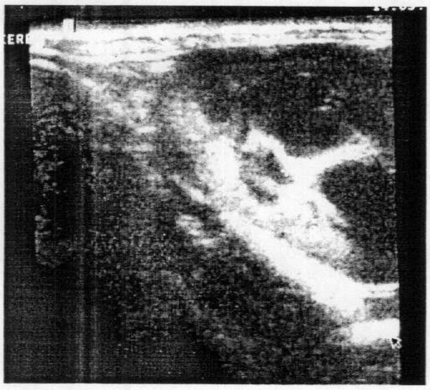


Fig.(10): Longitudinal sonogram of right kidney showing anechoic fluid filled structure with dilated renal pelvis

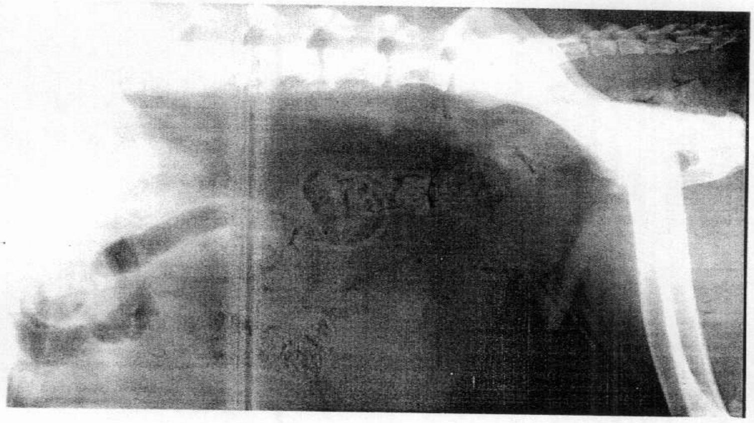


Fig. (11): Lateral abdominal radiograph showing enlarged left kidney with irregular borders

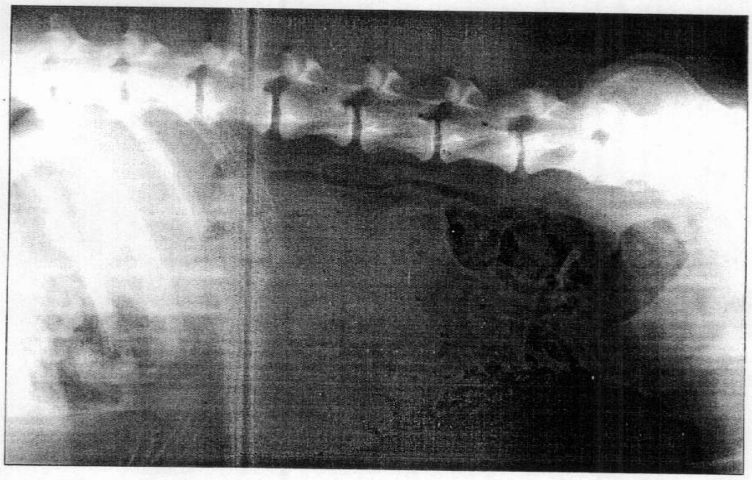


Fig. (12): Lateral abdominal radiograph showing multiple large smooth bordered mass attached to the kidney

URINARY BLADDER

In the present study, 23 dogs (22 male and 1 female) were presented with urinary bladder disorders. The age was ranged from 9 to 15 years. Breeds of dogs described were; Dalmatian, German shepherd, Bull terrier, Pit bull, Poodle, Mixed breed, bulldog, Dachshund, and collie.

Types of surgical affections, sex, breeds of animals, radiographic and Ultrasonographic findings were illustrated in table (2).

The most common clinical history was hematuria, dysuria, stranguria, fever, abdominal distention, arched back and abdominal pain.

Ultrasonographic finding; hyperechoic structures were visible within the urinary bladder indicated the presence of **cystic calculi**. Highly echogenic appearance and an acoustic shadow of calculi were observed in the most dependant portion of urinary bladder, which moved, with agitation of urinary bladder or patient movement. The wall of the urinary bladder was thickened (Fig., 13 A and B).

In case of **neck bladder tumor** a hypoechoic mass (8mm) with irregular margin was found caudal and dorsal to the bladder and attached to the bladder neck from outside (Fig., 14). This mass was appeared calcified in longitudinal images (Fig., 15), and not attached with the sub lumber lymph node.

In case of **transitional cell carcinoma** there were echogenic structures protruding into the bladder lumen arising from inner surface of urinary bladder. Infiltrating wall lesions were producing thickening of the bladder wall with loss of concave inner border of the urinary bladder. These structures appeared tubular in shape and remained fixed in position despite movement of the patient (Fig., 16).

In case of **mural hemorrhages** an echogenic luminal lesion in the dependent portion of the urinary bladder this thought to be a blood clot, which moved with changing patient position. The bladder wall was mild irregular and thickened with mild distended urinary bladder (Fig., 17 & 18).

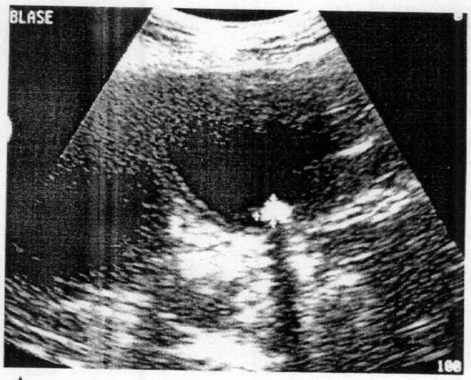
In case of **cystitis,** there was diffuse thickening of the bladder wall and irregular shape of the urinary bladder (Fig., 19). Hyperechoic bladder wall with multiples echogenic strands or materials were present in the dependant portion of the urinary bladder, which moved with patient movement. Anechoic fluid was seen throughout the abdomen, which revealed hemorrhages. The sonographic diagnosis was infiltrative urinary bladder wall disease (severe cystitis) (Fig., 20).

Radiographic findings; Radiographic examinations revealed presence of multiple poorly calcified calculi, large in size filling the urinary bladder. They clearly appeared with lateral abdominal radiography (Fig., 21). Double contrast cystography was made in case of transitional cell carcinoma. The bladder wall was thickened and revealed multiple large irregular masses within the bladder that have irregular surfaces with thick-ended bladder wall (transitional cell carcinoma) (Fig., 22).

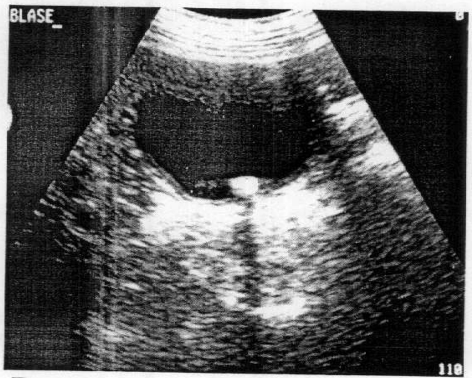
Table 2 - showing different surgical affection in urinary bladder

	Surgical affection	No.	Radiology pictures	Ultrasonographic pictures	Sex	Breed
1	**Cystic calculi**	5	Several multiple Poorly calcified Calculi	Hyperechoic structure within the urinary bladder. Shadowing deep to calculi.	M	Dalmatian (2) German shepherd (2) Bulldog (1)
2	**Neck bladder tumor**	1	Irregular mass caudal and dorsal to neck bladder.	Hypoechoic mass attached to Bladder neck from outside.	M	Poodle (1)
3	**Transitional cell carcinoma**	3	Irregular masses within the urinary bladder	Hyperechoic mass originated from bladder wall	M	Bull terrier (2) German shepherd (1)
4	**Mural hemorrhage**	3	——	Echogenic mass within the Urinary bladder.	M	Pit bull (1) Collie (2)
5	**Cystitis**	11	——	Thickening Bladder wall and hypoechoic tissue depress within anechoic bladder lumen.	M 1-F	Mix-breed (4) German shepherd (3) Dachshund (4)
	Total	**23**				

Cystic calculi



A



B

Fig.(13A&B): Transverse sonogram showing hyperechoic structure within the urinary bladder and shadowing deep to cystic calculi

Neck bladder tumor

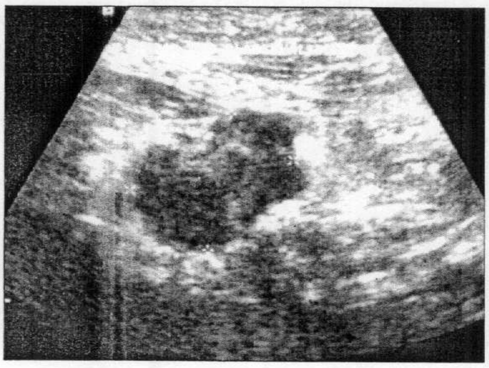


Fig. (14): Transverse sonogram of tumor showing hypoechoic mass with irregular margin located caudo-dorsal bladder neck

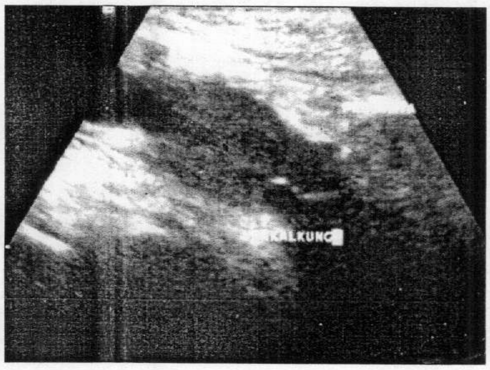


Fig. (15): Longitudinal sonogram of the neck bladder tumor showing calcification of the tumor

Transitional cell carcinoma

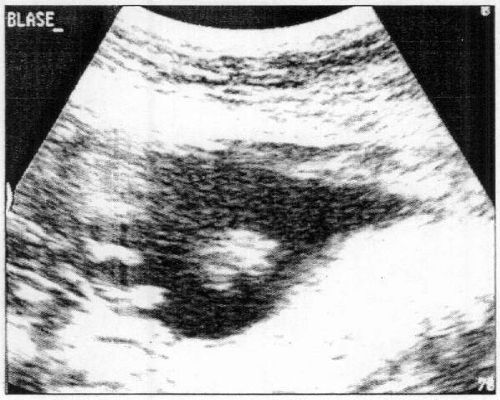


Fig. (16): Longitudinal sonogram of the bladder showing hyperechoic mass originated from bladder wall and fixed in position

Mural hemorrhages

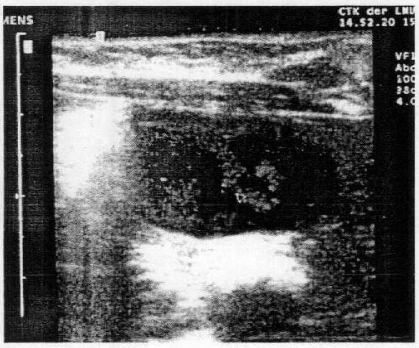


Fig. (17): Transverse sonogram showing echogenic mass within the bladder, the mass not arising from or attach to the bladder wall

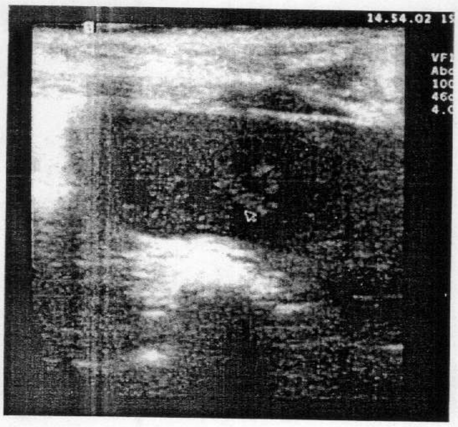


Fig. (18): Transverse sonogram showing echogenic mass changes position and shape with changes patient position and always remain in the dependant portion of urinary bladder

Cystitis

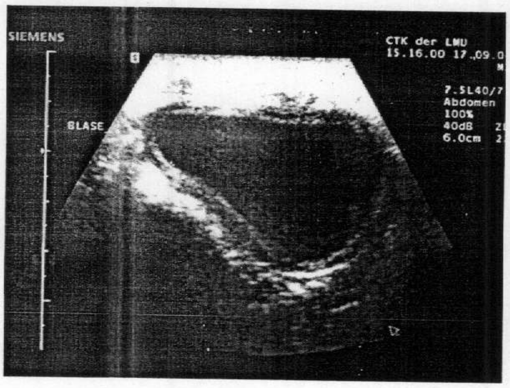


Fig. (19): Transverse sonogram of bladder showing echogenic bladder wall thickening and irregular bladder shape

Fig. (20): Transverse sonogram showing thickening of bladder wall and echogenic material in the dependant portion of the bladder

{FFL} Anechoic fluid attached with bladder wall from outside it consider to be blood due to sever cystitis

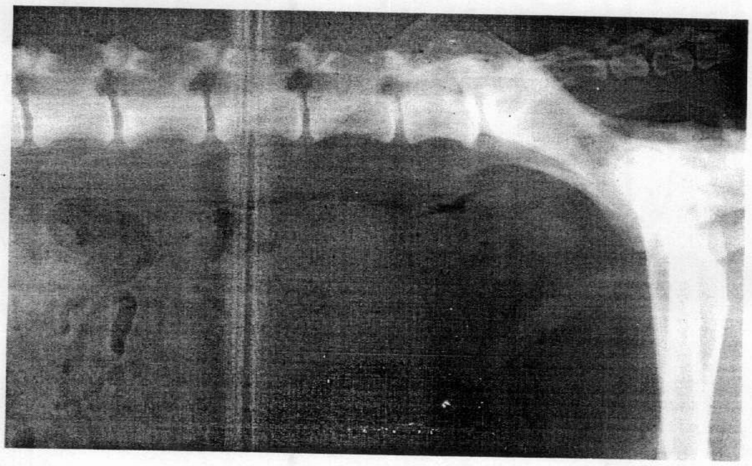


Fig. (21): Lateral abdominal radiograph showing several radiopaque calculi

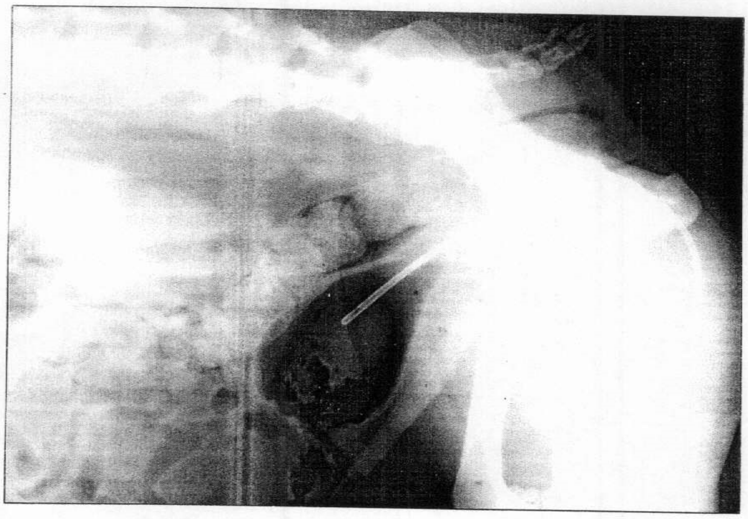


Fig. (22): Lateral abdominal radiograph of double contrast cystogram showing thick irregular bladder wall with masses protruded into lumen

PROSTAT GLAND

There were 23 cases of dogs had a prostate gland disease were presented for Ultrasonographic and radiographic examinations. Types of surgical affections, age, breeds of animals, radiographic finding, and Ultrasonographic finding were lustrated in table (3).

Breeds of dogs described here were Cocker spaniel, Poodle, German shepherd, Rottweiler, mixed breed, Dachshund, and Labrador retriever. The age was ranged from 9 to 13 years.

The most common presenting complaints were depression, stranguria, tenesmus, bloody penile discharge, hematuria, vomiting, fever, anorexia, and urinary incontinence. Abdominal and rectal palpation was performed for examination of prostatic enlargement.

Ultrasonographic findings; Intraparenchymal anechoic to hypoechoic cavity was seen in patient with **prostatic abscesses**. The parenchymal cavity was observed uniformly, irregularly margined oval in shape with tapered end in longitudinal view (Fig., 23, 24, & 25) but in transverse view it appeared semi-circular anechoic to hypoechoic lesion (Fig., 26, & 27). In case of **intraprostatic cyst,** the prostate was symmetrically enlarged and contain small anechoic focal lesion within prostatic parenchyma (Fig., 28). In patient with **prostatic hyperplasia** prostate was uniformly textured enlarged with multiple small hypoechoic and hyperechoic regions (Fig., 29 & 30).

Paraprostatic cysts appeared hypoechoic or anechoic structure not confined to the volume of prostatic parenchyma. Paraprostatic cysts had smooth internal irregular margins with anechoic luminal contents, without septa in one case, (Fig., 13 & 32). The cyst may be tubular in shape, enlarged in size and extended cranially to the margin of the spleen (Fig., 33). In other cases cysts contents were anechoic with hyperechoic septa extended from the cyst wall into the lumen (Fig., 34). The wall of the cyst was thin and irregular (Fig., 35 & 36). The prostatic parenchyma mainly homogeneous with several moderate sized irregular anechoic parenchymal cavities that communicated with the cyst (Fig., 37 & 38). The cyst was located in the ventrolateral aspect of bladder (Fig., 39) or attached caudally and ventrally to the bladder (Fig., 40).

Radiographic findings; Abdominal radiography In case of **prostatic hyperplasia,** positive contrast urethrocystography revealed an irregular intraprostatic urethra with leakage of contrast material at the level of prostate gland that appears extended cranial to the pelvic brim due to prostatic enlargement (Fig., 41). In case of **prostatic abscess,** abdominal radiography was revealed moderately enlarged prostate cranially to the pelvis (Fig., 42).

Table 3 - showing different surgical affection of the prostate

	Surgical Affection	No.	Urography	Ultrasonography Pictures	Breed
1	**Prostatic abscess & Prostatitis**	5	Moderately enlarged prostate	Anechoic to hypoechoic cavity with irregular margin	German shepherd (2) Poodle (3)
2	**Prostatic cysts**	4	Prostatomegaly	Focal anechoic or hypoechoic area	German shepherd (2) Mix-breed (2)
3	**Prostatic hyperplasia**	4	Enlarged prostate	Uniformly enlarged prostate with multiple small hypoechoic to hyperechoic regions	German shepherd (2) Labrador retriever (2)
4	**Paraprostatic cyst**	10	Abdominal fluid –filled mass in the Caudal abdomen	Large anechoic area with thin irregular wall	Rottweiler (3) German shepherd (2) Mix-breed (2) Dachshund (2) Cocker spinal (1)
	Total	23			

Prostatic abscess

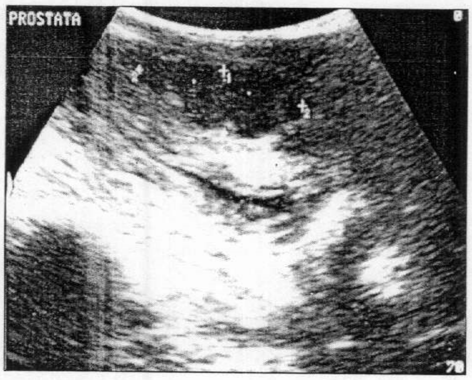


Fig. (23): Longitudinal sonogram of prostate showing hypoechoic to anechoic irregular shaped lesion within the prostatic parenchyma

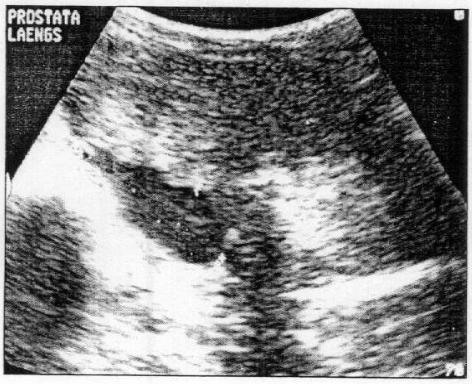


Fig. (24): Longitudinal sonogram of prostate showing hypoechoic to anechoic irregular shaped lesion within the prostatic parenchyma

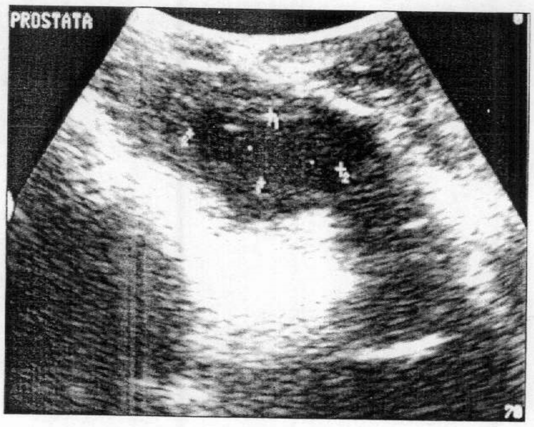


Fig. (25): longitudinal sonogram of prostate showing hypoechoic lesion within prostatic parenchyma

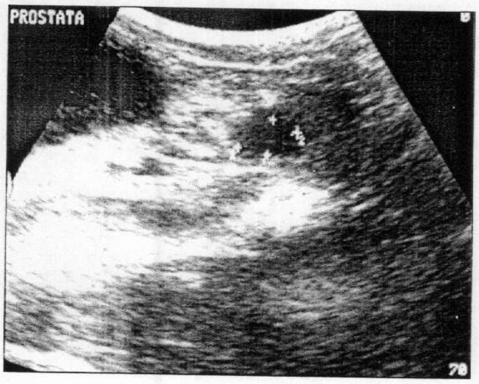


Fig. (26): Transverse sonogram of prostate showing hypoechoic lesion within prostatic parenchyma

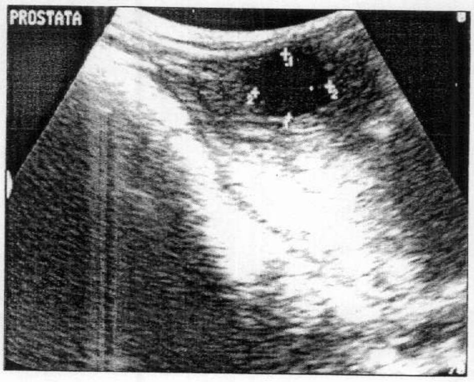


Fig. (27): Transverse sonogram of prostate showing uniformly irregularly margined anechoic lesion

Prostatic cyst

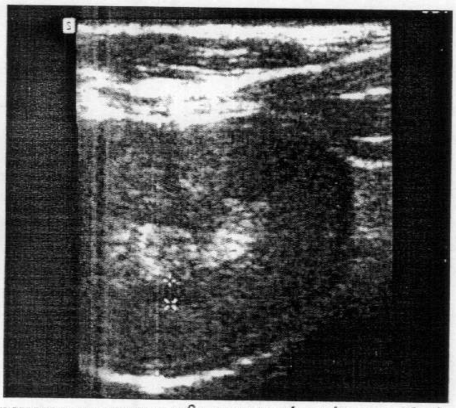


Fig. (28): Transverse sonogram of prostate showing anechoic lesion within enlarged prostatic parenchyma

Prostatic hyperplasia

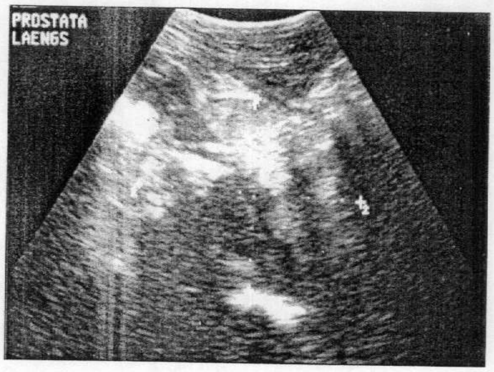


Fig. (29): Longitudinal sonogram of prostate showing uniformly enlarged gland

Fig. (30): Transverse sonogram of prostate sowing uniformly enlarged gland

Paraprostatic cyst

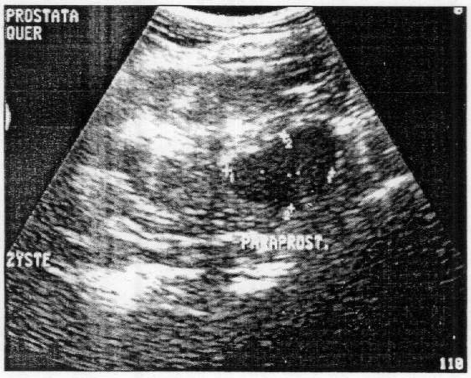


Fig. (31): Transverse sonogram of prostate showing anechoic lesion with regular margin

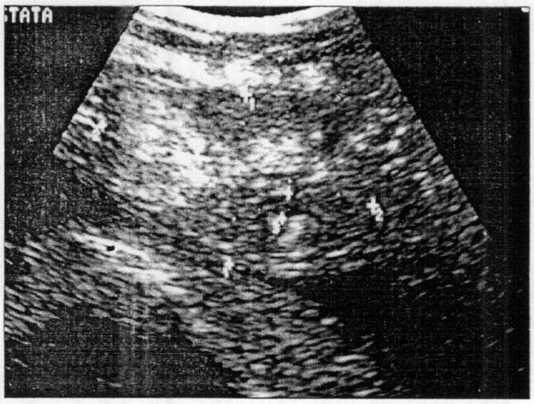


Fig. (32): Transverse sonogram of prostate showing hypoechoic small area within enlarged prostate

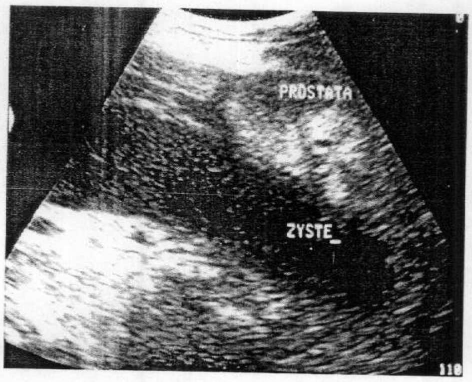


Fig. (33): Longitudinal sonogram of prostate showing anechoic structure was originated from prostate and extended cranially

Fig. (34): Transverse sonogram of paraprostatic cyst showing anechoic structure with hyperechoic septa

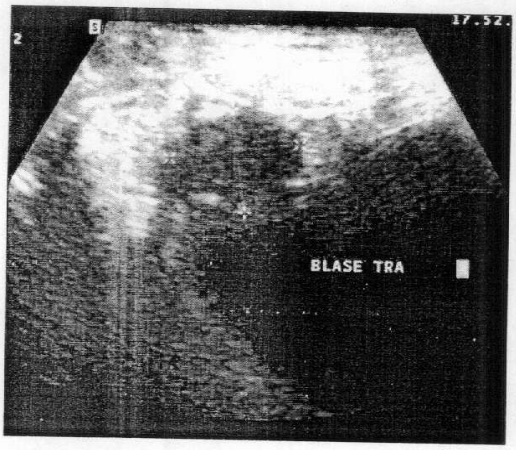


Fig. (35): Transverse sonogram of paraprostatic cyst the wall was thick and irregular

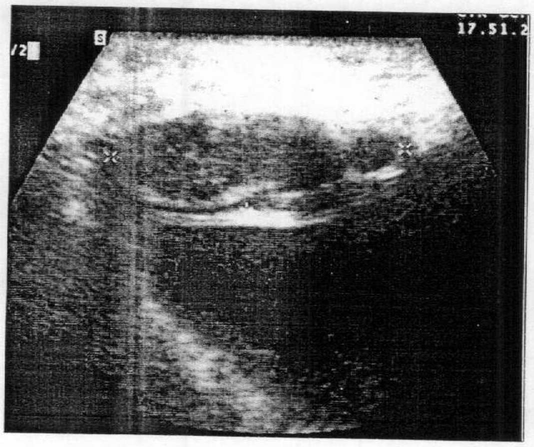


Fig. (36): Sagittal sonogram of paraprostatic cyst showing hypoechoic structure with irregular thick wall

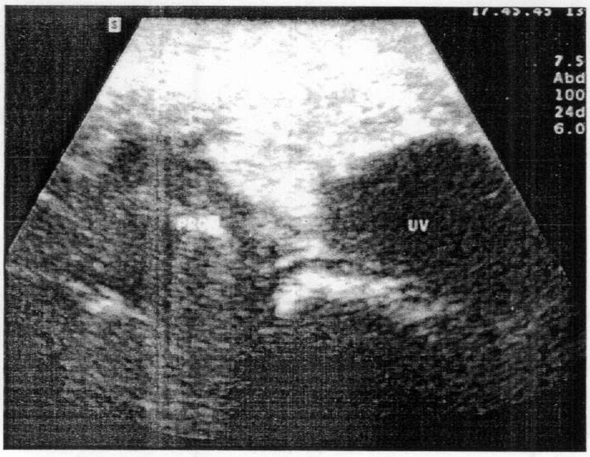


Fig. (37): Transverse sonogram of paraprostatic cyst with irregular thick wall showing communication with the prostate

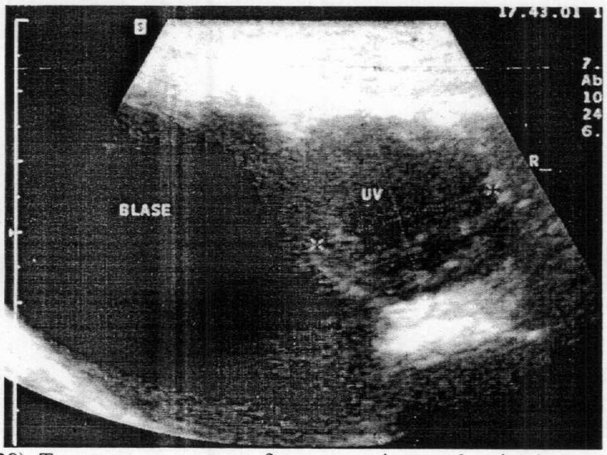


Fig. (38): Transverse sonogram of paraprostatic cyst showing hypoechoic to anechoic mass with internal septation

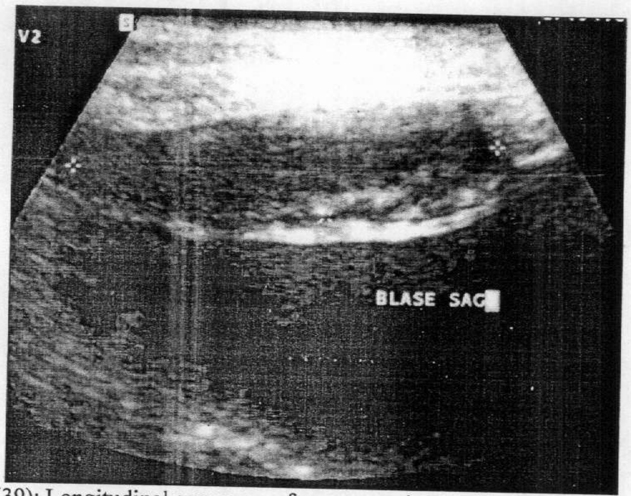


Fig. (39): Longitudinal sonogram of paraprostatic cyst located caudoventral of the bladder and labeled to the bladder

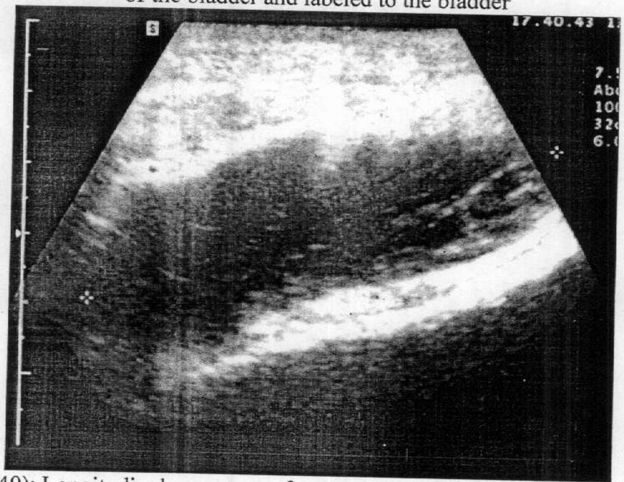


Fig. (40): Longitudinal sonogram of paraprostatic cyst showing anechoic to hypoechoic mass with irregular margin thin wall

Fig. (41): Lateral abdominal cystogram showing leakage of contrast material to the prostate indicative prostatic hyperplasia

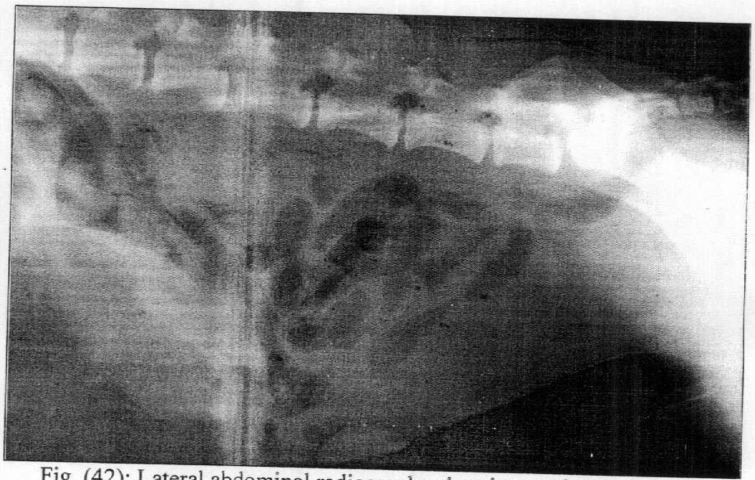


Fig. (42): Lateral abdominal radiography showing moderate enlarged prostate

FEMALE GENITAL SYSTEM

Uterus:-

Uterine and vaginal disorders were presented in 21 bitches. Ultrasonographic, radiographic findings, and breeds of animals were illustrated physical in table (4).

The dog breeds subjected to these affections were Chihuahua, Mixed breed, German shepherd, Cocker spaniel, Boxer, Dachshund, and Rottweiler. The age was ranged from 4 to 18 years.

The most common clinical findings were abdominal distention, depression, fever, anorexia, vaginal discharge, abdominal mass, dehydration, and lethargy.

Ultrasonographic findings; in cases of **pyometra** the uterus appeared as a well-defined tubular structure with hypoechoic to anechoic lumen (Fig., 43). The uterus was enlarge and filled with hypoechoic fluid, hyperechoic materials of tissue depress and remnant placenta (Fig., 44). The diameter of uterine horn was variable; ranging from 2cm to 6cm, in some cases the uterus appeared as 5-6 cm thick tubular structure with thin echogenic wall filled with echogenic fluid see (Fig., 45 & 46). In other cases the uterus appeared as 2.3 cm anechoic to hypoechoic mass contain echogenic materials with thick echogenic wall see (Fig., 47).

In case of **endometeritis** the uterus was enlarged in diameter with mixed echogenic content (tissue depress and remnant placenta). The uterine wall was thickened and irregular in shape indicative post partum endometeritis (Fig., 48).

Ultrasonography of the **vaginal tumor** revealed heterogenic mass located dorsal and caudal to the urinary bladder and attached to the vagina from outside. The tumor was large semicircular in shape attached to the ventrolateral aspect of the vagina and caudolateral aspect of the bladder pushing the colon dorsally and laterally (Fig., 49, 50, & 51).

Radiographic finding; The uterus was identified via ventrodorsal and lateral views, and appeared as soft tissue segmented tubular distension in caudal abdomen (mid ventral portion) (Fig., 52 & 53).

Lateral abdominal radiograph was performed in case of vaginal tumor and revealed abdominal distention in the right side of the abdomen and the tumor pushing the colon cranially and dorsally (Fig., 54).

Table 4- showing different surgical afflictions in female genital system

No.	Surgical affection	No.	Radiographic Finding	Ultrasonographic Finding	Breed
1	Pyometra	10	Soft tissue density segmented tubular distention	Well defined tubular structure with hypoechoic to anechoic lumen	Chihuahua (2) German shepherd (4) Cocker spaniel(2) Labrador retriever (2)
2	Endomet-ritis	9	Abdominal distention	Uterine enlarged with mixed echogenic contents	German Shepherd (1) Boxer (2) Rottweiler (4)
3	Vaginal tumor	2	Abdominal distention in the right side of abdomen	Heterogenic mass located dorsal and caudal to urinary bladder	Mixed breed (1) Dachshund (1)
	Total	21			

Pyometra

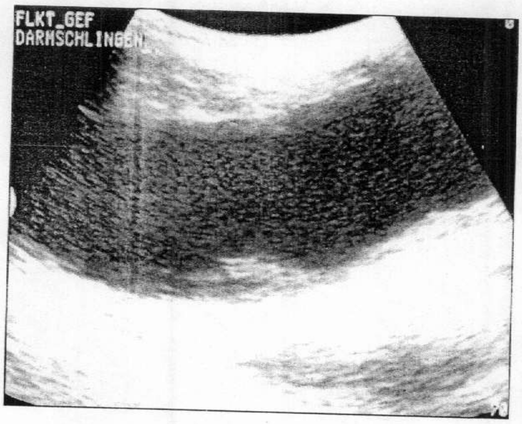


Fig. (43): Longitudinal sonogram of the caudal abdomen of 11 years Cocker spaniel showing enlarged uterus has hyperechoic thick wall and echogenic luminal contents within hypoechoic fluid

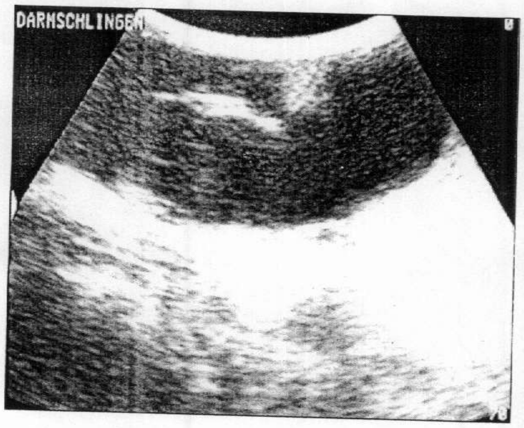


Fig. (44): Longitudinal sonogram of the caudal abdomen of 10 years Chihuahua showing enlarged uterus has hyperechoic thick wall, echogenic luminal contents and hyperechoic placentation sites

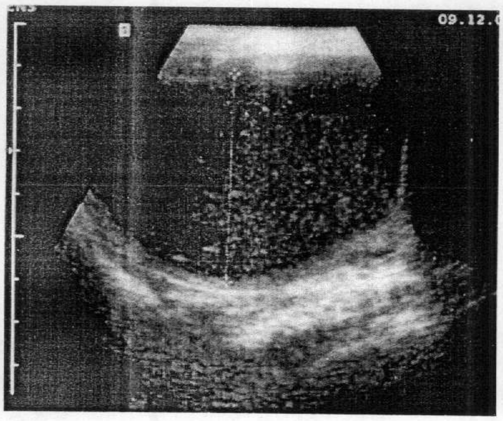


Fig. (45): Transverse sonogram of uterus of 9 years German shepherd showing very large uterine horn (4.9 cm in diameter) contain echogenic materials within hypoechoic fluid

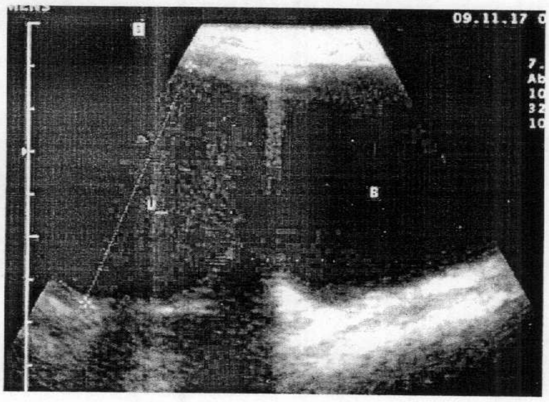


Fig. (46): Transverse sonogram of uterus of 8 years German shepherd showing very large hypoechoic round structure (6.1 cm in diameter) and thin echogenic wall located lateral to the urinary bladder

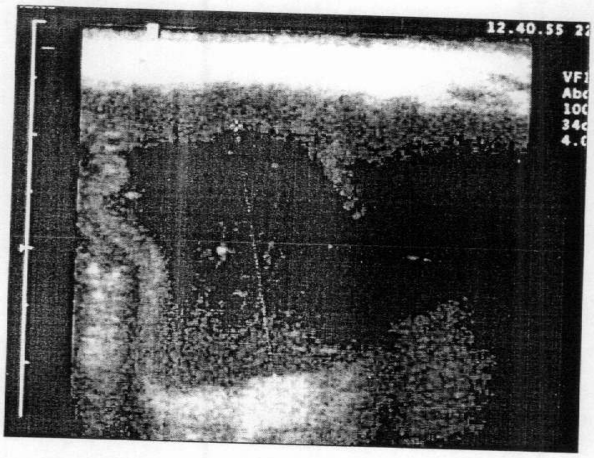


Fig. (47): Transverse sonogram of uterus of 12 years Chihuahua showing thick echogenic wall and anechoic lumen contain echogenic materials

Endometeritis

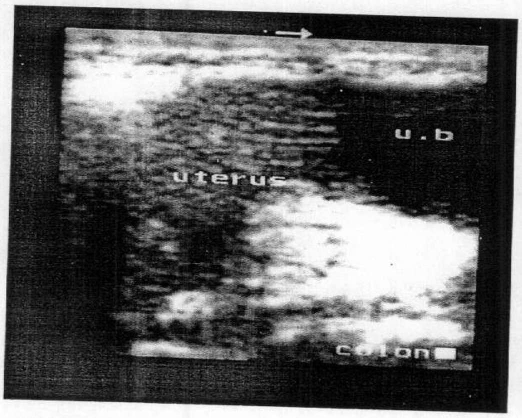


Fig. (48): Longitudinal sonogram of caudal abdomen showing hyperechoic materials within the uterine lumen indicative endometeritis

Vaginal tumor

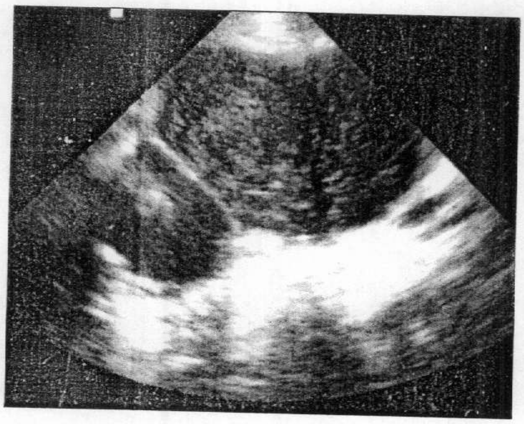


Fig. (49): Transverse sonogram of caudal abdomen showing heteroechoic mass attached to the ventral aspect of the vagina

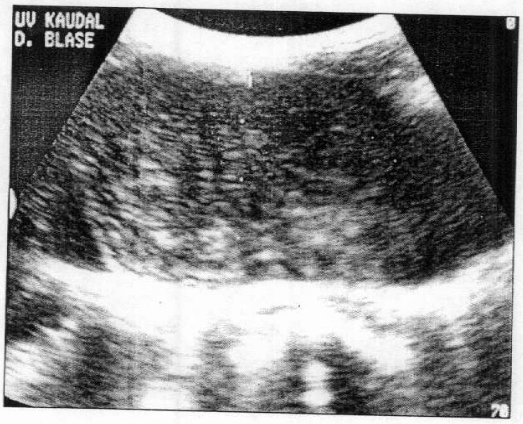


Fig. (50): Transverse sonogram of a large mass showing hyperechoic and hypoechoic areas within the mass

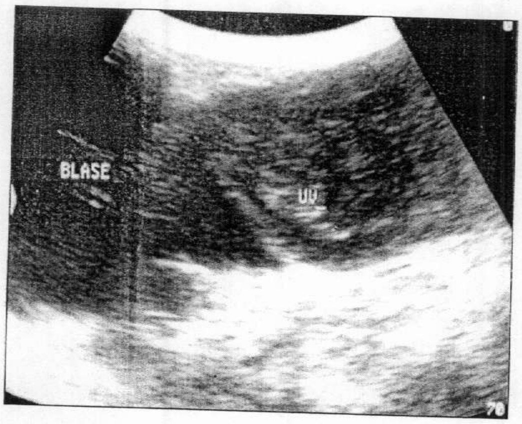


Fig. (51): Transverse sonogram of caudal abdomen showing heteroechoic mass caudodorsal to the bladder

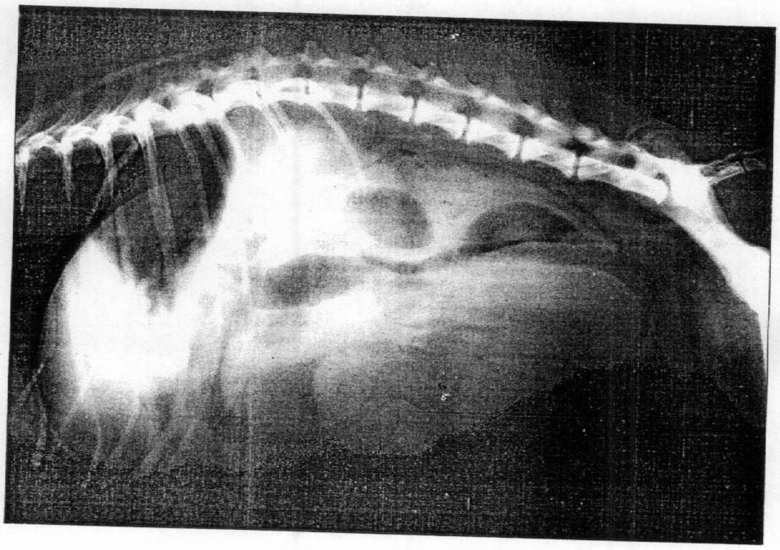


Fig. (52): Lateral abdominal radiograph showing soft tissue segmented tubular distention in caudal abdomen

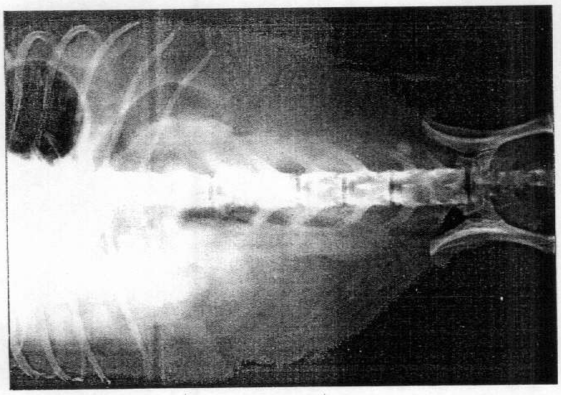


Fig. (53): Ventrodorsal radiograph showing caudal abdominal distention especially in the left side

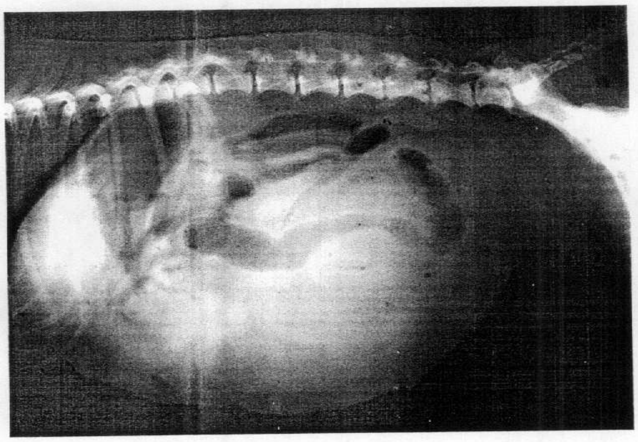


Fig. (54): Lateral abdominal radiograph showing enlarged slightly opaque structure pushing large intestine dorsally and cranially

DISCUSSION

In our study, ultrasonography could determine the lesion in urogenital system in dogs. It found that anechoic oval or rounded lesion within renal parenchyma indicated parenchymal kidney cyst in old aged male dogs specially German shepherd. These results are in agreement with that discussed by Konde et al., (1986) who found that a cyst appeared smooth, sharply demarcated deeply situated near and far the wall. The authors added that the abdominal radiography, contrast radiography and ultrasonography were complementary diagnostic modalities in the evaluation of renal mass and renal enlargement. They decided that radiography may not differentiate between cystic and solid masses.

Cystadenocarcinoma was recorded in old aged (mixed breed) dogs. Ultrasonography indicated large rounded mass complex echo pattern extended caudally from cortical kidney. This diagnosis was complementary diagnosed by plain radiography at the abdominal region. Burk and Ackerman (1996) was coincided our findings. Renal masses that displace the kidney could be identified using ultrasound but the kidneys may be displaced from their normal position by the pressure that the operator exerts on the ultrasound transducers. On the opposite side, Biller et al., (1991) mentioned that not all tumors of the kidney are hyperechoic and all hyperechoic lesions of the kidney are tumor. Hyper vesicular renal tumor commonly display increase echogenicity. While Burk and Ackerman (1996) concluded that ultrasound has limited use in discriminating benign lesions such as hemorrhages, abscesses, and malignant lesions such as adinocarcinoma. They also added that renal tumors, hemorrhages or infarct might produce hyperechoic, hypoechoic or heteroechoic focal abnormalities depending on their duration.

In our study, pyelonephritis was observed by ultrasonography as hyperechoic kidney with poor corticomedullary distinction indicating inflammatory kidney diseases in old aged dogs. These findings were met with Barr et al., (1990) who mentioned that renal diseases in dogs may be associated with change in renal size, such as acute pyelonephritis that may lead to kidney enlargement while in cases of chronic interstitial nephritis often results in decrease kidney size.

Hydronephrosis was seen as anechoic area gradually enlarged in renal pelvis which loss its Y shape and become wide, oval and large. While, Konde et al., (1986) mentioned that hydronephrosis is rapidly diagnosed sonographically as a large anechoic fluid filled structure with variable amount of renal cortex visible about the periphery of kidney depending on the degree of hydronephrosis. In the same time, Barr et al., (1990) observed hydronephrosis in dogs that was indicated by enlargement of the size of kidney ultrasonographically. On the other hand Grooters and Biller (1995), and Burk and Ackerman (1996) stated that ultrasound could detect mild degree of hydronephrosis with minimal renal pelvis or proximal urethral dilatation. They also decided that the transverse view was more useful than the longitudinal view. The ureter forms an anechoic Y, which is centered on the renal crest and can be distinguished from the renal vein. As the ureter and renal pelvis dilate, they will appear progressively larger and will gradually replace the renal medulla and finally the entire renal cortex. The dilated renal pelvis loss its Y shape and become wider, taking the shape of renal pelvis recesses and eventually becoming a large oval.

In our study, cystic calculi were recorded in male old dogs from different breeds' specially Dalmatian, German shepherd, and bulldog. It characterized by multiple hyperechoic material visible in urinary bladder. They have highly echogenic appearance and cause an acoustic shadow. They were fall to the most dependant portion of urinary bladder, and moved with agitation of urinary bladder or patient movement. In addition, the wall of the urinary bladder was slightly thickened and irregular. Biller et al (1990) obtained the same results. In the same time, Leveille et al (1992) found that bladder calculi have a characteristic sonographic appearance consisting of a bright echogenic structure in the urinary bladder with acoustic shadowing. Calculi also often change position as the animal position is changed, regardless of whether the stone is calcified.

Our results are in agreement with those mentioned by Burk and Ackerman (1996) who recommended that the bladder calculi are hyperechoic and often shadow. Calculi settle to the dependent portion of the bladder and move with agitation of the bladder or changes in patient position. Bladder wall mineralization can be identified as a hyperechoic area within the bladder, which also shadows. The lesion will be fixed in location when the patient was moved or bladder was agitated.

On the other hand, Lulich and Polzin (2001) reported that approximately 25% of dogs and cats with lower urinary tract diseases have urolithiasis; 90% of uroliths formed were composed of mineral salts that are easily detected by survey radiography. They also recommended that most uroliths greater than 3 mm have varying degrees of radiodensity and therefore it could be detected by survey abdominal radiography or ultrasonography. Uroliths less than 3 mm in size may not be visualized by these techniques. Compared with soft tissue density, uroliths composed of magnesium ammonium phosphate, calcium oxalate, calcium phosphate, silica and cystine are often radiodense; those composed of urate salts may be radiolucent difficult detected by radiography easily observed by sonography.

Survey abdominal radiography was helpful to show multiple poorly calcified calculi, large in shape, filling the urinary bladder. These results were met with Osborne et al., (1995) which observed that radiographic and ultrasonographic evaluation is useful in identifying and localizing uroliths within the urinary tract and may be of some benefit in helping to differentiate between urolith types. Uroliths containing calcium are much more radiodense than cystine or ammonium urate uroliths of comparable size. All forms of calcium phosphate uroliths tend to be multiple, and vary in size, with smaller sizes being more common. At the same time, Lulich (2000) recommended that most uroliths greater than 3 mm have varying degrees of radio-density and therefore it could be detected by survey abdominal radiography or ultrasonography.

Concerning neck-bladder tumor show, hypoechoic mass (8mm) with irregular margin attached to the bladder neck from outside was found in caudal and dorsal aspect of the bladder. While Biller et al., (1990) recommended that accuracy of diagnosis of urinary bladder tumors by ultrasound depend up on size and location of the mass. Bladder tumors less than 5 mm in diameter, regardless of location, as well as those located in the bladder neck are difficult to detect.

In the opposite side, transitional cell carcinomas were echogenic structures protruding into the bladder lumen and arising from inner surface of urinary bladder. Infiltrating wall lesions produced thickening of the bladder wall with loss of concave inner border of the urinary bladder. These structures were appeared tubular in shape and remained fixed in position despite movement of the patient. Similar results were obtained by Burk and Ackerman (1996) and O'Brien and Wood (1998). They mentioned that transitional cell carcinoma was the most common neoplasia of the urinary bladder. It may result in focal wall thickening with an irregular, sessile mass extending into the urinary bladder lumen, or one of three sonographic patterns: 1) focal exophytic masses, 2) regional irregular shaped masses, and 3) poorly marginated smooth infiltrative lesions causing loss of normal concave inner border. In the same time, Leveille et al., (1992) reported that tumors of urinary bladder comprise about 1% of all canine tumors. Transitional cell carcinoma was the most common malignant tumor of the urinary bladder in the dog. Squamous cell carcinoma, adenocarcenoma, and undifferentiated carcinoma also had been reported but occur less frequently.

Double contrast cystogram and positive contrast cystogram were helpful to confirm diagnosis of the tumor lesion, its location, and its extension. Double contrast cystography was made in case of transitional cell carcinoma. The bladder wall was thickened and revealed multiple large irregular masses within the bladder that have irregular surfaces with thick-ended bladder wall. In case of neck bladder tumor, positive contrast cystogram showed a mass-like tumor pushing the bladder from outside. This tumor located in the dorsolateral aspect of the bladder, this mass was not metastases, not attached with lymph node and not protruding into the bladder lumen. These results come in agreement with decided by Leveille et al., (1992) who recommended that ultrasound might fail to demonstrate the extent of the lesion within the urethra. Both intravenous urography and double-contrast cystography may be necessary to properly evaluate the extent of the disease but there were some disadvantages include patient and operator exposure to ionizing radiation, possible adverse reaction to contrast media, poor renal function, air embolism, risk of infection, and the increased time and expense of doing two diagnostic studies. The accuracy of ultrasound in detecting space-occupying lesion appears high and should be considered as a valuable, non-invasive, first line diagnostic imaging modality for evaluation of possible lower urinary tract malignancy. While, Burk and Ackerman (1996) stated that a double contrast cystogram our generally recommended contrast procedure for evaluating the bladder.

Regarding mural hemorrhage, in this work it was seen in old aged male dogs. It appeared as an echogenic luminal lesion in the dependent portion of the urinary bladder. This was thought to be a blood clot which moved with change in patient position. The bladder wall was mild irregular and thickened in the mildly distended urinary bladder. Similar finding were met with O'Brien and Wood (1998) who mentioned that blood clots were usually hyperechoic, non shadowing with irregularly shaped luminal lesion that were often located in the dependant portion of urinary bladder. While Burk and Ackerman (1996) found that blood clots settle to the dependent portion of the urinary bladder and move with changes in the patient's position. Blood clots were heteroechoic and may be confused with bladder tumor. Movement of patient and change position of heteroechoic mass help to determined that the lesion was a blood clot rather than neoplasm.

Cystitis was noticed in male and female subjects (8-18 years old). Ultrasonographically we revealed a diffuse bladder wall thickening with irregularity of the urinary bladder. Multiple echogenic strands or materials were present in the dependant portion of the urinary bladder that moved with patient movement. Our results are coincided with that mentioned by O'Brien and Wood (1998) who reported that the inflammatory lesion of the urinary bladder might cause wall thickening and chronic cystitis. When it was severe, the bladder wall becomes hyperechoic and irregularly thickened. In the opposite side, Burk and Ackerman (1996) stated that crystalline material, cells, air bubbles and fat globules can be observed floating within the usually anechoic urine. Agitation of the bladder will increase the movement of this structure. Air bubbles may produce reverberation artifacts (comet tail) that help to distinguish them from other floating objects. Blood clots settled to the dependent portion of the urinary bladder and it will move with changes in the patient's position.

In our studys, the most common prostatic disease was paraprostatic cyst. The age ranged from 9 to 13 years and the German shepherd was the most common breed affected with prostatic disease. On the opposite side, Krawiec and Heflin (1992) mentioned that the most common prostatic disease was bacterial prostatitis, followed by prostatic cyst, and prostatic adenocarcinoma. Prostatic abscesses and prostatitis in our study appeared as anechoic to hypoechoic cavities in prostatic parenchyma, there oval or semi-circular shape, uniformly and irregularly margined. These results are in agreement with that discussed by Kay (1994) and Burk and Ackerman (1996) where, they found that the prostatic abscesses produce multiple hypoechoic or anechoic lesions with irregular margins. While Feeney et al., (1987) stated that intraparenchymal anechoic foci or cavities and asymmetric glandular shape were observed in prostatic abscesses. While Kustritz and Klausner (2000) reported that abscesses are visible as hypoechoic to anechoic lesions with distant enhancement and cannot be differentiated from cyst or hematoma.

By using abdominal radiography prostate was seen moderately enlarged cranially to the pelvis at the same time Feneey et al., (1987) observed that prostatomegaly was detected in 50% or more of the patients affected with prostatic disease. Radiographic evidence of multifocal, irregularly shaped, and mineral density in the prostate gland was observed in case of prostatic carcinoma and bacterial prostatitis. They also recommended that if any prostatic dimension is larger than 90% of the pubic-promontory dimension, considered neoplasia, abscess, or paraprostatic cysts most likely. In the same way, Kustritz and Klausner (2000) observed that prostatitis, prostatic abscess appears radiographically as prostatomegaly, and prostatic mineralization may be evident.

Intraprostatic cyst was seen as small anechoic focal lesion within prostatic parenchyma and the prostate was symmetrically enlarged. This was met with Burk and Ackerman (1996) and Kustritz and klausner (2000). They mentioned that the cyst produce hypoechoic or anechoic lesions. While Ramirez and Homco (1995) stated that the most common focal lesions identified on ultrasonographic examination of the prostate gland are intraprostatic cyst.

Concerning prostatic hyperplasia, ultrasonographic findings in our study showed uniformly texture enlarged prostate with multiple small hypoechoic and hyperechoic regions. However, Burk and Ackerman (1996) mentioned that prostatic hyperplasia usually produces a uniformly textured enlarged prostate. The echo intensity of the prostate is normal.

Small hyperechoic or anechoic cysts may be identified. While Kustritz and Klausner (2000) mentioned that, the ultrasonographic lesion of benign prostatic hypertrophy appears as normal to slightly hyperechoic with or without multiple hypoechoic areas.

By using positive contrast urethrocystography, an irregular intraprostatic urethra with leakage of contrast material at the level of prostate gland was evident. Prostate appeared extended cranial to the pelvic brim due to prostatic enlargement. This come in agreement with Feeney et al., (1987), Kay (1994), Klausner et al., (1995), and Burk and Ackerman (1996) which they observed that extension of the prostate cranial to the pelvic brim usually indicates enlargement and the most common cause of prostatic enlargement is benign prostatic hyperplasia.

Paraprostatic cysts among the study under observation were of higher incidence. Out of 23 dogs affected with prostatic disorders, 10 proved to be suffering from paraprostatic cysts, representing 43.9 % of prostatic diseases. On the other hand Stowater and lamb (1989) recommended that the canine prostatic cysts are relatively uncommon compared with other prostatic diseases. Incidence rates of paraprostatic cysts vary from 2.6% to 5.3% of dogs presented with clinical prostatic disease. The incidence of paraprostatic cysts in the general canine population is unknown.

In our study, paraprostatic cyst was hypoechoic to anechoic focal lesion and not confined with the volume of prostatic parenchyma. Paraprostatic cyst had smooth internal irregular margin with anechoic luminal content without septa in one case. However, in other cases, contain hyperechoic septa extended from cyst wall to the lumen; the wall of the cyst was thin and irregular. Prostatic parenchyma was mainly homogenous with several anechoic cavities communicated with the cyst. The paraprostatic cyst may be tubular in shape and extended cranially to the margin of spleen. The cyst located in the ventrolateral aspect of the bladder or attached caudal and ventral to the bladder. Feeney et al., (1987) coincided our findings that paraprostatic cyst were hypoechoic or anechoic and not confined to the volume of prostatic parenchyma.

In addition, Stowater and Lamb (1989) recommended that, the paraprostatic cysts have been described as large ovoid structures with hypoechoic or anechoic contents with smooth internal margins. Most cysts were located cranial and or dorsal to the prostate gland or bladder trigone. There are some variety of ultrasonographic appearances of the cyst and prostatic parenchyma, as the following; 1- some cysts had anechoic spaces within the prostatic parenchyma that appeared to communicate directly with the prostatic cyst. 2- some cysts had hyperechoic septa extended from the cyst wall into the lumen and small anechoic spaces. 3- cyst walls having a smooth inner margin in some dogs and an irregular margin in other dogs. The variations due to secondary infection of prostatic secretion or other cysts contain bloody fluid and had pathologic evidence of a hemorrhagic origin.

In the same time, Burk and Ackerman (1996) mentioned that paraprostatic cysts are anechoic or hypoechoic structures that may be tubular or septated. Mineralization within the wall of the cyst may produce hyperechoic areas, which shadow. Communication of the paraprostatic cyst with the prostate may be identified.

On other hand, Welsh et al., (2000) reported that the paraprostatic cysts are commonly located intra-abdominally but may be extended through the pelvic canal to the perineum. Abdominal ultrasonography confirmed symmetrical prostatomegaly and multiple small fluid-filled cavities within the prostatic parenchyma. Perineal Ultrasonograhpy revealed a well encapsulated, multiloculated, fluid-filled structure separated from the rectum. They concluded that paraprostatic cysts should be included in the list of differential diagnoses of perineal swelling.

Pyometra in bitches, it was recorded in different breeds aging 6-12 years old. Ultrasonographically the uterus appeared as a well-defined tubular structure with hypoechoic to anechoic lumen. The uterus was enlarged and filled with hypoechoic fluid, and hyperechoic materials of tissue depress and remnant placenta. The diameter of uterine horn was variable; ranging from 2cm to 6cm, in some cases the uterus appeared as 5-6 cm thick tubular structure with thin echogenic wall, in other cases the uterus appeared as 2-3 cm anechoic to hypoechoic structure containing echogenic materials with thick echogenic wall. These results are in agreement with that discussed by Poffenbarger and Feeney (1986) who found that the uterus in case of pyometra is a 5 cm diameter anechoic tubular mass and appears to fold back on itself. Voges and Neuwrith (1996), and Fossum et al., (1997) mentioned that the sonographic appearance of pyometra is usually a convoluted tubular structure with anechoic to hypoechoic luminal contents.

While Fayrer-Hosken et al., (1991) reported that in case of pyometra the uterus was enlarged and filled with hypoechoic fluid, circular echogenic masses were identified. These masses thought to be the sites of resorbing placental tissue. On the other side Burk and Ackerman (1996) recommended that, the pyometra could be recognized when the uterus enlarged, thin walled, and filled with echogenic fluid. When the uterus slightly enlarged with a thick wall, a specific diagnosis is not possible and endometeritis, endometrial hyperplasia, hydrometra, pyometra, or hematometra may be detected.

Radiographically, pyometra was seen as soft tissue segmented tubular distension in caudal abdomen (mid ventral portion). This was met with Grooter (1994) who observed that pyometra result in a fluid-dense tubular structure in the caudal abdomen that often displaces bowel loops cranially and dorsally. However, this is also the appearance of a gravid uterus before fetal skeletal calcification. On the same way Burk and Ackerman (1996), Fossum et al., (1997), and Feldman (2000), they recommended that the uterus folds upon itself and appears oval or sausage shaped. The presence of gas within the intestine is an important feature that helps to distinguish between an enlarged uterus and distended small intestines. They also observed that enlargement of the uterus might be due to several causes as pregnancy, infection, postpartum hemorrhages or neoplasia. The differentiation of these conditions may be difficult based on radiographic signs.

Postpartum endometeritis was diagnosed ultrasonographically as enlarged uterine diameter and the wall was thickened and irregular in shape with mixed echogenic contents. These results are coincided with that reported by Poffenbarger and Feeney (1986) and Grooter (1994). They were recommended that ultrasonography was performed in case of endometeritis to confirm uterine enlargement and to check for the presence of retained fetuses or identified retained placenta. The uterus appeared as a 2 to 3 cm diameter anechoic to hypoechoic tubular structure with far enhancement. While Yeager and Concannon (1995) recorded that ultrasonographic diagnosis of meteritis and endometrial hyperplasia is not very accurate because the changes caused by these conditions are often subtle and inconsistent. During diestrus, some bitches with presumptive endometrial hyperplasia may accumulate small amounts of anechoic or hypoechoic fluid in the lumen of the uterus. They also observed that immediately postpartum, the endometrium appears as a thick hyperechoic inner layer and the placental sites appear as focal hypoechoic enlargements in the endometrial layer. By the same way, Burk and Ackerman (1996) also recommended that when the uterus slightly enlarged with a thick wall, a specific diagnosis is not possible and endometeritis, endometrial hyperplasia, hydrometra, pyometra, or hematometra may be present.

Vaginal tumor was noticed ultrasonography in a mixed breed bitch (18 years old). There was heterogenic mass located dorsal and caudal to the urinary bladder and attached to the vagina from outside. These results are agreement with that discussed by Burk and Ackerman (1996) who reported that the location of the mass rather than its echo intensity was usually diagnostic. The vaginal tumors are usually uniform in architecture and ranged from hypoechoic to hyperechoic.

SUMMARY

The present study was carried out on 91 animals from different breeds of dogs and different ages submitted to the small animal section of the department of Veterinary Surgery, Ludwig-Maximilians University in Munich, Germany, and the Department of surgery at Faculty of Veterinary Medicine, Alexandria University, Egypt.

The breed, gender, age, of each animal was recorded. Clinical symptoms, case history and general examination were recorded for each case.

The most prevalent surgical affections diagnosed by using ultrasound in abdomen and pelvis were found in **kidney, urinary bladder, prostate gland, and uterus.**

In Kidney; (kidney cyst 6 cases, cystadenocarcinoma 2 cases, pyelonephritis 10 cases, and hydronephrosis 6 cases). **In urinary bladder**; (cystic calculi 5 cases, transitional cell carcinoma 3 cases, neck bladder tumor 1 case, cystitis 11 cases, and mural hemorrhages 3 cases). **In prostate gland**; (prostatic abscess 5 cases, prostatic hyperplasia 4 cases, prostatic cyst 4 cases, and paraprostatic cyst 10 cases). **In uterus;** (pyometra 10 cases, endometeritis 9 cases, and vaginal tumor 2 cases).

The size, shape, location, echo intensity, homogenecity of the ultrasound images are evaluated by using a sonoline prema siemens. Radiographic examination was performed in most cases.

KIDNEY

Kidneys were scanned in a longitudinal and transverse plane, from medial to lateral or from cranial to caudal aspect.

Parenchymal kidney cyst appeared as anechoic lesion had smooth borders with thin inner wall, oval or rounded in shape and located within

the renal parenchyma, not communicate with renal pelvis. Lateral asymmetrical renal enlargement with irregular borders was observed following radiographic examinations.

Cystadenocarcinoma appeared as an anechoic to hypoechoic large mass, rounded with smooth demarcation, protruded from renal cortex and extending caudally. It found in both right and left kidney.

Radiographically a large smooth-bordered mass of undetermined origin was visible attached to the kidney.

In case of **hydronephrosis**, anechoic large area in renal pelvis which loss its Y shape and become wide, oval, and large was observed.

In case of **pyelonephritis,** the kidney was enlarged with irregular borders. Renal cortex was echogenic with hypoechoic focal lesions within the medulla.

URINARY BLADDER

Transverse and longitudinal images were obtained from caudal abdominal wall with complete or moderate distention of the urinary bladder.

Ultrasonography of the bladder revealed **cystic calculi,** which appeared as hyperechoic materials with highly echogenic appearance and caused an acoustic shadow within the urinary bladder. It was fall to the most dependant portion of urinary bladder and moved with patient movement.

Abdominal cystography revealed multiple poorly calcified calculi large in shape occluded or filling the urinary bladder.

In case of **neck bladder tumor**, a hypoechoic mass with irregular margin was found caudal and dorsal to the bladder and attached to the bladder neck from outside.

By using positive contrast cystogram, it appeared as a mass like tumor pushing the bladder from outside.

In case of **transitional cell carcinoma**, there were echogenic structures protruding into the bladder lumen arising from inner surface of urinary bladder. These structures were remained fixed in position despite movement of the patient

Double contrast cystography was made in this case; the bladder wall was thickened with multiple large irregular masses over the bladder, which had irregular surfaces.

In case of **mural hemorrhages,** an echogenic luminal lesion in the dependent portion of the urinary bladder this was thought to be a blood clot, which moved with change in patient position.

In case of **cystitis,** there was diffuse hyperechoic bladder wall thickening with irregularity of the urinary bladder shape.

PROSTATE GLANDS

Longitudinal and transverse planes of the prostate were obtained. Dogs placed in dorsal recumbency; the transducer placed against the ventral abdominal wall cranial to the pubis.

Ultrasonographic findings, revealed intra-parenchymal anechoic to hypoechoic cavities with irregular margin, and uniformly in shape were seen in patient with **prostatic abscesses**.

Abdominal radiography revealed the prostate gland was moderately enlarged cranially to the pelvis

In case of **intraprostatic cyst,** the prostate was symmetrically enlarged and contain small anechoic focal lesion within parenchyma.

In patient with **prostatic hyperplasia,** it was found that the prostate uniformly texture enlarged with multiple small hypoechoic and hyperechoic regions.

Positive contrast urethrocystography demonstrated an irregular intraprostatic urethra, and the prostate extended cranial to the pelvic brim

Paraprostatic cysts, appeared as a hypoechoic or anechoic structure not confined to the volume of prostatic parenchyma.

Paraprostatic cysts had smooth internal irregular margins with anechoic luminal contents.

Radiographically, paraprostatic cyst appeared as a large dark (radio-opaque) tubular soft tissue-dense structure in a caudal ventral abdomen.

UTERUS

Longitudinal and transverse images were obtained.

in case of **pyometra,** the uterus appeared as a well-defined tubular structure with hypoechoic to anechoic lumen. The diameter of uterine horn was variable; ranging from 2 to 6 cm.

Lateral abdominal radiography was taken; the uterus identified and appeared as soft tissue segmented tubular distension in caudal abdomen

In case of **endometeritis**, the uterus was enlarged in diameter with mixed echogenic content (tissue depress and remnant placenta). The uterine wall was thickened and irregular in shape.

In case of **vaginal tumor**, the tumor was large semicircular in shape, appeared as heterogenic mass located dorsal and caudal to the urinary bladder and attached to the vagina from outside

Lateral abdominal radiograph revealed that distention was found at the right side of the abdomen and the tumor pushing the colon cranially and dorsally.

Conclusion

The purpose of this study was to determine if ultrasonographic images could be used as a first method of diagnosis surgical affections in the abdomen and pelvic region.

Kidney ultrasonography complemented with radiography as a diagnostic modality in eliciting additional information on renal diseases. Ultrasonography can reliably resolve cystic lesions with a diameter of 1 cm or larger and solid lesions with a diameter of 2cm or larger.

The urinary bladder was an organ ideally suited for ultrasonographic examination. Ultrasonography provides a rapid safe noninvasive imaging technique to diagnose or verify cystic calculi, mass lesion, or inflammatory conditions and as a sonographic window for evaluation of sublumbar lymph nodes, uterine body, and other intrapelvic structure.

Ultrasound of the prostate gland was beneficial in suspected prostatic abscesses, prostatic hyperplasia, prostatic cyst, paraprostatic cysts.

Ultrasound could potentially distinguish between normal and abnormal post partum uterine state because the uterine wall and luminal contents could be images in detail.

REFERENCES

Ackerman, N (1981): Radiographic evaluation of the uterus: a review. Veterinary Radiology, Vol. 22, No. 6 (252-257).

Adams, W. M.; and Dibartola, S. P.; (1983): Radiographic and clinical features of pelvic bladder in the dog. J. A. V. M. A., Vol.182, No.11, (1212-1217).

Allen, W. E.; Noakes, D. E. and Renton. J. P. (1984): Canine Medicine and Therapeutics 2nd. Edition. Blackwell scientific publication. Oxford. London, pp 442.

Atalan, G.; Barr.F. J. and Holt. P. E. (1999): Comparison of ultrasonographic and radiographic measurements of canine prostate dimensions. Veterinary Radiology and Ultrasound. Vol. 40, No.4, (408-412).

Atalan, G.; Holt, P. E. and Barr. F. J. (1999): Ultrasonographic estimation of prostate size in normal dogs and relationship to body weight and age. Journal of small animal practice. Vol. 40, (119-122).

Barr, F. J.; Holt, P. E. and Gibbs, C. (1990): Ultrasonographic measurement of normal renal parameters. Journal of small animal practice. Vol. 31, (180-184).

Biller, D. S.; Bradley, G. A. and Partington, B.P. (1992): Renal medullary rim sign: ultrasongraphic evidence of renal disease. Veterinary Radiology and Ultrasound. Vol. 33, No. 5, (286-290).

Biller, D. S.; Schenkman, D. I.; and Bortnowski, H. (1991): ultrasonic appearance of renal infarcts in a dog. J. A. A. H. A. Vol. 27 (370-372)

Biller, D. S; and Haider, P. R. (1994): Small Animal Practice. W. B. Saunders Comp. Philadelphia. Pennsylvania pp 59-63.

Biller, D.S.; kantrowitz, B.; Partington, B. P. and Miyabyashi, T. (1990): Diagnostic ultrasound of urinary bladder. J. A. A. H. A. Vol. 26, (397-402)

Bjorling, D. E. (1994): Small Animal Practice. W. B. Saunders Comp. Philadelphia. Pennsylvania pp 821.

Boag, B. L.; Atilola, M. and Pennock. P. (1993): Renal sonographic measurements in the dog precending and following unilateral nephrectomy. Veterinary Radiology and Ultrasound. Vol. 34, No. 2, (112-117).

Booth, H. W. (1994): Small Animal Practice. W. B Saunders Company, Philadelphia, Pennsylvania.

Burk. R. L. and Ackerman. N. (1996): Small Animal Radiology and Ultrasonography. Second edition. W. B. Saunders Company. Philadelphia, Pennsylvania.

Bush. B. M. (1984): Canine Medicine and Therapeutics 2nd. Edition. Blackwell scientific publication. Oxford. London, pp 406.

DiBartola, S. P. (2000): Veterinary Internal Medicine, disease of dog and cat. Fifth edition, W. B. Saunders Comp., Philadelphia, Pennsylvania pp 1611-1612.

Fayrer-Hosken, R. A; Mahaffey, M; Millerliebl, D. and Caudle, A. B. (1991). Early diagnosis of canine pyometra using ultrasonography. Veterinary Radiology. Vol. 32, (287-289).

Feeney, D. A.; Johanston, G. R.; Klausner, J. S.; Perman, V.; Leininger. J. R.; and Tomlinson. M. J. (1987): Canine prostatic diseases – Comparison of radiographic appearance with morphologic and microbiologic findings: 30 cases (1981-1985). J. A. V. M. A. Vol. 190, No. 8, (1018-1026).

Feeney, D. A.; Johanston, G. R.; Klausner, J. S.; Perman, V.; Leininger, J. R.; and Tomlinson, M. J. (1987): Canine prostatic diseases – Comparison of ultrasonographic appearance with morphologic and microbiologic findings: 30 cases (1981-1985). J. A. V. M. A. Vol. 190. No. 8 (1027-1034).

Feldman. E. C. (2000): Veterinary Internal Medicine disease of dog and cat. Fifth edition, W. B. Saunders Comp. Philadelphia, Pennsylvania pp 1551.

Fingland, R. B. (1994): Small Animal Practice. W. B Saunders Company, Philadelphia, Pennsylvania pp 837.

Forrester, S. D. and Lees. G. E. (1994): Small Animal Practice. W. B Saunders Company, Philadelphia, Pennsylvania pp 807.

Fossum, T. W.; Hedlund, C. S.; Hulse, D. A.; Johnson, A. L.; Seim, H. B.; Willard, M. D.; and Carroll, G. L. (1997): Small Animal Surgery. Mosby, Inc. St. Louis Philadelphia

Fox, L. E.; Ackerman, N. and Buergelt, C. D. (1993): Urinary obstruction secondary to a retroperitoneal carcinoma in a dog. Veterinary Uadiology and Ultrasound Vol. 34. No. 3. (181-184).

Grooters, A. M. (1994): Small Animal Practice. W. B. Saunders Company, Philadelphia, Pennsylvania pp 874.

Grooters. A. M. and Biller D. S. (1995): Kirk's Current Veterinary Therapy; XII; Small Animal Practice W. B. Saunders Company pp 936.

Hager, D. A; Nyland, T. G. and Fisher, P. (1985): Ultrasound guided biopsy of the canine liver, kidney, and prostate. Veterinary Radiology Vol. 26 No. 3 (82-88).

Kay, N. D. (1994): Small Animal Practice. W. B Saunders Company, Philadelphia, Pennsylvania pp 895.

Kincaied, L. F.; Sanghvi, N. T.; Cummings, O.; Bihrle, R.; Foster, R. S. Zaitsev, A.; Phillips, M.; Syrus, J. and Hennige, C. (1996): Noninvasive ultrasonic subtotal ablation of the prostate in dogs. A. J. V. R. Vol. 57. No. 8 (1225-1227).

Klausner. J. S.; Johnston. G. R.; and Bell. F. W. (1995): Kirk's Current Veterinary Therapy; XII; Small Animal Practice W. B. Saunders Company pp 1104.

Konde, L. J.; Park, R. D.; Wrigley, R. H.; and Lebel. J. L. (1986): Comparison of radiography and ultrasonography in the evaluation of renal lesions in the dog. J. A. V. M. A. Vol. 188, No. 12, (1420-1425).

Konde, L. J.; Park, R. D.; Wrigley, R. H. and Lebel, J. L. (1985): Sonographic appearance of renal neoplasia in the dog. Veterinary Radiology. Vol. 26. No.3 (74-81).

Konde. L. J.; Wrigley, R. H.; Park, R. D. and Lebel, J. L. (1984): Ultrasonographic anatomy of the normal canine kidney. Veterinary Radiology. Vol. 25, No.4, (173-178).

Krawiec. D. R. and Heflin. D. (1992): Study of prostatic disease in dogs: 177 cases (1981-1986). J. A. V. M. A, Vol. No. 8, (1119-1122)

Kustritz, M. V. and Klausner, J. S. (2000): Veterinary Internal Medicine. Diseases of the dog and cat. Fifth edition, W. B. Saunders Comp. Philadelphia, Pennsylvania pp 1689.

Larry, D; Cowgill.; Denis. A. and Elliott. (2000) Veterinary Internal Medicine: Diseases of the dog and cat. Fifth edition. W. B. Saunders Comp. Philadelphia, Pennsylvania pp 1621.

Leveille, R.; Biller, D. S.; Partington, B. P. and Miyabyashi, T. (1992): Sonographic investigation of transitional cell carcinoma of the urinary bladder in small animals. Veterinary Radiology and Ultrasound. Vol. 33, No. 2, (103-107).

Lulich, J.P. and Polzin, D.J. (2001): Upper urinary tract diseases updated: Dog and Cat. Seminar January 4, 2001. District of Columbia Academy of Veterinary Medicine, Inc.

Miles, K. G. and Jergens, A. (1992): Unilateral perinephric pseudocyst of undetermined origin in a dog. Veterinary Radiology and Ultrasound. Vol. 33. No. 4 (277-281).

Nyland, T. G.; Fisher, P. E.; Doverspike, M.; Hornof, W.J. and Olander, H.J. (1993): Diagnosis of urinary tract obstruction in dogs using duplex Doppler ultrasonography. Veterinary Radiology and Ultrasound. Vol. 34. No. 5. (348-352).

O'Brien, R. and Wood, E. F. (1998): Urinary bladder mural hemorrhage associated with systemic bleeding disorders in three dogs. Veterinary Radiology and Ultrasound. Vol. 39 No. 4 (354-356).

Osborne. C. A.; Klausner. J. S. and Lulich J. P. (1995): Kirk's Current Veterinary Therapy; XII; Small Animal Practice W. B. Saunders Company pp 992.

Pharr, J. W; and Post, K, (1992): Ultrasonography and radiography of canine postpartum uterus. Veterinary Radiology and Ultrasound, Vol. 33, No. 1, (35-40).

Poffenbarger, E. M; and Feeney, D. A; (1986): Use of gray-scale ultrasonography in the diagnosis of reproductive disease in the bitch. J. A. V. M. A, Vol. 189, No. 1 (90-95).

Ramirez. and Homco. L. D. (1995): Ultrasonographic diagnosis cystic prostatic hyperplasia. Veterinary Radiology and Ultrasound, Vol. 36, No. 2 (146-147).

Ruel. Y. R.; Barthez. P. Y.; Mailles. A.; and Begon. D. (1998): Ultrasonographic evaluation of the prostate in healthy intact dogs. Veterinary Radiology and Ultrasound. Vol. 39 No3. (212-216).

Stowater. J. L.; and lamb. C. R. (1989): Ultrasonographic features of paraprostatic cyst in nine dogs. Veterinary Radiology, Vol. 30 No. 5 (232-239).

Voges. A. K; and neuwirth. L. (1991): Ultrasound diagnosis cystic uterine hyperplasia. Veterinary Radiology and Ultrasound, Vol. 37, (131-132).

Weichselbaum. R. C.; Johnston. G. R.; Feeney. D. A.; and Walter. P. A. (1995): Kirk's Current Veterinary Therapy; XII; Small Animal Practice W. B. Saunders Company pp 1056.

Welsh. E. M.; Kirby. B. M.; Simpson. J. W. and Munro. E. (2000): Surgical management of perineal paraprostatic cysts in three dogs. Journal of Small Animal Practice, Vol. 4, (358-361).

Zohil. A. M. and Castellano. M. C. (1995): Prepubic and transrectal ultrasonography of canine prostate: A comparative study. Veterinary Radiology and Ultrasound, Vol. 36 No. 5 (393-396).

ARABIC SUMMARY

الملخص العربي

الملخص العـــــــربى

تتمتع الكلاب بعدد من المزايا والخواص الحسية التى تجعل لها دور بارز ومهم فى العمل الشرطى. فهى تستخدم لحراسة الشخصيات الهامة و المنشآت الحيوية مثل البنوك والكبارى وشركات البترول والسيطرة على التجمعات الجماهيرية وتقليل الانشطة الاجرامية. ولحاسة الشم القوية للكلاب دور فعال فهى تجعلها قادرة على أكتشاف المفرقعات والمواد المخدرة والمساعدة فى عمليات الاغاثة والبحث عن المفقودين عند حدوث الكوارث. ولذلك تعتبر كلاب الشرطة من أهم الاسلحة التابعة لوزارة الداخلية فى مصر التى يعتمد عليها فى كثير من المهام الصعبة.

وقد اجريت هذة الدراسة لبحث أستخدام الموجات فوق الصوتيه لدراسة بعض الاصابات الجراحية فى البطن والحوض فى الكلاب وقد تم أستخدام عدد ٩١ كلب من مختلف السلالات والاعمار وتم أختيارهم من كلاب الشرطة وقسم الجراحة بكلية الطب البطرى جامعة الاسكندرية وقسم الحيوانات الصغيرة بكلية الطب البيطرى – جامعة ليدفيج – ماكسيماليان – ميونخ – ألمانيا. وقد تم تسجيل نوع وجنس ووزن كل حيوان والاعراض المرضية لكل حالة على حدة كما تم عمل فحص أكلينيكى للجهاز البولى والتناسلى لكل حالة. وقد وجد أن معظم الاصابات الجراحية التى تم تشخيصها بجهاز السونار تركزت فى الكلى والمثانة البولية والبروستاتا والرحم .
ففى الكلى تم تشخيص الاصابات الجراحية الآتية : الحويصلة الكلوية – السرطان الغدى لحوض الكلية – ألتهابات الكلى – الاستسقاء الكلوى .
وفى المثانة البولية تم تشخيص الاصابات الجراحية الآتية : حصوات المثانة – سرطان الغشاء المتدرج المبطن للمثانة – سرطان عنق المثانة – النزيف داخل المثانة – ألتهابات المثانة .
وفى البروستاتا تم تشخيص الاصابات الجراحية الآتية : خراج البروستاتا – تضخم البروستاتا – الحويصلات الداخلية والخارجية للبروستاتا .
وفى الرحم تم تشخيص الاصابات الجراحية الآتية : ألتهاب الرحم – التجمع الصديدى فى الرحم – سرطان المهبل – الانتكاس الرحمى بعد الولادة .
وقد تم فحص الاصابات الجراحية من حيث الشكل والحجم والمكان وكثافة صور الاشعة الموجات فوق الصوتية بواسطة أستخدام جهاز السونار . كما تم الفحص بالاشعة السينية لتأكيد التشخيص .

- **الكلـــى**

وقد تم عمل مسح ضونى للكلى من الداخل للخارج ومن الامام للخلف وأخذت الصور الطولية والعرضية لتشخيص الاصابات الآتية : ـ

١. الحويصلة الكلوية : وقد ظهرت عديمة الوميض داخل النسيج الكلوى , مستديرة أو بيضاوية الشكل لها حدود ملساء وغير متصلة بحوض الكلى. وبأستخدام الاشعة السينية نجد أن هناك تضخم بالكلى غير منتظم الحواف.

٢. السرطان الغدى لحوض الكلى : وهو يظهر هيئة كتلة كبيرة مستديرة الشكل عديمة الوميض أو قليلة الوميض لها حواف ملساء , تبرز من القشرة الكلوية وتمتد للخلف. وهى موجودة بالكلى اليمنى أو اليسرى على السواء.

وبأستخدام الاشعة السينية تظهر على هيئة كتلة كبيرة لها حواف ملساء متصلة بالكلى.

٣. الاستسقاء الكلوى: فى هذة الحالة نلاحظ مساحة عديمة الوميض بحوض الكلى والذى يفقد شكلة المميز (Y) ويصبح متسع وكبير وبيضاوى الشكل.

٤. الالتهاب الكلوى : وفى هذة الحالة تكون الكلى متضخمة بدون أنتظام لشكلها الخارجى. وتظهر القشرة الكلوية ولها وميض أما النخاع الكلوى أو لب الكلى فتظهر بة أنسجة بؤرية قليلة الوميض.

- **المثانة البولية**

وقد تم أخذ صور طولية وعرضية للمثانة من الجزء الخلفى للبطن وذلك عندما تكون المثانة ممتلئة كليا أو جزئيا بالبول وتم تشخيص الاصابات التالية : ـ

١. حصوات المثانة : وهى تظهر على هيئة مواد لها وميض كثير ولها بريق شديد واضح وتسبب فى نفس الوقت ما يسمى بالظل الضوئى داخل المثانة. وهذة الحصوات تقبع فى قاع المثانة وتتحرك أذا أهتز الحيوان أو تحرك.

وبعمل الاشعة السينيه على البطن تظهر حصوات قليلة التكلس كبيرة الحجم كثيرة العدد.

٢. سرطان عنق المثانة : وهو عبارة عن نسيج لة وميض واضح بحواف متعرجة وهو موجود على الجزء الظهرى الخلفى للمثانة ومتصل بعنق المثانة من الخارج.

بأستخدام الاشعة السينية (تصوير المثانة بطريقة التباين الموجب) يظهر على هيئة كتلة متورمة تدفع المثانة من الخارج

٣. سرطان الغشاء المتدرج المبطن للمثانة : وهو عبارة عن نسيج لـه وميض يبرز من الجدار الداخلى للمثانة البولية الى تجويفها وهو ثابت فى مكانة بالرغم من أهتزاز الحيوان أو تحريكة.

بأستخدام الاشعة السينية (تصوير المثانة بطريقة التباين المزدوج) يظهر جدار المثانة سميك جدا مع بروز أنسجة كبيرة غير واضحة المعلم أو منتظمة الحدود.

٤. نزيف المثانة : وفيها تظهر أنسجة مومضة بالجزء السفلى من تجويف المثانة ويعتقد أنها أنزفة متجلطة وهى تتحرك مع تغيير وضع الحيوان.

٥. ألتهابات المثانة : وفيها يكون جدار المثانة كلة سميك جدا وله وميض عالى مع عدم أنتظام شكل المثانة البولية.

- **البروســـتاتا**

يتم وضع الحيوان مستلقيا على ظهرة ويوضع محول جهاز السونار على جدار البطن أمام منطقة العانة وتم أخذ صور طولية وعرضية لتشخيص الاصابات التالية.

١. خراج البروستاتا : فيظهر على هيئة تجاويف ليست لها وميض أو قليلة الوميض داخل نسيج البروستاتا وهى غير منتظمة فى شكلها أو حدودها الخارجية.
وبأستخدام الاشعة السينية تظهر البروستاتا متوسطة التضخم أمام الحوض.

٢. حويصلات البروستاتا الداخلية : تكون البروستاتا منتظمة التضخم وتحتوى على بؤر غديمة الوميض بالنسيج الداخلى لها.

٣. تضخم البروستاتا : تكون البروستاتا متضخمة بانتظام مع وجود بؤر ذات وميض قليل وأخرى ذات وميض كثير. وباستخدام الاشعة السينية نجد عدم أنتظام لقناة مجرى البول داخل البروستاتا والبروستاتا ممتدة حتى حافة الحوض

٤. حويصلات البروستاتا الخارجية : وهى عبارة عن نسيج مفرغ عديم أو قليل الوميض غير متصل بالنسيج الداخلى للبروستاتا. والحويصلة لها تجويف بة سائل ليس لـه وميض ولها حدود خارجية ملساء منتظمة. وبالاشعة السينية تظهر الحويصلة على هيئة نسيج أنبوبى كبير معتم وأملس فى الجزء الخلفى المعتم من البطن.

- **الرحـــــم**

لقد تم أخذ صور طولية وعرضية للرحم . وتم تشخيص الاصابات التالية .

١. الالتهاب الرحمى الصديدى : يظهر الرحم على هيئة نسيج أنبوبى واضح لـة تجويف قليل أو عديم الوميض. ويتراوح قطر القرن الرحمى بين ٢سم : ٦ سم.
وبأستخدام الاشعة السينية يتم التعرف على الرحم المتضخم بسهولة ويظهر على هيئة نسيج مستطيل محزز ومنتفخ فى الجزء الخلفى من البطن.

٢. ألتهاب الرحم الغير صديدى(الانتكاس الرحمى) : يكون الرحم متضخما فى قطره مع وجود مواد مختلطة الوميض بداخلة (بقايا المشيمة والانسجة) والجدار الرحمى سميك الحجم وغير منتظم الشكل.

٣. سرطان المهبل : يظهر الورم بالسونار ولة شكل شبة دائرى كبير الحجم على هيئة كتلة مختلطة الوميض موجودة خلف المثانة البولية ومتصلة بالمهبل من الخارج.

وبعمل أشعة سينية على منطقة البطن يظهر أنتفاخ من الناحية اليمنى للبطن ونرى الورم يدفع القولون للأمام وللظهر.

ومن هذة الدراسة نستطيع أستخلاص الآتى : —

أولا الكلى :

يعتبر السونار مكمل للاشعة السينية كطريقة من طرق التشخيص وهو يعتبر من أهم طرق التشخيص حيث أنة يبرز معلومات أضافية عن أمراض الكلى فالسونار يستطيع أن يشخص أمراض الحويصلات التى لا يتعدى قطرها ١سم وأيضا مشاكل الاجسام الصلبة التى لا يتعدى قطرها ٢سم.

ثانيـــــا المثانة البولية :

فسونار المثانة يعتبر من أسرع وأحسن وسائل التشخيص كما انة غير مضر بلانسجة ويشخص بسهولة ويسر حصوات المثانة وأورام المثانة وأصابات وألتهابات المثانة. والمثانة تعتبر كنافذة لتحديد أماكن الغدد اليمفاوية والرحم والاعضاء الاخرى داخل الحوض.

ثالثـــــا البروستاتا :

فسونار البروستاتا هام جدا فى تشخيص خراج البروستاتا وتضخم البروستاتا والحويصلات الداخلية والخارجية للبروستاتا وسرطان البروستاتا.

رابعـــا الرحـــم :

يعتبر جهاز السونار من أهم الوسائل التشخيصية التى تفرق بين حالة الرحم الطبيعية والغير طبيعية وخصوصا بعد الولادة وذلك لسهولة التصوير التفصيلى بالسونار لجدار الرحم ومكوناتة

تحت إشـــــــراف

الأستاذ الدكتور / **مصطفى محمـــد قاســـم**

أســـــتاذ الجراحـــــة

كليـــة الطب البيطـــرى

جامعة الأسكندرية

الأستاذ الدكتور/**أحمـــدعبد المنعم قنـــاوى**

أســـــتاذ الجراحـــــة

كليـــة الطب البيـــطرى

جامعة الأسكندرية

أستخدام الموجات فوق الصوتية لدراسة الأصابات الجراحية للبطن والحوض فى الكلاب

رســــــالة مقدمة من

ط.ب / محمد ابراهيم محمد على

كالوريوس العلوم الطبية البيطرية ـ كلية الطب البيطرى ـ جامعة أسيوط ـ ١٩٨٨)

اجستير العلوم الطبية البيطرية ـ كلية الطب البيطرى ـ جامعة الأسكندرية ـ ١٩٩٥)

للحصول على
درجة دكتور الفلسفة فى العلوم الطبية البيطرية
(جراحـــــــــــــة)

مقدمة الى
قســـم الجراحــــة
كلية الطب البيـــــــطرى
جامعة الأســــــــــــكندرية
٢٠٠٥