

Diagnostic accuracy of ultrasound in space occupying lesions of canine abdomen

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A total of 20 cases of space-occupying lesions (SOLs) in the abdominal cavity presented to Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, were included in the study. Ultrasonographic examination was performed in all cases to determine the organ of origin of the masses. Renal affections were identified in five dogs, comprising hydronephrosis (n=3) and renal tumours (n=2). Retained testicular tumours and para-prostatic affections were diagnosed in three and two dogs, respectively. All of these diagnoses were confirmed during surgery. Three dogs were diagnosed with ovarian affections on ultrasonography; however, surgical exploration confirmed the diagnosis in only two cases, while the mass in the third dog was found to be of mesenteric origin. Among the four dogs with splenic affections, ultrasonography correctly identified the organ of origin in three cases. In the remaining case, the mass was erroneously attributed to the liver on ultrasonography but was confirmed to be splenic in origin during surgery.

Overall, ultrasonography accurately identified the organ of origin in 18 of the 20 cases (90%). It was therefore concluded that ultrasonography is a reliable diagnostic modality for determining the organ of origin of abdominal SOLs in dogs, with an accuracy of approximately 90%. However, its diagnostic performance may be influenced by the operator's level of expertise.

Keywords: Abdominal mass, Canine, Space-occupying lesions, Ultrasonography

A considerable number of canine patients are presented to veterinary clinics with intra-abdominal space-occupying lesions (SOLs). In many cases, the clinical presentation is nonspecific, making it difficult to determine the organ of origin based solely on physical examination and haematobiochemical findings. Transabdominal ultrasonography is widely used for the evaluation and diagnosis of intra-abdominal SOLs. However, when lesions become extensive and occupy a large portion or the entirety of the abdominal cavity, identifying their organ of origin can be challenging even with ultrasonographic examination. Furthermore, limited information is available regarding the diagnostic accuracy of ultrasonography in determining the organ of origin of intra-abdominal SOLs and its correlation with surgical findings and outcomes.

A total of 20 dogs affected with space occupying lesions were included in this study. These dogs were divided into 5 groups according to the organ of origin of space occupying lesion. Five dogs were affected with renal affections (3 with hydronephrosis and 2

with renal tumour), 3 with mesenteric affections, 3 with ovarian affections, 2 with para-prostatic affections and 4 with splenic affections. Various observations like age, gender, physical examination and clinical signs were noted. Haematological parameters (Hb, PCV, TLC, DLC) and biochemical parameters (ALKP, AST, ALT, BUN, creatinine) were estimated. Plain lateral and ventro-dorsal abdominal radiographs were taken. Contrast radiographs were taken whenever required. The SOLs were evaluated for the organ of origin, size of the lesion, echotexture, blood supply using colour Doppler, status of adjacent organs and metastasis to other organs if any.

The ultrasonographic examination of the kidney affected by hydronephrosis (Fig. 1) demonstrated a dilated anechoic renal pelvis. Urinary obstruction causing back pressure resulted in atrophy of the renal parenchyma. The renal cortex exhibited a reduction in thickness. The corticomedullary junction and interlobar vessels were unclear (Dehmiwal *et al.*, 2016). The cause of hydronephrosis in all three cases was the presence of an ectopic ureter. Although ectopic ureters are reported to occur more frequently in female dogs (Holt *et al.*, 1982), all affected dogs in the present study were male and cryptorchid. The main clinical signs of affected animals were abdominal distension and urinary incontinence since birth. Ectopic ureter in these dogs was diagnosed by intravenous pyelography using iohexol (1 mg/kg, i.v.). Two dogs of mean age of 10.5 yr were affected with renal tumour, the main clinical signs of the animals affected were abdominal distension and anorexia. Ultrasonography was able to accurately diagnose the organ of origin in all five dogs so the accuracy of ultrasonography in diagnosing renal affections was 100%.

Three dogs of mesenteric affections were presented with the main complaint of anorexia. Two dogs were affected with mesenteric cyst characterized by anechoic contents present in the mass; however, one dog presented with anorexia, fever and vomiting and elevated TLC count was diagnosed with mesenteric abscess, characterized ultrasonographically by the presence of echogenic contents in the mass (Fig. 2). The ultrasound was able to accurately diagnose organ of origin in all three cases, and hence the accuracy of diagnosing mesenteric affections by ultrasonography was 100%.

Three dogs of mean age of 5 yr were presented with a main complaint of abdominal distension and inappetence. Ultrasonography is a diagnostic tech-

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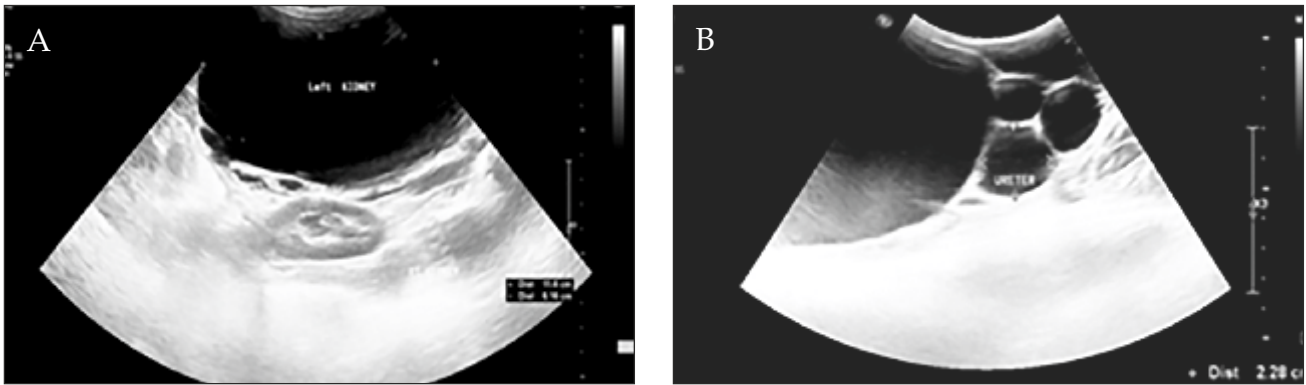


Fig. 1: (A) Ultrasonographic image of hydronephrotic image characterized by thin cortex and loss of cortico-medullary differentiation; (B) Ultrasonographic image showing presence of dilated ureters measuring up to 2.28 cm in diameter.

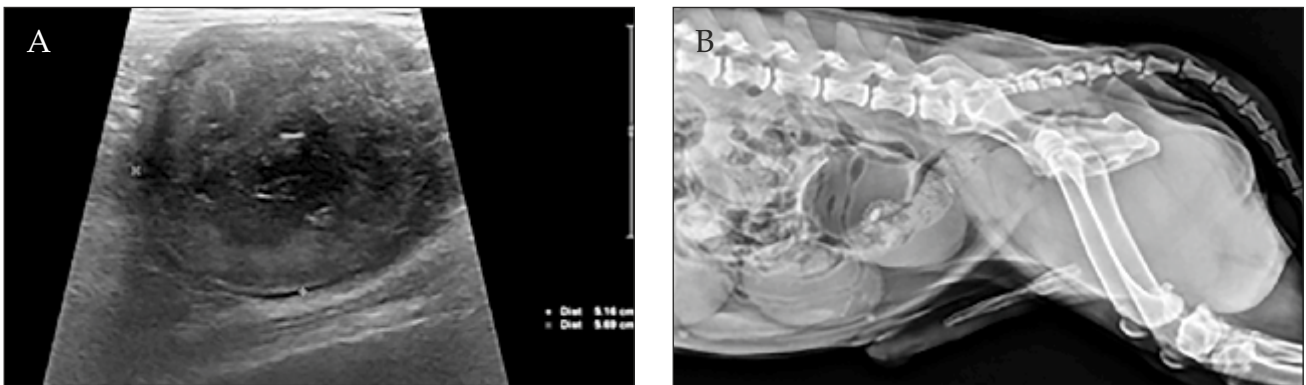


Fig. 2: (A) Ultrasonographic image of mesenteric abscess measuring 5.16 x 5.69 cm; (B) radiograph showing the location of mesenteric abscess (arrows).

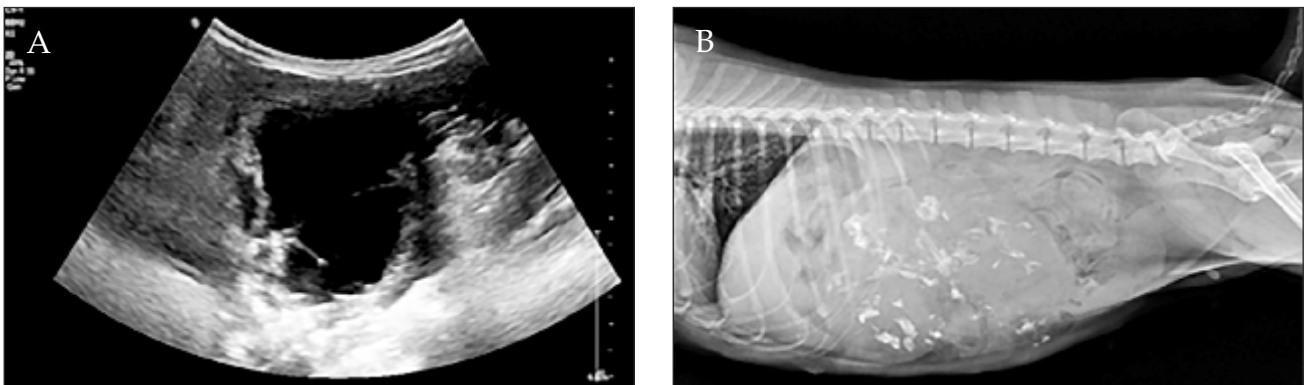


Fig. 3: (A) Ultrasonographic image of ovarian tumour with presence of cystic lesions inside it; (B) Radiograph shows areas of calcification present inside the ovarian mass most likely to be ovarian teratoma.

nique that enables the detection of ovarian masses (Fig. 3). The identification of an ovarian mass is enhanced if its diameter does not exceed 6 cm, and identification is more difficult when they are unilateral and exceed 10 cm in diameter. Adenomas are noted to possess fluid-filled cysts of diverse dimensions, while teratomas are characterized as either solid or cystic. Granulosa cell tumours may occasionally include cysts. Teratomas are noted to sometimes possess mineralized bone or teeth. Ultrasonographically these regions would present as hyperechoic, shadow-casting foci, perhaps aiding in differentiating these tumours from other ovarian masses (Jergens *et al.*, 1987). Out of three cases the ultrasound was able to accurately identify the organ of origin in two dogs, however in one dog it was

found to be of mesenteric origin, so the accuracy of ultrasound in diagnosing ovarian affections was 66%.

Two dogs of mean age of 7 yr presented with main complaint of palpable abdominal mass and anorexia were affected with para-prostatic cysts. Para-prostatic cysts mainly affect older large breed dogs. A positive contrast retrograde cysto-urethrogram is recommended to differentiate between the bladder and cyst, as well as to evaluate the prostatic region. Ultrasonography revealed that para-prostatic cysts were typically large anechoic cavities, often including internal septations. Moderately sized anechoic cavities or cysts were identified in the prostatic parenchyma, with visualization of connectivity to the para-prostatic cyst. No unequivocal ultrasonographic criteria existed



Fig. 4: Ultrasonographic image of para-prostatic abscess signifying the abscess present cranial to prostate.



Fig. 5: Ultrasonographic image showing splenic tumour.

to differentiate septic from non-septic para-prostatic conditions (Stowater and Lamb, 1989). Both cases were accurately diagnosed by ultrasonography (Fig. 4) so the accuracy of ultrasonography in diagnosing para-prostatic affections was found to be 100%.

Three dogs of mean age of 7.5 yr were presented with a main complaint of patchy alopecia, gynecomastia affected with retained testicular tumour. Among them, two dogs were monorchid while one was cryptorchid. Sertoli cell tumour (SCT) is predominantly seen in younger dogs, but seminoma (SEM) and interstitial cell tumour (ICT) have a comparable mean age at diagnosis, generally affecting older canines. Feminization may also occur in canines, with the probability of a SCT developing in a feminized dog being considerably higher than that of other tumour forms; nevertheless, feminization can also be present in dogs with SEM or ICT. When a dog displays cryptorchidism and feminization, it may be indicative of a SCT (Mischke *et al.*, 2002). The sensitivity of ultrasonography was 96.6% for abdominal testes and 100% for inguinal testes. All the three cases were accurately diagnosed with ultrasonography, so the accuracy of ultrasonography in diagnosing retained testicular tumour was 100%.

Four dogs of mean age of 9 yr presented with main complaint of anorexia and weakness were affected

with splenic tumours (Fig. 5). Hemangiosarcoma was the most often diagnosed malignant tumour in spleen, succeeded by lymphoma, histiocytoma, metastatic mast cell tumour, and metastatic osteosarcoma. The tumour lesions ranged in size from 0.5 to over 7 cm, displaying irregular forms, uneven outlines, and indistinct boundaries from the surrounding tissue. In cases of bigger malignant tumours, hetero-echogenicity and internal holes were clearly evident due to tissue degradation. The existence of a splenic tumour in conjunction with haemorrhagic peritoneal effusion is a notable indicator of forthcoming hemangiosarcoma (Hristov, 2020). Ultrasonography could accurately diagnose the organ of origin in three dogs, however in one dog ultrasonography diagnosed the lesion as of hepatic origin but intra-operatively it was also found to be of splenic origin. The accuracy of ultrasound in diagnosing splenic affections was found to be 75%.

From the results of this study, it was concluded that overall accuracy of ultrasonography in diagnosing space occupying lesions was 90%; however the accuracy may be variable depending on the expertise of the operator.

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