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Clinical Article

SURGICAL MANAGEMENT OF ASEPTIC PYONEPHROSIS IN A DOG

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SUMMARY

A five year old female Dalmatian dog was presented with history of pyuria, inappetance and abdominal distension for last two weeks. History of patient revealed that the animal had fever and vomiting and was treated with antibiotics and antiemetics. Based on radiography and ultrasonography, it was diagnosed as pyonephrosis of right kidney which was further confirmed via aspiration cytology. Right nephroureterectomy was performed and animal recovered uneventfully.

Keywords: Dog, Kidney, Nephroureterectomy, Pyonephrosis, Pyuria

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Pyonephrosis refers to an infected hydronephrotic kidney which arises from pyelonephritis followed by exudate accumulation in a dilated renal pelvis or hydronephrosis followed by ascending infection (Choi *et al.*, 2010). It is a serious complication of hydronephrosis that may develop as a direct consequence of urinary stasis and secondary infection (Channa *et al.*, 2001; Szatmari *et al.*, 2001). Calculi in the renal collecting system is the most common cause of obstruction, although other causes such as tumours, fibrosis, prostatic disease and urinary bladder disease can also cause obstruction (Subramanyam *et al.*, 1983). Prompt recognition of pyonephrosis and its differentiation from hydronephrosis is important because pyonephrosis needs immediate treatment to avoid pyrexia and septic shock and/or prevent the loss of renal parenchyma. Kidneys with bacterial infection and obstructive uropathy are serious candidates for progressive and irreversible loss of renal parenchyma (Apparacio *et al.*, 2007). The present report describes a case of pyonephrosis in a dog and its successful surgical treatment.

A five years old female Dalmatian dog, weighing 28 kg was presented with history of passing milky white urine, inappetance and abdominal distension for last two weeks. Earlier the animal had vomiting and fever for which it was treated with antiemetics and antibiotics about four weeks ago. However, two weeks later, the animal had started voiding milky white urine. All clinical parameters were found to be within normal range. The values of haemoglobin, PCV and TEC were 8.1g/dL, 24.5% and 3.39×10^6/µL, respectively while there was prominent leucocytosis (24.2×10^3/µL) along with neutrophilia (74.5%). The values of ALT, AST and ALP were 30.06 U/L, 38.90 U/L 68.9 U/L, respectively. Total protein was slightly increased (8.09 g/dL) and creatinine was also increased moderately (2.67 mg/dL), whereas Albumin: Globulin ratio was decreased markedly (0.60). Lateral and VD abdominal radiographs revealed enlargement of right kidney appearing as a soft tissue opacity occupying mid abdomen with presence of three radiopaque calculi. The left kidney was normal in size but showed the presence of nephroliths (Fig. 1 & 2). On ultrasonography (USG), the right kidney was seen as an anechoic fluid filled sac of approx. 13.60×9.68 cm size, with few free moving hyperechoic foci in the anechoic fluid. The cortex and medulla were not visible and only the capsule with few hyperechoic septae was visible (Fig. 3). No vascularity was appreciable in right kidney in colour Doppler mode. The left kidney had normal size (6.88 × 4.29 cm) and echotexture, except a central hyperechoic region with fade acoustic shadow indicating presence of renal calculi (2.37 × 1.93 cm). The left kidney had normal vascularity with no change in Resistive Index (0.61) and Pulsatility Index (0.98) values on Doppler ultrasonography. Ultrasound guided fine needle aspiration cytology revealed pus cells, however, culture of the aspirate did not reveal any bacterial growth (Fig. 4). Intravenous pyelography, with iohexol 350 mg I/ml@ 0.5 ml/kg b.wt. was unable to delineate right kidney but left kidney was faintly visible after 15 minutes only. The case was diagnosed as pyonephrosis and right nephroureterectomy was planned accordingly.

The animal was administered enrofloxacin @ 5 mg/kg b.wt. and tramadol @ 4 mg/kg b.wt. pre-operatively. Ventral abdomen was prepared aseptically for surgery. After anaesthetizing the dog with xylazine and ketamine combination, the animal was intubated and restrained in dorsal recumbency. I/V line was maintained for administering anaesthetic and other drugs intraoperatively. After performing midline celiotomy, the right kidney was approached by incising the parietal peritoneum. The kidney was isolated

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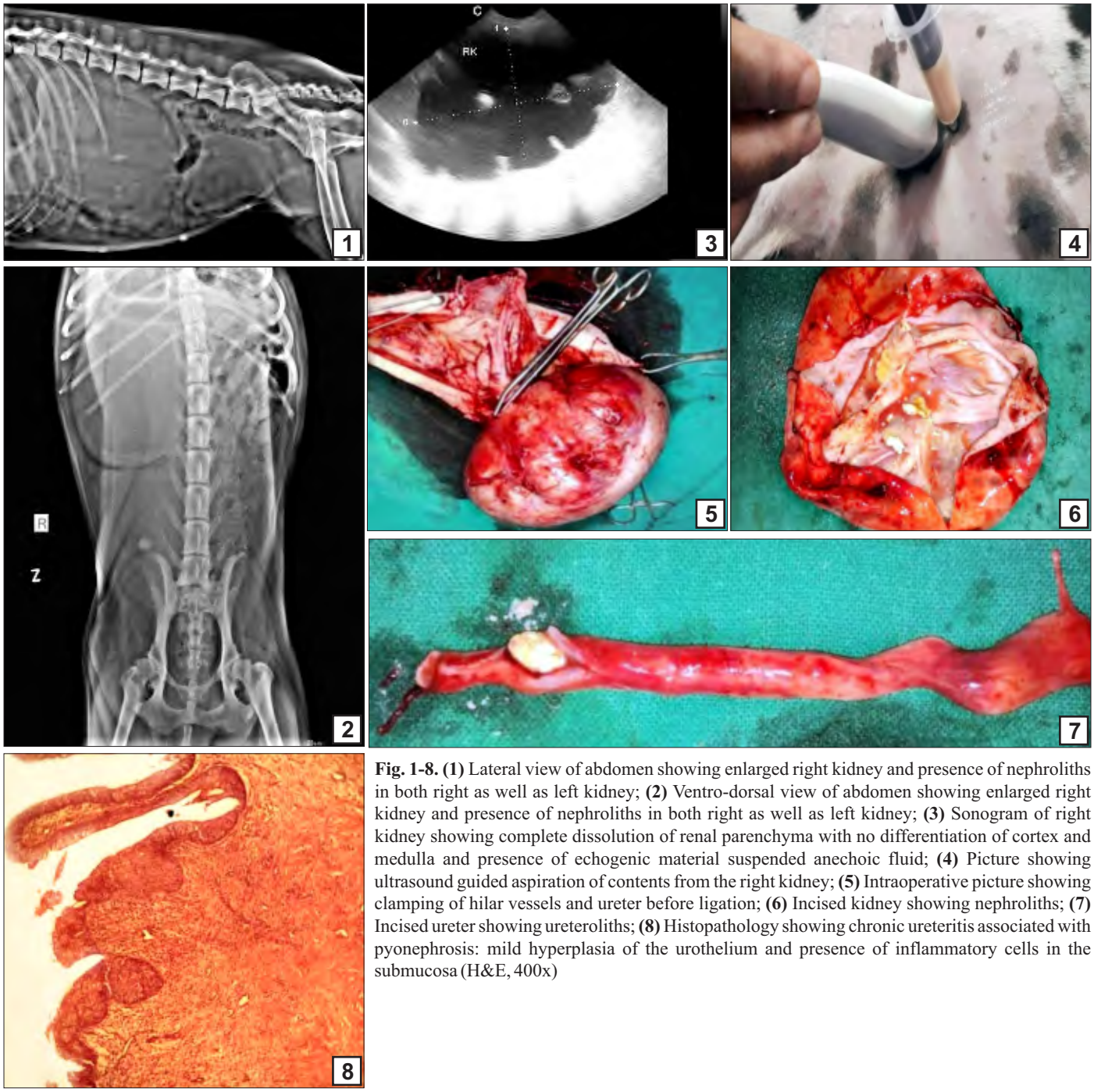

Fig. 1-8. (1) Lateral view of abdomen showing enlarged right kidney and presence of nephroliths in both right as well as left kidney; **(2)** Ventro-dorsal view of abdomen showing enlarged right kidney and presence of nephroliths in both right as well as left kidney; **(3)** Sonogram of right kidney showing complete dissolution of renal parenchyma with no differentiation of cortex and medulla and presence of echogenic material suspended anechoic fluid; **(4)** Picture showing ultrasound guided aspiration of contents from the right kidney; **(5)** Intraoperative picture showing clamping of hilar vessels and ureter before ligation; **(6)** Incised kidney showing nephroliths; **(7)** Incised ureter showing ureteroliths; **(8)** Histopathology showing chronic ureteritis associated with pyonephrosis: mild hyperplasia of the urothelium and presence of inflammatory cells in the submucosa (H&E, 400x)

by bluntly dissecting its attachment from the sublumbar area, hilus of the kidney was isolated and freed of surrounding fat. The renal vessels and ureter were double ligated near the renal hilus and severed between the ligatures (Fig. 5). The ureter was doubly ligated close to its entry into the bladder and severed. The stump of ureter over the bladder was sewn by lambert sutures to cause inversion of the bladder wall. The ureter was pulled proximally free from the peritoneum. Both, the right kidney and the ureter were removed and nephroliths and ureteral stones were recovered after incising them (Fig. 6 & 7) and tissue samples were taken in 10% formalin for histopathology. The parietal peritoneum was sutured using continuous suture pattern and then the abdominal incision was sutured in routine manner. Postoperatively, the animal was administered enrofloxacin @ 5 mg/kg, i.m. for 5 days and tramadol @ 4 mg/kg, i.m. BID for two days. The wound was dressed with 5% povidone iodine on alternate days. The animal recovered uneventfully and skin sutures were removed on 10th postoperative day. The histopathology revealed thickening of ureteral mucosa (Fig. 8). Allopurinol was advised @ 15 mg/kg once daily for three months.

Pyonephrosis is a collection of sloughed urothelium and inflammatory cells within a hydronephrotic kidney

and or ureter (Mattoon and Nyland, 2015). Hydronephrosis may progress to pyonephrosis caused by urinary stasis and subsequent infection. Choi *et al.* (2010) reported that pyonephrosis or hydronephrosis have many non specific signs *viz.* anorexia, vomiting and urinary signs such as haematuria, oliguria or polyuria. A non-invasive and reliable way to discriminate between pyonephrosis and hydronephrosis is important, as hydronephrosis may extend to pyonephrosis which may cause septic shock and renal failure. As in the present case, Watson *et al.* (1999) have also reported that clinical findings and percutaneous pyelocentesis can support the diagnosis of pyonephrosis. Moreover, all dogs with pyonephrosis showed echogenic contents in the renal pelvis and anechoic contents were found only in dogs with hydronephrosis. Physiological parameters in the present case were towards the higher side of the normal range. Hb, PCV and TEC were decreased, however TLC was very high with neutrophilia. Cytology of needle aspirate from right kidney revealed only pus cells and culture of the aspirate did not show any growth which could be due to complete ureteral obstruction with calculi at several sites that might have prevented ascending infection and could be the reason for the absence of systemic signs at the time of case presentation. Right nephroureterectomy was performed under general anaesthesia and animal recovered without any complication. Intraoperatively, the kidney was like a fluid filled balloon and ureter was also dilated. Kidney had three nephroliths and ureter had two nephroliths close to vesicouretral junction and some in the middle and close to the proximal end. The chemical analysis of the stones revealed it to be urate stones, which are the most commonly occurring stones in Dalmatian dogs because of genetic defect in metabolism of urate to allantoin in hepatocytes (Tion *et al.*, 2015). The ureteroliths and renoliths might have initially caused hydronephrosis leading to dilatation of renal pelvis and later on causing progressive degeneration of renal parenchyma without producing signs of renal failure, as the function of the left kidney was able to maintain homeostasis. The degenerated renal tissues and inflammatory cells might have resulted in aseptic pyonephrosis. Ureteral obstruction has been reported as the cause of hydronephrosis by many workers (Finco, 1995; Apparacio *et al.*, 2007). Obstruction of outflow of urine markedly raises the risk of renal infection via haematogenous or ascending bacteria and has been associated with an increased risk of pyelonephritis. Kidneys with bacterial infection and obstructive uropathy are serious candidates for progressive and irreversible loss of renal parenchyma. In the present case, lack of ascending infection did not result in severe systemic signs and since the ureteral obstruction was unilateral, the condition hydronephrosis followed by aseptic pyonephrosis might have persisted for quite a long time destroying the entire parenchyma and causing severe distension. Moreover, because of absence of systemic signs, the dog recovered well from anaesthesia and surgery and is living a healthy life till date.

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