



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; SP-11(9): 2391-2394  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 18-07-2022  
Accepted: 21-08-2022

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## Contrast radiography and ultrasonography as a diagnostic aid for the obstructive urolithiasis in small ruminants

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### Abstract

The present study was carried out to know the diagnostic value of ultrasonography and contrast radiography for diagnosis of obstructive urolithiasis in small ruminants. Ultrasonography and contrast radiography are widely employed as diagnostic tool in the companion animals where as these are less commonly used in the farm animals. In the present study ultrasonography was used to assess the status of urinary bladder (weather intact or ruptured) preoperatively and position of catheter postoperatively. Contrast radiography of lower urinary tract was performed using Urografin as contrast agent which helped to know the site of obstruction preoperatively, position of catheter and patency of urethra postoperatively. Both these diagnostic tools proved highly helpful in diagnosis and management of obstructive urolithiasis in small ruminants.

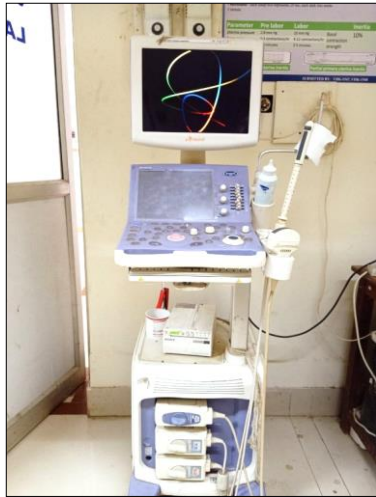
**Keywords:** Obstructive urolithiasis, contrast radiography, patency of urethra

### Introduction

Obstructive urolithiasis in ruminants is a life-threatening condition that requires immediate attention. Potential economic losses can occur because of this condition. It occurs because of retention of urine subsequent to the lodgement of calculi anywhere in the urinary tract up to the urethral orifice. Obstructive urolithiasis is the most prevalent urinary tract disease in rams and bucks and other causes include cystitis, bladder atony, stricture and neoplasms (Radostits *et al.*, 2000) [6]. Decision making on diagnosis involved integrating findings from the history, signalment, physical examination, clinical signs, time course of disease and urinary tract imaging (Radostits *et al.*, 2007) [7]. Obstructive urolithiasis can be diagnosed using a history, clinical symptoms, per-rectal examination, urinalysis, radiography, ultrasonography, and haematobiochemical analysis (Parrah *et al.*, 2011) [5]. Radiology and ultrasonography helped to differentiate patients with uroliths from urinary tract infections, granulomatous urethritis, prostatic disease, and neoplasia (Makhdooni and Gazi 2013) [3]. Contrast radiography provides maximum visualization of mucosal and serosal surfaces of the bladder wall so it was a useful technique for evaluation of bladder wall (Palmer *et al.*, 1998) [4]. Ultrasonography was a accurate tool for diagnosis of cystitis, uroperitoneum, serosal erosion of cystic wall and urocystoliths but it was not effective in diagnosis of urethral rupture and urethritis (Parrah *et al.*, 2011) [5].

### Materials and methods

The present study was conducted on the 12 clinical cases of small ruminants presented to the Department of Veterinary Surgery and Radiology, Hebbal, Bangalore with the complaint of obstructive urolithiasis. Survey radiographs were taken in all the animals. The animals were placed in dorsal and lateral recumbency for ultrasound examination of the bladder using a convex probe with frequency ranging from 5 to 7 MHz (Prosound Alpha) (Fig. 1). After urethral process amputation (Fig. 2) retrograde infusion of contrast agent through infant feeding tube was performed to know the site of obstruction preoperatively. Postoperatively contrast radiographs were taken to assess the position of Foley's catheter and patency of urethra using Diatrizoate meglumine and Diatrizoate sodium (Urografin) as contrast agent by normograde cystourethrography via Foley's catheter (Fig. 3).



**Fig 1 A:** Ultrasound machine used



**Fig 1 B:** Positioning and ultrasound examination using curvilinear probe



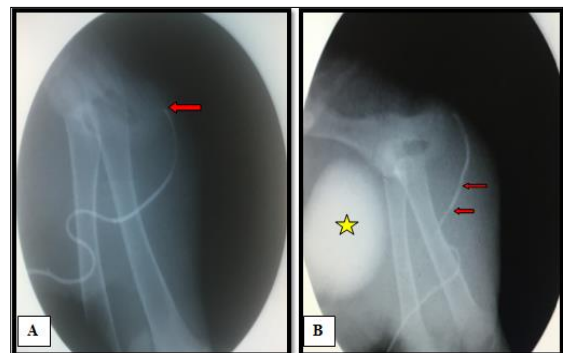
**Fig 2:** Urethral process amputation



**Fig 3:** Infusion of contrast agent into the bladder through Foley's catheter

**Results and Discussion**

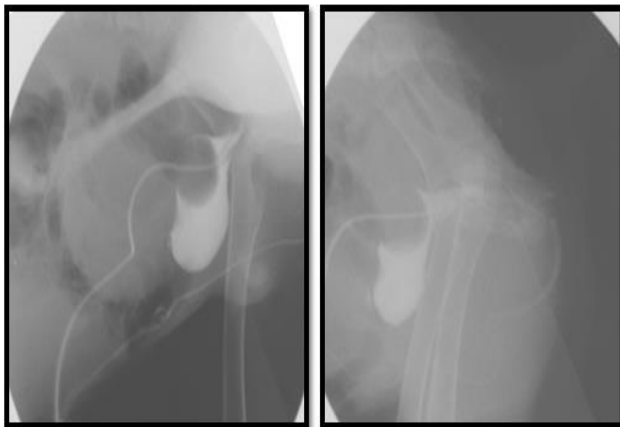
In the present study radiographic examination was done in all the animals. Plain radiographic examination did not reveal calculi and site of obstruction in any animal but helped in knowing the bladder whether distended or not. Weeren *et al.* (1987) [9] stated survey radiographs were of little use in their study and also reported despite the presence of uroliths, the survey radiographs revealed no abnormalities. After urethral process amputation retrograde contrast radiograph was taken by infusing contrast material through infant feeding tube to know the site of obstruction. In animal with complete obstruction the contrast material did not reach the bladder. Whereas in case of incomplete obstruction the contrast material reached the bladder along with filling defects in the urethra suggestive of presence of amorphous miliary calculi (Fig. 4B). Immediately after surgery positive contrast cystourethrography in normograde manner through the tube cystostomy catheter helped to know the obstruction site. On seventh and fifteenth postoperative day contrast cystourethrography performed by which the position of catheter (whether in-situ or dislodgement (Fig. 5) and the progressive development of patency of urethra were noted. In those animals in which the obstruction was relieved, the contrast agent was voided through the normal urinary tract by which the patency of urethra was confirmed (Fig. 6). This was in accordance with Palmer *et al.* (1998) [4] and Kannan and Lawrence (2010) [1]. One animal had catheter dislodgement which was confirmed by the presence of contrast material in the abdominal cavity (Fig. 7). Ultrasonographic examination was performed on preoperative, seventh and fifteenth post operative day in all the animals. Preoperatively the status of bladder (whether intact or ruptured) (Fig. 8) was confirmed using ultrasonography and the hyper echoic calculi with distal acoustic shadow were observed at the dependent part of the bladder (Fig. 9). Sarker *et al.* (2020) [8] stated ultrasonographic examination was considered to have very high diagnostic value and they used it to identify calculi in the bladder. On seventh and fifteenth post operative day the anechoic balloon of Foley's catheter was present in the bladder which confirmed the catheter in-situ (Fig. 10). Makhdoomi and Gazi (2013) [3] stated that sonography was safer for both patients and the operators as it was not involved in the use of ionising radiation and they suggested that ultrasonography could be used as a primary diagnostic tool for the diagnosis of urolithiasis. Mahajan *et al.* (2017) [2] reported ultrasonography was proved to be a highly useful, non invasive and relatively inexpensive tool to confirm the status of urinary bladder in obstructive urolithiasis.



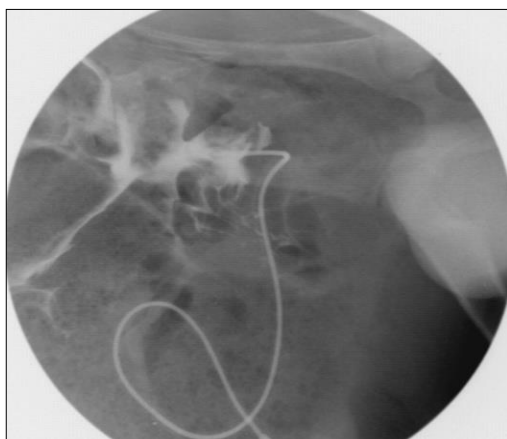
**Fig 4:** A. Retrograde urethrography in animal with complete obstruction  
**B:** Incomplete obstruction with seepage of contrast material into bladder



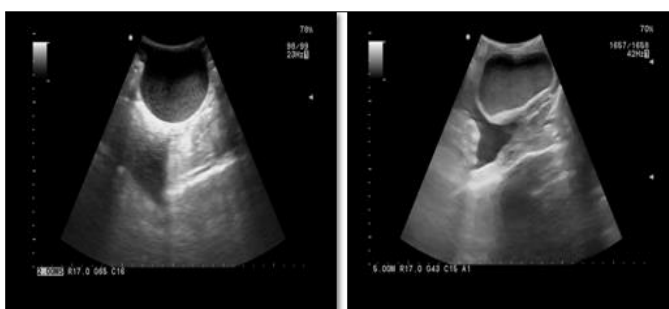
**Fig 5:** Postoperative contrast radiograph of urinary bladder showing presence of contrast agent in the bladder and catheter in-situ



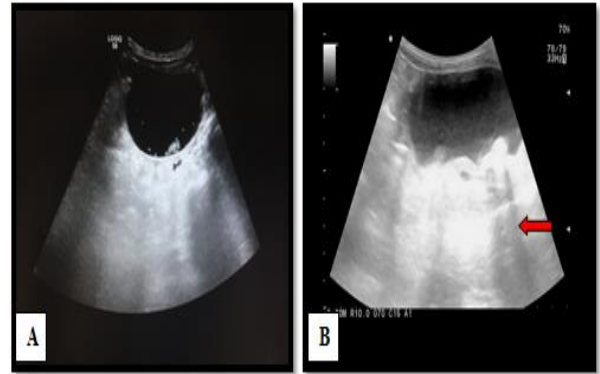
**Fig 6:** Postoperative contrast radiographs showing passage of contrast agent through the normal urethral tract



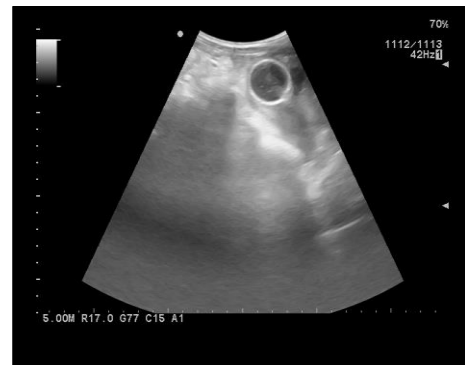
**Fig 7:** Postoperative contrast radiograph showing presence of contrast material in the abdomen suggestive of catheter dislodgement



**Fig 8:** A. Intact urinary bladder B. Ruptured urinary bladder



**Fig 9:** A. Showing presence of hyper echoic calculi B. Acoustic shadow



**Fig 10:** Postoperative ultrasound image showing anechoic Foley's catheter bulb inside the bladder

**Conclusion**

In conclusion both contrast radiography and ultrasonographic techniques were proved to be effective tools for diagnosis of obstructive urolithiasis and also helped in differentiating other lower urinary tract diseases in small ruminants, further they also aided in selecting most appropriate treatment regime for management of obstructive urolithiasis in small ruminants.

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