Acta Scientiae Veterinariae, 2025. 53(Suppl 1): 1045.

CASE REPORT
Pub. 1045

ISSN 1679-9216

Urethral Diverticula in an Australian Cattle Dog Puppy: Clinical Treatment Based on Radiographic and Ultrasonographic Findings

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ABSTRACT

***Background*:** Urethral diverticulum is rare in animals, presenting with variable clinical signs, such as urinary incontinence and dysuria. It is typically of congenital origin and can be classified, according to location, in prostatic, membranous, and penile, as well as by form, in saccular and diffuse. Reports in the veterinary literature are limited mainly to isolated cases in dogs, a single cat, and 1 horse. This case report aims to describe the radiographic and ultrasonographic findings, as well as the clinical response to treatment, in the youngest dog diagnosed with this anomaly.

***Case*:** A 57-day-old male Australian Cattle Dog presented with a history of dysuria, oliguria, and urinary incontinence. Physical examination revealed no abnormalities. Mild changes were observed in hematological, biochemical, and urinalysis profiles. The result of the hemoparasite screening was negative. Plain abdominal radiographs suggested hepatomegaly and nephromegaly, but were inconclusive for visualization of the urinary tract. Abdominal ultrasonography revealed saccular dilations in the prostatic urethra, bilateral ureteral dilation, mild bilateral pyelectasia, and urinary sedimentation in the bladder. A retrograde urethrocystography confirmed multiple saccular dilations in the membranous and prostatic urethra. Based on these findings, a diagnosis of urethral diverticula was established, and a medical management approach was initiated, including antibiotics, gastroprotectants, and manual bladder compression. After 30 days, the patient showed significant clinical improvement, with normalization of urination and reduced urinary incontinence, which remained only during periods of agitation. Follow-up physical and laboratory examinations were unremarkable. However, the patient was not returned for continued monitoring, precluding long-term evaluation of therapeutic outcome.

***Discussion*:** To date, urethral diverticulum involving both portions of the urethra has been reported in only 1 other dog, among several others with an average age of 11 months at diagnosis. The dog in this report did not exhibit any physical examination abnormalities that could reinforce this suspicion, except for urinary incontinence and dysuria, which were associated with slow emptying of the diverticula and with urethral compression, respectively. The mild bilateral pyelectasis and bilateral ureteral dilation in this report can be considered secondary findings resulting from urinary flow overload, while urinary sedimentation may be associated with increased urine concentration and delayed bladder emptying. Physical examination and even rectal palpation may not be useful in identifying urethral diverticula; therefore, a combination of conventional imaging techniques was employed, given that imaging modalities such as magnetic resonance imaging and micturating cystourethrography, though effective in humans, are difficult to apply in routine veterinary practice. A clinically based medical treatment approach was chosen, since surgical correction may not fully resolve urinary incontinence and could lead to complications. The placement of an artificial urethral sphincter, although a less invasive therapeutic option, may worsen the condition in the long term. The patient showed significant clinical improvement after 30 days. This case represents the 1st documented occurrence of multiple diverticula in such a young dog, successfully diagnosed through contrast radiography and ultrasonographic findings that had not previously been described in veterinary literature. Given the absence of the patient from the hospital after the final assessment, it was not possible to monitor the case until complete resolution or to propose a new therapeutic intervention.

Keywords: urinary incontinence, dysuria, retrograde urethrocystography.

DOI: 10.22456/1679-9216.144725

Received: 8 January 2025 Accepted: 6 June 2025 Published: 26 July 2025

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INTRODUCTION

Urethral diverticula, also known as urethroceles, have variable etiologies and clinical presentations [5,7-12,19]. Similar to human medicine, they are rare in animals and have been associated with urinary incontinence and dysuria [5,8,10,11], as well as recurrent urinary tract infections, stranguria, and urethral obstruction [8]. Congenital origin is considered the primary cause [11,10]; however, trauma, urolithiasis, long-term catheterization, surgical repairs, stenoses, and periurethral abscesses can also contribute to their development [8]. They are categorized into prostatic, membranous, and penile types, according to their appearance and size [12]. Saccular diverticula have direct communication with the urethral lumen and are commonly associated with urinary flow obstruction [8-12,19]. Diffuse diverticula, known as megalourethra, are characterized by a gradual increase in urethral width [8,12].

Proximal urethral diverticulum has been described in 2 male dogs aged 2 and 7 years [4,19], 1 male cat aged 5 months [8], and 1 male horse aged 26 years [9], as well as occurring in association with other clinical conditions, including the presence of urethral plugs [17], surgical complications following urethroplasty [2], and urolithiasis [13]. When confined to the prostatic urethra, the congenital anomaly has been reported in a 3-month-old dog [5], in dogs with urethral sphincter incompetence [1] or artificial urethral sphincters [12], and in dogs with urethral dilation [18]. This report aims to document the radiographic and ultrasonographic findings, as well as the clinical response, of the youngest dog diagnosed with this anomaly.

CASE

A 57-day-old male Australian Cattle Dog, weighing 3 kg, was presented to the "Governador Laudo Natel" Veterinary Hospital of São Paulo State University, in the city of Jaboticabal, with a one-week history of dysuria, oliguria, and urinary incontinence. On physical examination, the patient was alert, with normochromic oral mucosa, a capillary refill time of 2 s, no signs of dehydration, non-reactive lymph nodes, a body temperature of 37.8°C, a heart rate of 160 bpm (beats per minute), and a respiratory rate of 32 (breaths per minute). Abdominal palpation revealed no abnormalities.

Additional diagnostic tests were requested to assess the clinical condition further. The hematological profile indicated moderate anisocytosis and mild polychromasia. In the white cell series, the patient presented with mild leukocytosis. The result of the hemoparasite screening was negative. In the biochemical profile, phosphorus and urea levels were elevated. Urinalysis was also performed, with catheterization carried out due to insufficient bladder filling for cystocentesis. The urine appeared slightly turbid, with a odor *sui generis* (characteristic), a urine specific gravity of 1.050, and a pH of 7.0. Glucose and bilirubin were negative, and there was a trace amount of protein. Transitional epithelial cells, squamous cells, and cocci bacteria were observed in the urine sediment examination.

Given the clinical findings and the suspicion of urinary system abnormalities, including the possibility of a congenital malformation, imaging studies were performed. On plain abdominal radiography (RG150/100gl)[1], gastric repletion with alimentary content and a significant amount of intestinal fecal matter were observed, hindering the topographic visualization of the ureters and urinary bladder (Figures 1A and 2A). Radiographic signs suggestive of hepatomegaly and nephromegaly were identifiable.

On abdominal ultrasonographic study (ACUSSON S2000™)[1], dilated and tortuous areas were observed in the prostatic urethra, with an accumulation of anechoic fluid inside, indicating prostatic urethral

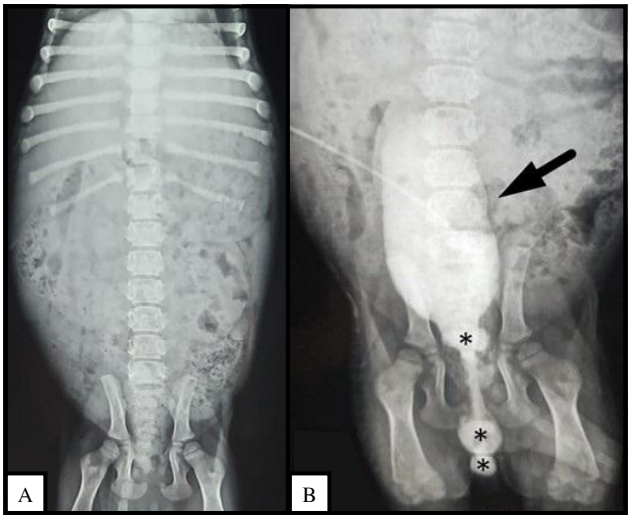

Figure 1. A- Plain abdominal radiograph, ventrodorsal projection. Gastric repletion due to ingested content and a significant amount of intestinal fecal material are noted, obscuring the topographic visualization of the ureters and urinary bladder. B- Retrograde urethrocystography, caudal ventrodorsal projection. Multiple saccular dilations along the membranous and prostatic urethra are observed. [Asterisks: urethral diverticula; Arrow: urinary bladder].

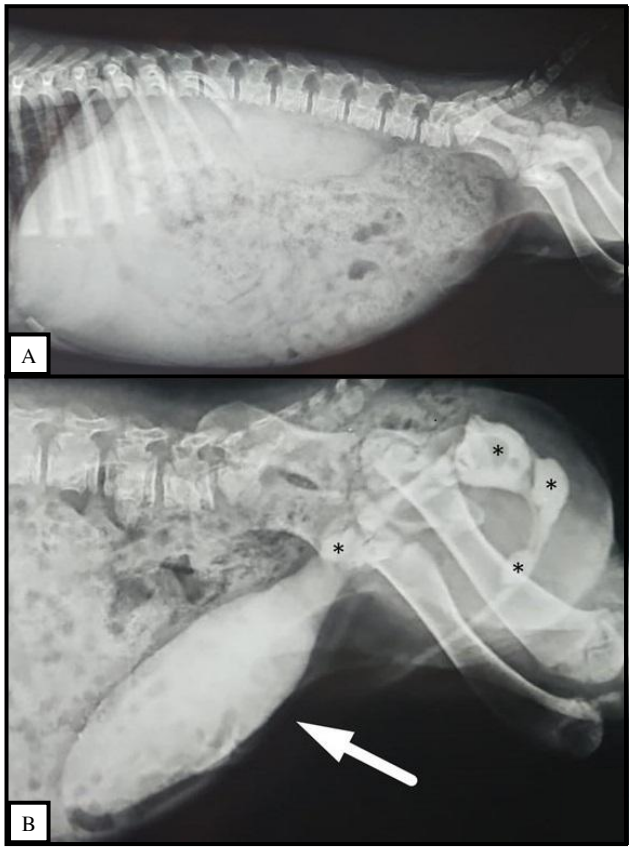

Figure 2. A- Plain abdominal radiograph, right laterolateral projection. Gastric repletion due to ingested content and a significant amount of intestinal fecal material are noted, obscuring the topographic visualization of the ureters and urinary bladder. B- Retrograde urethrocystography, right caudal laterolateral projection. Multiple saccular dilations along the membranous and prostatic urethra are observed. [Asterisks: urethral diverticula; Arrow: urinary bladder].

saccular dilations (Figure 3). The proximal membranous urethra could not be evaluated, due to its pelvic location. The prostate appeared uniformly echogenic, measuring approximately 1.93 cm in width and 1.05 cm in height. Mild ureteral dilation was observed, with the right and left ureters measuring 0.31 cm and 0.30 cm in diameter, respectively. Both kidneys exhibited a slight increase in cortical echogenicity, measuring approximately 5.13 cm on the right and 5.27 cm on the left, with no evidence of lithiasis, and mild bilateral pyelectasia. On the other hand, the urinary bladder contained punctate hyperechoic intraluminal structures, which did not produce posterior acoustic shadows and floated with ballottement, suggesting sediment or cellular debris. The bladder wall measured approximately 0.20 cm.

Due to the observed clinical signs, the difficulty in identifying the ureters and urinary bladder on a plain radiograph, and the ultrasound findings in the prostatic urethra, a contrast radiographic study was requested. Multiple saccular dilations along the membranous urethra and in the prostatic urethra were observed (Figures 1B and 2B). Based on these findings, a diagnosis of urethral diverticula was established, and a medical approach was chosen. This consisted of antibiotic therapy, gastroprotective medication, and supportive care, including manual bladder compression.

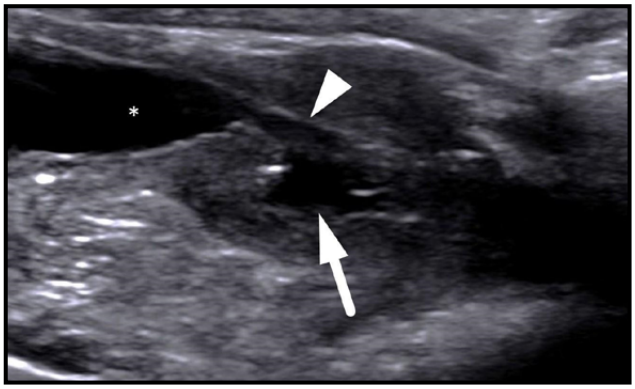

Figure 3. Representation of a saccular dilation of the prostatic urethra. [Arrowhead: prostatic urethra; Arrow: urethral diverticulum; Asterisk: urinary bladder].

After 30 days, the patient returned showing clinical improvement under treatment. The owner reported that the animal exhibited normal urination and a significant improvement in urine dribbling, with incontinence only occurring during periods of agitation. In a new physical examination, the patient was alert, with normochromic mucous membranes, non-reactive lymph nodes, a capillary refill time of 2 s, no signs of dehydration, a body temperature of 38.6°C, a heart rate of 170 bpm, and a respiratory rate of 38 (breaths per minute). There was again no abdominal pain on palpation. Hematological findings revealed mild anisocytosis. The hemoparasite test was again negative, and there were no abnormalities in serum biochemistry. After these latest updates to the condition, the owner did not return to the hospital and did not maintain contact.

DISCUSSION

This report presents the youngest dog diagnosed with urethral diverticula, identified through imaging findings that revealed multiple saccular dilations in the membranous and prostatic urethra. To date, similar findings involving both portions of the urethra have been reported in only 1 other dog, among several others with an average age of 11 months at diagnosis [12]. The congenital origin of this condition in the present case is supported by the patient's age and duration of the clinical signs.

Urinary incontinence in male dogs is uncommon; therefore, when it is persistent and refractory to medical treatment, the presence of a urethral diverticulum should be considered as an important differential diagnosis [12]. It is believed that incontinence arises from the slow emptying of the diverticula due to gravity [9], while dysuria results from urethral compression, as urine flows into the saccular structures during urination [5,19]. Urine stasis may lead to inflammation or infection of the urinary tract, worsening pain during micturition [9]. Urinary dermatitis [5] and perineal swelling [4,19] are also reported as clinical findings that support the suspicion of urethral diverticulum. The dog in this report did not exhibit any physical examination abnormalities that could reinforce this suspicion, except for the urinary incontinence and disuria reported by the owner, making the diagnosis even more challenging.

In this report, the mild bilateral pyelectasis and bilateral ureteral dilation can be considered secondary findings resulting from urinary flow overload. Similarly, urinary sedimentation may be associated with increased urine concentration and delayed bladder emptying. Patients with urethral diverticulum may exhibit dilation and tortuosity along the course of the proximal urethra on ultrasound, as observed in 1 case [12]; however, the majority do not present significant ultrasonographic abnormalities related to the anomaly [5,19]. On the other hand, they may present with concurrent urogenital abnormalities, including renal dysplasia, chronic pyelonephritis, cryptorchidism, and pelvic bladder, which are the most commonly reported [12].

Retrograde urethrocystography and micturating cystourethrography (fluoroscopy) combined with ultrasound are described as diagnostic options in human patients [3,6,14]. A definitive diagnosis of urethral diverticulum using micturating cystourethrography was achievable in 65% of cases [16]. However, its routine veterinary application is limited by the inability to control urination in animals. In this case report, the findings of conventional cystourethrography, together with transabdominal ultrasound, were consistent with urethral diverticula, allowing for the establishment of a definitive diagnosis.

Physical examination and even rectal palpation may not be useful in identifying urethral diverticula [12]. Although magnetic resonance imaging is considered the gold standard imaging modality for diagnosing urethral diverticula due to its superior anatomical detail, particularly for surgical planning [15], its high cost, compared to other modalities, limits its use in veterinary medicine. Another diagnostic option for characterizing urethral diverticula involves an association between imaging modalities, including micturating cystourethrography (fluoroscopy), positive contrast retrograde urethrocystography, transabdominal ultrasound, computed tomography, and urethroscopy (retrograde urethrocystoscopy). This approach allows for the exclusion of ureteral ectopia and the determination of the location and configuration of the diverticular opening via endoluminal visualization, enabling its correction during inspection and thus providing therapeutic assistance [5,12,19].

The success of both surgical and medical treatments in dogs with prostatic urethral dilation has been evaluated, and both approaches resulted in improvement in urinary continence after treatment. However, complete resolution was not achieved [18]. Surgical treatment involves partial or complete excision of the urethral diverticulum and subsequent urethroplasty, which requires the use of a catheter to investigate the site of communication of the diverticulum with the urethra and repair the incised area [4,5,8,19]. However, some male patients without urethral obstruction may be managed conservatively through follow-up, including manual decompression [6]. Surgical correction of congenital urethral diverticula in dogs can lead to either complete or partial resolution of clinical signs, although occasional urinary incontinence may persist even after intervention [4,5].

Among postoperative complications of diverticulectomy and urethral reconstruction are urethrocutaneous fistula formation, epididymo-orchitis, urinary tract infection, recurrence of the urethral diverticulum, sterile cystitis, and urethral stricture [8,12]. In this regard, a less invasive and adjustable therapeutic approach, which does not require surgical resection, has been reported, based on the placement of an artificial urethral sphincter [12]. This approach resulted in improved continence scores in all 8 dogs studied. However, the authors cautioned that the use of an artificial sphincter in a dog with a preexisting urethral diverticulum has the potential to worsen the condition in the long term, a complication whose progression remains unknown.

Given that surgical intervention would pose a greater challenge due to the multiple lesion sites in the presented case, for which no prior descriptions are found in the literature, a clinically based medical treatment approach was chosen. The patient showed significant clinical improvement after 1 month of treatment; however, due to his absence from the hospital after this assessment, ongoing monitoring until complete resolution of the condition or the implementation of a new therapeutic intervention was not possible.

Although a rare malformation with few reports in the literature, urethral diverticula should be considered a differential diagnosis in dogs with urinary incontinence and dysuria. This case represents the 1st documented occurrence of multiple diverticula in a 57-day-old dog, diagnosed through a combination of clinical signs, contrast radiography, and ultrasonographic findings not previously described in the veterinary literature. Clinical signs were resolved following medical management.

MANUFACTURER

[1]Siemens®. Munich, Germany.

Acknowledgments. We would like to extend our sincere thanks to the Veterinary Hospital "Governador Laudo Natel" (HV) of the School of Agricultural and Veterinary Sciences (FCAV) for providing the data and images. We are also grateful to the Veterinary Imaging Laboratory at the College of Animal Science and Food Engineering of the University of São Paulo (LIV-FZEA), Esaote, and RTS, along with all other individuals who made it possible to document this case.

Declaration of interest. The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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