



## NOTE

Surgery

# Leiomyosarcoma of urinary bladder in a Shih Tzu dog

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**ABSTRACT.** A 10-year-old intact male Shih Tzu dog presented with hematuria. Double-contrast cystography revealed a polypoid filling defect at the apex of the urinary bladder. Ultrasonography revealed a heterogeneously hypoechoic intramural mass with minimal vascular flow beneath the submucosal layer. After partial cystectomy, a well-demarcated bladder leiomyosarcoma was diagnosed on histopathology. The patient was alive and well without any clinical signs, recurrence, or metastasis at the 29-month follow-up after the surgical removal of the bladder mass. Leiomyosarcoma should be considered as a differential diagnosis if mass-like lesions are observed in the urinary bladder, although this type of malignancy is rare in canines. Histopathological confirmation is important for predicting prognosis and determining further medical plans.

**KEYWORDS:** dog, leiomyosarcoma, mitotic count, partial cystectomy, urinary bladder

Urinary bladder cancers account for 2% of all canine malignancies and are the most frequent among the urinary system tumors in dogs [4, 6]. Local extension from nearby tumors in the urethra or prostate into the urinary bladder is relatively common, rather than metastatic bladder tumors [3]. Common clinical symptoms, including hematuria, dysuria, pollakiuria, stranguria, and urinary incontinence, mimic those of dogs with urinary tract infections [6].

Most canine bladder tumors originate in the epithelium. Invasive transitional cell carcinoma (TCC) is the most frequently diagnosed, accounting for 75% of all bladder tumors, and more than 90% in some reports [17, 19, 23]. TCCs generally show aggressive behavior, with intermediate- to high-grade papillary infiltrative tumors. At the time of diagnosis, 78% had invaded the bladder wall with induration, and 20% had invaded neighboring organs, including the prostate, uterus, vagina, and pelvic canal [13]. Moreover, a high rate of nodal and/or distant metastases to the lungs and bones has been reported in dogs with TCC [14]. Infrequently reported types of canine bladder cancer include squamous cell carcinoma, adenocarcinoma, undifferentiated carcinoma, rhabdomyosarcoma, lymphoma, hemangiosarcoma, fibroma, and other mesenchymal tumors [7]. The treatment approaches and consequent prognosis vary considerably depending on whether the masses are TCCs, non-TCC tumors, or non-neoplastic lesions; therefore, histopathological confirmation is required.

Leiomyosarcoma is a type of malignant tumor that arises in any hollow organ containing smooth muscle cells and rarely involves the urinary bladder [12]. This report describes a urinary bladder tumor that was diagnosed as a leiomyosarcoma after surgical resection in a dog.

A 10-year-old intact male Shih Tzu dog weighing 7.2 kg presented with acute hematuria with blood clots. The patient was bright and alert with a good body condition score on physical examination.

A complete blood count showed a mildly increased hematocrit (57%, reference range 32–55) and serum biochemistry parameters revealed no significant findings. A longitudinal sonogram of the urinary bladder revealed a 1.6 × 1.8 cm sized, round, pedunculated mass protruding into the bladder lumen, which was identified beneath the submucosal layer (Fig. 1A). The intramural mass had a heterogeneously hypoechoic echotexture and revealed minimal vascular flow within it on the Doppler study. On double-contrast cystography, a mass-like polypoid filling defect was identified at the apex of the urinary bladder (Fig. 1B). On computed tomography, the intraluminal mass connected to the bladder apex exhibited peripheral and heterogeneous contrast

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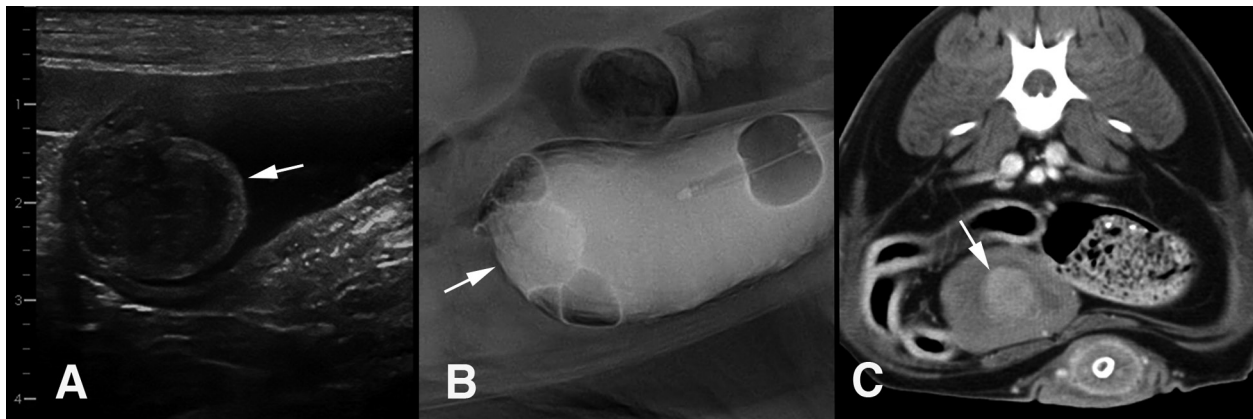
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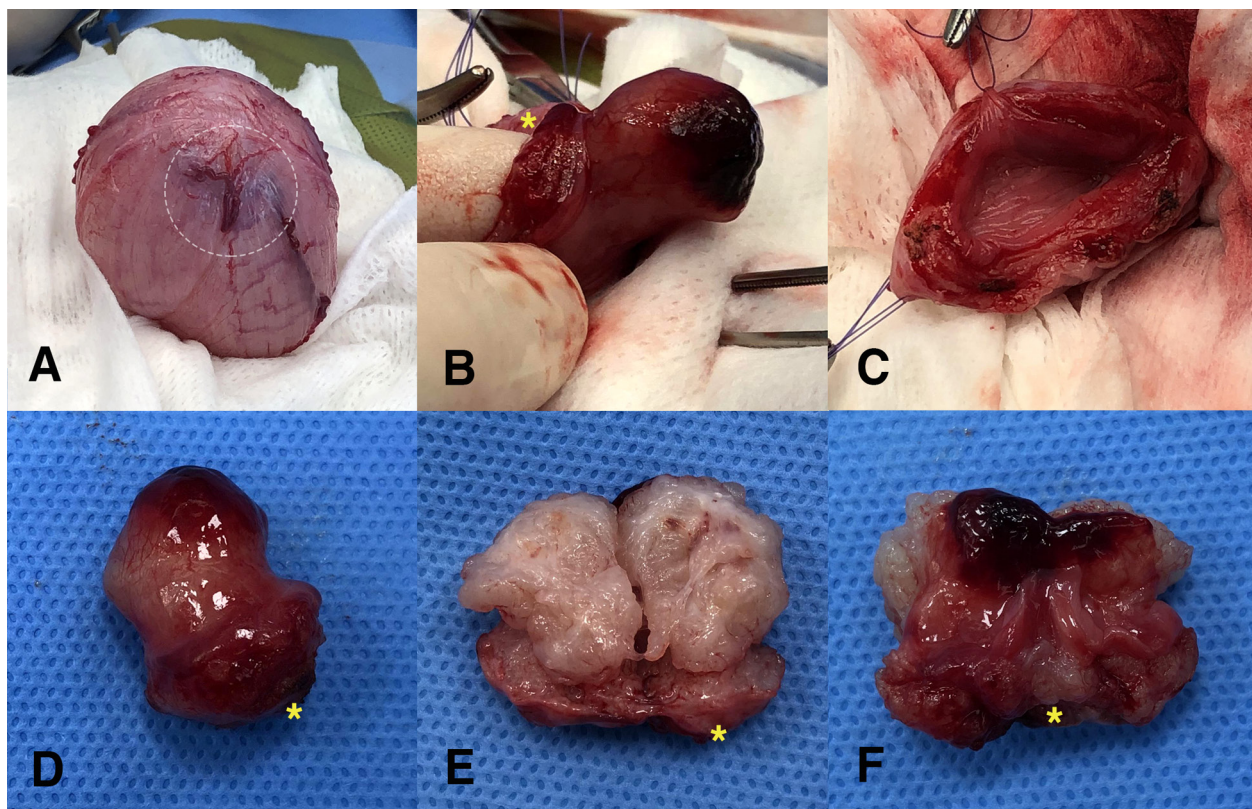
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enhancement (Fig. 1C). The bladder wall was thickened throughout (3–4 mm). There were no remarkable findings including invasion of the other parts of the urinary system or metastasis to the nodal and distant organs. No diagnostic cells were collected via traumatic urinary catheterization except a few neutrophils and red blood cells. A veterinary bladder tumor antigen test (V-BTA<sup>®</sup> Test, Polymedco, Inc., Cortlandt, NY, USA) yielded a positive result.

The patient's hematuria was not improved on medication with antibiotics (amoxicillin 20 mg/kg) and had been waxing and waning for a month. The mass grew up to 2 cm in diameter on follow-up ultrasonography; hence, the bladder mass was surgically resected via partial cystectomy. Following caudal midline celiotomy, a mass was palpable inside the urinary bladder at the craniodorsal aspect adjacent to the apex (Fig. 2A). A cranioventral incision of the bladder was extended to the apex near the mass



**Fig. 1.** Diagnostic images of urinary bladder leiomyosarcoma in a dog. A round intramural mass with heterogeneously hypoechoic echotexture bulging into the urinary bladder lumen on ultrasound (A); Radiographic image of the double contrast cystography (B); Computed tomography image of the mass, venous phase, showing peripheral and heterogeneous contrast enhancement (C). Arrows; bladder mass.



**Fig. 2.** Surgical views and macroscopic appearances of urinary bladder leiomyosarcoma in a dog. Urinary bladder and the palpable margin of the mass (dotted circle) (A); An intraluminal mass everted with localized dark bruising (B); Urinary bladder after partial cystectomy (C); The marginally resected mass (D); Cross sections of the mass (E, F). Asterisks: outer serosal surface of the bladder.

and the bladder was everted. The protruding intraluminal mass was solitary and firm with a smooth surface continuous with the bladder mucosa. A dark bruised region on top of the mass appeared to be a bleeding site (Fig. 2B). The margin of the mass was marked using electrocautery, and a full-thickness excision of the bladder wall, including the mass, was conducted with a 5-mm margin (Fig. 2C). The bladder was closed via two-layer suturing, and the surgical site was routinely closed.

Grossly, the mass was enveloped by bladder mucosa (Fig. 2D–F). When the mucosa was vertically incised, the mass was extruded; it had an irregular and pinkish, creamy colored surface. On histopathological examination, the lesion was well-demarcated in the detrusor smooth muscle, extending from the deep submucosa toward the peritoneal surface (Fig. 3A). The mass was composed of loosely interwoven spindle-cell fascicles with various but overall high cellularity (Fig. 3B). Tumor cells had oval-to-oblong, cigar-shaped nuclei with stippled vesicular chromatin and prominent nucleoli (Fig. 3C). Cellular outlines were elongated and merged imperceptibly with small amounts of fibrillar intercellular matrix. The average mitotic count was five per high-power field and no vascular invasion was detected. The neoplastic cell population was immunohistochemically positive for desmin and smooth muscle actin markers. Consequently, leiomyosarcoma was diagnosed.

After being hospitalized for three days, the patient was discharged without any urinary symptoms. No clinical signs or medical findings suggestive of recurrence of the mass or metastasis were observed during regular follow-up examinations, including radiography, ultrasonography, and urinalysis, for 29 months.

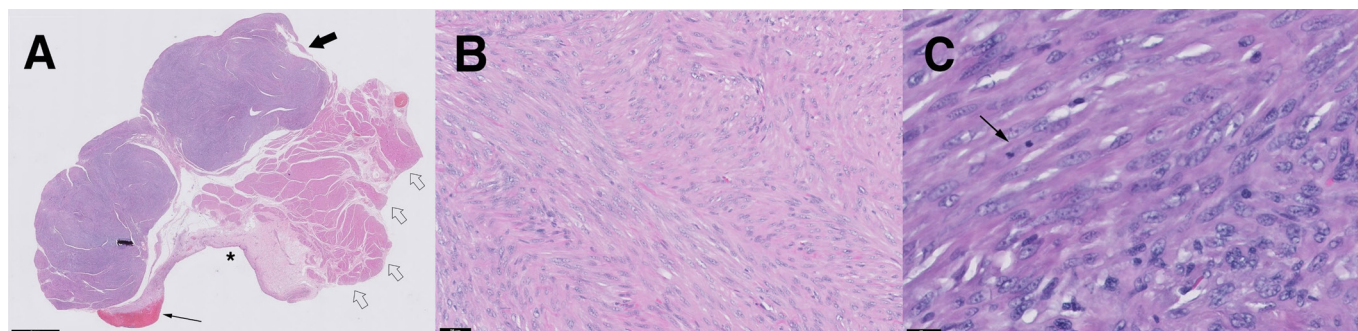
This report describes a urinary bladder tumor that was surgically removed and histopathologically confirmed as leiomyosarcoma in a dog. Leiomyosarcomas are malignant mesenchymal tumors that arise from the smooth muscle cells. Most of them occur in the gastrointestinal tract, with less common sites including the spleen, liver, vulva/vagina, prostate, retroperitoneal space, vessel wall, and subcutaneous tissue [6, 22]. Few cases of urinary bladder leiomyosarcoma have been reported in dogs. Two retrospective studies of 110 and 115 cases of canine bladder and urethral tumors, respectively, included three leiomyomas but no leiomyosarcoma in one [23], and two leiomyomas and only one leiomyosarcoma in the other [19]. In human medicine, leiomyosarcoma is the most frequently occurring malignant mesenchymal tumor in the urinary bladder, comprising less than 1% of all bladder malignancies [15]. While it is a highly aggressive and metastatic neoplasm in adult humans [20], in dogs the tumor is considered slow-growing, rarely metastatic, and relapsable [1, 17].

Contrast radiography is a non-invasive technique for the visualization of low urinary tract lesions, including neoplasia [19]. In the present case, the bladder mass was identified on the dorsal apex with an intraluminal filling defect detected on a double-contrast cystogram. Reported canine bladder leiomyosarcomas originate from the cranial to the trigone, craniodorsal wall, and bladder trigone [1, 10, 18]. The range and severity of clinical symptoms primarily depend on the mass size and location. Our patient exhibited only hematuria, while a report on a Boxer dog with an 80 × 40 × 30 cm mass weighing 4.6 kg originating in the bladder trigone and involving the ureter exhibited dysuria, hyporexia, abdominal distension, and anuria [1].

Leiomyosarcomas are likely to present as polypoid lesions. Polypoid cystitis, a rare disease of the lower urinary tract, is characterized by chronic inflammation and epithelial proliferation [16]. Ultrasonographic features include a single or multiple polypoid, ovoid, or pedunculated intraluminal mass protruding from the bladder mucosa into the lumen; the mass is isoechoic compared with the bladder wall [21]. Another differential diagnosis, TCC, originates from the transitional epithelium in the bladder mucosa and involves the trigone in over 50% of dogs [8, 9]. Tumors invading the bladder wall commonly occur, resulting in wall disruptions. Vascular signal is often detected in TCC but not in leiomyosarcomas on color Doppler examination [8, 10]. Ultrasonographic appearances of two leiomyomas and one leiomyosarcoma in the canine urinary bladder were previously reported; a single, round, well-defined intraluminal mass presented with hypo-to-mixed echogenicity and did not exhibit signal of blood flow [10]. In addition to these characteristics, the lesion in the present case was restricted to the muscular layer, being enclosed by the prominent submucosal lining on ultrasound. A well-demarcated intramural mass was demonstrated on gross inspection and histopathology while the tumor cell extending from the submucosa to the bladder peritoneal surface under a microscope.

Surgery for bladder masses is indicated to obtain tissue for definitive diagnoses, to eradicate tumors by wide excision if the lesions are distant from the trigone, and to relieve the distress caused by urinary tract obstruction [6]. The diagnostic accuracy of transurethral cystoscopic biopsy is only 65% in male dogs with TCC in the lower urinary tract [5]. A decision to perform surgery should be carefully considered, given the possibility of local recurrence, potential for diffuse malignant transformation of the urothelium, and risk of seeding, especially in invasive TCC [2, 6]. Because the location and diagnostic imaging of the tumor in the present case were different from those of TCC and the intraoperative appearance of the bladder wall adjacent the mass was shown to be normal, partial cystectomy and histopathology were performed; postoperative chemotherapy or radiation was considered if the histopathology revealed malignancy and incomplete margin.

Leiomyosarcoma is distinguished by evidence of invasion, high mitotic count, giant cells, and anaplastic cellular characteristics [17]. Mitoses are rare, even in the presence of malignant properties indicating a leiomyosarcoma in dogs; the average mitotic count is 1–2 per high power field (1.65 of mitotic index) [11, 17]. The tumor in the present case exhibited nuclear atypia and an increased mitotic count of five, but the patient was still alive at the 29-month follow-up, without local infiltration or metastasis. Even though there was no literature for relationship between mitotic index and prognosis in canine bladder leiomyosarcoma with its sparse incidence, the patient's survival is quite long compared to that of TCCs. A recent review stated that median survival times of canine TCCs treated with partial cystectomy or cytoreductive surgery were 106 days and 125 days, respectively [7]. In another study, 1-year survival rate in dogs with lower urinary tract tumors was reported to be only 16% despite of various modalities of treatment [19]. The longest median survival time, 365 days, was reported in 9 dogs with completely excised and non-metastatic bladder tumors (8 TCCs and 1 leiomyosarcoma); the dog with leiomyosarcoma survived 730 days. A previous report described a dog with prostatic leiomyosarcoma who received metronomic chemotherapy with cyclophosphamide and firocoxib after partial subcapsular prostatectomy [22]. Our patient did not receive adjuvant chemotherapy because the well-demarcated tumor was completely removed.



**Fig. 3.** Microscopic images of urinary bladder leiomyosarcoma in a dog (hematoxylin and eosin stain). The bladder mass was demarcated in the muscular wall (open arrows), deep submucosa (thick arrow), and adjacent to the peritoneal surface (asterisk) with hemorrhagic mucosa (thin arrow) (A); A pattern of interwoven spindle-cell fascicles of elongated tumor cells was evident (B); A nuclear atypia and mitoses (arrow) were identified (C). Scale bar: A=2 mm; B=50  $\mu$ m; C=20  $\mu$ m.

This report describes a rare case of canine bladder leiomyosarcoma with a high mitotic count and a favorable outcome attained via surgical management. Therefore, leiomyosarcoma should be considered in the differential diagnosis of urinary bladder masses in dogs. Further research is necessary to identify the prognostic factors for bladder leiomyosarcoma.

**CONFLICT OF INTEREST.** The authors declare that there are no conflicts of interest.

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