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Partial Cystectomy for Papillary Urothelial Carcinoma in a Dog

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ABSTRACT

The study was conducted during October, 2024 to June, 2025 at the Teaching Veterinary Clinical Complex, Bihar Veterinary College, Patna, Bihar, India. This study evaluated the surgical management of high-grade papillary urothelial carcinoma (UC) in a young Great Dane dog using partial cystectomy combined with ureteral reimplantation. Transitional cell carcinoma (TCC), or urothelial carcinoma, is the most common malignancy of the canine urinary bladder and serves as a relevant model for human bladder cancer. The study involved a three-year-old male Great Dane presented with a history of persistent hematuria and stranguria. Ultrasonographic examination revealed a large, vascular intravesical mass. Based on the clinical signs, history, and ultrasonographic findings, the case was tentatively diagnosed as high-grade papillary urothelial carcinoma, and surgical management was decided. A partial cystectomy was performed, involving excision of approximately 60% of the bladder wall, including part of the trigone and the right ureter, followed by ureteral reimplantation. Histopathological examination confirmed a high-grade papillary UC. Postoperatively, the dog was treated with a broad-spectrum antibiotic for seven days and an analgesic for three days, along with supportive therapy. Recovery was uneventful, and normal urinary function was restored within one week. Tumor recurrence was detected three months post-surgery; however, the dog survived an additional seven months with a good quality of life. The findings suggested that partial cystectomy with ureteral reimplantation was an effective surgical technique for managing high-grade papillary urothelial carcinoma in dogs.

KEYWORDS: Canine, urothelial carcinoma, transitional cell carcinoma, partial cystectomy

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1. INTRODUCTION

Urothelial carcinoma (UC), previously known as transitional cell carcinoma (TCC), is the most common malignancy affecting the canine urinary bladder, accounting for approximately 1–2% of all canine cancers (Knapp et al., 2020). The disease is typically aggressive, locally invasive, and associated with poor prognosis due to late-stage diagnosis and limited options for curative treatment (Marvel et al., 2017; Hildebrandt et al., 2023). Clinical signs-including hematuria, dysuria, and pollakiuria-often mimic urinary tract infection, leading to diagnostic delay and tumour progression (Govoni et al., 2021). In dogs, UC most often arises in the trigone region, where its proximity to the ureters and urethra complicates surgical management (Saulnier-Troff et al., 2008; Takahashi et al., 2025). Canine UC has gained attention not only as a clinical concern in veterinary medicine but also as a naturally occurring model for invasive bladder cancer in humans. The disease shares key histopathological features, clinical progression, and molecular alterations with human UC, including mutations in TP53 and PIK3CA (Wu, 2023). This makes dogs valuable translational models in comparative oncology. Furthermore, urinary extracellular vesicle-associated microRNAs identified in dogs with UC parallel those under investigation as biomarkers in human bladder cancer diagnostics, further supporting their use in cross-species research (Karttunen et al., 2024). Environmental risk factors-such as exposure to lawn herbicides, insecticides, and aromatic amines-are common to both canine and human populations, reinforcing the importance of dogs as sentinels for environmental carcinogenesis (Kim and Park, 2023; Owada, 2024). As companion animals, dogs share household environments with humans and therefore provide unique insights into shared health risks through a One Health lens. Surgical management of canine UC remains complex due to the disease's predilection for the trigone and the frequent presence of microscopic metastases at diagnosis. Although total cystectomy has been explored, it is technically demanding and associated with high complication rates, including urinary tract infections and renal insufficiency (Roberts et al., 2023; Takahashi et al., 2025). Consequently, partial cystectomy-particularly when combined with ureteral reimplantation -has emerged as a feasible alternative in anatomically favorable cases. This technique allows for local tumor control while preserving urinary function (Marvel et al., 2017; Chu et al., 2025).

Evidence from recent studies supports the role of partial cystectomy, particularly when integrated with adjuvant medical therapy, in improving clinical outcomes for dogs with urothelial carcinoma (UC). Marvel et al. (2017) reported a median survival of 348 days following surgery alone, while Bradbury et al. (2021) demonstrated significantly extended survival-up to 498 days-when surgery was combined with chemotherapy and non-steroidal anti-inflammatory drugs (NSAIDs). A prospective cohort study by Owens and Huang (2025) further highlighted not only prolonged survival but also preservation of urinary continence and marked improvements in post-surgical quality of life. Prognostic indicators such as tumour grade, the presence of lymphatic invasion, and clear surgical margins have consistently been associated with reduced recurrence and improved survival (Govoni et al., 2021; Garcia et al., 2022). Although partial cystectomy is generally considered palliative, tumour debulking offers substantial therapeutic benefit by facilitating local control, relieving urinary obstruction, and enhancing the efficacy of systemic therapies (Xu et al., 2024).

Advances in diagnostic imaging, histopathological evaluation, and surgical techniques have renewed interest in bladder-sparing surgery as a means to improve both quality of life and survival time in affected dogs. Present study described the clinical presentation and surgical management of a high-grade papillary urothelial carcinoma (UC) in a young Great Dane dog using partial cystectomy with ureteral reimplantation.

2. MATERIALS AND METHODS

The study was conducted during October, 2024-June, 2025 at Teaching Veterinary Clinical Complex, Bihar Veterinary College, Bihar Animal Sciences University, Patna, Bihar, India. A three-year-old male Great Dane dog weighing approximately 50 kg was presented with chronic hematuria and stranguria unresponsive to medical therapy. Routine hematological and biochemical evaluations were within normal limits, and infectious causes were excluded. Ultrasonography revealed a hypoechoic, highly vascular mass measuring 3.71×6.38 cm^2 that occupied more than half of the urinary bladder lumen (Figure 1 a and b). Histopathological examination of the bladder wall, stained with hematoxylin and eosin at 100× magnification, demonstrated high-grade papillary urothelial carcinoma characterized by papillary fronds lined by atypical urothelial cells exhibiting pleomorphism, nuclear hyperchromasia, prominent nucleoli, a high mitotic index, disorganized stratification, necrosis, and invasion into the submucosa (Figure 2a and b).

2.1. Surgical management

For removing the papillary urothelial carcinoma a partial cystectomy along with ureteral reimplantation was performed. The surgery was performed under general anesthesia. Approximately 60% of the bladder wall, including part of the trigone and right ureter, was excised. Hemostasis was maintained with electrocautery, and the

Figure 1: Ultrasonographic images of the urinary bladder; a: Intraluminal soft tissue mass with prominent vascular supply; b: Mass attachment to the dorsal bladder wall near the trigone; c: Recurrent soft tissue mass visualized three months postoperatively

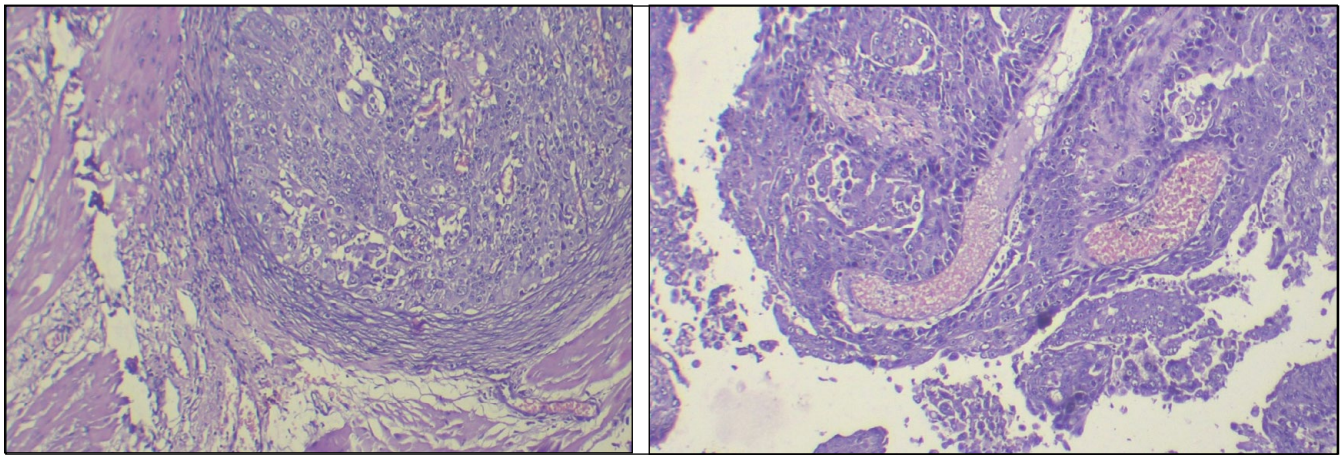

Figure 2: Histopathological features of the urinary bladder wall (Hematoxylin and Eosin staining, 100× magnification); (a) Bladder mucosa replaced by papillary fronds lined with markedly atypical urothelial cells exhibiting nuclear pleomorphism, hyperchromasia, prominent nucleoli, and frequent mitotic figures, (b) Loss of epithelial polarity, cellular crowding, and submucosal invasion consistent with high-grade papillary urothelial carcinoma (H&E, 100×)

right ureter was reimplanted into the lateral bladder wall. The bladder was reconstructed using a double-layer closure, consisting of an inner simple continuous appositional layer followed by a Cushing inverting pattern, employing 3-0 polyglactin 910 absorbable suture material. The entire bladder was omentalized to support vascularization and healing, while preservation of the trigonal neurovascular supply was prioritized as recommended for functional outcomes (Figure 3a, b, and c) (Saulnier-Troff et al., 2008). Patency was confirmed intraoperatively by urethral catheterization and saline flushing; the abdominal incision was then closed routinely. Postoperatively, the animal was treated with amoxicillin-sulbactam @ 12 mg kg^{-1} body weight intramuscularly twice for 7 days, and meloxicam @ 0.2 mg kg^{-1} body weight intramuscularly for one day and 0.1 mg kg^{-1} body weight intramuscularly for next two days.

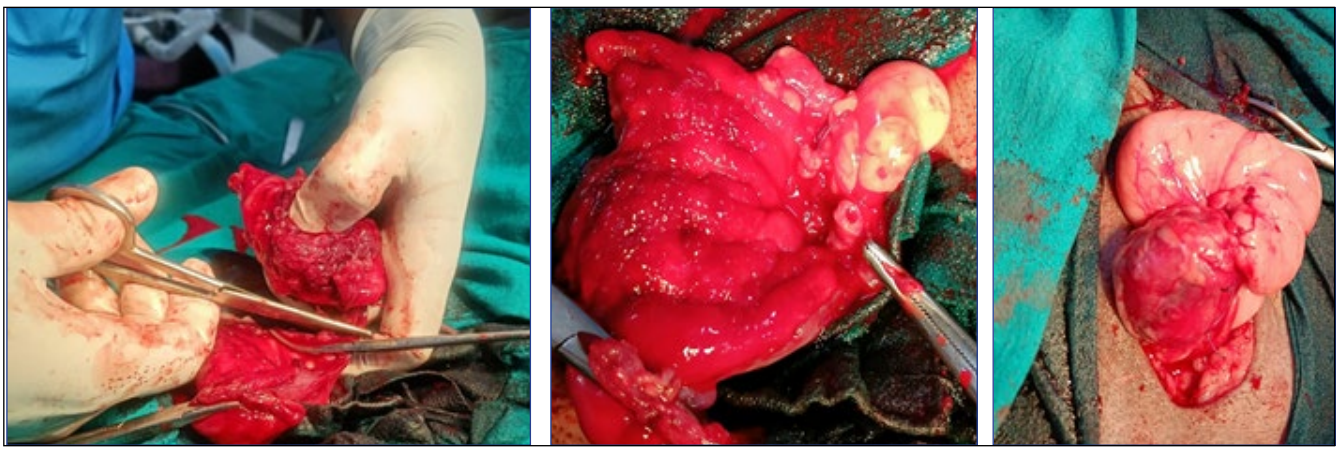

Figure 3: Intraoperative photographs during partial cystectomy: (a) Resection of the tumorous mass; (b) Reimplantation of the right ureter; (c) Omentalization of the reconstructed urinary bladder

3. RESULTS AND DISCUSSION

Postoperative recovery was uneventful. The dog was bright, alert, and responsive within hours of surgery, with appetite returning within 24 hours. Adequate urine output was maintained via urethral catheterization for the first 48 hours, followed by spontaneous urination. Voluntary urination was completely restored by postoperative day seven, and no signs of urinary incontinence or dysuria were observed. The surgical wound healed without complications, and the animal resumed normal feeding and activity within one week. Routine postoperative hematological and biochemical parameters remained within normal limits, indicating satisfactory systemic recovery. Daily monitoring for ten days revealed no evidence of infection, hematuria, or urinary retention. These findings demonstrate that partial cystectomy with ureteral reimplantation, when performed with preservation of the trigonal neurovascular supply and omentalization, ensures favorable short-term functional outcomes. Similar successful postoperative recoveries have been reported by Saulnier-Troff et al. (2008) and Marvel et al. (2017), emphasizing the importance of meticulous surgical technique in maintaining bladder function.

Follow-up ultrasonography performed three months after surgery revealed satisfactory bladder wall regeneration with a smooth mucosal surface and a patent ureterovesical junction, confirming the success of ureteral reimplantation. However, a recurrent intravesical mass measuring approximately 1.89×4.28 cm^2 was detected on the dorsal bladder wall. Despite this recurrence, the dog maintained normal urination and an acceptable quality of life. The patient survived for an additional seven months following diagnosis, demonstrating that partial cystectomy can provide meaningful palliation and preservation of urinary function even in high-grade cases. These findings align with previous studies reporting that partial cystectomy offers effective palliative benefit in dogs with urothelial carcinoma. Bradbury et al. (2021) and Hildebrandt et al. (2023) observed median survival times of up to 498 days in dogs treated with partial cystectomy combined with adjuvant therapy. Such outcomes highlight the value of bladder-sparing surgery in prolonging survival and improving life quality when tumors are localized and non-infiltrative.

Canine urothelial carcinoma closely parallels human muscle-invasive bladder cancer at molecular and pathological levels, sharing mutations in *TP53* and *PIK3CA* (Wu et al., 2023). These similarities underscore the translational significance of canine models for advancing human oncology. Recent studies also identified urinary extracellular vesicle–associated microRNAs-such as *miR-182* and *miR-221*-as potential biomarkers for early detection and disease monitoring in both species (Karttunen et al., 2024). From a One Health perspective, dogs serve as environmental sentinels due to shared exposure to carcinogenic compounds such as pesticides, herbicides, and aromatic amines, which are implicated in urothelial carcinoma in both humans and animals (Owada, 2024). Therefore, this case not only contributes to veterinary surgical oncology but also holds broader implications for environmental and comparative cancer research. The absence of adjuvant chemotherapy or immunotherapy represents a key limitation in this case, as these modalities have been shown to improve disease control and survival in canine UC (Xu et al., 2024). Additionally, molecular profiling was not performed, which restricted deeper understanding of tumor biology and its relevance to human UC.

Nevertheless, this case reinforces that partial cystectomy with ureteral reimplantation is a viable surgical option for managing high-grade papillary UC in dogs. While not curative, it significantly alleviates clinical signs, restores urinary function, and enhances quality of life. With appropriate case selection and integration of adjuvant therapies, bladder-sparing surgery can offer substantial clinical and palliative benefits in veterinary oncology.

4. CONCLUSION

Partial cystectomy with ureteral reimplantation effectively managed high-grade papillary urothelial carcinoma in a Great Dane, restoring normal urinary function and providing meaningful palliation. Despite recurrence, the dog maintained good urinary function and quality of life for seven months postoperatively. This study highlighted the clinical value of bladder-sparing surgery in the management of urothelial carcinoma.

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