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CASE

A novel combined laparoscopic and transurethral resection technique for urachal adenocarcinoma: technique description and literature review

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Abstract

Urachal adenocarcinoma is a rare malignancy representing a small percentage of all bladder adenocarcinomas. While open surgery with partial cystectomy and en bloc resection of the umbilicus remains the gold standard, minimally invasive approaches are gaining traction. This report presents a novel combined laparoscopic and transurethral resection technique for urachal carcinoma, detailing its feasibility, minimal morbidity, and long-term outcomes. We describe the case of a 60-year-old male who presented with frank hematuria and was found to have a 1.5 cm domal bladder mass, later confirmed as urachal adenocarcinoma. The patient underwent a combined laparoscopic and transurethral resection, wherein the tumor was first resected transurethrally with laparoscopic monitoring, followed by laparoscopic dissection along the urachal tract. The bladder was then repaired laparoscopically. This approach allowed for complete tumor resection with clear surgical margins and minimal blood loss. The patient experienced no postoperative complications and demonstrated no evidence of recurrence after 12 years of follow-up. A review of the existing literature highlights the diverse clinical presentations of urachal adenocarcinoma, the lack of a standardized staging system, and the evolving role of minimally invasive surgery. While open surgery remains the preferred approach in many cases, our experience, along with other emerging evidence, suggests that a combined laparoscopic and transurethral resection can be a safe and effective alternative for selected patients. This technique warrants further investigation in larger studies to confirm its long-term oncological efficacy.

Keywords: Uracus carcinoma, laparoscopic resection, transurethral

Introduction

Bladder adenocarcinomas represent only 1.4% of all types of bladder cancer. 10 – 40% of these rare bladder adenocarcinomas are urachal adenocarcinomas [1]. The estimated annual incidence of urachus adenocarcinoma is one in five million individuals within the general population [2]. While open surgery with partial cystectomy and en bloc resection of the umbilicus remains the gold standard, minimally invasive approaches are gaining more indications [3]. This report describes a novel combined laparoscopic and transurethral resection technique for urachal carcinoma, highlighting its feasibility, operation related comorbidity and long-term outcomes.

Case presentation

A 60-year-old male presented to our urological center with frank hematuria. Cystoscopic examination revealed a 1.5 cm domal bladder mass. The intravenous pyelography (IVU) did not show any abnormalities. The next step would be a transurethral resection of bladder tumor (TURBt) which was done, and the mass was biopsied, and the base of the mass was in the bladder diverticulum. It was also noticed that necrotic tissues were coming through the diverticulum by pressing on the lower abdo-

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Figure 1. CT with IV contrast showing the remnants of uracus (yellow arrow).

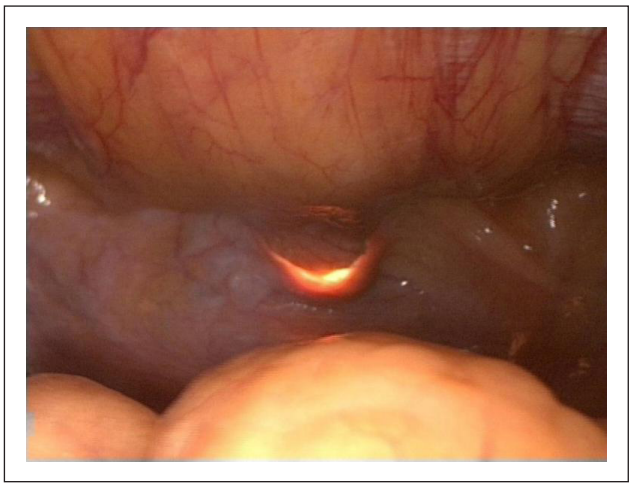

Figure 2. Laparoscopic monitoring the transurethral resection progress.

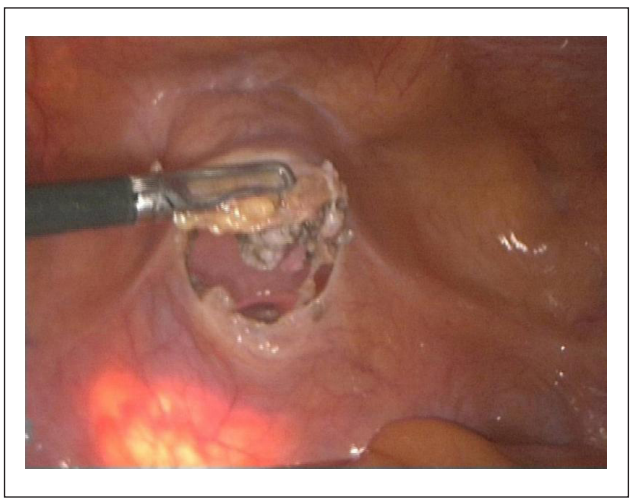

Figure 3. The tumor is completely resected through the bladder wall transurethrally.

men. A strong suspicion of patent urachus remnants and urachus adenocarcinoma was developed, which was confirmed by the pathology which reported a tumor tissue of a moderately differentiated invasive partly papillary, partly cribriform, focal extracellular mucus-forming adenocarcinoma

CT with IV contrast showed the remnants of uracus (Figure 1). It was also recommended to exclude colon carcinoma, so the patient underwent a colonoscopy which revealed no relevant colonic abnormalities. After the tumor board approval, the patient consented to a combined laparoscopic and transurethral resection.

Surgical technique

Transurethral resection and marking of tumor margins: Under general anesthesia, cystoscopy was performed. Using a resectoscope, the tumor's extent within the bladder dome was assessed. The tumor margins were precisely marked with electrocautery, ensuring accurate resection from inside the bladder.

Laparoscopic Monitoring

Simultaneously, a laparoscopic approach was established with 3 ports. The surgeon monitored the transurethral resection progress, ensuring it was not injuring the sur-

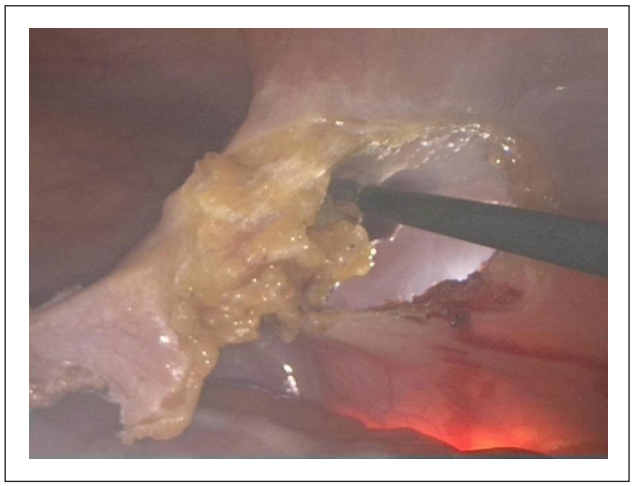

Figure 4. Laparoscopic dissection along the urachal tract towards the umbilicus.

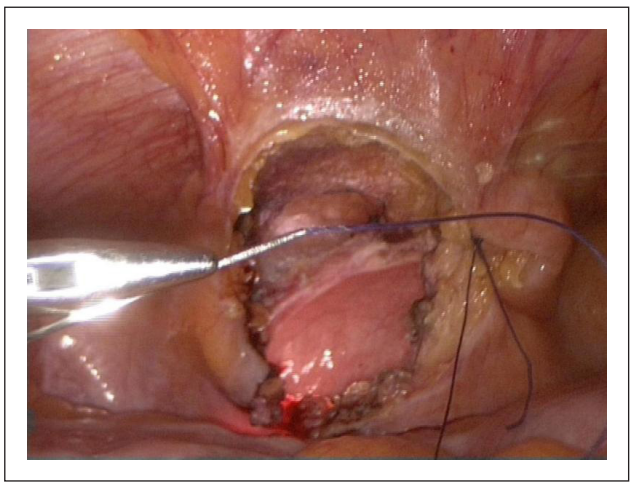

Figure 5. Laparoscopic bladder defect repair in 2 layers

rounding structures, particularly bowel loops (Figure 2).

Laparoscopic resection

Once the tumor was resected through the bladder wall transurethraly (Figure 3). The laparoscopic dissection was performed along the urachal tract towards the umbilicus, ensuring complete tumor removal (Figure 4). The bladder defect was repaired in 2 layers with 2-0 absorbable sutures (Figure 5).

Specimen Retrieval

The resected urachus and tumor mass were retrieved en bloc in a retrieval pouch through a trocar port site. Blood loss was approximately 150 mL.

Histopathological analysis of the specimen confirmed the diagnosis of an adenocarcinoma in the bladder dome with transmural Carcinoma extension. An adenocarcinoma originating from the urachus. Surgical margines are free.

In the early post operative phase: The patient had no post-operative complications; the hospital stay was 9 days. On the 9th day, a filling cystogram was performed to confirm the bladder's contour and the absence of leakage. No major perioperative complications were observed. Long-term follow-up over 12 years with cystoscopy, ultrasound, and urine cytology demonstrated no evidence of recurrence or operation related complications. This study demonstrates the feasibility and potential benefits of a combined laparoscopic and transurethral approach for urachal carcinoma. The technique offers accurate tumor resection with optimal visualization and less perioperative morbidity and prompt oncological control supported by 12 years of follow-up.

Discussion

Although in our current case, the patient was presented with frank hematuria, there are diverse clinical presentations of urachal adenocarcinoma in the literature. A recent study examined 7 patients with urachal abnormalities and reported varying modes of presentation: Four patients were diagnosed with CT after complaining of abdominal discomfort. One patient was incidentally diagnosed with urachal anomaly during positron emission tomography imaging PET-CT in the context of a follow-up plan for a prior malignant melanoma of the skin. Another patient was complaining of recurrent urinary tract infections, while the seventh patient who was already diagnosed with DiGeorge syndrome presented with secondary nocturnal enuresis [4].

Examining 17 patients, a study of urachal carcinoma reported that the most prevalent symptom was hematuria. The most common radiographic finding was a mass at the dome or anterior wall of the bladder. Additionally, they performed urine cytology for 5 patients, and only one of them (20%) showed positive urine cytology [5]. In a comprehensive systematic review, conducted to establish guidelines for the Canadian Urological Association, it was found that hematuria is a common presenting symptom in approximately 80% of patients with urachal adenocarcinoma either micro or macroscopic. Bacteriuria, mucinuria, pain, abdominal mass, and umbilical involvement were the other less frequent clinical manifestations [1].

Until now there has been no validated standardized staging system for urachal cancer. In 1984 Sheldon *et al*. introduced the first classification system for uracus carcinoma [6]. Since then various approaches have been proposed in clinical practice for staging such as the Ontario and Mayo classifications [2, 7]. Although American Joint Committee on Cancer (AJCC) did not introduce a specific TNM staging for uracus carcinoma likely because of its rarity, some studies demonstrated the usability of the TNM system and its prognostic predictability [8, 9]. Based on data from 626 patients from the national cancer database, Lemonnik *et al*. have proposed a novel TNM system which can be more balanced and more accurate in predicting prognosis, but it will need further validation studies [10].

We used the Staging system developed by Mayo Clinic who described a system based on 38 patients with uracus adenocarcinoma [7]. According to Mayo Staging, our patient was in stage II. (Table 1)

En bloc surgical resection, including partial cystectomy in conjunction with removal of the umbilicus along with the urachal ligament, was the preferred management for localized urachal adenocarcinoma. This surgery has the longest median survival rate compared to cystectomy without umbilical excision [3, 9]. In the present case, we did not remove the umbilicus, as our perspective admitted that adenocarcinoma was localized to the proximal portion of the urachus at the side of the bladder dome. This decision was supported by the lack of any abnormalities detected on CT imaging or direct inspection via laparoscopy. The same approach was used by a surgical team in Ireland when managing a comparable case, they justified their decision based on PET-CT findings confirming that the disease did not extend beyond the perivesical fat [4].

The decision to not remove umbilicus aligns with the evidence presented by Ashley *et al*. that there was no significant survival benefit of umbilectomy [11].

We did not perform pelvic lymphadenectomy as there

Table 1. Mayo staging system of urachal cancer and 10 years cancer-specific survival rate.

Stage	Tumor extent	10 years cancer-specific survival rate
I	Tumor confined to urachus and/or bladder	57%
II	Tumor extending beyond the muscular layer of urachus and/or bladder	46%
III	Tumor infiltrating the regional lymph node	0%
IV	Tumor infiltrating non-regional lymph nodes or distant sites	0%

is no survival benefit of pelvic lymphadenectomy over the primary surgical resection in the available literature, moreover, the lymphadenectomy might be accompanied by increased complications and morbidity postoperatively [1].

Though open surgery has been always the standard of care in treating uracus carcinoma as noticed in large systematic reviews [1, 5], but with the recent development in laparoscopic surgeries, it has been implemented to achieve the complete en block resection [4]. To our knowledge in 2012, we were the first to use the simultaneous combined laparoscopic and cystoscopic technique. In 2023 Irish work group reported a similar technique which was done in one case between 2015 and 2022 [4]. In our patient, the catheterization duration was 9 days, this is shorter than the mean duration of 15.33 days (range: 10-21 days) reported for the three patients who underwent laparoscopic partial cystectomy in done by Ryan *et al*. [4]. We did not face perioperative complications with our patient. In another study, Ryan *et al*. reported one case with a urinary tract infection postoperatively that necessitated rehospitalization for intravenous antibiotic administration [4].

Because of the rarity of urachal adenocarcinoma, there is limited information available regarding overall survival rates or follow-up protocols for patients with this cancer. In our present case, the patient has been closely followed up for 12 years without any evidence of recurrence of disease. According to Ashley *et al*., the 10-year cancer-specific survival rate for patients with stage II urachal adenocarcinoma is approximately 64% (Table 1) [11].

Another study reported a median overall survival time of 57.6 months for 17 patients with urachal adenocarcinoma, with 29% of patients surviving more than five years after treatment. The same study also reported that when the tumor was confined to the urachus, the median overall survival time was 6.2 years. It also reported a significant reduction in life expectancy in the case of regional lymph node involvement or distant metastases [5].

In a study of 42 Patients, the overall survival from diagnosis was 46 months, with 40% of patients surviving at 5 years. 46% of patients treated by surgical resection remained disease-free. The study reported a direct correlation between negative surgical margins as well as the absence of nodal involvement and long-term survival. The median survival was 24 months in the 26 patients who had distant metastases [3].

Conclusions

This novel combined laparoscopic and transurethral resection technique represents a promising minimally invasive approach for selected cases of urachal carcinoma. Long-term follow-up studies confirmed its efficacy and safety.

Declarations

Authors' contributions: Not applicable.

Author contributions: Kassem G. has done the surgery, Yousef A. has written the manuscript and followed the patient up while Mohammed N. has done a critical revision of the manuscript.

Availability of data and materials: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Fundings: None.

Competing interests: The authors declare that they have no competing interests.

Ethics committee approval: Ethics committee approval was received for this retrospective report.

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