

Injury to a Vesicourachal Diverticulum During Laparoscopic Port Placement: Case Report and Literature Review

Muhammad Qureshi

Department of Medicine, Spain

***Corresponding Author:**

Muhammad Qureshi

Department of Medicine, Spain

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1. Abstract

Minimally invasive surgery is widely used in modern surgical practice due to its advantages, including reduced postoperative pain, shorter hospital stay, and improved visualization. However, laparoscopic access is associated with specific risks, particularly during trocar insertion. Injury to the urinary bladder is an uncommon but recognized complication, and may be more likely in the presence of unrecognized congenital anomalies such as urachal remnants.

We report a rare case of bladder injury through a vesicourachal diverticulum caused by suprapubic port insertion during laparoscopic appendectomy in a 10-year-old boy. The injury was initially unrecognized intraoperatively but diagnosed postoperatively following abnormal drain output and imaging. The patient was successfully managed with laparoscopic repair and recovered without sequelae. A review of urachal anomalies and recommendations for prevention are also discussed.

2. Introduction

Laparoscopic surgery has become the preferred approach for many abdominal procedures, including appendectomy, due to its minimally invasive nature and diagnostic advantages. Despite its safety profile, complications related to abdominal entry remain a concern, particularly during trocar placement.

Bladder injury is a rare but significant complication of laparoscopic surgery. The risk increases with suprapubic port insertion, especially when the bladder is distended or when congenital abnormalities are present.

The urachus is an embryological structure connecting the fetal bladder to the umbilicus. Normally, it obliterates after birth to form the median umbilical ligament. Failure of complete involution results in urachal anomalies, which include patent urachus, urachal sinus, urachal cyst, and vesicourachal diverticulum. These

anomalies are usually asymptomatic and often remain undiagnosed until complications occur.

Among these, vesicourachal diverticulum is particularly relevant clinically because it represents a persistent communication between the bladder dome and a superior blind pouch, which may be vulnerable to injury during suprapubic access.

3. Case Report

A 10-year-old boy underwent elective laparoscopic appendectomy for ultrasound-confirmed acute appendicitis. Pneumoperitoneum was established using a 10-mm infraumbilical port inserted via an open technique. Two additional 5-mm working ports were placed under direct vision, including one suprapubic port.

Intraoperative findings confirmed acute appendicitis with mild pelvic fluid. A standard appendectomy was performed without complication. A 10-F Blake drain was placed through the suprapubic port site at the end of the procedure.

Postoperatively, the patient remained hemodynamically stable but developed unusually high drain output, approaching 2 liters of clear serous fluid within 24 hours. Urine output was reduced, although abdominal examination revealed only mild suprapubic tenderness without peritoneal signs.

Given the disproportionate drain output and intraoperative difficulty during suprapubic port insertion, urinary tract injury was suspected. A Foley catheter was inserted, and CT cystography was performed using diluted water-soluble contrast.

Imaging demonstrated a midline vesicourachal diverticulum extending superiorly from the bladder dome toward the umbilicus. The surgical drain was seen traversing the diverticulum, with contrast leakage into the peritoneal cavity, confirming bladder injury associated with the urachal remnant.

The patient was returned to the operating theatre for laparoscopic re-exploration. Intraoperatively, the drain was carefully removed under direct vision, revealing a small defect in the bladder wall.

The injury was repaired using a two-layer absorbable suture closure. A new drain was placed via a lateral abdominal port.

Postoperatively, the patient recovered well and was discharged on day three with an indwelling urinary catheter. A follow-up cystogram performed 10 days later demonstrated complete healing, and the catheter was removed without complications.

4. Discussion

Laparoscopic appendectomy is one of the most frequently performed emergency minimally invasive procedures and is generally associated with low morbidity. However, trocar insertion remains a critical step with potential for serious complications, including injury to the bowel, vessels, and urinary bladder.

Bladder injury during laparoscopy is uncommon, with reported

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incidence ranging from 0.2% in diagnostic procedures to higher rates in complex operative cases. The suprapubic port is particularly associated with risk due to its proximity to the bladder dome, especially when bladder decompression is inadequate or anatomical variations exist.

Urachal anomalies are rare congenital remnants of incomplete obliteration of the urachus. Vesicourachal diverticulum represents a persistent connection between the bladder and a superior blind pouch. Although typically asymptomatic, such anomalies may alter normal bladder anatomy and increase susceptibility to injury during suprapubic trocar placement.

In this case, the presence of an undiagnosed vesicourachal diverticulum resulted in inadvertent drain placement through the abnormal tract and subsequent bladder injury. The diagnosis was delayed until postoperative imaging was performed due to persistent high drain output.

This case highlights several important clinical lessons:

- Difficulty or resistance during suprapubic port insertion should raise suspicion of abnormal anatomy.
- Unexpectedly high postoperative drain output should prompt early evaluation for urinary tract injury.
- CT cystography is the imaging modality of choice for detecting bladder injuries and associated anomalies.
- Awareness of rare congenital anomalies is essential even in routine laparoscopic procedures.

5. Conclusion

Injury to a vesicourachal diverticulum during laparoscopic port placement is an extremely rare complication but can lead to significant postoperative morbidity if unrecognized. This case emphasizes the importance of careful trocar insertion technique, bladder decompression, and early recognition of abnormal postoperative findings. Prompt imaging and surgical repair result in excellent outcomes. Awareness of urachal anomalies should be maintained, particularly when unexpected resistance or complications occur during suprapubic port placement.

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