Isolated Blunt Traumatic Bladder Injury: Laparoscopic Repair and Literature Review

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Introduction

Blunt traumatic bladder injuries are relatively uncommon, accounting for less than 2% of all trauma cases. They are typically associated with significant pelvic fractures, and isolated cases without concurrent injuries are rare. The most common type is intraperitoneal bladder rupture, typically occurring at the bladder dome due to its vulnerability to increased intravesical pressure during trauma. Surgical management usually involves open repair, with laparoscopic approaches being less documented. We present a rare case of isolated intraperitoneal bladder rupture secondary to blunt abdominal trauma, successfully managed with laparoscopic two-layer repair. This case contributes to the growing body of evidence supporting laparoscopic management of bladder injuries.

Case Description

A 36-year-old female was brought in by EMS as a level 1 trauma activation following a motor vehicle collision (MVC) with reported loss of consciousness and suspected intoxication. She presented hemodynamically stable, with abdominal pain and a positive focused assessment with sonography in trauma (FAST) in the emergency department. There was diffuse mild tenderness, but no frank peritonitis.

A CT scan revealed moderate intra-abdominal and pelvic fluid surrounding the spleen, liver, paracolic gutters, mesentery, retroperitoneum, and pelvis, raising concerns for intra-abdominal injury. Notably, there was fluid accumulation in the right mid-abdomen adjacent to a segment of small bowel located anterior to the second portion of the duodenum. Bowel injury could not be ruled out, and no solid organ injury was identified.

Case Description

A Foley catheter was placed, revealing gross hematuria. Given the concern for hollow viscus injury, the patient was taken to the operating room for exploratory laparoscopy. Intraoperatively, an isolated 3 cm bladder dome rupture was found, with no other signs of intra-abdominal injury. A two-layer laparoscopic bladder repair was performed using intracorporeal suturing with a running 2-0 Vicryl suture for the mucosal and muscular layers, followed by a second layer of seromuscular sutures. Intraoperative cystoscopy confirmed an intact repair with a negative leak test. A Foley catheter was left in place for decompression.

The patient tolerated the procedure well and was discharged in stable condition on postoperative day (POD) 4 with an indwelling catheter. A follow-up cystogram on POD 14 showed no evidence of bladder leakage, and the Foley was successfully removed. The patient was seen again in the clinic weeks later with full recovery and was discharged from further follow-up.

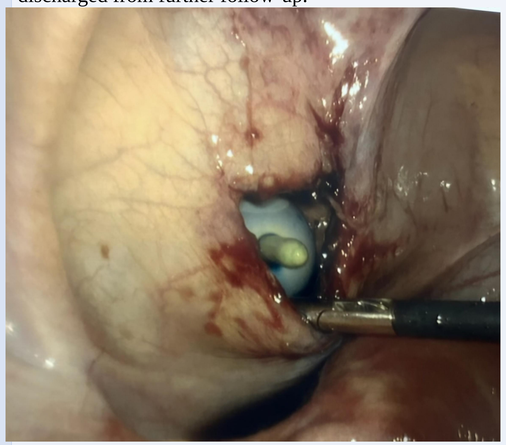


Figure 1. Dome of bladder rupture ~3cm with Foley balloon visible from the peritoneal cavity.



Figure 2. Completed two-layer, laparoscopic intracorporeal repair

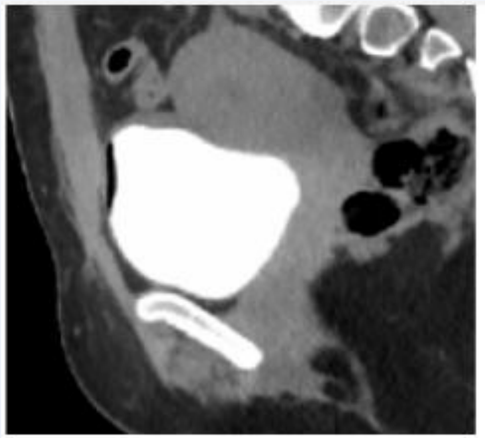


Figure 3. Sagittal CT cystogram POD 14 demonstrating well healed bladder with lack of contrast extravasation.

Discussion

Surgical Approach:

Traditionally, intraperitoneal bladder ruptures have been managed via open surgical repair. However, advancements in minimally invasive techniques have introduced laparoscopic repair as a viable alternative. Laparoscopy offers several benefits, including reduced operative morbidity, decreased postoperative pain, shorter hospital stays, and faster recovery times. In this case, the successful laparoscopic two-layer repair of the bladder dome injury aligns with findings from similar cases reported in the literature. For instance, a study by Hanna et al. demonstrated that laparoscopic repair of traumatic intraperitoneal bladder rupture is a safe and effective technique, offering advantages over traditional open repair.

Patient Selection:

The selection of patients for laparoscopic repair should be meticulous. Ideal candidates are hemodynamically stable with isolated bladder injuries and no indications for immediate laparotomy due to other intra-abdominal injuries. In this case, the patient's stability and the isolated nature of the bladder injury made her an appropriate candidate for the laparoscopic approach. This selection criterion is supported by the European Association of Urology (EAU) guidelines, which suggest that laparoscopy might be considered in repairing isolated intraperitoneal injuries in hemodynamically stable patients without other indications for laparotomy.

Surgical Technique:

The laparoscopic technique employed involved a two-layer closure of the bladder defect, which is consistent with recommended practices. A study by Jeong et al. reported successful laparoscopic repair of intraperitoneal bladder ruptures using similar techniques, highlighting the feasibility and safety of this approach.

Postoperative Management:

Postoperative care included bladder decompression with a Foley catheter and follow-up imaging to ensure the integrity of the repair. This approach is in line with current guidelines, which recommend urinary drainage with a urethral catheter after surgical management of bladder injuries.

Conclusion

This case underscores the importance of considering isolated intraperitoneal bladder rupture in patients with blunt abdominal trauma, even in the absence of pelvic fractures. The successful laparoscopic management of such injuries demonstrates that, with appropriate patient selection, minimally invasive surgery can be a safe and effective alternative to open repair. The benefits of laparoscopic repair, including reduced postoperative pain, shorter hospital stays, and faster recovery, highlight the need for further studies to establish standardized guidelines and to compare outcomes between laparoscopic and open repair techniques for bladder injuries.

References

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