



Important Points of Diagnosis and Treatment Strategy of Intraperitoneal Bladder Perforation due to Blunt Pelvic Trauma in a Pediatric Case

Pediyatrik Bir Olguda Künt Pelvik Travmaya Bağlı İntraperitoneal Mesane Perforasyonunun Tanı ve Tedavi Stratejisinde Önemli Noktalar

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Abstract

Intraperitoneal bladder perforation is a vital condition that is characterized by perforation of the bladder into the intra-abdominal area. It can lead to severe peritonitis and a delayed diagnosis can be life-threatening. Bladder perforations are occurred by high-energy blunt trauma that disrupts the bony pelvis, direct blow to a distended bladder, penetrating traumas, urogynecological interventions, indwelling catheters and iatrogenic causes. A 9-year-old boy who was involved in a moderate velocity a motor vehicle accident was referred to our hospital due to pelvic fracture. Primary assessment of the patient suggested hemodynamic stability without any signs of peritonitis and/or distention. With this case report, we aimed to present the clues in the diagnosis of intraperitoneal bladder perforation and our treatment strategy in cases where the symptoms and signs are insufficient to show intraperitoneal bladder perforation.

Keywords: Bladder perforation, pelvic fracture, laparoscopy

Öz

Intraperitoneal mesane perforasyonu, mesanenin karın içi bölgeye perforasyonu ile karakterize yaşamsal bir durumdur. Şiddetli peritonite yol açabilir ve gecikmiş tanı hayatı tehdit edici olabilir. Mesane perforasyonları, kemik pelvisi bozan yüksek enerjili künt travmalar, dolu mesaneye direkt darbe, penetran travmalar, ürojinekolojik girişimler, kalıcı kateterler ve iyatrojenik nedenlerle oluşur. Orta hızlı motorlu trafik kazası geçiren 9 yaşında erkek çocuk pelvis kırığı nedeniyle hastanemize sevk edildi. Birincil değerlendirmede olgu hemodinamik olarak stabildi, herhangi bir peritonit bulgusu ve/veya distansiyonu yoktu. Bu olgu sunumu ile semptom ve bulguların intraperitoneal mesane perforasyonunu göstermede yetersiz kaldığı durumlarda intraperitoneal mesane perforasyonu tanısının koyulmasındaki ipuçlarını ve tedavi stratejimizi sunmayı amaçladık.

Anahtar Kelimeler: Mesane perforasyonu, pelvis kırığı, laparoskopi

Introduction

Bladder perforations are occurred by high-energy blunt trauma that disrupt the bony pelvis, a direct blow to a distended bladder, penetrating traumas, urogynecological interventions, indwelling catheters and iatrogenic causes.¹ In pediatric age group, it is uncommon, in approximately accounting for only 0.05-2.0% of all pelvic trauma cases.² Intraperitoneal perforation of bladder accounts for nearly 17% of the bladder injuries in children³ and may lead to cause a wide clinical

spectrum such as abdominal pain, gross hematuria, inability to urinate, infection, peritonitis, sepsis and death.^{1,4} Computed tomography (CT) with contrast scan with retrograde cystography is the most sensitive and specific radiologic imaging to reveal intraperitoneal bladder perforation.⁵

Herein, we report a pediatric case with intraperitoneal bladder perforation due to motor vehicle accident. The main purpose in this case report to emphasize important and challenging points of diagnosis and treatment strategy.

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Case Report

A 9-year-old boy who was involved in a moderate velocity motor vehicle accident was referred to our hospital due to pelvic fracture after his initial treatment at the 12th hour of the trauma. Primary assessment of the patient suggested hemodynamic stability without any signs of peritonitis and distention. The patient had a 8 FR Foley catheter and urine output during the follow-up was 1.1 cc/kg/h. While the patient had gross hematuria upon arrival, the urine gradually became clear visual appearance. Digital rectal examination was uneventful. No concomitant rectal injury was detected.

Laboratory results showed increased blood urea nitrogen (BUN) (21.7 mg/dL) and creatinine (0.8 mg/dL) levels, leukocytosis (26.800/uL), thrombocytosis (410.000/uL), slight anemia (11.7 g/dL) and microscopic hematuria. Plain radiographs were uneventful except for pelvic fractures (Figure 1). CT images ruled out thoracic injury or solid organ pathology and revealed pelvic and paracolic free fluid. The superior and inferior right pubic ramus and the left iliac wing were fractured. Hematoma was detected in presacral area. Bladder perforation could not be ruled out due to presence of presacral hematoma, persistence of microscopic hematuria, presence of intraabdominal fluid without any solid organ injury, and inability to clearly assess the bladder because of the Foley catheter. CT scan with retrograde cystography using water-soluble contrast was performed and revealed intraabdominal contrast extravasation with a 2 mm defect from the superiolateral aspect of the bladder (Figure 2A). An orthopedic consultation regarding pelvic fractures was requested. No surgery was planned by the orthopedics and immobile follow-up was recommended.



Figure 1. A plain radiograph showing of the superior and inferior right pubic ramus fracture (arrow)

Laparoscopy was performed with three 5 mm ports. Laparoscopic examination of the abdomen revealed approximately 5 cm perforation at the dome of the bladder (Figure 2B). The perforation was repaired in two layers using continuous 3/0 polyglactin (Ethicon, Inc., Somerville, NJ, USA) for mucosa and water-tight 2/0 polyglactin (Ethicon, Inc., Somerville, NJ, USA) for detrussor muscle. The repair was tested using dilute methylene blue. No extravasation was observed and no drains were used. Under recommendation of orthopedics, the patient was kept immobile. Proper intravenous (IV) hydration, IV ampicillin-sulbactam [150 mg/kg/day ter in die or three times a day (t.i.d.)] and oxybutynin were given. The follow-up laboratory results showed normalized BUN and creatinine levels with a normal leukocyte count. The Foley catheter was removed on day 10 after a control cystography (Figure 3A, 3B) and the patient was discharged with no complications. Postoperative first month control visit was uneventful.

All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki. Written informed consent was obtained from the patient and parents for publication of this manuscript.

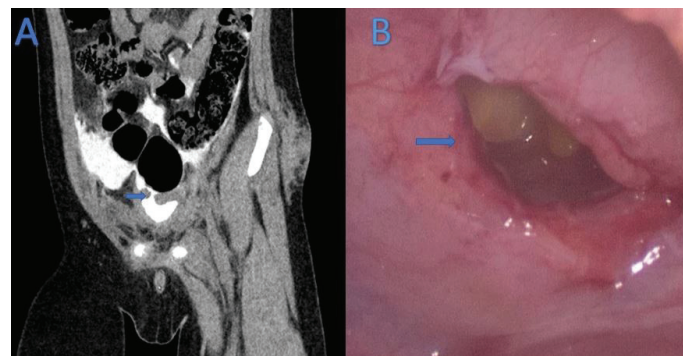


Figure 2. (A) CT-assisted cystography revealed of contrast medium extravasation from superiolateral aspect of bladder (arrow) (B) Laparoscopic view of the bladder wall defect (arrow)
CT: Contrast scan

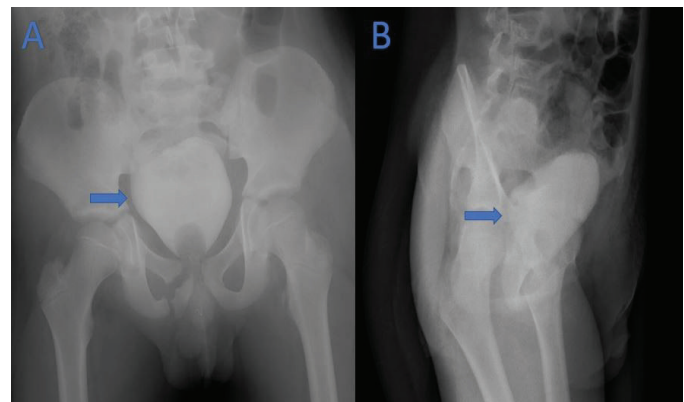


Figure 3. (A) Retrograde cystogram confirmed an intact bladder with no extravasation (anteroposterior view) (arrow) (B) Lateral view (arrow)

Discussion

Injury to the urinary bladder is rare, challenging situation for pediatric emergency specialists and pediatric surgeons due to controversies in diagnosis and treatment. Basically, four types of bladder injuries can be observed, these are bladder contusion, extraperitoneal perforation, intraperitoneal perforation, and combined perforation with extraperitoneal and intraperitoneal. While extraperitoneal bladder perforation usually occurs at anterolateral aspect near the bladder neck related to pelvic fracture, intraperitoneal bladder perforation occurs via a large horizontal tear in the dome of the full bladder and is believed to be the result of a blow delivered to the lower abdomen.¹

Clinically, abdominal pain and/or abdominal distention, hematuria, inability to urinate or no urine output via catheter are suggestive findings regarding intraperitoneal bladder perforation. Intraperitoneal bladder perforation and urinary ascites can lead to severe peritonitis, electrolyte imbalance and acute kidney failure.⁶⁻⁸ In present case, there was no peritonitis signs and/or abdominal distention. Throughout the whole diagnostic process, the urine output was above >1 cc/kg/h and hematuria was gradually cleared. In laboratory analyzes, the patient had increased value of BUN and creatinine levels and microscopic hematuria. When the clinical findings of the patient were evaluated, although the vital signs were stable, acute renal failure signs and decreased urine output that did not improve despite appropriate fluid replacement and microscopic hematuria were conditions suggestive of intraperitoneal bladder perforation.

The diagnostic methods for bladder perforation are conventional cystography or CT-assisted cystography. CT-assisted cystography with high sensitivity and specificity⁵ has some advantages that gives valuable information in terms of showing the perforation area in detail, demonstrating adjacent and distant organ injuries and determining the perforation relationship with the surrounding bony tissues. In present case, the diagnosis of intraperitoneal bladder perforation was confirmed by CT-assisted cystography. CT-assisted cystography revealed a perforation area of approximately 2 mm in the superolateral of the bladder, contrast extravasation from this localization to the intraabdominal area, and hematoma in the adjacent presacral area.

In the literature, intraperitoneal bladder perforations are repaired via laparotomy or laparoscopy.^{1,3} Conservative treatment is also applied in the treatment of intraperitoneal bladder perforation.⁹ In current case, perforation was repaired with laparoscopy, which is a minimally invasive method. During laparoscopy, the perforation area, which was evaluated as 2 mm radiologically, was detected to be approximately 5 cm. We think that it is remarkable that

the 2 mm perforation, which encourages the conservative method, is observed to be quite large during laparoscopy. This observation indicate us that in case of intraperitoneal injury, laparoscopy should be performed regardless of radiological size of defect. Intraperitoneal injuries of the bladder should be laparoscopically evaluated and repaired. Laparoscopic repair is a safe method in hemodynamically stable patients with no significant intraabdominal injuries.

Conclusion

Microscopic hematuria and impaired renal function tests without abdominal pain or abdominal distension may indicate intraperitoneal bladder perforation, while clear visual appearance of urine with a catheter or presence of urine output may not exclude perforation. CT-assisted cystography must be performed in the presence of clinical suspicion in multi trauma patients with pelvic fracture.

Considering the anatomical features of the bladder, it may be misleading to decide on conservative treatment with the perforation area evaluated only radiologically, as in our case. In the presence of intraperitoneal bladder perforation, laparoscopy should be performed to avoid the morbidity and mortality caused by intraperitoneal bladder perforation and to determine the defect size. Laparoscopic repair can be performed as an effective method in both diagnosis and treatment.

Ethics

Informed Consent: Written informed consent was obtained from the patient and parents for publication of this manuscript.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: C.K., O.U., Concept: C.K., O.U., E.U., M.D., Design: C.K., O.U., E.U., M.D., Data Collection or Processing: C.K., O.U., E.U., Analysis or Interpretation: O.U., E.U., M.D., Literature Search: O.U., E.U., M.D., Writing: O.U., E.U., M.D.

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