

CASE REPORT

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Bladder Neck Rupture Following Perineal Bull Horn Injury: A Surgical Challenge

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Abstract: Pelvic-abdominal injuries caused by goring are serious lesions which require rapid diagnosis and urgent treatment in the context of a polytraumatized patient. The simultaneous rupture of both the bladder and the prostatic-membranous urethra occurs in 10%–29% of males with pelvic fractures but bladder neck injuries in adults are rarer. Unstable pelvic fractures, bilateral fractures of the ischiopubic branches (also referred to as fractures from falling astride) and the diastasis of the pubic symphysis are those that have the greatest likelihood of injuring both the posterior urethra and the bladder.

We present a case of perineal bull horn injury with muscle laceration, bone fractures, scrotal avulsion and rupture of the bladder neck involving the right ureter which required two operations to be repaired.

Keywords: bull horn injury, reconstructive surgery, urethral disruption, bladder rupture

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Introduction

In Spain, bullfights are the cause of 20–26 serious injuries per year. Of these patients, 3% die from associated injuries, contusions, and multiple trauma.¹ The most affected areas are the thighs and inguinal region (54%).² The perineum is affected in 7% of the cases. Penetrating inguinal and perineal injuries are associated with major vascular injuries in many cases.³

Here we report a case of perineal bull horn injury with muscle laceration, bone fractures, scrotal avulsion, and bladder neck disruption which required two operations to be repaired.

Case Report

A 27 year old male was transported to the emergency department after suffering a penetrating bull horn injury. He was standing watching a bull race when the animal charged at the audience and gored him in the perineum. His past medical history was unremarkable. Upon examination, the skin and mucous membranes were pale; the patient had normal blood pressure but was tachycardic. The abdomen was tender to palpation with rebound tenderness. On inspection of the injury several entry points were noted and multiple internal trajectories were suspected. Laboratory examinations revealed a hemoglobin of 12 g/dl, hematocrit 35%, leukocytes 12,240/mm³, platelets 55,000/mm³; sodium 145 mEq/L, potassium 4.8 mEq/L; normal renal function, the venous blood gases showed a pH of 7.27, pCO₂ 39 mmHg, pO₂ 45 mmHg, bicarbonate 17.9 mEq/L.

An emergency surgical exploration by surgeons was performed, which revealed multiple injuries in the anal canal. These injuries follow upward bilateral trajectories in the anterior perineum. A semicircular incision was made anterior to the anal margin extending to the right inguinal fold. The anterior perineal muscles were lacerated on both sides to a depth of 15 cm on the right side and 12 cm on the left side. There was a profuse bleeding from the torn muscles. In addition, diastasis of the pubic symphysis and the right sacroiliac joint and multiple pelvic fractures were observed. While attempting to catheterize the urethra, a rupture at the base of the bladder as well as an injury of the prostatic urethra was discovered.

In light of these findings, a midline infraumbilical laparotomy was performed, dissecting the Retzius space, and the urologist was called. A rupture of

the bladder neck with complete separation of the prostate was found. Additionally, ruptures of the anterior and the left lateral walls of the bladder with the trigone partially conserved were also discovered. Reconstruction of both the urethra and the bladder neck around the urethral catheter balloon was performed, as well as the plasty of the bladder walls following the guide of a cystostomy tube. This characterized an important lack of substance which increased the difficulty of suturing the recognized structures. The right ureteral orifice was not found in the residual trigone attached to the bladder. A cystostomy tube was left in place. Single-layer closure was carried out on the bladder wall due to the active pelvic bleeding. Isolated descending colostomy with a Hartmann pouch was performed due to the damages of the rectum and the pelvic floor muscles. The anorectal tear was sutured, and a FloSeal[®] hemostatic matrix (Baxter, Spain) and a compressing packing were applied to control bleeding. The perineal incision was only partially closed. In the plain roentgen of the abdomen, a right acetabular fracture associated with diastasis of the pubic symphysis, with a Tile type B fracture were identified. An external fixator supported by the iliacal crests was placed by the orthopedic surgeon. Because of the concomitant sacroiliac injury it was not possible to close completely the pubic diastasis (Fig. 1).

After arriving the Intensive Care Unit, a hemoglobin of 5 g/dl and a prothrombin time of 45% and an activated partial thromboplastin time of 48 seconds



Figure 1. External fixator.

were identified, and the patient required transfusion of 12 units of packed red blood cells. In addition prothrombin complex, fibrinogen and activated factor VII and high dose vasoactive medication were administered.

On the third postoperative day, urine loss from the perineal wound was observed and there was decreased urine output through the catheter.

On the sixth postoperative day, a CT-scan was performed which confirmed multiple fractures in the right acetabulum and right side of the sacrum and a large diastasis of the pubic symphysis (Fig. 2). Diluted blue methylene instilled through the urethral catheter exited through the perineal wound.

On the 25th day after injury, a reoperation was performed. The bladder was approached extraperitoneally through the midline incision and opened after releasing multiple adhesions. A perforation on the left and posterior vesical wall near the bladder neck was identified. The right ureter was found to enter in the previously reconstructed prostatic urethra. Two ureteral catheters were placed and individually externalized, the bladder opening was double-layer closed, and a perivesical drain was left in place (Fig. 3).

Metal plates were placed on the pubic symphysis without achieving perfect union. The external fixator

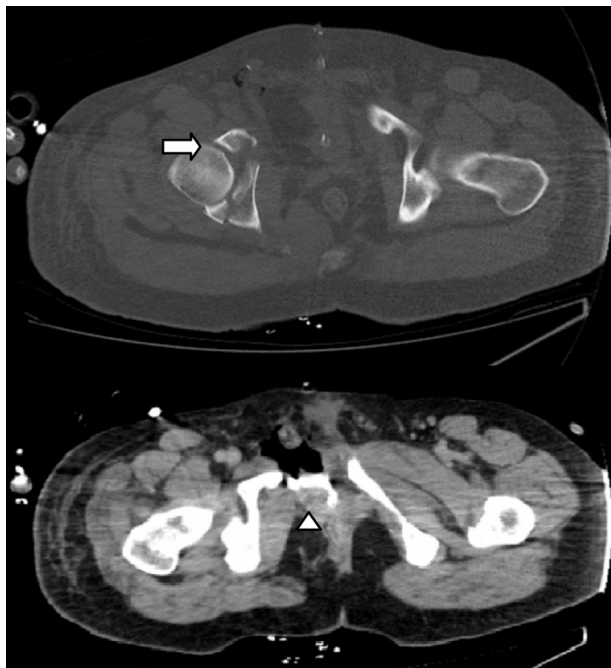


Figure 2. CT-scan: multiple fractures in the right acetabulum (arrow) and right side of the sacrum and a large diastasis of the pubic symphysis (triangle).

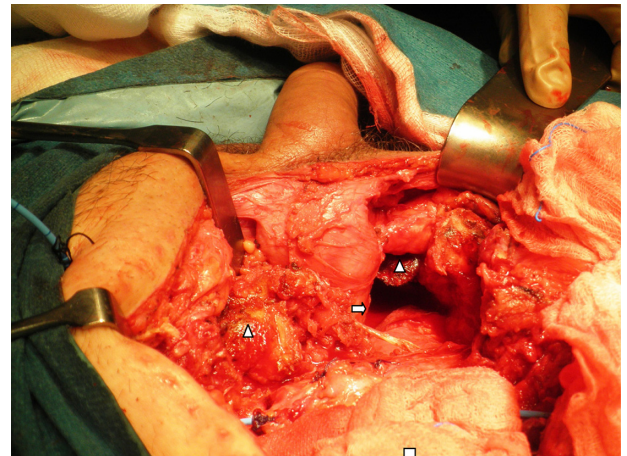


Figure 3. Extraperitoneal approach with tissue loss (arrow), bone displacement (triangle) and the bladder (square).

was removed. The right testicle was identified above the fractured pubic ramus and was replaced in the scrotum (Fig. 4).

The postoperative recovery was uneventful, all urine drained from the ureteral catheters and the fistula closed. Nine days after the second intervention the patient was transferred to his home hospital.

After three months of urinary continence and spontaneous urination, urine leak through the perineum began because of reopening of the perineal fistula, and urine diversion with an ileal conduit was necessary. The patient also presented a severe

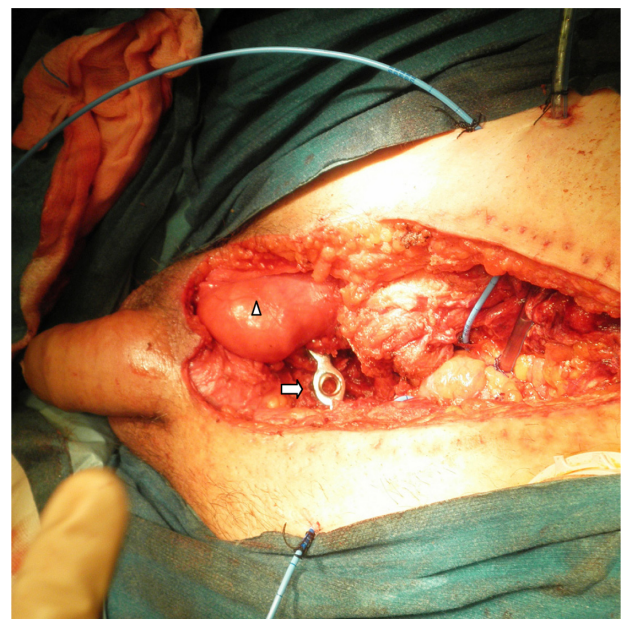


Figure 4. Metal plate on the pubic symphysis (arrow) and right testicle above the fractured pubic ramus (triangle).



erectile dysfunction and a three-piece penile prosthesis has been offered after the failure of other medical treatments.

Discussion

Penetrating bull horn wounds are often associated with pelvic fractures and should be considered in the context of a polytraumatized patient. First, life-threatening conditions must be stabilized. When the patient is stable, the retrograde studies of the genitourinary injuries should be performed. A systematic evaluation is the key to the rapid identification of an injury, completing in order the following sequence: (a) understand the mechanism of the injury; (b) physical examination; (c) urine analysis; (d) imaging techniques. We must take into consideration that multiple associated injuries are often present, for which reason a complete evaluation should always be done.

The standard primary management of these patients includes the control of any bleeding with direct pressure, the stabilization of the pelvis if unstable (especially important if there is an open book fracture), the administration of intravenous fluids, blood products, analgesics, tetanus immunization, and no oral feedings until the necessity of surgical intervention has been determined.^{4,5}

More than 30% of pelvic fractures have some degree of associated bladder injury. Conversely, when the bladder injury is traumatic, 70%–79% of cases have a concomitant pelvic fracture.⁶ The simultaneous rupture of both the bladder and the prostatic-membranous urethra occurs in 10%–29% of males with pelvic fractures. Bladder neck injuries are rare in adults.⁷ These injuries can be intraperitoneal (17%–39%), extraperitoneal (56%–78%) or of both.⁸ Diastasis of the pubic symphysis, sacroiliac

diastasis, and the fracture of the sacrum, iliac bones, and pubic rami are strongly associated with these types of injuries.

Currently, the classification of bladder injuries suggested by the American Association of Trauma Surgery is in use, which divides injuries in five types and establishes the appropriate treatment for each (Table 1).⁹

The International Panel of Urological Consensus classifies bladder injuries in four categories:¹⁰

Type I: Bladder contusion. Partial injury of the thickness of the bladder wall without rupture. Cystography normal. Usually produced by a blunt trauma. Courses with hematuria. Most frequent type of injury, but not serious.

Type II: Intraperitoneal rupture: Rupture of the bladder dome. Usually occurs after blunt trauma to the full bladder. This injury represents 33% of the severe bladder injuries. 25% of cases do not have an associated fracture of the pelvis.

Type III: Extraperitoneal rupture. Bladder wall laceration by a bone spicule from a pelvic fracture. The anterior or anterolateral wall tears and sometimes the bone fragments penetrate the bladder. This type of injury represents 60% of serious bladder injuries.⁴ In a simple extraperitoneal rupture the contrast goes outside the extraperitoneal pelvic space. In a complex rupture, the contrast extends to the anterior wall of the abdomen, the penis, the scrotum and the perineum, which requires a differential diagnosis with a concomitant urethral injury.

Type IV: Combined Rupture: Simultaneous intra and extraperitoneal bladder injuries. These represent 5% of severe bladder injuries.

With respect to urethral injuries, the American Association of Trauma Surgery proposes the following classification (Table 2).¹¹

Table 1. AAST bladder injury scale.

Grade	Injury type	Description of injury	Treatment
I	Hematoma Laceration	Contusion, intramural hematoma Partial thickness	Observation Repair, Foley catheter drainage
II	Laceration	Extraperitoneal bladder wall laceration < 2 cm	Repair, Foley catheter drainage
III	Laceration	Extraperitoneal (>2 cm) or intraperitoneal (<2 cm) bladder wall laceration	Repair, Foley catheter drainage
IV	Laceration	Intraperitoneal bladder wall laceration > 2 cm	Repair, Foley catheter drainage
V	Laceration	Intraperitoneal or extraperitoneal bladder wall laceration extending into the bladder neck or ureteral orifice (trigone)	Repair, Foley catheter drainage; ureteral repair ± stent

**Table 2.** AAST urethral injury scale.

Grade	Injury type	Description of injury
I	Contusion	Blood at urethral meatus; urethrography
II	Stretch injury	Elongation of urethra without extravasation on urethrography
III	Partial disruption	Extravasation of urethrography contrast at injury site with visualization in the bladder
IV	Complete disruption	Extravasation of urethrography contrast at injury site without visualization in the bladder; <2 cm of urethra separation
V	Complete disruption	Complete transection with >2 cm urethral separation or extension into the prostate or vagina

Other Authors have developed new classifications for pelvic trauma including anatomical differences and offering a way to compare therapeutic strategies and results.^{8,12}

If the clinical and hemodynamic situation of the patient permits it, the definitive diagnostic should be performed through imaging tests, although in some cases these tests are not conclusive.^{9,13}

- Retrograde urethro-cystography: Considered the gold standard for the identification of bladder and urethral ruptures since it is the most accurate of the radiological tests.
- CT cystography: Has a sensitivity of 95% and a specificity of 100%. It should be performed through the retrograde infusion of contrast, permitting the evaluation of possible associated injuries.
- Intravenous urography: It only detects 15% of bladder injuries which is why it is not considered an adequate study for bladder trauma.

Other tests, such as ultrasonography, angiography or the MRI, have been used in these cases, but they have fewer advantages versus those previously mentioned. The MRI can be interesting in the evaluation of the posterior urethra, although it is not normally used as either an initial or emergency test.^{9,13}

Treatment depends on the type of injury, following the previously explained classifications. Currently there is a tendency to handle bladder injuries conservatively through catheterization with a Foley catheter.

Type I Injury: Place Foley catheter with or without irrigation depending on the hematuria⁴

Type II Injury: Surgical repair is the rule. These are blunt traumas with high degree of force, with many associated injuries and a mortality of 20%–40%.¹⁴ There exists a risk of peritonitis if not treated.¹⁵

Type III Injury: Can be managed non-operatively using only a catheter drainage, unless there are injuries associated with the bladder neck, rectum or vagina, if there are bone fragments or a laparotomy is performed for other indications.^{16,17} In blunt traumas, 90% can be cured with catheter drainage, including retroperitoneal or scrotal extravasation.^{15,18} 87% are cured in 10 days and practically 100% in 3 weeks.¹⁹

With respect to urethral injuries, we can outline their treatment in the following manner:⁹

- Grade I: No treatment required;
- Grades II and III: Conservative treatment (suprapubic cystostomy, urethral catheter);
- Grade IV: Endoscopic or open surgery, primary or deferred;
- Grade V: Primary open repair.

In any case, penetrating trauma's injuries which affect the bladder and/or urethra always require urgent exploration and repair.¹⁵ 20%–60% of patients with injuries of the posterior urethra suffer erectile dysfunction as a consequence, depending on the intensity of the initial injury and in <5% of cases due to surgical repair.²⁰

This case report is an example of Grade V urethral rupture involving the bladder neck and extending to the trigone. Due to the profuse bleeding and the injuries to other organs, it is mandatory to perform a fast and effective surgical approach. These life-threatening lesions are very common in our area during summer festivals, and a multidisciplinary approach is important in order to reach the best functional results.

Conclusions

Pelvic-abdominal bull horn injuries are serious lesions with a high mortality rate due to bleeding. They require rapid diagnosis of the affected structures and an urgent and effective treatment of them together with the clinical management of a polytraumatized patient.

In the case of pelvic bone fractures, special care should be taken in the evaluation of the bladder and urethra for frequently associated concomitant injuries.



In the case of rupture of the bladder or urethra due to penetrating trauma, the urgent surgical repair is paramount to re-establish the urinary tract's anatomy and adequately drain the urine, which can be complicated by simultaneous injuries in the muscles, bones and other pelvic viscera. On occasion, a second surgery may be required once the patient has been stabilized in order to re-evaluate the damaged structures.

Author Contributions

Wrote the first draft of the manuscript: JFVS, BPF. Contributed to the writing of the manuscript: MFLG, MAGG. Agree with manuscript results and conclusions: FJDA, MHP. Jointly developed the structure and arguments for the paper: BPF, MFLG. Made critical revisions and approved final version: MFLG, FJDA. All authors reviewed and approved of the final manuscript.

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