

RUPTURE OF URINARY BLADDER: AN EXPERIENCE WITH 55 CASES IN SHIRAZ

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ABSTRACT

We reviewed 55 cases with trauma to the urinary bladder. Blunt trauma was the cause of injury in 78 percent of cases and associated pelvic fracture was present in 75 percent. Eighty percent of extraperitoneal ruptures were associated with fracture of the pelvis. The most common cause of trauma was car accident (63%), followed by war injury (20%).

Nearly two-thirds of patients (63%) had extraperitoneal rupture.

The most common presentation was gross hematuria (49%), followed by abdominal pain and tenderness (38%). In 24 patients, diagnosis was made by retrograde cystography, in 9 patients by intravenous pyelography and the remaining patients were diagnosed by physical examination and diagnostic laparotomy. All of the patients were treated by surgical repair. Mortality rate was two percent.

MJIRI, Vol. 14, No. 2, 127-131, 2000.

Keywords: Bladder, Rupture, Extraperitoneal, Intraperitoneal, Trauma, Pelvic fracture.

INTRODUCTION

The urinary bladder in the adult male lies in the anterior pelvis just behind the symphysis pubis. The dome and upper posterior aspect of the bladder are covered by peritoneum. Inferiorly, the bladder and prostate are firmly attached to the pubis by the puboprostatic ligaments. In the female the neck of the bladder lies directly on the pelvic fascia, surrounding the short urethra. The extraperitoneal part of the bladder is surrounded by loose areolar connective tissue which anteriorly is known as "the space of Retzius".⁵

In children up to the age of about three years, the pelvis is relatively small and the bladder is in fact intraabdominal, although still extraperitoneal.⁶ The location of an empty adult urinary bladder in the pelvis usually provides significant protection from blunt or penetrating trauma.¹ However, when the bladder is distended or the pelvis is fractured, the normal protective effect of the intact pelvic ring is lost and bladder injury is relatively common. Difficulty in urination following a blow to the lower abdomen or pelvis in any subject should arouse the suspicion of a ruptured bladder.⁷

Bladder injuries are surgical emergencies. Appropriate early therapy usually results in a favorable outcome, but delayed treatment causes a significant increase in morbidity

and mortality.

Up to 1890 the mortality rate of ruptured bladder, whatever the cause, was 86.7%.² After instituting proper surgical intervention and repair it declined to 48%;² recently this has reached 11%³ and in a study in Shiraz a decade ago it was reported to be 2%.⁴

Some important points in successfully managing these patients are knowledge of the mechanism of injury, accurate uroradiologic investigation, diagnosis and finally prompt surgical repair. The aim of the current study is to evaluate patients who referred to our clinic in different aspects including cause, signs and symptoms, sex, age, diagnostic modality, treatment and finally comparing the results with those of other studies.

PATIENTS AND METHODS

In this study 55 cases of rupture of the bladder admitted to our hospitals (Nemazee and Shahid Faghihi) during a 19 year period were reviewed. Each record was reviewed with respect to age, sex, cause and type of injury, its site, signs and symptoms, associated injuries including fracture of pelvis or femur, hollow viscus, urethral and ureteral injuries, diagnostic procedures, type of repair and mortality. From

Rupture of Urinary Bladder

1976 to 1994, 55 patients (47 male and 8 female) with ruptured bladder were admitted to Nemazee hospital. Patients were in the first decade of life, 34 in the second and third decade and 15 were above the age of 30 years (Table I).

Table I. Distribution of patients by age and sex.

| Age (years) \ Sex (No.) | <10 | 10-30 | 30-50 | >50 |
|-------------------------|-----|-------|-------|-----|
| Male (47) | 1 | 33 | 9 | 4 |
| Female (8) | 5 | 1 | 2 | 0 |

Type of trauma

Blunt trauma was responsible for rupturing the bladder in 43 cases, five due to a fall, was due to war injury. Injuries which were comprised of 10 war injuries and two cases of stab wound (Table II).

Table II. Type of bladder trauma.

| Type | No (%) |
|--------------------|---------|
| Blunt | 43 (78) |
| Car accident | 35 (63) |
| Falling down | 5 (9) |
| Direct blow | 2 (4) |
| War injury | 1 (2) |
| Penetrating | 12 (22) |
| War injury | 10 (18) |
| Stab wound | 2 (4) |

Presenting signs and symptoms were variable; 27 cases presented with gross hematuria, 14 had lower abdominal pain, 9 were in shock on arrival, and eight patients had no record concerning the clinical presentation (Table III).

Table III. Clinical presentation.

| Item | No. of Patients (%) |
|----------------------|---------------------|
| Gross hematuria | 27 (49) |
| Lower abdominal pain | 14 (25) |
| Shock | 9 (16) |
| Abdominal tenderness | 21 (38) |
| No information | 8 (14) |

Thirty-four cases (62%) had extraperitoneal rupture from which twelve had anterior wall rupture and four had lateral wall rupture of the bladder. In 10 cases, cases (25%) had intraperitoneal rupture and in 3 cases (6%) both extra and intraperitoneal ruptures were detected. In the remaining four (7%) the site of perforation was not pointed out in their records (Table IV).

Associated injuries

As a whole, pelvic fracture was seen in 41 cases (75%), consisting of 27 extraperitoneal, 14 combined and 3 unidentified ruptures. In 10 cases with extraperitoneal rupture of bladder had pelvic fracture, while in 57% of patients intraperitoneal rupture was associated with pelvic fracture (Table V).

Diagnosis

Diagnosis was made by physical examination,

Table IV. Type of trauma in relation to bladder injury.

| Trauma (No.) | Extraperitoneal rupture (%) | Intraperitoneal rupture (%) | Extra & intraperitoneal rupture (%) | Unknown (%) |
|------------------|-----------------------------|-----------------------------|-------------------------------------|-------------|
| Blunt (43) | 27 (63) | 10 (23) | 2 (5) | 4 (9) |
| Penetrating (12) | 7 (59) | 4 (33) | 1 (8) | -- |

Table V. Relation of type of bladder rupture and pelvic fracture.

| Bladder rupture | No. (%) | No. with associated pelvic fracture (%) |
|---------------------------|----------|---|
| Extraperitoneal | 34 (62%) | 27 (80%) |
| Intraperitoneal | 14 (25%) | 8 (57%) |
| Extra and Intraperitoneal | 3 (5.5%) | 3 (100%) |
| Unidentified | 4 (7.5%) | 3 (75%) |

Other concomitant injuries are shown in Table IV.

Table VI. Associated organ injuries in patients with rupture of bladder.

| Type of injury | No. | Percent |
|-------------------------------------|-----|---------|
| Injury to hollow viscus | 13 | 24 |
| Urethral injury | 10 | 18 |
| Fracture of femur | 6 | 11 |
| Ureteral injury | 2 | 4 |
| Vascular injury in pelvis (rupture) | 2 | 4 |
| Sciatic nerve damage | 2 | 4 |
| Rupture of diaphragm | 1 | 2 |
| Anoxic brain damage | 1 | 2 |
| Fat embolism | 1 | 2 |

Table VII. Methods of evaluation of patients with bladder injury.

| Method | No. of patients | No. diagnosed | Diagnostic percent |
|-------------------------------|-----------------|---------------|--------------------|
| Retrograde cystography | 25 | 24 | 96 |
| Intravenous pyelography (IVP) | 14 | 9 | 64 |

cystography, intravenous pyelography and laparotomy. Retrograde cystography was done in 25 patients where extravasation was noted in 24 and a normal finding in one case, which was diagnosed later during laparotomy as a case of extraperitoneal bladder rupture. In two cases a tear-drop shaped bladder was reported, and in one case complete disruption of the bladder was noted. Intravenous pyelography was performed in 14 patients which showed extravasation of the bladder in 9 cases, and in the remaining 5 the diagnosis was made by retrograde cystography (Table VII).

RESULTS

In this record review, extraperitoneal as well as intraperitoneal and combined ruptures of bladder were treated by repair of the defect, drainage of the perivesical space and suprapubic cystostomy.

In 3 patients a urethral catheter was inserted instead of cystostomy. Due to associated injuries, it was impossible to determine the exact period of the hospital course. There were three cases of urinary incontinence in patients with associated urethral injury in a 6-month follow-up. Also, there was one case of peritonitis as a result of intraperitoneal rupture of the bladder which was treated by appropriate antibiotic therapy and one patient died due to associated brain damage. Therefore we had a 2% mortality rate.

DISCUSSION

Rupture of the urinary bladder may occur following blunt penetrating trauma. Penetrating injuries represented 10-

20% and blunt trauma comprises 80-90% of cases of rupture of the bladder in the most recent studies.⁸ In a review by A.A Khezri⁴ penetrating and blunt trauma were responsible for 30% & 70% of ruptured bladders respectively. In the current review of 55 cases of bladder rupture, we had 12 patients (22%) with penetrating trauma and 43 cases (78%) with blunt trauma, of which 35 subjects were victims of car accident and the remaining cases were due to falling down, direct blow, etc..., representing that the incidence of blunt bladder injuries is significantly more than the penetrating type (Table II). It must be emphasized that because of war time conditions the majority of our penetrating bladder injuries were due to bullet or shell fragments, which is different from those studies in other centers. There were no cases of iatrogenic rupture of the urinary bladder. Traumatic bladder injuries are classified either as contusion, extraperitoneal, intraperitoneal and combined extra- and intraperitoneal ruptures. In the current review we didn't have any cases of bladder contusion which may be due to either misdiagnosis or association with other injuries such that the records were labelled with other diagnoses. Bladder contusion is usually self-limiting and requires no specific therapy.⁵ Extraperitoneal rupture most commonly occurs when the bladder is lacerated by a sharp bony prominence in a patient with a fracture of the anterior pelvic arch. It is uncommon with isolated fractures of the sacrum, coccyx, ilium, or acetabulum. The anterolateral wall, especially around the vesical neck, is the site of the majority of extraperitoneal bladder injuries.⁹

In the current review the site of rupture was not delineated except in 12 extraperitoneal ruptures that were in the

anterolateral area of the bladder. In extraperitoneal rupture urine extravasates to the perivesical space of Retzius and if left untreated may gradually invade via facial planes to regions as high as the umbilicus or as low as the thighs.

also follow facial planes in the pelvis and ultimately reach the perinephric areas.¹⁰ None of these complications were seen in our patients. Extraperitoneal rupture of the bladder is reported to account for 58% of all traumatic bladder injuries¹¹ and is in accordance with Hayes et al. review 34 cases (62%) of bladder injuries were extraperitoneal ruptures (Table V).

ated pelvic fracture in extraperitoneal rupture is reported to be as high as 95%¹¹ and in our patients it amounted to 80% which is nearly equal to that reported in a previous study in Shiraz⁴ (Table V).

Intraperitoneal rupture of the bladder occurs when there is a sudden rise in intravesical pressure secondary to a blow to the pelvis or lower abdomen.

sults in rupture of the weakest portion of the bladder. Commonly it occurs as a result of steering wheel or seat belt injuries and without associated pelvic fracture,⁵ but in the current review 57% of intraperitoneal ruptures were associated with pelvic fracture (Table V), and in a review by Rambeaud et al. 27% of intraperitoneal bladder ruptures were associated with a fractured pelvis.¹¹ Conversely in two studies the incidence of bladder rupture was reported to be 1.6% and 10%.^{13,14}

Peritonitis is a complication of bladder rupture if infection is introduced into the peritoneum. The presence of sterile urine in the peritoneal cavity will not cause signs of peritonitis.¹⁵

nary extravasation that was tolerated for three months without any clinical or chemical abnormalities.¹³

peritonitis is recorded in our patients. The incidences of various bladder injuries are different in the literature.

reported an equal incidence of intra- and extraperitoneal rupture.²³ Sandler et al. however reported that the intraperitoneal variety accounts for only 20% of all bladder injuries.⁵ In another study by Khezri 32% of bladder injuries were intraperitoneal.⁴

intraperitoneal, just equal to that reported by Rambeaud et al.¹¹ Combined extra- and intraperitoneal ruptures are reported to occur in 9% in a study⁵ and 5% in Khezri's report.⁴ In this review we had 3 cases (5.5%) of combined ruptures (Table V).

While bloody urine is a dramatic indicator of trauma of the urinary tract, hematuria does not localize the site or delineate the type or extent of injury nor does the amount of bleeding necessarily correlate with the severity of the trauma. While intraperitoneal lacerations may be associated with microscopic hematuria, a simple contusion may produce gross hematuria. In two reviews of 51 and 21 cases of rupture of the bladder, all patients had hematuria (microscopic or macroscopic).^{16,1}

gross hematuria.⁷ In the current review, we found 27 cases (49%) of gross hematuria (Table III). Intraperitoneal rupture of the bladder can exist in the presence of grossly clear urine and conversely hematuria may occur in the absence of significant injury to the urinary bladder.¹⁸

in this review may be due to the fact that our records were incomplete.

Abdominal pain and tenderness were present in 25% and 38% respectively (Table III).

tured pelvis is so severe that the pain of an injured bladder is overlooked. While generalized abdominal pain & tenderness was present most commonly in intraperitoneal ruptures, limited lower abdominal pain and tenderness were noted in subjects with extraperitoneal rupture of the bladder. In a report sixty percent of patients with bladder rupture were in shock, but after excluding associated extra-urinary causes, it dropped to 3%.¹⁰

patients presented in shock, in whom 5 cases had associated injuries. In the current study we had 9 patients (16%) who were in shock on arrival while 6 of them had pelvic fracture or hollow viscus injuries (Table III).

After initial assessment, evaluation of the urinary system proceeds as follows. A plain abdominal film is taken and the presence of pelvic or other fractures sought. Calcifications and foreign bodies (missiles) should be noted.¹⁵ Urinary flow after introduction of a catheter does not exclude vesical rupture, since urine may be drained from the peritoneal cavity.

tities of fluid introduced into the bladder through the catheter does not permit exclusion of vesical injuries.

The value of cystoscopy in trauma of the lower urinary tract is the subject of much controversy.^{18,19}

of rupture of the bladder is confirmed by roentgenologic studies including cystography and excretory urography. Pneumocystography is apparently feared because of the danger of air embolism. This procedure was not performed for any patient in this study. For evaluation of the upper part of the urinary tract, an excretory urogram is performed, but this procedure alone is not adequate to rule out the possibility of injury to the bladder, because of incomplete distension of the bladder and insufficient density of the contrast within it. Brosman and Paul were able to diagnose successfully only 15% of 98 cases of bladder injury solely on the basis of the excretory urogram.²⁰ Intravenous pyelography was performed in 14 patients with bladder rupture in the current review, and the diagnosis was made in 9 cases (64%) (Table VII).

In the present study retrograde cystogram was done for 25 patients, in which only one false-negative was found (96 percent accuracy) (Table VII). In a study by Khezri the sensitivities of intravenous pyelography and retrograde cystography were 54% and 94% respectively.⁴ Treatment of rupture of the bladder depends on the type of injury. Those patients who are immobilized and are unable to void while

lying in bed will need catheter drainage. Also occasional patients who have an extensive hematoma of the pelvis may develop urinary retention on an obstructive or neuropathic basis and need catheter drainage.²⁰ This type of injury was not found in our patients. Early surgical intervention is necessary when a diagnosis of intraperitoneal rupture has been made.

Treatment of this type of injury in the current review consisted of exploration of the peritoneal cavity with repair of the site of rupture and drainage of the bladder and perivesical space by suprapubic cystostomy. Extraperitoneal rupture of the bladder has also been treated by a surgical approach (repair of the defect and drainage of the prevesical space and bladder, either with suprapubic cystostomy or transurethral catheter). Recently a non-operative approach for extraperitoneal rupture of the bladder has been advocated and tried in multiple studies.^{8,11,21,22} This approach was not performed in our patients. Intra- and extraperitoneal rupture of the bladder are occasionally complicated by peritonitis and pelvic cellulitis respectively. In the present study only one patient with intraperitoneal rupture of the bladder developed peritonitis who was treated successfully.

The mortality rate of bladder rupture has been reported from 11-60%.^{6,19} Actually the multiple injuries associated with ruptured bladder are mainly responsible for this mortality rate. However, delay in diagnosis and treatment of more than 24 hours greatly increases mortality. Therefore immediate diagnosis and treatment of the ruptured bladder are important in an effort to reduce this significant mortality rate.³ The mortality rate reported by Khezri was 2 percent.⁴ In the current review we had only one mortality, who died due to associated anoxic brain damage.

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