

EXPERIENCE WITH 41 CASES OF RUPTURE OF URINARY BLADDER IN SHIRAZ

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ABSTRACT

41 patients with trauma to the urinary bladder are reviewed. 70 percent were injured as a result of blunt trauma and 63 percent of patients had an associated fracture of the pelvis. 82 percent of extraperitoneal ruptures were associated with fracture of the pelvis. The most common cause of trauma was car accident (56 percent), followed by war injury (25 percent). The incidence of intra and extraperitoneal rupture was nearly equal. The most common presentation was abdominal pain and tenderness (48 percent), followed by gross hematuria (37 percent). In 16 patients diagnosis was made by retrograde cystography and in another six by intravenous pyelography. 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.

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INTRODUCTION

The bladder, because of its position deep within the bony pelvis, is not often injured from blunt or penetrating abdominal trauma.¹

Injuries of the bladder are surgical emergencies. Appropriate therapy, if instituted early, usually yields favorable results, but delay in treatment causes a sharp increase in the morbidity and mortality.

Before 1890, the mortality rate of ruptured bladder regardless of its cause was 86.7%.² Following the introduction of aseptic surgery it dropped to 48%.² In recent years it has been quoted as 11%.³

Knowledge of the mechanism of injury, accurate urologic diagnosis, and prompt surgical repair are the cornerstones to successful management of these patients. This study is primarily aimed at evaluating patients in our clinic, regarding the cause, symptoms, signs, age, sex, diagnosis, treatment and eventually to compare the results with those in the literature.

MATERIALS AND METHODS

We reviewed 41 cases of rupture of the bladder admitted to our hospital during the past 10 years. Some

of them were war-injured patients. Each record was reviewed with respect to age, sex, cause and type of injury, its location, signs and symptoms, associated injuries including pelvic and femoral fractures, injury to hollow and solid viscera, urethra and ureter, diagnostic procedures, types of repair and mortalities.

From 1976 to 1985, 41 patients (37 males and 4 females) with bladder rupture were admitted to Namazee Hospital. Five patients were in the 1-9 year age group, 27 in the 10-29 year group, and 9 were above the age of 30 (Table I).

Types of trauma: Blunt external trauma was responsible in 29 patients, 23 of whom were victims of car accidents, three were due to a fall, two had direct blows and one case was due to war injury. Penetrating external trauma caused 12 injuries which comprised of 10 war injuries and 2 cases of stab wound (Table II).

The patients had a variety of signs and symptoms. 15

Table I. Distribution of patients by age and sex

	1-9	10-29	30 and >
Male	1	27	9
Female	4	0	0

Table II. Types of bladder trauma

	No. of patients	Percent
Blunt		
Roadside injury	23	56
Falling down	3	7
Direct blow	2	5
War injury	1	2
Total	29	70
Penetrating		
War injury	10	25
Stab wound	2	5
Total	12	30

Table III. Common clinical presentation

	No. of patients	Percent
Gross hematuria	15	37
Lower abdominal pain	13	32
Shock	8	19
Abdominal tenderness	20	48
No information	8	19

cases presented with gross hematuria, 13 had lower abdominal pain, eight were in shock on arrival, 20 had abdominal tenderness, and eight patients had no record of clinical presentation (Table III).

Twenty two cases (53%) had extraperitoneal rupture, from which eight had anterior wall rupture and two had a rupture in the lateral side of the bladder. The records of remaining cases were not pointed out. 13 cases (32%) had intraperitoneal rupture, and in two cases (5%) both extra and intraperitoneal ruptures were noted. In the remaining four (10%), no information regarding the type of injury was found (Table IV).

Associated injuries: Twenty six cases (63%) had associated pelvic fractures. The latter consisted of 18 extraperitoneal, six intraperitoneal, and two combined ruptures. As noted in Table V, 82% of patients with extraperitoneal rupture of the bladder had pelvic fracture, while 46% of patients with intraperitoneal rupture had a fracture of the pelvis. Other associated injuries are shown in Table VI.

Diagnosis was made by physical examination, retrograde cystography, intravenous pyelography, and incidentally during laparotomy.

Retrograde cystography was performed in 17 cases, where extravasation was noted in 16 and normal findings (false negative) was reported in one case. This patient was a case of extraperitoneal rupture of bladder that was diagnosed during laparotomy. A post wash-out film was not obtained with cystography in any of these cases. In two cases a tear drop shaped bladder was reported. Complete disruption of bladder was reported in one case. Intravenous pyelography (IVP) was

performed in 11 cases which showed extravasation of bladder in six cases. In the remaining five, the diagnosis was made by retrograde cystography (Table VII).

RESULTS

Intraperitoneal rupture was treated by repair of the defect, drainage of the prevesical space, and suprapubic cystostomy. Unfortunately it was impossible to determine the exact period of hospital course due to associated injuries.

Extraperitoneal rupture was treated by repair of the defect, drainage of the prevesical space, and suprapubic cystostomy in 18 cases; and repair of the defect, drainage of prevesical space, and insertion of a urethral catheter in two patients.

Patients with extra and intraperitoneal rupture were treated by repair of the defect, drainage of the prevesical space, and suprapubic cystostomy.

There were two cases of urinary incontinence, and three cases of urethral stricture in patients with associated urethral injury, in a 6-month follow-up. One patient developed peritonitis as a result of intraperitoneal rupture of bladder, which was controlled with intravenous antibiotic therapy. One patient died of brain damage, thereby we had a 2% mortality rate.

DISCUSSION

The adult male urinary bladder lies in the anterior pelvis immediately behind the symphysis pubis. The superior portion (dome) and the upper posterior aspect of the bladder are covered by peritoneum. Inferiorly, the bladder and prostate are firmly attached to the

Table IV. Relationship of types of pelvic trauma and bladder injury

	Extraperitoneal rupture	%	Intraperitoneal rupture	%	Extra & Intra Peritoneal rupture	%	Unknown	%
Blunt trauma 29 Patients	15	62	9	33	1	3	4	12
Penetrating trauma 12 Patients	7	58	4	34	1	8	-	-

Urinary Bladder Rupture

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

Type of bladder injury	No.	No. of associated pelvic fracture	percent
Extraperitoneal rupture	22	18	82%
Intraperitoneal rupture	13	6	46%
Intra and extraperitoneal rupture	2	2	100%

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."⁴ 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.⁵

The pelvic location of the empty adult urinary bladder usually provides significant protection from traumatic injury. However, when the bladder is distended or the pelvis is fractured the normal protective influence of the intact pelvic ring is lost and bladder injury is relatively common. Any person who has received a blow to the lower abdomen or pelvis and has never had previous difficulty in urination but is unable to void following trauma must be suspected of having a ruptured bladder.⁶ Rupture of the urinary bladder may occur following blunt or penetrating trauma. In the most recent series 33% of bladder injuries were secondary to penetrating trauma, most commonly caused by gunshot wounds. Blunt bladder injuries represented 67% of the cases.⁷

In our review of 41 cases of bladder injuries, we had 12 patients (30%) with penetrating trauma, of which 10 were war victims (bullet or shell fragments), and the remaining two were due to stab wounds. Blunt bladder injuries were found in 28 cases (70%) from which 23 had car accidents, five patients had sustained falls and a direct blow, and in the remaining one case war injury was responsible (Table II), signifying that the

Table VI. Associated organ injuries

Type of injury	No.	%
Fracture of femur	5	12%
Injury to hollow viscus	8	20%
Urethral injury	8	20%
Ureteral injury	2	5%
Rupture of diaphragm	1	2/5%
Sciatic nerve damage	2	5%
Vascular injury in pelvis	2	5%
Fat embolism	1	2/5%
Anoxic brain damage	1	2/5%

Table VII. Methods of evaluation of injury

studies	No. of pts.	No. diagnosis	Percentage Diagnostic
Retrograde cystography	17	16	94%
Intravenous pyelography (IVP)	11	6	54%

incidence of blunt and penetrating bladder injuries in our study were in accordance with that of the above mentioned report.⁷ It must be emphasized that because of the war time conditions the primary cause of penetrating bladder injury differed from that study. There were not any cases of iatrogenic rupture of the urinary bladder in our study. Bladder injuries secondary to trauma are classified either as contusions, extraperitoneal, intraperitoneal, and combined extra- and intraperitoneal ruptures. In the current review we did not have any cases of bladder contusion. This can be due to: (1) misdiagnosis, (2) combination of bladder contusion with other injuries, so the records are laden with other diagnoses. Bladder contusion is usually self-limiting and requires no specific therapy.⁴

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 (Figure 1). It is uncommon with isolated fractures of the sacrum, coccyx, ilium, or acetabulum. The majority of extraperitoneal injuries of the bladder occur on the anterolateral wall close to the vesical neck.⁸ In our series the site of rupture was not identified except in 10 extraperitoneal ruptures that were in the anterolateral area of the bladder. In extraperitoneal rupture urine extravasates to the prevesical space (of Retzius) and if left untreated, may gradually invade via fascial planes to regions as low as the thighs or as high as the umbilicus. It may also follow fascial planes in the pelvis and ultimately reach the perinephric areas.⁹ Fortunately these complications were not seen in our patients.

Extraperitoneal rupture of bladder is reported to account for 62% of all traumatic bladder injuries.¹ In the current review we had 22 cases (53%). This is in accordance with the Hayes, et al. record.¹⁰ The incidence of pelvic fracture in extraperitoneal rupture is reported to be as high as 96%.¹¹ In our series it amounted to 82%.

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. The increased pressure results in rupture of the weakest portion of the bladder (Figure 2).

It commonly occurs without associated pelvic fracture as a result of steering wheel or seat belt injuries.⁴ In

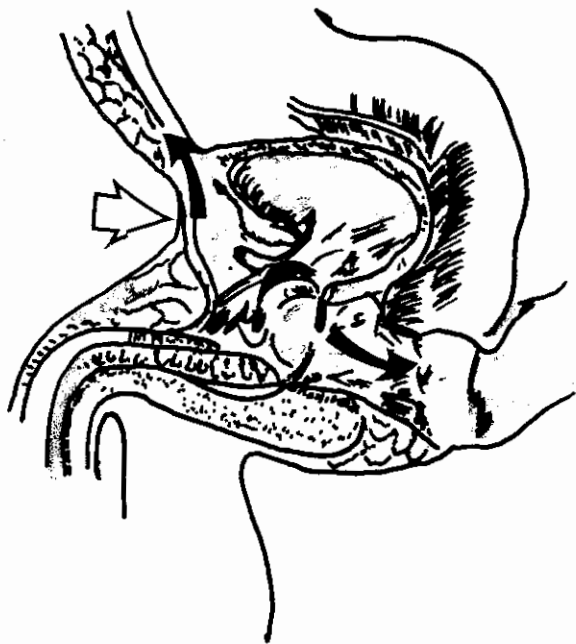


Fig. 1. Mechanism of extraperitoneal bladder rupture. The bladder injury is caused by laceration of its base by a bony spicule.

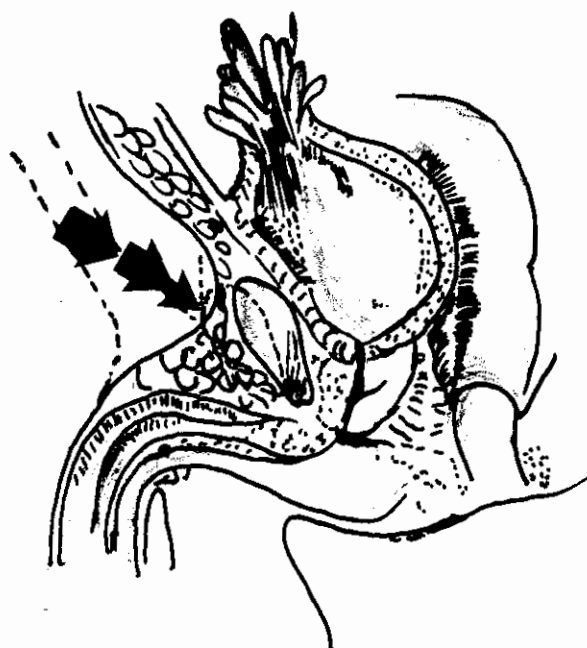


Fig. 2. Mechanism of intraperitoneal bladder rupture. Increased intravesicular pressure causes rupture of the dome, the weakest portion of the bladder.

our review however, 46% of intraperitoneal ruptures were associated with pelvic fractures.

Peritonitis may also ensue if infection is introduced from external sources. The presence of sterile urine in the peritoneal cavity will not cause signs of peritonitis (Bourdeau, et.al. 1974).¹² Bourdeau reported a case of intraperitoneal urinary extravasation that was tolerated for three months without any clinical or chemical abnormalities.¹² We found peritonitis in one of our patients.

There is no universal agreement on the relative incidence of various bladder injuries. Cass¹³ reported an almost equal incidence of intraperitoneal and extraperitoneal rupture. Sandler, et.al. however reported that the intraperitoneal variety accounts for only 20% of all bladder injuries.⁴ In our study 32% of bladder injuries were intraperitoneal.

Combined extra-and intraperitoneal ruptures are reported to occur in 9% of the cases. In this review we had only two cases (5%).

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, neither does the amount of bleeding necessarily correlate with the severity of the trauma. An intraperitoneal laceration may be associated with microscopic hematuria only, while a simple contusion may produce gross hematuria. In a review of 51 cases of rupture of the bladder, all patients had hematuria (microscopic and macroscopic).¹ In another series 98% of patients had gross hematuria. In the current study we found only 15

out of 41 patients (37%), having gross hematuria. Intraperitoneal rupture of bladder can exist in the presence of grossly clear urine and conversely hematuria may occur in the absence of significant injury to the urinary tract.¹¹ The low incidence in this study may be due to the fact that our records were incomplete.

Abdominal pain was present in 32% of patients on arrival to the emergency room. Abdominal tenderness was noted in 48% of cases. Frequently, pain from a fractured pelvis is so severe that the injury of the bladder may be completely overlooked. Generalized abdominal pain and tenderness was present most commonly in intraperitoneal cases, while lower abdominal pain and tenderness were noted in patients with extraperitoneal rupture of bladder.

In one report 60% of the cases of rupture of bladder were in shock,⁹ but when the associated extra-urinary causes were excluded, the incidence of shock dropped to 3%. We had seven patients (19%), which were in shock on arrival five of whom had associated injuries.

After the initial assessment, evaluation of the urinary tract proceeds as follows. A plain abdominal film is taken and the presence of pelvic or other fractures is sought. Calcifications and foreign body (missiles) should be noted.¹⁴

of a catheter does not exclude vesical rupture, since urine may be drained from the peritoneal cavity.

For the same reason, recovery of measured quantities of fluid introduced into the bladder through a catheter does not permit exclusion of vesical injuries.

Urinary Bladder Rupture

The value of cystoscopy in trauma of the lower urinary tract is the subject of much controversy.^{11,17}

The diagnosis of rupture of the bladder is confirmed with 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.

An excretory urogram is performed to assess the upper part of the urinary tract, but this study alone is not adequate to rule out the possibility of injury of the bladder. Because of incomplete distension of the bladder and insufficient density of the medium within it, Brosman and Paul,¹⁵ were able to diagnose successfully only 15% of 98 bladder injuries solely on the basis of the excretory urogram.

In the present series intravenous pyelography was performed in 11 patients with rupture of the bladder from which a diagnosis was made in six cases. Thereby 54% of 11 cases of bladder injuries were diagnosed successfully on the basis of intravenous pyelography. The retrograde cystogram or cysto-urethrogram is now considered to be the most significant single procedure in the attempt to diagnose a ruptured bladder.² Its accuracy rate had been reported between 85 and 100 percent. In the present review retrograde cystography was available for 17 patients, in which only 1 false negative was found (94 percent sensitivity).

The most common cystographic appearance of the bladder is that of a vertically elongated narrow bladder, "tear drop" shaped secondary to pelvic hematoma.

In the current series, two tear-drop shaped bladders were reported on cystography. Lateral displacement of the bladder (half moon) may result from a large extraperitoneal hematoma. If an extensive type of bladder laceration exists there is a marked diffusion of the contrast material into the pelvic tissues with the medium forming a sunburst-like pattern. These types of radiologic appearances were not present in our patients.

Treatment of rupture of 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. An occasional patients who has had an extensive hematoma of the pelvis may be in urinary retention on an obstructive or neuropathic basis and need catheter drainage.¹⁵ As mentioned before, this type of injury was not found in our patients.

Prompt surgical intervention is necessary when a diagnosis of intraperitoneal rupture has been made. Treatment of this type of injury in current series consists of exploration of peritoneal cavity with repair of the site of rupture, prevesical drainage, and bladder drainage by suprapubic cystostomy.

Extraperitoneal rupture of bladder has been treated

by surgical approach (repair of the defect, drainage of prevesical space and bladder drainage either with suprapubic cystostomy or transurethral catheter). Up to 1969, it was stated that extraperitoneal rupture of the bladder may be handled conservatively but not a single case was reported.¹⁶

Mulkey and Witherington,¹⁶ advocated a non-operative approach for selected patients. This approach was not performed in our series.

Peritonitis is the most common complication of intraperitoneal rupture. In the present series one patient developed peritonitis, who was a case of intraperitoneal rupture and was treated successfully. Pelvic cellulitis is a possible complication in patients with extraperitoneal rupture of the bladder.

The mortality rate with ruptured bladder has been reported from 11-60 percent.^{3,17} The multiple injuries associated with a ruptured bladder are mainly responsible for this mortality rate. However, delay in the diagnosis and treatment past 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 In the present study we had only one case, a war injured patient, who died of anoxic brain damage (2 percent mortality rate).

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