Bladder Injuries: Evaluation, Management, and Outcome.

Samir A. Muter* **FICMS (Urology)**

Summary:

Background: Civil violence in Iraq has reached an epidemic level during the last few years, and an increasing number of urological injuries were faced in dealing with unprotected civilians who were exposed daily to violence in streets, at homes, and at work.

Bladder injuries are an example of injuries which were faced rarely before but increasingly now, if not dealt with properly such injuries may end with serious morbidity and even crippling, on the other hand proper management will greatly decrease morbidity and mortality of such injuries.

Patients and method: over the period from March 2004 to June 2005 all the patients triaged to the emergency unit of Medical City with genitourinary trauma were included in the study, those with bladder injury discovered pre-operatively or per-operatively were involved in the study, for all patients the mechanism, grade, site, associated other organ injury, and outcome were defined. Data collected and statistically analyzed.

Results: The total number of patients sustained genitourinary tract injuries was 197, only 73 (37%) of them had bladder injuries, the majority were males (87.6%) in their active life (67% aged 20-40 years). Most of the injuries were caused by bullets (50.6%) and shells (25.3%), were sever (82.1% had grades III and IV), and affecting the dome of the bladder (39.7%). The gastrointestinal tract was the commonest system to be injured in association with the bladder (87.6%), but the mortality rate was associated only with affection of chest, head, and vascular systems. The over all mortality rate was 9.5% and the morbidity rate was 12.3%.

Conclusion: the incidence of bladder injury in urological trauma is high in civilian casualties because of lack of protection, they are usually severe and of high grade, and associated with other organ injuries. Bullets are the main causative factor, and the dome is the mostly affected site. The mortality rate is low (9.2%) and is related to the associated organ injury, but not related to the severity of injury.

We need to continuously evaluate our experience in trauma management, and to establish specialized trauma centers to cope with the increasing number of civilian victims.

Keywords: bladder injuries, urologic injuries.

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Introduction

Bladder injuries can be caused by high energy blunt or penetrating trauma, blunt trauma is responsible for more than two thirds of cases, the most frequent causes are, falls, industrial crushes, and blows; it may cause either bladder contusion, intra-peritoneal rupture, extra-peritoneal rupture, or a combination of intra and extra-peritoneal ruptures [1,2,3]. More than 80% of blunt bladder injuries have associated pelvic bone fracture; on the other hand, up to 30% of pelvic fractures are associated with bladder injuries [4, 5, and 6]. Penetrating bladder injuries are reported to occur in about 3.6% of abdominal injuries, gunshot injuries, sharp objects and projectile missiles and shells are the most common causes [1, 4]. The degree of tissue damage is related directly to the velocity and size, and inversely to the distance of the projectile subject [7]. Diagnosis and evaluation of bladder injury is done by history, Clinical examination, and laboratory and imaging studies, however; the clinical signs and symptoms are non-specific [8, 9], retrograde cystography on the other hand has an accuracy rate of 85-100% [10,11]. The American Association for the Surgery of Trauma (AAST) scoring system classifies bladder injuries into the following grades: [12, 13].

Grade I: Contusion, intramural hematoma, or partial thickness laceration

Grade II: Extra-peritoneal bladder wall laceration < 2 cm

Grade III: Extra-peritoneal (≥ 2 cm) or intra peritoneal (<2 cm) bladder wall laceration

Grade IV: Intra-peritoneal bladder wall laceration (≥ 2 cm)

Grade V: Intra or extra-peritoneal bladder wall laceration extending into bladder neck or ureteral orifice (trigone)

Note: advance one grade for multiple lesions up to grade III

Most of the isolated and uncomplicated extra-peritoneal injuries can be managed conservatively, however; surgical intervention is indicated when there is failure of catheter to provide adequate drainage, associated vaginal or rectal injury, or bladder neck injury [9]. In Intra-peritoneal rupture and penetrating injuries**,** surgical exploration and repair is the standard management with lesser complications [14, 15, 16, and 17]. How common were bladder injuries at time of armed conflict? How did surgeons manage them? What was the ultimate result of management? We, in our study, tried to answer these questions.

* *Dept. of Surgery, College of medicine, Baghdad University*

Patients and method:

From March 2004 to June 2005, all urological trauma cases triaged to emergency department in the medical city were considered regardless of the mechanism of injury. Injuries were staged according to the (AAST) scoring system, the mechanism of injury and associated injuries were noted. A total number of 197 patients were included in the study, 25 females, and 172 males, their ages ranged between 4 and 61 years. All patients were first managed in the emergency department, with full resuscitation, clinical evaluation, and subsequent decision made on final treatment strategy. Most cases were subjected to emergency surgeries. On this study we selected only patients in whom a bladder injury was documented either by pre-operative evaluation, or intra-operative findings. The injuries were classified according to the causative mechanism into blunt or penetrating; with the penetrating injuries being further sub-classified into bullets, shells and explosions, and sharp objects injuries. When a bladder injury was found and staged according to the AAST staging system, grades I and II were managed conservatively, while the higher grades were explored surgically. The principle was to repair the bladder and promptly drain it, the approach depended on associated injury whether necessitated laparatomy or not. Bladder injury site(s) was closed (after doing necessary debridement of devitalized tissues if any) with two layers of absorbable suture material with exception of some difficult areas (like the bladder neck) which were sutured in a single layer only. When a rectal or vaginal injury was associated, selective separation of organ walls was done, and sutured separately with omental patch interposition, and avoidance of suture line overlap. All bladders were drained by urethral Foley's catheter to which a supra-pubic catheter is added when seems clinically necessary. Catheter was kept in place for 10-14 days before removal, and broad spectrum antibiotics were given to all patients starting from the emergency room. Surgeries were done by different teams members according to which team was on duty that day, and the patients were followed up before and after discharge from the hospital for recovery or appearance of complications.

Statistics: Statistical package for social science (SPSS) was used for data entry and analysis, Chi square test of association was used with P value of less or equal to 0.05 was considered significant.

Results:

Total number of urological trauma patients included in this study was 197 (172 males and 25 females), 73 (37%) patients (64 males and 9 females) sustained a bladder injury. Their ages ranged from 4 to 61 years with a mean age of 30.6, table 1 shows the age and sex distribution of all bladder injury patients. The majority of victims were males in their active years of life.

Table 1: age and sex distribution of patients

	total	Age (years)		
		<20	20-40	>40
male	64	14	43	7
female	9	2	6	1
total	73	16	49	8

Bullets constituted the major cause of bladder trauma (50.6%), followed by shells of explosions (25.3%), then motor vehicle accidents (21.9%), while no case of bladder injury due to blows or sharp objects was recorded.

More than half of the cases sustained severe injury, grade IV and higher (figure 1), with almost equal involvement of the dome (39%) and lateral wall (35%) (Figure 2). Concomitant injuries have been identified in all of the patients (figure 3).

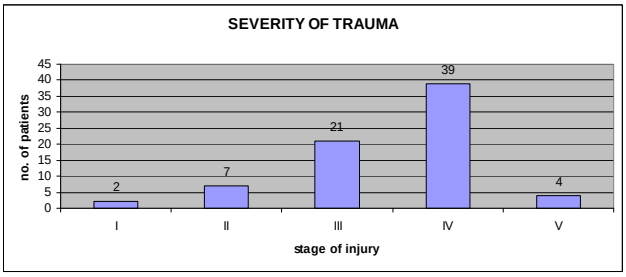

Figure 1: AAST severity scale grade of the bladder injuries.

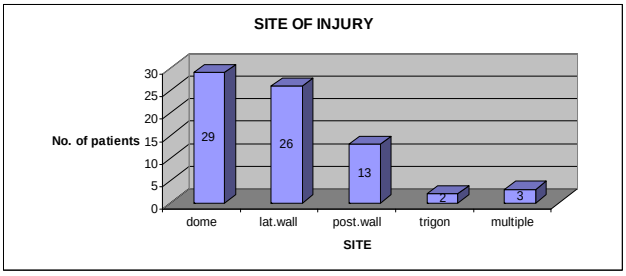

Figure 2: The location of bladder injury.

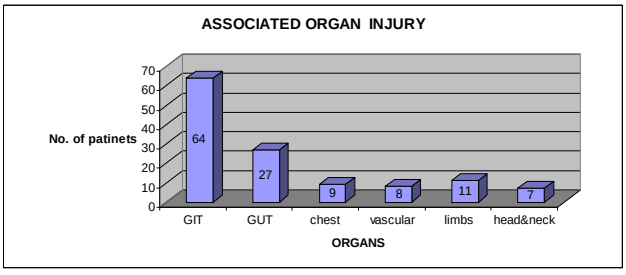

Figure 3: concomitant injuries in the bladder injury patients.

The only patient who was managed conservatively was a case of motor vehicle accident, in whom hematuria was present on presentation and cystography revealed stage I bladder trauma. All the other 72 patients were managed surgically. Fifty eight patients (79.4%) were discharged well with no urinary complications, 9 patients had urinary complications (12.3%), 5 of them had recurrent attacks of severe hematuria with clot retention that necessitated blood transfusion, 3 developed vesico-

rectal fistulae, and one ended with a vesico-vaginal fistula. Seven (9.5%) patients died, all deaths occurred within the first 48 hours after trauma, the causes of death were not related to the bladder injury itself, they were due to associated vital organs injuries, 4 of them had head injury, and the other 3 had both vascular and chest trauma. Death was significantly associated ($P \leq 0.05$) only with concomitant head injury (4/7), chest injury (3/9), and vascular injury (3/8).

Discussion:

During the years of violence, unprotected Iraqi civilians were exposed to increasing risk of trauma whether by criminals or by militants, in streets, at homes or at work. This added a big burden on the health service system and uncovered the need to emphasize on training on trauma surgery, the need for special trauma centers supplied with a good deal of facilities and appliances. There is a great difference in rates of battlefield bladder injury between older and recent series due to the impact of using body armor. Bladder injuries were reported in 14.7% of patients sustained GU trauma in Veitnam [18], 17.2% in Croatia [19], 11% in Korea [20,21], 17% of cases in the first Gulf war (desert storm)[22], and 12.3% in the American civil war[23], whereas it is below 2% in modern conflicts [20]. Abu Zidan studied trauma in Kuwait following the first Gulf War and gave an incidence of bladder injuries of about 11.4% among all genitourinary injuries [24]. In our study bladder injuries constituted about 37% of all urological traumas which is higher than what is reported in previous studies. The majority (87.6%) of victims in our study were males in their active life years, this seems logical because this group used to go outdoor to earn the family living which makes them exposed to trauma in such bad security situation and reflecting the same male predominance (81% and 87%) in civilian penetrating abdominal injuries [25,26]. Unlike times of security where motor vehicle accident make the main cause of bladder injuries, here bullets and shells were the main causes, 50.6% and 25.3% respectively, this figure is near to what was reported by Abu Zidan who found that 58% of cases was due to gunshots [24], but differs from what's stated by Vuckovic and colleagues (Croatian war) where shells caused 66% of the cases [19]. No case was reported to be caused by neither stab wounds nor direct blow to the bladder; this reflects the rarity of such causes of bladder injury at times of armed conflict, this agrees with what's reported in the American civil war [23]. All penetrating bladder injuries whether caused by bullets or shells were associated with penetrating injuries to other abdominal organs, which coincide with what's reported in most of literature [12, 20, 24, 26]. Fractures of pelvic bone were found in 15 of the 16 cases caused by motor vehicle accidents (93%), but only in 6 cases caused by bullets and shells (10.5%). The gastrointestinal tract was the commonest organ to be injured in association with bladder injuries (87.6%), a similar percentage was also reported by Abu-Zidan, Rush, and Justin [21, 24, 25], but no increase in mortality rate was found in those patients. The organs which were significantly associated with an increased mortality rate when injured in association with bladder were the head, chest and major blood vessels, all mortalities had either head, chest or major vascular trauma which was the cause of death rather than the bladder injury itself, death was significantly associated ($P \leq 0.05$) with concomitant head injury (4/7), chest injury (3/9), and vascular injury (3/8), a similar conclusion was drawn by Rabi et al [27] and Rush [25]. In fact, surgeons' experience from previous wars Iraq passed through in the past few years, availability of blood for transfusion, antibiotics, and surgical equipments helped to reduce both the mortality rate (9.5%), and morbidity rate (12.3%), such figures are much lower than rates reported by Abu-Zidan (23%) and Netterville (32.7%) [24, 25]. We were unable to monitor for chronic complications as bladder neck stenosis, erectile dysfunction, or over active bladder symptoms which were reported to occur in 5-21% in different literature [12]. Further more, the severity of bladder injury was not found to be significantly related to the mortality rate, out of the 7 patients who died, 3 had grade III, 2 had grade II, and 2 had grade IV bladder injury reflecting the fact that death was the result of associated injuries rather than bladder injury itself. This overview of bladder injuries in Iraq points to the fact that such a huge number of civilians injured should be a great incentive to the government to establish specialized trauma centers in Baghdad and other governorates, and for the junior surgeons to improve their practice in dealing with these cases.

Conclusion:

Bladder injuries are common among civilians at times of war and armed conflict, because they are unprotected unlike soldiers. The majority of blunt bladder injuries were associated with pelvic bone fractures, while penetrating injuries were associated primarily with GI tract injuries. The morbidity and mortality rates were generally low, and death was found to be related to concomitant organ injury rather than the bladder injury itself. Associated head, chest and vascular injuries were found to be significantly associated with higher death rate. Improved surgeons' practice and experience from past wars through which Iraq had passed as well as availability of blood, antibiotics, and medical supplies helped a lot in reducing mortality and morbidity rates.

References:

1. Reynaldo G. Gomez, Lily Ceballos: Consensus statement on bladder injuries, BJU international 2004, 94; 1: 27-32.

2. Jong M Choe, MD, FACS, Benjamin S Battino,MD: Bladder Trauma Article ,eMedicine , 2004 , pp 1-15.

3. Europian Association of Urology: EAU Guidelines office; Guidelines. 2006 edition. Arnhem-The Netherlands

4. Caroll PR, McAninch JW: Major bladder trauma: Mechanisms of injury and a unified method of diagnosis and repair. JUrol, 1984;132:254-257.

5. Coppola PT, Coppola M: Emergency department evaluation and treatment of pelvic fractures. Emerg Med Clin North Am,2000;18:1, 1-27.

6. Antoci JP, Schiff M Jr: Bladder and urethral injuries in patients with pelvic fractures. JUrol 1982; 128: 25–26.

7. Hutton JE, and Rich NM: Wounding and wound ballistics, in McAninch JW (Ed): traumatic and Reconstructive Urology. Philadelphia, WB Saunders,1996, PP 3-25.

8. Sagalowsky AL,Peters PC,: Genitourinary trauma In: Campbell's Urology WalshPC et al.(eds)WB Saunders; Philadelphia,1998, pp. 3085-3120.

9. Cass AS, Luxenberg M: Features of 164 bladder ruptures .J Urol 1987;138: 743–745.

10. Rehm CG, Mure AG, Omally KF, Ross SE: Blunt traumatic bladder rupture: The role of retrograde cystogram. Ann Emerg Med,1991;20:8,845-847.

11. Cass AS: The multiple injured patient with bladder trauma. J Trauma, 1984;24:731- 734.

12. Richard A. Santucci,Jack W. Mcaninch: Bladder injuries: evaluation and management , Brazilian Journal of urology,2000;26:4,408-414.

13. Moore EE, Cogbill TH, Jurkovich GJ, McAninch JW, Champion HR, Gennarelli TA, MalangoniMA, Shackford SR, Trafton PG: Organ injury scaling III: Chest wall, abdominal vascular, ureter, bladder, and urethra. J Trauma, 1992; 33: 337-339.

14. Robards VL, Haglund RV, Lubin EN, Leach JR.: Treatment of rupture of the bladder. J Urol 1976; 116: 178–9.

15. Cass AS, Johnson CF, Khan AU, Matsuura JK, Godec CJ. Non-operative Management of bladder rupture from external trauma. Urol 1983; 22:27–29.

16. Velmahos GC, Degiannis E.: The management of urinary tract injuries after gunshot wounds of the anterior and posterior abdomen. Injury 1997;28: 535–538.

17. Cass AS, Luxenberg M.: Management of extraperitoneal ruptures of Bladder caused by external trauma. J Urol 1989; 33: 179–183.

18. salratierra O, Rigdon WO, Norris DM, and Brady TW.: Vietnam experience with 252 urological war injuries. J Urol 1960;101:615-620.

19. Vuckovic I, Tucak A, Gotovac J, et al: Croatian experience in the treatment of 629 urogenital war injuries. J Trauma 1995;39:733-736.

20. Steven JHudak, Allen F.Morey,Thomas A.Rozanski,C.William Fox, Jr,. Battlefield Urogenital injuries: changing patterns during the past century. Urol.2005;65:1041- 1046.

21. Justin AA: Abdominal wounds in Korea: A report of ninety-two cases. Annals of surgery 1954;140:6,850-859.

22. C.Ian M Thompson, Stephen F Flaherty, and Allen F Morey.: Battlefield urologic injuries: the Gulf war experience. J Am Coll Surg:1998;187:2,139-141.

23. Harry W. Herr. Urological injuries in the civil war, J Urol 2004;172:1800-1804.

24. F.M.Abu-Zidan. A. Al-Tawheed. Y.M.Ali: Urologic Injuries In the Gulf War. Intr Urol and Neph.1999;31:5,577-583.

25. Rush EN, James DH: Penetrating wounds of the abdomen: Analysis of 155 cases with problems in management. Annals of surgery 1967;166:2,232-237.

26. G.C Velmahos, H. Gomez, A.Falabella and D.Demetriades: operative management of civilian rectal gunshot wounds: simpler is better. World Journal of Surgery.2000;24:1,114-118.

27. Rabi T, John FH, Patrick MH, et al: Management of shotgun injuries to the pelvis and lower genitourinary system. Urol 2000;55:2,193-197.