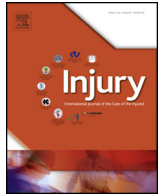




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## The incidence, spectrum and outcomes of traumatic bladder injuries within the Pietermaritzburg Metropolitan Trauma Service

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### ABSTRACT

**Introduction:** The purpose of this study is to provide a comprehensive overview of the incidence, spectrum and outcomes of traumatic bladder injury in Pietermaritzburg, South Africa, and to identify the current optimal investigation and management of patients with traumatic bladder injuries.

**Methods:** The Pietermaritzburg Metropolitan Trauma Service (PMTS) trauma registry was interrogated retrospectively for all traumatic bladder injuries between 1 January 2012 and 31 October 2014.

**Results:** Of 8129 patients treated by the PMTS over the study period, 58 patients (0.7% or 6.5 cases per 1,000,000 population per year) had bladder injuries, 65% caused by penetrating trauma and 35% by blunt trauma. The majority (60%) were intraperitoneal bladder ruptures (IBRs), followed by 22% extraperitoneal bladder ruptures (EBRs). There was a high rate of associated injury, with blunt trauma being associated with pelvic fracture and penetrating trauma being associated with rectum and small intestine injuries. The mortality rate was 5%. Most bladder injuries were diagnosed at surgery or by computed tomography (CT) scan. All IBRs were managed operatively, as well as 38% of EBRs; the remaining EBRs were managed by catheter drainage and observation. In the majority of operative repairs, the bladder was closed in two layers, and was drained with only a urethral catheter. Most patients (91%) were managed definitively by the surgeons on the trauma service.

**Conclusion:** Traumatic bladder rupture caused by blunt or penetrating trauma is rare and mortality is due to associated injuries. CT scan is the investigative modality of choice. In our environment IBR is more common than EBR and requires operative management. Most EBRs can be managed non-operatively, and then require routine follow-up cystography. Simple traumatic bladder injuries can be managed definitively by trauma surgeons. A dedicated urological surgeon should be consulted for complex injuries.

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### Introduction

South Africa has a high burden of trauma and injury [1,2]. Injury to the urogenital system occurs in 10% of trauma patients [3,4] and the bladder is one of the most commonly injured urological organs [3]. Bladder trauma is frequently managed by general or trauma surgeons and not by dedicated urological surgeons. The purpose of this study is to provide a comprehensive overview of the incidence, spectrum and outcomes of traumatic bladder injury in

Pietermaritzburg, South Africa, and to identify the current optimal investigation and management of patients with traumatic bladder injuries. It is hoped that this audit will better define the role of the generalist in the management of bladder trauma.

### Setting

The Pietermaritzburg Metropolitan Trauma Service (PMTS) encompasses two hospitals within the city of Pietermaritzburg, KwaZulu-Natal (KZN) Province, South Africa. The service offers regional trauma care to patients living in the greater Pietermaritzburg area, as well as regional and tertiary referral services to a large number of clinics, district hospitals and regional hospitals in KZN. Injured patients are assessed by trauma or surgical doctors in the

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receiving departments and managed according to standard protocols. When a urological injury is identified it is usually managed by trauma surgeons. Referral to the sub-specialist urology service is reserved for patients in need of further specialist investigation or intervention. Appendix 1 shows the PMTS management algorithm for bladder trauma.

## Methods

A prospective hybrid electronic trauma registry was introduced by the PMTS in January 2012 [5]. The PMTS trauma registry was interrogated retrospectively and all patients diagnosed with traumatic bladder injuries, having presented to the PMTS between 1 January 2012 and 31 October 2014, were identified. Data captured included demographic data, mechanism of injury, Injury Severity Score (ISS), associated injuries, diagnostic procedures performed, type of bladder injury diagnosed, management of the bladder injury and outcome of the admission. The mechanism of injury was classified into blunt (RTAs, assaults, falls and other causes) and penetrating (SWs, GSWs and other causes). The type of bladder injury was classified into bladder contusion, intraperitoneal rupture (IBR), extraperitoneal rupture (EBR), bladder neck avulsion and combined IBR and EBR (which are grouped with IBR in the PMTS database). The data were analysed and the incidence of traumatic bladder injury was calculated in terms of the number of injuries per 1,000,000 population per year, as the population served by the PMTS is known, and the PMTS is the only referral centre for traumatic bladder injuries. Ethics approval for this study was granted under the class approval for the PMTS trauma registry by the Biomedical Research Ethics Committee (BREC) of the University of KwaZulu-Natal (BCA221/13).

### Statistical analysis

Statistical analysis was performed using IBM SPSS statistics software. Pearson's chi-squared ( $\chi^2$ ) test was used to assess association between categorized variables and dichotomous classification of bladder injury type. If an expected cell count was less than five observations, the Fisher's exact test was used instead. The  $\chi^2$  test was also used to analyse subgroups with the null hypothesis that each category in the subgroup occurred with equal frequency. An independent sample *t*-test was used to compare the mean ISS in different categories. A *p*-value of less than 0.05 (or 5%) was deemed statistically significant.

## Results

During the period under review, 8129 trauma patients were treated by the PMTS. There were 4376 cases of blunt trauma including 1757 RTAs, 1576 assaults and 290 falls. There were 3365 cases of penetrating trauma including 2606 SWs and 631 GSWs. Of the 8129 patients treated, 58 were diagnosed with traumatic bladder injury (0.7%). The incidence of traumatic bladder injury in the districts served by the PMTS was 6.5 cases per 1,000,000 population per year. The mean age of our patients was 30 years and 10 months (standard deviation [SD] = 12.7; range 3–79 years), 83% were male and 17% were female.

### Blunt trauma

Blunt trauma accounted for 65% of bladder injuries, and 0.9% of patients presenting with blunt trauma were found to have bladder injuries. The majority of blunt trauma was a result of RTAs ( $n = 24$ , 63%), followed by assaults ( $n = 6$ , 16%), falls ( $n = 6$ , 16%) and others ( $n = 2$ , 5%) including one sports related injury and one animal related injury (Fig. 1).

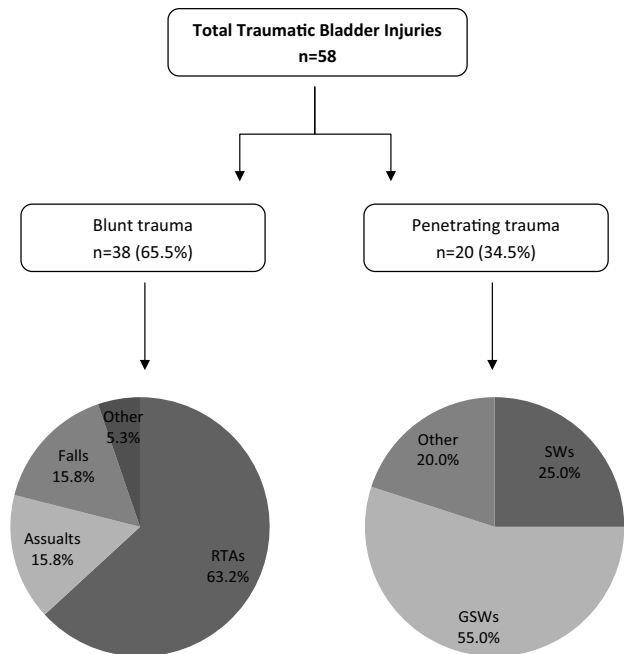


Fig. 1. Summary of the mechanism and causes of the traumatic bladder injuries.

### Penetrating trauma

Penetrating trauma accounted for 35% of bladder injuries and 0.6% of patients presenting with penetrating trauma were found to have a bladder injury. There was no difference between blunt and penetrating trauma as the cause of bladder injury ( $p = 0.052$ ). GSWs accounted for more than half the penetrating trauma cases ( $n = 11$ , 55%), followed by SWs ( $n = 5$ , 25%) and impalements ( $n = 4$ , 20%). Although there were more GSWs than SWs, the difference between the two was not significant ( $p = 0.134$ ) (Fig. 1).

### Types of bladder injuries

The majority of bladder injuries were intra-peritoneal bladder ruptures (IBRs) ( $n = 35$ , 60%; 95% confidence interval [CI] = 47.8–72.9%), followed by EBRs ( $n = 13$ , 22%), bladder contusions ( $n = 8$ , 14%) and bladder neck avulsions ( $n = 2$ , 4%). Bladder contusions were caused exclusively by blunt trauma. Extra-peritoneal bladder ruptures (EBRs) were caused by blunt trauma in 69% ( $n = 9$ ) and by penetrating trauma in 31% ( $n = 4$ ) of cases. This difference was not significant ( $p = 0.166$ ). IBRs were caused by blunt trauma in 57% ( $n = 20$ ) and by penetrating trauma in 43% ( $n = 15$ ) of cases. The difference was not significant ( $p = 0.398$ ). There were two bladder neck avulsions, one caused by GSW and the other by RTA (the patient was run over by a truck) (Fig. 2).

### ISS and associated injuries

The mean ISS for all patients with traumatic bladder injury was 14 (SD = 7, range 4–40). Patients with bladder injuries caused by blunt trauma had a mean ISS of 14 and those with injuries caused by penetrating trauma had a mean ISS of 15. These were not significantly different ( $p = 0.672$ ). Pelvic fracture was the commonest injury associated with bladder injury ( $n = 19$ , 33%; CI = 20.7–44.8%). Patients with bladder injuries due to blunt trauma ( $n = 19$ , 50%) were more likely to have associated pelvic fractures than those with penetrating trauma ( $n = 0$ , 0%;  $p < 0.001$ ).

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