

The spectrum of blunt abdominal trauma in Pietermaritzburg

P Rhimes,¹ S Moffatt,² VY Kong,^{3,4} JL Bruce,⁴ MTD Smith,⁴ W Bekker,⁴ GL Laing,⁴ DL Clarke^{3,4}

¹ Critical Care Directorate, Nottingham University Hospitals, United Kingdom

² Emergency Department, University Hospital Coventry, United Kingdom

³ Department of Surgery, University of the Witwatersrand, South Africa

⁴ Department of Surgery, University of KwaZulu-Natal, South Africa

Corresponding author, email: victorywkong@yahoo.com

Background: This study reviews the Pietermaritzburg Metropolitan Trauma Service (PMTS) experience with the management of blunt abdominal trauma (BAT).

Methods: A retrospective review of the hybrid electronic medical registry (HEMR) between December 2012 and September 2019 was conducted. All patients admitted following BAT were included.

Results: During the study period, 1 123 BAT patients were managed by the PMTS. The mean age was 29.19 years (SD 14.03). Of these admissions, 73.6% were male. The most common mechanism was road traffic crashes (RTCs) – 435 motor vehicle collisions (MVCs) and 250 pedestrian vehicle collisions (PVCs). There were 186 assaults, 118 falls, 62 community assaults, 22 accidents related to agriculture, construction or industry, 11 sporting injuries, nine animal injuries, seven patients injured by falling objects, five injured by trains, two hangings, one burn-related fall and two other causes. The mechanism of injury was unknown in 22 cases. There were 445 abdominal CT scans and 270 whole body CT scans. Surgical management was required for 395 patients. There were 259 index laparotomies and 176 repeat laparotomies. Four patients underwent selective arterial embolisation. Laparoscopy was undertaken in ten, and subsequently converted to laparotomy in five. There were 106 orthopaedic operations. Hospital stay ranged from 0–155 days (median stay three days). ICU admission was required in 24.9% of patients. The mortality rate was 7.5%.

Conclusion: BAT is common in South Africa. Whilst the vast majority of patients require non-operative treatment, a well-defined subset require a laparotomy. Imaging is central to the management of patients with BAT.

Keywords: blunt abdominal trauma, hybrid electronic medical registry

Introduction

Internationally, trauma is a leading cause of death in those less than 45 years old.¹ In South Africa, despite a quarter of a century of relative political stability, trauma remains a major problem that places a huge burden on an already overstretched healthcare system.² What makes the high burden of trauma in South Africa even more egregious is the high level of interpersonal violence which includes both blunt assault and frequently the use of firearms or bladed weapons.³ Much of the trauma oeuvre from South Africa over the last half-century has focused on penetrating trauma.⁴⁻⁹ However, a significant amount of trauma in South Africa is caused by blunt mechanisms. Common mechanisms for blunt trauma are road traffic injuries and non-penetrating violence.¹⁰ Road traffic injuries are a major cause of death in South Africa with the mortality rate being 2.7 times that of the global mean.¹¹ Assaults with fists, and blunt weapons are also common. Blunt abdominal injury can be particularly challenging for a number of reasons. The abdomen contains a large number of viscera and multiple organ injury is common.¹⁰ The mechanisms of injury in blunt abdominal trauma (BAT) often result in concurrent non-abdominal injury which may also need urgent intervention. Clinical examination is not diagnostically reliable¹² and the use of

US scanning¹³ and CT scanning¹⁴ are important diagnostic tools. This study reviews the Pietermaritzburg Metropolitan Trauma Service (PMTS) experience of suspected BAT and describes the spectrum and investigation, management of BAT in our setting.

Clinical settings

The hybrid electronic medical registry (HEMR) is a registry of patients admitted to the PMTS. The PMTS provides definitive trauma care to Pietermaritzburg, the capital of KwaZulu-Natal province, and is a trauma centre which acts as a referral centre for 19 rural hospitals. The ethical approval to maintain the HEMR is granted by the University of KwaZulu-Natal's Biomedical Research Ethics Committee (BE221/13 and BE207/09).

The study

A retrospective review of the HEMR between December 2012 and September 2019 was conducted. All patients with suspected BAT on admission were included. Only patients treated at Grey's Hospital, Pietermaritzburg, were included in this study, patients who were transferred from Edendale Hospital for CT scanning were excluded. Patient characteristics were reported alongside mechanism of injury,

imaging requirements, management (including surgical intervention) and mortality.

Patient characteristics

During the study period, 1 123 patients were admitted with suspected BAT and were managed by the PMTS. The mean age of these patients was 29.19 years (SD 14.03). Of these admissions 73.6% ($n = 827$) were male, 24.8% ($n = 279$) were female and in 1.5% ($n = 17$) of cases, the sex was not clear from the HEMR. The median ISS was 14. Patient characteristics are displayed in Table I and presenting physiology is displayed in Table II.

Table I: Patient characteristics

Total (n)	1 123
Mean age (years)	29.19
Range of age (years)	0.5–85
Median age (years)	28
Sex	Male 827, Female 279, unknown 17
Injury to hospital mean time	1 day 13 hours 27 minutes
Injury to hospital range	27 minutes – 118 days 1 hour 21 minutes
Injury to hospital median time	14 hours 13 minutes
Injury to hospital SD	6 days 7 hours 55 minutes

Table II: Presenting physiology

Mean HR (BPM)	98.65
HR range (BPM)	18–197
Median HR (BPM)	96
Mean SBP (mmHg)	121.22
SBP range (mmHg)	47–237
Median SBP (mmHg)	120
Mean lactate (mmol/L)	2.77
Lactate range (mmol/L)	0.3–17
Median lactate (mmol/L)	1.8
Mean pH	7.37
pH range	6.87–7.63
Median pH	7.39
Mean BE (mmol/L)	-2.62
BE range (mmol/L)	-27.6–15.8
Median BE (mmol/L)	-2
Mean HCO_3^- (mmol/L)	22.33
HCO_3^- range (mmol/L)	5.3–40.9
Median HCO_3^- (mmol/L)	22.8
Mean Hb (g/dL)	11.62
Hb range (g/dL)	4.1–22.8
Median Hb (g/dL)	11.65

Mechanism of injury

The most common mechanism was road traffic crashes (RTCs) which accounted for 61% ($n = 685$) of all cases. Of these, 435 were motor vehicle collisions (MVCs) and 250 were pedestrian vehicle collision (PVCs). There were 186 assaults, 118 falls, 62 community assaults, 22 accidents

related to agriculture, construction or industry, 11 sporting injuries, nine animal injuries, seven patients injured by falling objects, five injured by trains, two hangings, one burn-related fall and two other causes. The mechanism of injury was unknown in 22 cases.

Imaging

There were 445 abdominal CT scans and 270 whole body CT scans. Imaging is summarised in Table III.

Table III: Imaging performed

CXR	576
AXR	223
CT abdomen	445
Whole body CT	270
CT thorax	144
CT pelvis	174
CT angio	49
Contrast meal/swallow	9
Cystogram	79
US abdomen	49
US pelvis	3
US thorax	1
FAST scan	7

Management

The majority of patients (64.8%) did not need surgical intervention. The remaining 395 patients required some form of surgical intervention, including orthopaedic surgery ($n = 106$) and other non-abdominal surgery ($n = 129$). There were 259 index laparotomies, of which 50.2% were conducted without prior abdominal CT. There were a total of 176 repeat laparotomies with several patients undergoing multiple repeat laparotomies. At index laparotomy, sple-

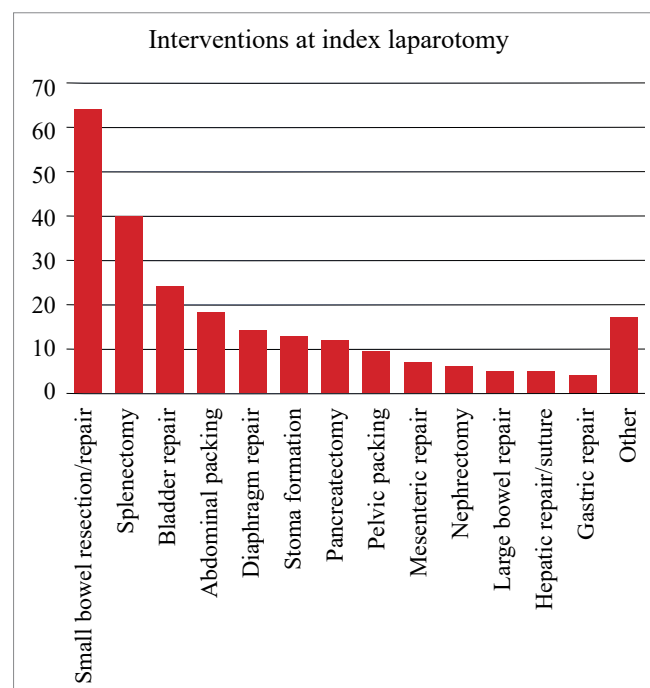


Figure 1: Interventions at index laparotomy

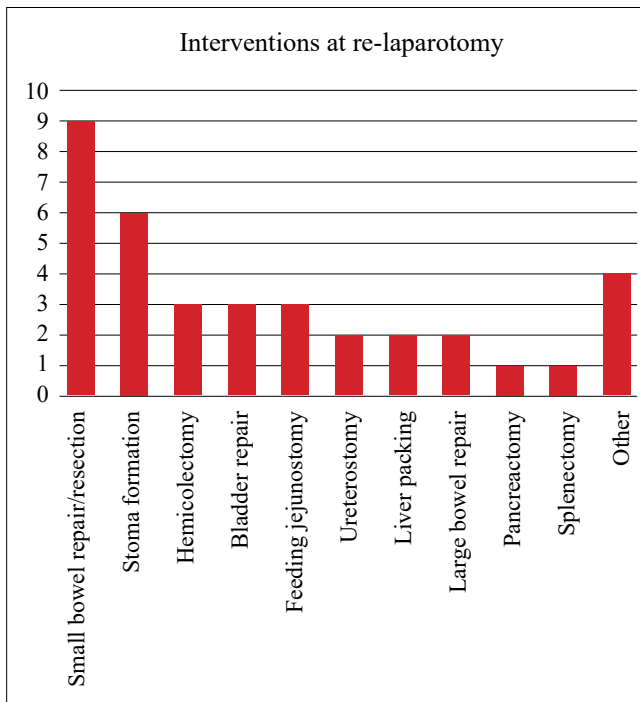


Figure 2: Interventions at re-laparotomy

nectomy, small bowel repair, bladder repair and hepatic packing were the most common interventions. Common interventions at laparotomy or repeat laparotomy are shown in Figure 1 and Figure 2. Two patients underwent selective embolisation for splenic injury, one for hepatic injury and one for a renal injury. Laparoscopy was undertaken in ten cases, and subsequently converted to laparotomy in five cases. Hospital stay ranged from 0–155 days with the median stay being three days. ICU admission was required in 24.9% ($n = 280$) of patients. The mortality rate was 7.5% ($n = 84$).

Discussion

Our series demonstrates two main mechanisms of BAT in our region. The first is related to RTC and the second to interpersonal violence in the form of assaults by individuals and mobs. These two mechanisms accounted for 83% of the injuries described in this study. A coordinated nationwide multi-faceted strategy to reduce the high rate of road traffic related trauma is long overdue. Such a strategy will require political will and general buy-in from all stakeholders as it will require a major change in the culture of road usage.¹¹ The experience with the total societal mobilisation around HIV/AIDS¹⁵ and more recently with the response to the COVID-19 pandemic¹⁶ suggests that it is possible to achieve the same with trauma in general and road traffic collisions in particular. Reducing the high rates of interpersonal trauma may be more difficult to achieve.

The management of BAT relies heavily on imaging. In the United Kingdom, it is rare for a case of BAT to proceed to surgery without first undergoing a CT scan.¹⁷ In our series, the rate is not as high. This difference is likely due to the disparity in injury severity and scanner availability between the two regions. It is difficult to rely on clinical examination to assess patients with injuries to multiple body regions.¹² The use of sonar in the form of focused abdominal sonar for trauma (FAST) is increasingly common.¹⁸ We have still not fully developed this modality at our institution and there were only seven documented FAST scans in our

series. CT remains the gold standard in assessing BAT;¹⁹ it is very sensitive in the detection of free fluid and it is able to diagnose solid organ injury and grade almost all solid organ injuries. FAST scan is increasingly used to identify the presence of intra-abdominal fluid. As such, FAST remains an excellent modality for ruling in abdominal injury but is poor in grading the severity of the injury and must usually be followed by a CT if a non-operative approach is to be followed.¹³

Hollow visceral disruption cannot be treated non-operatively and the commonest indication for laparotomy was a small bowel injury. Blunt small bowel injury has been well described from our unit and is still associated with delay in recognition and morbidity.^{10,20} Duodenal injury and bladder disruption were also common indications for laparotomy.²¹ Solid visceral injuries, especially hepatic, splenic and renal are amenable to non-operative management (NOM) provided the patient remains in a state of haemodynamic stability. CT imaging helps grade these injuries and direct therapy. Selective embolisation, endo-urological intervention and laparoscopy are adjuncts which increase the scope of NOM in these injuries.^{22,23} The low number of embolisations in our series again reflects our institutions inability to deliver this intervention. Pancreatic trauma is insidious and associated with delayed recognition. Complete ductal disruption should mandate an operation. If the disruption is at the neck of the pancreas, distal pancreatectomy or pancreatico-gastrostomy are potential solutions. If the injury involves the pancreatic head and duodenum, then the initial operative approach is to control soiling and provide drainage. Once the patient is stabilised, these injuries usually require a formal pancreaticoduodenectomy.

Surgical management is complex and there is a high rate of repeat operation. This is frequently secondary to the use of damage control procedures. Once the patient's physiology has been restored, definitive surgery can be undertaken, packs removed and open abdomens closed. Multiple, repeat laparotomies may be required to deal with ongoing intra-abdominal sepsis. There is a high rate of non-abdominal operations in these patients and this reflects the fact that blunt torso trauma is truly polytrauma involving multiple body regions. The high rate of ICU admission and the high mortality rate reflect the severity of the polytrauma.

Conclusion

BAT is a common problem in South Africa. Whilst the vast majority of patients require non-operative treatment, a well-defined subset require a laparotomy. Imaging is central to the management of patients with BAT. Management is complex and associated with significant morbidity and mortality.

Conflict of interest

The authors declare no conflict of interest.




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Ethical approval

The ethical approval to maintain the HEMR is granted by the University of KwaZulu-Natal's Biomedical Research Ethics Committee (BE221/13 and BE207/09).

ORCID

P Rhimes  <https://orcid.org/0000-0002-9689-3688>
S Moffatt  <https://orcid.org/0000-0002-7649-4970>
VY Kong  <https://orcid.org/0000-0003-2291-2572>
JL Bruce  <https://orcid.org/0000-0001-8666-4104>
MTD Smith  <https://orcid.org/0000-0002-6954-153X>
W Bekker  <https://orcid.org/0000-0003-0695-5994>
GL Laing  <https://orcid.org/0000-0001-8075-0386>
DL Clarke  <https://orcid.org/0000-0002-8467-1455>

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