

## Current trauma patterns in Pietermaritzburg

N B Moodley, D L Clarke, C Aldous

Department of Surgery, Nelson R Mandela School of Medicine; University of KwaZulu-Natal, South Africa

Corresponding author: Damian Clarke (damianclar@gmail.com)

**Background:** The aim of this observational study was to audit the burden of trauma with which patients present at the three hospitals that comprise the Pietermaritzburg Metropolitan Complex, as well as their intensive care units (ICUs) and the government medico-legal mortuary.

**Method:** A retrospective audit was conducted by assessing emergency department, critical care unit admission record books and medico-legal mortuary report files over a period of two years as well as reviewing patient demographics and the mechanism of trauma in patients. Data were manually entered into a data spreadsheet for the period 1 January 2010 to 31 December 2011. Recorded data included basic demographic information, mechanism of injury and the facility. Details of the injury precipitating the ICU admission and the length of stay were included in the ICU data.

**Results:** During the period 10 644 patients presented to the Pietermaritzburg Metropolitan Trauma Service as a result of trauma-related injuries. Of the 10 644 trauma patients seen, there were 3 688 assault-related injuries (35%), 3 715 motor vehicle accident (MVA)-related injuries (35%), 516 gunshot wound (GSW)-related injuries (5%) and 2 725 stabbings (26%). The trauma burden consisted predominantly of blunt trauma (70%), followed by penetrating trauma (30%). The majority of trauma patients were male (77%). Of the 10 644 trauma patients seen, 510 (5%) needed admission to an ICU. The composition of the group requiring ICU was assault (8%), MVAs (48%), GSWs (14%) and stabbings (30%). A total of 1 105 (10%) trauma victims died, 471 of whom survived long enough to be admitted to a medical facility. The mortuary group consisted of 56% incidents of blunt trauma and 44% of penetrating trauma. There were 153 (14%) assault-related deaths, 462 (42%) MVA-related deaths, 181 (17%) GSW-related deaths and 309 (28%) stabbing-related deaths.

**Conclusion:** Although the rate of penetrating trauma remains high, it is being overtaken by blunt trauma. Almost half of this blunt trauma load is nonintentional. MVAs are expensive to treat, consume ICU resources and are associated with significant mortality. Injury-prevention strategies are a priority, and should address the high rate of MVAs and the high rate of interpersonal violence. The decline in GSW-related trauma is cause for cautious optimism.

S Afr J Surg 2015;53(3&4)

Trauma in South Africa was described as a “malignant epidemic” over two decades ago, and this remains an apt term.<sup>1</sup> An epidemic demands a coordinated systematic public health response, and consequently, there has been considerable interest in developing an appropriate and sustainable trauma system in South Africa. The development of a comprehensive registry which allows tracking of the disease is part of the public health response to an epidemic.<sup>2</sup> This has as yet not been established in South Africa, and tracking trends of this epidemic rely upon anecdotal reports and local studies. The low-velocity stab wound was the major mechanism of penetrating trauma in the 1970s and 1980s.<sup>3-9</sup> The pattern of trauma evolved with the social instability which accompanied political change in the mid 1980s and early 1990s. The alarming increase in gunshot wounds (GSWs) and the increased use of military style assault weapons resulted in severe injuries, which were difficult and expensive to manage.

Trauma has continued to blight South Africa over the last two decades. However, accurate and reliable data on this epidemic are unavailable. Anecdotal evidence suggests that the profile of the epidemic continues to evolve. A unique opportunity to analyse current trauma patterns across an entire metropolitan complex was offered in Pietermaritzburg. The aim of this observational study was to audit the burden of trauma with which patients present at the three hospitals that comprise the Pietermaritzburg Metropolitan Complex, as well as their intensive care units (ICUs) and the government medico-legal mortuary.

### Setting

The Pietermaritzburg Metropolitan Trauma Service (PMTS) functions as a trauma service, rather than a trauma centre, and attempts to deliver trauma care across the Pietermaritzburg

Metropolitan Complex, and provide strategic and political leadership in trauma care to the western rural health districts of KwaZulu-Natal. Pietermaritzburg is the capital of KwaZulu-Natal, and is the largest city in the western part of the province. The population of Pietermaritzburg was estimated to be one million people, with a density of 1 665 inhabitants/km<sup>2</sup>, in the 2011 census. It is served by a tertiary hospital (Grey's Hospital), a regional hospital (Edendale Hospital) and a district hospital (Northdale Hospital). There are three private hospitals in the city. Forensic work is undertaken at the police mortuary based at Fort Napier in the city centre. Trauma-related fatalities need to undergo mandatory police postmortem under South African law.

## Method

Ethics approval was obtained prior to commencing the study (BE 177/11). A retrospective audit was conducted by assessing emergency department, critical care unit admission record books and medico-legal mortuary report files over a two-year period (January 2010 to December 2011), as well as reviewing patient demographics and the mechanism of trauma in patients. Data were manually entered into a data spreadsheet for the period 1 January 2010 to 31 December 2011. Recorded data included basic demographic information, mechanism of injury and the facility. Details of the injury precipitating the ICU admission and the length of stay were included in the ICU data.

## Results

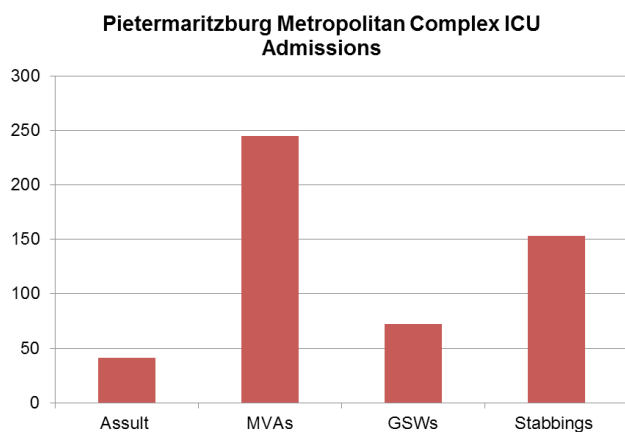


Fig. 1. Intensive care unit admissions for trauma over the two-year period

During the period 1 January 2010 to 31 December 2011, 10 644 patients presented to the PMTS as a result of trauma-related injuries. Of the 10 644 trauma patients seen, there were 3 688 assault-related injuries (35%), 3 715 motor vehicle accident (MVA)-related injuries (35%), 516 gunshot wound (GSW)-related injuries (5%) and 2 725 stabbings (26%). The trauma burden consisted predominantly of blunt trauma

(70%), followed by penetrating trauma (30%). The majority of trauma patients were male (77%). Of the 10 644 trauma patients seen, 510 (5%) needed admission to an ICU. The composition of the group requiring ICU was assault (8%), MVAs (48%), GSWs (14%) and stabbings (30%). This cohort is detailed in Figure 1. A total of 1 105 (10%) trauma victims died, 471 of whom survived long enough to be admitted to a medical facility. The mortuary group consisted of 56% incidents of blunt trauma and 44% of penetrating trauma. There were 153 (14%) assault-related deaths, 462 (42%) MVA-related deaths, 181 (17%) GSW-related deaths and 309 (28%) stabbing-related deaths.

## Discussion

Trauma is a major public health problem in South Africa, and requires a concerted public health response. In 1991, Muckart drew attention to the fact that trauma was an epidemic, and highlighted the observation that it mutated and evolved in tandem with political and social determinants.<sup>1</sup> He used a single centre (King Edward VIII Hospital) as an example, and showed that in the five-year period from 1983–1988, trauma admission increased from 50% for all emergencies to 60%. GSWs to the torso increased by over 300%, and vascular trauma by 340 new cases per year, in that period. These injuries were extremely complex to manage and massively consumed already limited resources. Muckart pointed out that by the end of the period under review, almost half the admissions to the ICU at King Edward VIII Hospital were victims of trauma, and that in addition, nearly half as many again were denied access to the ICU because of the subsequent shortage of beds. This, in turn, meant that elective surgical patients who required ICU care were also denied their procedures.<sup>1</sup> This dramatic change in the volume of trauma was accompanied by the violent political change experienced in South Africa from 1983–1993. The unpublished 1997 Durban Metropolitan Pilot Study confirmed that the high rates of penetrating trauma and GSWs in comparison to blunt trauma continued to characterise trauma in Durban well into the last decade of the previous century.<sup>3–6</sup>

Trauma has continued to blight South Africa since the advent of democracy,<sup>7–9</sup> and yet little has been carried out to monitor and track this epidemic. A number of socio-political changes have continued, and these will impact on the trauma patterns seen in the country. Gun control legislation has been enforced since the turn of the millennium, and there have been ongoing attempts to demilitarise society by removing assault weapons. The ongoing demilitarisation of society means that the number of young men with military training and skill has gradually decreased with time. In conjunction with this, there has been ongoing urbanisation and an increased level of motorisation. This is not a uniquely South African phenomenon. In 2009, MVAs were the ninth leading cause of deaths worldwide, with more than 1.2 million deaths reported annually. Twenty million to 50 million nonfatal injuries are caused by MVAs annually. The United Nations has declared that MVAs are a major public health problem, requiring concerted efforts to

ensure effective and sustainable prevention.<sup>2</sup> This morbidity and mortality is not evenly distributed. Over 90% of total deaths and 96% of paediatric deaths occur in low- and middle-income countries, although only have 48% of the world's vehicles are registered in these countries. Muckart also predicted that road trauma in South Africa would be an ever-growing burden on the health service, and this has been borne out by events.<sup>1,6</sup> South African statistics have confirmed predictions by demonstrating a steadily increasing number of registered vehicles and drivers.<sup>10,11</sup> It has been estimated that there were 13 802 deaths from MVAs in 2011 in South Africa (27.5 per 100 000 population).

Our data highlight the significant volume of trauma with which patients present to the government health services in Pietermaritzburg. Trauma victims are predominantly male (77%) and have a mortality rate of 10%. We have confirmed that the epidemic has mutated. Unlike the situation as recently as 15 years ago, the ratio of blunt to penetrating trauma has changed. Blunt trauma now predominates by 56% to 44%. GSWs have significantly declined in the still significant category of penetrating trauma injuries. This is almost certainly because of stricter gun control regulations and the ongoing demilitarisation of society. The dramatic increase in MVAs as a cause of trauma confirms the World Health Organization predictions, and presents a new challenge in terms of injury prevention. MVA-related trauma is expensive to treat, and our group recently performed a bottom-up costing on 100 consecutive MVA-related admissions to our centre. The total cost of in-patient care for these 100 patients was USD 698 850.<sup>10,11</sup> This translates to an individual cost of approximately USD 60 000 to treat one victim of a MVA requiring admission. The use of ICU resources is also significant, and a MVA was the most common mechanism requiring ICU admission in. MVA-related trauma and GSW-related trauma are more lethal than other forms of trauma, as evidenced by the breakdown of the mortuary figures. Injury prevention needs to be prioritised if the epidemic of trauma is to be dealt with meaningfully. The high levels of interpersonal violence, as typified by the high rate of assault, need to be considered, as well as the high rate of MVAs. It would appear that progress has been made with a reduction in GSW-related trauma, and this is cause for cautious optimism.

## Conclusion

The tremendous volume of trauma-related injuries treated in South African hospitals annually is once again emphasised by this study's findings. Emerging trends in the epidemic have been identified. Although penetrating trauma remains high, it is being overtaken by blunt trauma. Almost half of this blunt trauma load is nonintentional. However, MVAs comprise almost half of the blunt trauma load. MVAs are expensive to treat, consume ICU resources and are associated with significant mortality. Injury-prevention strategies are a priority and should address the high rate of MVAs and the high rate of interpersonal violence. The decline in GSW-related trauma is cause for cautious optimism.

## REFERENCES

1. Muckart DJ. Trauma: the malignant epidemic. *S Afr Med J*. 1991;19(79):93–95.
2. Laing GL, Bruce JL, Aldous C, Clarke DL. The design, construction and implementation of a computerized trauma registry in a developing South African metropolitan trauma service. *Injury*. 2014;45(1):3–8.
3. Meumann C, Peden M, Gouws E, van der Spuy J. Durban Metropolitan Pilot Study: provisional mortuary data [unpublished]. Durban: Medical Research Council, National Trauma Research Programme, 1997.
4. Norman R, Matzopoulos R, Groenewald P, Bradshaw D. The high burden of injuries in South Africa. *Bull World Health Organ*. 2007;85(9):695–702.
5. Seedat M, Van Niekerk A, Jewkes R, et al. Violence and injuries in South Africa: prioritizing an agenda for prevention. *Lancet*. 2009;374(9694):1011–1022.
6. Muckart DJ, Meumann C, Botha JB. The changing pattern of penetrating torso trauma in KwaZulu-Natal: a clinical and pathological review. *S Afr Med J*. 1995;85(11):1172–1174.
7. Clarke DL, Kong VY, Handley J, Aldous C. A concept paper: using the outcomes of common surgical conditions as quality metrics to benchmark district surgical services in South Africa as part of a systemic quality improvement programme. *S Afr J Surg*. 2013;51(3):84–86.
8. Hardcastle TC, Samuels C, Muckart DJ. An assessment of the hospital disease burden and the facilities for the in-hospital care of trauma in KwaZulu-Natal, South Africa. *World J Surg*. 2013;37(7):1550–1561.
9. Clarke DL. Ensuring equitable access to high quality care: the task of uplifting trauma care in rural and district hospitals. *S Afr Med J*. 2013;103(9):588–558.
10. Parkinson F, Kent SJ, Aldous C, et al. The hospital cost of road traffic accidents at a South African regional trauma centre: a micro-costing study. *Injury*. 2014;45(1):342–345.
11. Parkinson F, Kent S, Aldous C, et al. Road traffic crashes in South Africa: the burden of injury to a regional trauma centre. *S Afr Med J*. 2013;103(11):850–852.