

Spectrum of injuries resulting from gunshot wounds in car hijacking: a South African experience

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ABSTRACT

Background Car hijacking, known as “carjacking”, is a form of aggravated robbery of a vehicle from the driver frequently involving firearm and is common in South Africa. There is, however, little literature on the spectrum of injuries sustained by victims of car hijacking. The study aimed to describe the spectrum of gunshot wound-related (GSW) injuries and review our experience of management of victims of car hijacking in our trauma center based in South Africa.

Methods A retrospective review was conducted during an 8-year period from January 2010 to January 2018 on all patients who presented with any form of GSW after a car hijacking incident.

Results During the 8-year study period, a total of 101 patients were identified. Seventy-four percent were male (75 of 101) and the mean age was 34 years. The mean time from injury to arrival at our trauma center was 7 hours (rural district: 10 hours, urban district: 4 hours; $p < 0.001$). Seventy-five percent (76 of 101) of all patients sustained GSWs to multiple body regions, whereas the remaining 25% (25 of 101) were confined to a single body region. The most common region involved was the chest (48 cases), followed by the abdomen (46 cases) and neck (34 cases). Sixty-three of the 101 (62%) patients required one or more operative interventions. The most common procedure was laparotomy (28 cases), followed by vascular (20 cases) and neck (14) exploration. Eighteen percent (18 of 101) of all patients required intensive care unit admission. The mean length of hospital stay was 7 days. The overall morbidity was 13% (16 of 101) and the overall mortality was 18% (18 of 101).

Discussion The spectrum of injuries from GSW related to car hijacking commonly involves close range GSWs to multiple body regions. Torso trauma is common and a substantial proportion of victims require major operative interventions. The mortality from these injuries is significant.

Level of Evidence Level III.

INTRODUCTION

Car hijacking, commonly referred to as “carjacking”, is an aggravated robbery of a vehicle from the driver which usually involves the use of a firearm.¹ South Africa has one of the highest rates of car hijacking in the world, with an average of 46 vehicles being hijacked per day, which equates to 2 every hour.¹ Between 2016 and 2017 alone, 16 717 hijacking incidents were recorded by the South African Police Service (SAPS). This alarming figure was the highest recorded in the past decade and represents a 15% increase from the previous year.² There is, however, little literature on the spectrum of injuries sustained

by victims of car hijacking. In light of this, we set out to describe the spectrum of gunshot wound-related (GSW) injuries sustained and review our experience of management of victims of car hijacking in the setting of a low-income/middle-income country.

PATIENTS AND METHODS**Clinical setting**

This was a retrospective, observational study that focused specifically on patients who sustained GSWs during a car jacking incident. The study was based at the Pietermaritzburg Metropolitan Trauma Service (PMTS), Pietermaritzburg, South Africa. The PMTS provides definitive trauma service to the city of Pietermaritzburg, the capital of KwaZulu Natal (KZN) province. KZN is located on the east coast of the country and has a population of over 11 million. Fifty percent of the population live in rural areas.³ The PMTS is the largest academic trauma center in western KZN and is the tertiary trauma referral center covering a total catchment population of over three million people. Due to the high incidence of interpersonal violence and criminal activities in our region, penetrating trauma is exceedingly common and represents a significant proportion of workload at our institution. The PMTS maintains a formal electronic regional trauma registry. All patients who present to our trauma center are prospectively entered into the electronic database, and the pertinent information entered include details regarding injury mechanism, operative intervention, patient progress, and clinical outcomes. Our catchment area is divided into two distinct health districts. The urban district (UD) includes the city of Pietermaritzburg and the surrounding suburban areas. The rural district (RD) includes all areas outside the geographic boundaries of the city of Pietermaritzburg.

The study

A retrospective review was conducted during an 8-year period from January 2010 to January 2018 on all patients who presented with any form of GSW after a car hijacking incident. Basic demographic details including age and gender were reviewed. Specific information was sought from the prehospital emergency medical service (EMS) documentation in relation to the location of incidence, transport time, and time of arrival at our trauma center. Further clinical information reviewed included body regions injured, operative interventions, need for intensive care unit (ICU) admission, morbidity, and mortality.

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**Table 1** Injury by body region

Body region	Frequency
Chest	48
Abdomen	46
Neck	34
Lower limb	33
Upper limb	28
Head	12
Pelvis	9

Statistical analysis

Data were processed and analyzed using Stata V.143.0. χ^2 tests were used to examine differences in categorical transport time between urban and rural cases.

RESULTS

Demographics

During the 8-year study period, a total of 101 patients with GSW related to car hijacking incidents were identified. During the same period, 1645 GSW victims were treated at our institution; thus, the proportion of GSW related to car hijacking constituted 6% of all GSWs managed. Seventy-four percent were male (76 of 101) and the mean age was 34 years. Fifty-five percent (56 of 101) of these occurred in the RD outside the catchment of the city of Pietermaritzburg, and the remaining 45% (45 of 101) occurred within the UD. The median time from injury to arrival at our trauma center for those in the RD was 9 hours (Q1, Q3: 9, 9), and the median time for those in the UD was 3 hours (Q1, Q3: 3, 3) ($p < 0.001$).

Injury pattern

Seventy-five percent (76 of 101) of all patients sustained GSWs to multiple body regions, whereas the remaining 25% (25 of 101) were confined to a single body region. [Table 1](#) summarizes the frequency injury encountered by body region.

Operative interventions

Sixty-three of the 101 (62%) patients required one or more operative interventions. [Table 2](#) summarizes the operative procedures performed and the associated injuries.

Clinical outcome

Eighteen percent (18 of 101) of all patients required ICU admission. The median length of hospital stay was 7 days (Q1, Q3: 6, 8). The overall morbidity was 13% (16 of 101) and the overall mortality was 18% (18 of 101). The 18 deaths were related to the following: 6 died from hospital-acquired pneumonia, 4 exsanguinated in the operating room from intra-abdominal vascular injury prior to vascular control were possible, 3 with major cardiac and/or pulmonary hilar injury and 1 had combined thoracic great vessel and intra-abdominal vascular injury, 3 died from Multiple Organ Failure (MOF) (expired 48 hours after the initial operation). 1 died from acute respiratory distress syndrome (ARDS).

DISCUSSION

Carjacking is common in South Africa and the incidence remains the highest in the world.¹⁻⁴ The word “carjacking” is a portmanteau of “car” and “hijacking” and was first coined by EJ Mitchell, an editor in *The Detroit News*.¹ Despite the usual media coverage, carjacking remains an under-researched and poorly understood

Table 2 Operative interventions in 63 patients

Operations	n
Neurosurgery	2
Neck exploration	14
Venous	9
Arterial	5
Esophageal	6
Tracheal	3
Laryngeal	3
Cervical spine	6
Thoracotomy	5
Cardiac and great vessels	2
Pulmonary	4
Laparotomy	28
Small bowel	8
Colon	2
Rectum	2
Stomach	3
Duodenum	3
Pancreas	2
Liver	6
Spleen	3
Kidney	6
Bladder	10
Ureter	2
Intra-abdominal vascular	3
Urethral	2
Vascular exploration	20
Brachial artery	4
Radial artery	1
External iliac artery/superficial femoral artery	14

crime.⁵ Paradoxically, there is currently no published literature specific to this in South Africa. Due to the ease of access to firearms in South Africa, coupled with organized criminal syndicates operating in most major cities, the incidence of carjacking continues to increase each year.² Most if not all are related to the use of firearm in an attempt to neutralize the victim and to deter them from contacting law enforcement. One of the major barriers in understanding this phenomenon in South Africa is the complete lack of official data. Although the current data that are available do provide a limited view in terms of the numbers within each province, these are not sufficiently comprehensive as the true incidence is likely to be substantially higher due to under-reporting. Official data from the SAPS are difficult to obtain and data from private insurance companies are heavily restricted. Currently, the majority of information released to the public is from private security companies. There has been a surge in the number of these private businesses that profit from providing a wide range of services that include vehicle tracking, installation of antihijacking devices, and roadside assistance specifically related to carjacking. Even then, those who use the service are likely to be a specific to the subgroup of the population who are able to afford it, and thus these data would not provide the entire picture. With technological advances in recent years, several mobile phone applications are now available which provide cumulative collected user statistics on the specific roads where carjacking is common so drivers can

Box 1 Make of the 10 most frequently hijacked vehicle in South Africa.¹²

- ▶ Volkswagen.
- ▶ Toyota.
- ▶ Ford.
- ▶ Citroen.
- ▶ Kia.
- ▶ Hyundai.
- ▶ BMW.
- ▶ Audi.
- ▶ Renault.
- ▶ Chevrolet.

avoid certain areas. This may provide a useful source of data in the future.

Despite the scale of this problem across the country, public health response has been slow and continues to prioritize infectious diseases, whereas violent trauma remains a silent epidemic.^{6,7} In a small number of major cities (eg, Johannesburg, Durban), certain areas are signposted as “hijacking hotspot” to warn drivers of the potential imminent risk. The exact outcome and actual effectiveness of these limited public health measures are currently unknown.

One of the limitations of this study is that some of the information related to the vehicle model and the exact location of the incidents were not known in detail. **Box 1** illustrates the top 10 make of vehicles hijacked in South Africa. Another limitation is that this study was based on a single-center experience in our province. Currently, there is no available local study from the literature on this topic from other provinces. To our knowledge, this study is the only study in this area published in South Africa to date.

Our study demonstrated that a significant proportion of these injuries occur in rural areas within our catchment area and that transportation to definitive care at our trauma center is prolonged. Globally, literature has consistently shown that patients who sustain trauma in rural areas have poorer outcomes than their urban counterparts for a whole range of injuries.^{8–11} The reasons that have been postulated to explain such discrepancy are complex, and include differences in quality of prehospital care, delay in transport, and prolonged discovery time.¹¹

KZN is the largest and most populous province in South Africa, with a population of over 11 million, 50% of which resides in rural areas.³ South Africa is considered a low-income/middle-income country, with an overwhelming burden of trauma, where the resource allocated is perennially insufficient.⁷ Although a prehospital system of EMS exists, the organization is less structured than that of the developed world. This translates into significant delays to definitive care. Although cynics may argue that the “devil of distance” is difficult to overcome, investing in the reorganization of EMS to improve patient transfer could potentially improve the outcome in these patients.

Perpetrators often prefer GSW as it inflicts a more severe injury to victims. Even if the victims surrender the vehicle without resistance or any ensuing struggles, they were often still deliberately injured as it was commonly thought that if the victim was discovered by a passer-by, the first contact is with the ambulance service rather than police, thus allowing more time for the perpetrators to escape from law enforcement agencies. This is reflective of the wide spectrum of severe injuries from GSW in close proximity.

Based on our institutional experience, the majority of victims sustained multiregional GSWs and almost two-thirds require surgery, with high mortality. Transaxial GSW of the torso is

particularly common and thoracic injury carries a particularly high mortality. These injuries are challenging to manage and the priority of management is often difficult to be made with certainty. The incidence of proximal lower limb vascular injury was also common.

CONCLUSIONS

The spectrum of injuries from GSW related to car hijacking commonly involves close range GSWs in multiple body regions. Torso trauma is common and a substantial proportion of victims require major operative interventions. The mortality from these injuries is significant.

Contributors Dr Victor Kong conceptualized and designed the study. All authors contributed to the writing of this article and the author order is reflective of the time commitment.

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Disclaimer Victor Kong, John Bruce, Grant Laing and Damian Clarke are current Advanced Trauma Life Support instructors.

Competing interests None declared.

Patient consent for publication Not required.

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