Extremity Injuries From Motorcycle Road Traffic Accidents: The Experience From a Tertiary Referral Hospital in Jamaica

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Citation

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Abstract

Objectives: There is little data available on the prevalence of extremity injuries from motorcycle accidents in Jamaica. We performed a descriptive, analytical study to evaluate the injury profiles from motorcycle accidents in a tertiary referral hospital in Jamaica.
Methods: Between January 1, 2000 and January 1, 2007, demographic and clinical data on all motorcycle accident victims admitted to the University Hospital of the West Indies with extremity injuries were collected in a prospective database. The data were analyzed using the SPSS version 12.0.
Results: Of 270 motorcycle accident victims, there were 257 (95.2%) males and 13 (4.8%) females. The commoner extremity injuries were: soft tissue trauma 270 (100%); limb fractures 198 (73.4%); vascular 9 (3.3%); nerve (0); muscle 65 (24.1%). Associated injuries involved the head 143 (53.0%), abdomen 38 (14.1%) and thoracic viscera 71 (26.3%). The mean injury severity score was 9.0 (SD 9.4; Median 8; Mode 4). There were 195 patients needing surgical intervention in the form of orthopaedic operations (94), neurosurgical operations (43), abdominal operations (49), and vascular operations (14). The mean duration of hospitalization was 10 days (SD 11.2; Range 0-115; Median 6; Mode 3). There were 12 (4.4%) deaths, 9 (75%) due to traumatic brain injuries. Fatal injuries were commoner in males (11) and un-helmeted patients (10).
Conclusions: Motorcycle accident victims place an additional burden on emergency
surgical services. Educational intervention strategies and legislative policies are needed to minimize the impact of these preventable injuries on the limited resources of the health services.

INTRODUCTION

Approximately 11% of all road traffic accident victims in Jamaica are injured on motorcycles ([1,2]). These motorcycle accidents place a heavy toll on the publicly funded health care system in Jamaica ([2]).

Motorcycle riders involved in road traffic accidents are seriously disadvantaged by the lack of available safety equipment such as seat belts and air bags. Due to the nature of the accidents, trauma to the exposed limbs account for a significant proportion of these injuries ([2,3]). Yet, there is little data available on the prevalence of extremity injuries from these incidents.

In order to document the prevalence and demographics of these injuries, we performed a cross-sectional analytic study of motorcycle accident victims presenting to the University Hospital of the West Indies (UHWI), a tertiary referral hospital serving Kingston, the capital city of Jamaica.

METHODS

The UHWI is a 500-bed tertiary hospital in Kingston, Jamaica with seven operating theatre suites and two eight-bed multidisciplinary Intensive Care Units (ICU). Patients involved in road traffic accidents usually present to the emergency room, where they are evaluated, resuscitated and treated appropriately for their injuries.

Ethical approval from the UHWI Faculty of Medical Sciences ethics committee was secured to collect and analyze data for this study (UWI/ECP51 2008/2009). Between January 1, 2000 and January 1, 2007, demographic and clinical data on all motorcycle accident victims with extremity injuries presenting to the UHWI were collected in

a prospective database (Collector Trauma Registry-T ®).

Pedestrians and automobile passengers who were involved in collisions with motorcycles were not included. We also excluded patients in whom data were unavailable or incompletely collected. Three categories of injury were identified: peripheral vascular injuries; soft tissue injuries and long bone fractures.

Soft tissue injuries were defined as any traumatic lesions to skin, subcutaneous, muscular, connective and/or nervous tissues of the upper or lower limbs.

Peripheral vascular injuries were defined as a traumatic lesion to a named blood vessel that was confirmed with radiographic techniques and/or at operation. The vessels included were any named blood vessels that were distal to the inguinal ligament in the lower limb or distal to the axilla in the upper limb.

A fracture was defined as disruption in the continuity of a bone that was confirmed on radiographic studies. Once there was a break in the continuity of the overlying skin, the patient was considered to have an open fracture. Those without disruption of the overlying skin were considered to have closed fractures. All bones of the respective extremity were included: From pectoral girdle to phalanges for the upper limb and from pelvic girdle to phalanges in the lower limb.

The data collected included patient demographics, injury details, Injury Severity Scores (ISS), skin disruption, duration of hospitalization and patient function on discharge. The data were analyzed using SPSS version 12.

RESULTS

During the study period, 293 patients required hospitalization for extremity injuries sustained in motorcycle accidents. Incomplete data was collected in 23 patients and they were excluded from further analysis.

There was a marked preponderance of males with a 25:1 male to female ratio. There were 257 (95.2%) males at a mean age of 34.2 years (SD +/-11.0; Range 13-71; Median 34; Mode 28). Only 13 (5.1%) males were pillion passengers. There were 13 (4.8%) females with a mean age of 26 years (SD +/-8.5; Range 14 - 42; Median 26; Mode 27). These women were all pillion passengers.

These patients had a mean ISS of 9.0 (SD +/-9.4; range 1-75; median 8; mode 4). In addition to extremity injuries, 244 (83.3%) patients also sustained trauma to the head and/or torso. Head injuries occurred in 143 (53%), thoracic injuries in 71 (26.3%) and abdominal visceral injuries in 38 (14.1%) cases.

With regard to the extremity injuries, soft tissues followed by limb fractures were the commonest systems traumatized. There were no peripheral nerve injuries recorded. The injury demographics are outlined in table 1.

Figure 1

Table 1: Extremity Injuries in Motorcycle Accident Victims

Extremity Injury	No	Percent
Soft Tissue Trauma		
• Skin and subcutaneous tissues	270	100%
• Muscle (exclusive of fractures)	65	24.1%
• Nerve	0	0
Peripheral Vascular Injury		
• Arterial injury	9	3.33%
• Venous Injury	0	0
Fractures		
• Upper Limb (open)	22	8.15%
• Upper Limb (closed)	55	20.4%
• Lower Limb (open)	39	14.4%
• Lower Limb (closed)	82	30.4%

Figure 2

Table 2: Fractures in the Upper Extremity

Bone involved	Closed	Open
Clavicle	5	0
Scapula	5	0
Humerus: shaft	6	0
Both forearm bones	3	7
Ulna only	4	8
Radius only	8	6
Metacarpals	5	0
Carpal bones	0	0
Hand phalanges	5	1
Multiple upper limb sites	14	0
Total	**55**	**22**

Figure 3

Table 3: Fractures in the Lower Extremity		
Bone	**Closed**	**Open**
Pelvis	12	0
Femur: cervical	1	4
Femur: shaft	3	4
Femur: supracondylar	1	0
Patella	5	4
Tibia / Fibula: upper end	5	3
Tibia / Fibula: shaft	27	9
Ankle: medial malleolus	15	2
Ankle: lateral malleolus	5	9
Calcaneus	1	0
Metatarsals	5	4
Foot phalanges	2	0
Total	**82**	**39**

There were 9 patients who sustained peripheral arterial injuries: Superficial Femoral (5); Posterior Tibial (1); Popliteal (1); Brachial (1); Radial (1). Two patients had vessel injuries (posterior tibial and popliteal) associated with fracture-dislocations. The remaining vessel injuries were associated with penetrating trauma.

The majority of patients required some form of operative intervention for their injuries. There were 204 minor surgical procedures (wound debridement and/or closure) performed in the emergency room or minor operating theatre for soft tissue injuries. There were 9 limb explorations to repair arterial injuries and 94 orthopaedic procedures for fracture stabilization. There were 92 operative procedures aimed at repairing injuries to other body systems: central nervous system (43), torso (49).

The duration of hospitalization ranged from 0-115 days, with a mean of 10 days (SD +/-11.2; Median 6; Mode 3). At the time of hospital discharge, 90 (33.3%) patients were able to ambulate without assistance and 180 (66.7%) were ambulant with the use of assisting devices (crutches, walker, etc).

There were 12 (4.4%) deaths recorded in the study period in 11 (91.7%) males and 1 (8.3%) female. The deaths occurred in patients who sustained multiple system injuries. None of the deaths occurred as a direct result of extremity injury: head injury accounted for 9 (75%) cases; abdominal visceral injury 2 cases (16.7%) and thoracic injury 1 case (8.3%).

DISCUSSION

Motorcycles have become a popular means of transportation because, compared to the traditional automobile, they are easier to maneuver, consume less fuel and have shorter acceleration and transit times ([3]). Motorcycle riders are seriously disadvantaged by the lack of available safety equipment such as airbags and seatbelts. For this reason, motorcycle accident victims usually sustain injuries to multiple body systems.

Long established patterns of injury risk confirm that the lower limbs are the body parts most likely to be injured in motorcycle accidents ([4,5]). The probable explanation for the high frequency of lower-limb injuries is that the limb is often squeezed between the motorcycle and impacting vehicle, the ground or some other fixed object. Although they can be quite severe more than half of all injuries are relatively minor soft tissue injuries ([4,5]).

The high prevalence of soft tissue extremity injuries in our series was expected considering the body exposure of the riders. Most were minor injuries that involved only skin and/or subcutaneous tissues, requiring only wound debridement and/or closure. Only 24% of soft tissue injuries penetrated fascia and required more involved procedures to debride and/or repair muscular injuries.

These injuries are caused by unprotected contact with hard surfaces on accident vehicles or by the rider tumbling, rolling or sliding along the road surface. Specialized protective motorcycle clothing does provide some protection against this type of injury mechanism ([8,9,10,11,12,13,14,15]). Schuller et al reported that injured riders who had been wearing protective leather clothing spent an average of seven days less in hospital, returned to work 20 days earlier and were 40% less likely to suffer permanent physical defects compared to unprotected riders ([11]). They concluded that protective clothing prevented or reduced 43% of soft tissue injuries and 63% of deep and/or extensive injuries ([11]). Otte et al reported similar findings, where impact protective gear and high boots significantly reduced the incidence of limb injuries and complex leg fractures ([13]).

Some counterarguments to the benefits of impact protective gear are that they do not offer protection in high-speed collisions. However, the recent Motorcycle Accident In depth Study (MAIDS) revealed that 75% of motorcycle accidents occurred at speeds <50 km/h (35 mph), especially in urban areas ([5,15]). Additionally, 40% of riders tumbled, rolled or slid along the road surface without impacting another vehicle or fixed object ([5,15]). These are the types of accidents where protective clothing can offer the greatest

injury reduction.

There are several ways in which protective clothing can offer protection against skin and soft tissue injuries. Leather reduces the tendency of the body to tumble as it gives the body a smoother motion when it slides over the road surface in an accident. However, leather is neither practical nor suitable for tropical climates and hence not worn by local riders. Manufacturers of protective motorcycle clothing should develop protective material that is suitable for consumers in tropical countries.

Extremity fractures were the second commonest injuries sustained in this series, accounting for 73% of the injuries. We also noticed a propensity for fractures to occur in the lower limbs (45%) compared to the upper extremity (29%). These findings are in keeping with reports from other developing countries ([11,13]).

With the exception of the talus, cuboid and cuneiform bones, all bones in the lower limbs sustained fractures in our series. As expected, the commonest fractures were to the tibia / fibula (16.2%) and the ankle (11.4%). It was also notable that one third of all lower limb fractures were compound fractures that required operative debridement and/or external fixation. These complex injuries place heavy demands on operating theatre time and valuable medical resources in this resource strapped setting.

Crash bars have been touted as a means of preventing these injuries although there is little scientific evidence to support their use as effective injury countermeasures ([3,6]). Crash bars may reduce the prevalence of foot and ankle injuries ([6]), but the incidence of injuries to the femur, knee, proximal leg and upper body are actually increased ([3,6]). Additionally, crash bars change the collision dynamics and increase the likelihood for the rider to impact the pavement “head-first”, thereby increasing the potential for fatal head and neck injuries ([6]).

Most countries have not mandated the use of crash bars on motorcycles, although they do not prohibit their use. The government of Jamaica updated the Road Traffic Act in 1999 by defining mandatory protective gear for motorcycle users on Jamaican roads ([7]). The use of crash bars as mandatory safety equipment was not addressed, but it is important to consider since 47% of the motorcycle accident victims in this series sustained serious (excluding soft tissues) injuries to the lower limb (fractures 121; vascular injury 7).

It was notable that 83% of motorcycle accident victims in this series sustained concomitant head injuries. These patients are afforded some head and neck protection if they wear an approved helmet at the time of their accident. Helmets have been shown to significantly reduce the incidence of head injuries, overall injury severity, ICU requirements, mortality and the cost of health care ([3,8,9,14]). Although we could not ascertain the prevalence of helmet use with this study design, this is an obvious target for injury prevention. The updated Road Traffic Act already stipulates that helmets are mandatory for all motorcycle users on Jamaican roads ([9]). Attention now needs to be focused on enforcing these laws.

Although not quantitatively measured, it is easy to appreciate that motorcycle extremity injuries place a heavy financial burden on our health care system, with each injury requiring 10 days of hospitalization and requiring major operative intervention in 72% of cases. These injuries also have a serious negative impact on Jamaica's productive sector. There were disproportionately more young males between the ages of 20 and 35 years in this series, accounting for 53% of the accident victims. When these potentially productive individuals are injured, the society loses many man hours of work ([11,12,13]). Primary prevention strategies are one way in which the country can preserve precious health and human resources that are spent as a result of these incidents.

CONCLUSIONS

Extremity injuries from motorcycle accidents burden an already resource strapped Jamaican health care system. To date, there is no suitable protective clothing designed specifically for the tropics and no mandatory requirements for motorcycle accessories that are proven to protect the extremities. Therefore, we must focus on other preventative measures such as educational campaigns for god driving practices and enforcement of road traffic laws.

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