

Upper Extremity Injuries in Motorcyclists: Implications for Mortality and Need for Rehabilitation Services

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BACKGROUND

Motorcycle crashes (MCC) constitute a disproportionately high number of roadside accidents and are characterized by higher mortality and injury rates than motor vehicle collisions. The distribution and characteristics of upper extremity injuries sustained by motorcycle riders and their implications are not well-known. The purpose of this study was to investigate the epidemiology of upper extremity injuries in the motorcyclist and determine their independent effects on mortality and need for rehabilitative services.

HYPOTHESES

Our hypotheses were that upper extremity injuries are:

- 1) independently associated with an increased need for rehabilitation services
- 2) not significant associated with mortality after controlling for injury severity

METHODS

All motorcyclist admissions to our level I trauma center between 2006 and 2010 were retrospectively reviewed. ICD-9 codes were used to identify and categorize all upper extremity injuries. Demographic data, in-hospital mortality, disposition to a rehabilitation facility and other potential confounding covariates were obtained. Logistic regression models were used to quantify the effect of upper limb injuries on mortality and transfer to a rehabilitation facility.

Overall Demographics			
n=2151			
Median Age (IQR)		39	(26-49)
Sex			
	Male	1896	(88%)
	Female	255	(12%)
Race			
	White	1483	(69%)
	Black	583	(27%)
	Other	85	(4%)
Mean GCS (SD)		13.9	(2.9)
Median ISS (IQR)		10	(5-21)
Median LOS (IQR)		2.3	(0.3-5.4)
Upper extremity injury		759	(35%)
Disposition			
	Home	1505	(70%)
	Rehab	538	(25%)
	Died	87	(4%)
	Other	21	(1%)

Multivariate Logistic Regression of Mortality on Covariates				
	OR	p-value	95% CI	
Scapula fx	0.32	0.02	0.12	0.85
Injury Distal to Elbow	0.21	<0.01	0.08	0.55
ISS	1.11	<0.01	1.09	1.14
GCS	0.76	<0.01	0.70	0.81
Age	1.06	<0.01	1.03	1.08

Distribution of Upper Extremity Injuries		
n=patients with at least 1 of the following		
Fractures		
	Clavicle	200 (9.3%)
	Scapula	168 (7.8%)
	Humerus	101 (4.7%)
	Forearm	272 (12.7%)
	Carpus	60 (2.8%)
	Metacarpals	131 (6.1%)
	Phalanges	84 (3.9%)
Dislocations		
	Shoulder	65 (3%)
	Elbow	25 (1.2%)
	Wrist/Carpal	88 (4%)
	Finger	34 (1.6%)

Multivariate Logistic Regression of Rehabilitation on Covariates				
	OR	p-value	95% CI	
Injury Distal to Elbow	2.31	<0.01	1.81	2.94
Humerus fx	1.64	0.03	1.05	2.57
ISS	1.06	<0.01	1.05	1.07
Age	1.02	<0.01	1.02	1.03

RESULTS

35% (759/2151) of MCC victims sustained an upper extremity injury, with forearm fractures being the most common injury (272). The mortality incidence was 4% (87/2,151) for all MCC admissions. Multivariate models demonstrated that injuries distal to the humerus and scapula fractures had independent odds ratios (OR) for mortality of 0.21 (95% CI 0.08, 0.55) and 0.32 (95% CI 0.12, 0.85), respectively, when adjusted for ISS, GCS, and age. In addition, the odds of requiring rehabilitation after discharge were 1.82 (95% CI 1.47, 2.27) times higher when any upper extremity injury was sustained, independent of ISS.

CONCLUSION

Upper extremity injuries are common in motorcycle crashes. There is a protective effect of distal injuries and scapula fractures on mortality. This may be due to the absorption of thoracic impact by the scapulae sparing the vital organs and a "crumple zone effect" of distal upper extremities sparing the head and neck region of direct impact in a head first mechanism of injury. MCC victims with upper extremity injuries are more likely to require rehabilitation services.