

Obesity and age as factors in lethal leg amputation following motorcycle crashes

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Abstract

The autopsy files at Forensic Science South Australia (FSSA) were searched from January 2008 to December 2018 for all cases of motorcycle fatalities with a lower limb amputation. Six cases were identified; five male riders and one female pillion passenger, with age ranging from 48 to 67 years (average 59 years), significantly older than the control group (40.6 years; $p < 0.01$). All decedents were overweight with body mass indices (BMI) of 28.7-43.5, average 34.9, significantly greater than the control group (28.8; $p < 0.05$). This study has shown that older motorcycle riders with higher BMIs are at greatest risk of lower limb/pelvis amputations.

Background

Amputations are fatal when there is extreme trauma causing damage to major blood vessels or delay in medical attention. Unlike a motor vehicle where the external structure of the vehicle can absorb and disperse impact force, individuals on a motorcycle often expose the upper and lower extremities to concentrated, unprotected impact forces from another vehicle, a fixed object such as a tree, or the road itself, often resulting in ipsilateral injuries (Ball, Rozycki, & Feliciano, 2009; Ross, 1983). Single motorcycle crashes in which a rider has skidded along a road and not come into contact with other objects are less likely to result in an amputation (Craig, Sleet, & Wood, 1983). Motorcycle–motor vehicle collision and motorcycle – fixed object collisions, in which a rider remains on the machine during the impact, increase the susceptibility of the tibia, knee and hip joints to collision forces given the angle of the leg on impact (Craig et al., 1983; Findlay, 1972). These seating postures position the legs of the individual differently depending on the motorcycle model, providing a possible increased risk for amputations (Ma'Arof, 2012).

Method

The autopsy files at FSSA were searched for all cases of motorcycle fatalities in which there had been lower limb amputations in the 11-year period. Amputations were defined as either complete separation of the leg, or part of the leg, from the body. Age and sex of de-identified decedents were recorded, along with the circumstances of the crash, the nature of the injury, the body mass index (BMI) and the cause of death. A control group of 100 cases of motorcycle fatalities were randomly selected from the same autopsy data base to determine the average age, sex and BMI for comparison. Statistical analyses were performed using Pearson's chi squared.

Results

Six cases were identified consisting of five male riders and one female pillion passenger. The ages between 48 to 67 years (average 59 years). All the decedents were overweight with body mass indices (BMI) of 28.7-43.5, average 34.9. Five of the incidents involved a collision between a motorcycle and a motor vehicle resulting in right sided amputation, the remaining case involved a collision with a tree resulting in left sided amputation. The details are summarized in Table 1.

Control cases ($n=100$) ages were between 17 to 73 years (average 40.6 years; Male:Female 24:1). The average age was significantly lower than the study group ($p < 0.01$). The BMI range for the control group was 16.8–56 with an average of 28.8. This was also significantly lower than the study group ($p < 0.05$).

Table 1. Characteristics of motorcycle fatalities in which there had been lower limb amputations in South Australia over an 11-year period from January 2008 to December 2018

Case	Age	Sex	Body Mass Index (BMI)	Event	Cause of Death	Leg Injury	Type of Motorcycle	RIPOC¹⁴ (Riding Posture Classification)
1	48	M	39	MC vs. MV	Multiple injuries	Amputation of right foot	Harley Davidson FXSTB (1584cc)	Type 3
2	53	M	31	MC vs. MV	Multiple injuries	Right sided traumatic hemipelvectomy	Honda CBR 1000 RR8 (998cc)	Type 1
3	59	M	36.2	MC vs. MV	Leg amputation; ischaemic heart disease	Amputation of right leg	Suzuki TS 4003 (396cc)	Type 2
4	64	F	43.5	MC vs. MV	Leg amputation	Amputation of right lower leg	Honda Goldwing (1520cc)	Type 2
5	67	M	28.7	MC vs. MV Trailer	Multiple injuries	Amputation of right lower leg	Suzuki DL650 (645cc)	Type 2
6	61	M	31	MC vs. Tree	Blunt Chest trauma	Amputation of lower left leg	Harley Davidson (FLSTC) (1584cc)	Type 2

Conclusions

There is limited data on the risk of amputation for older, obese individuals. It has been noted that older riders are more likely to select larger, heavier model motorcycles (Dischinger, Ryb, Ho & Braver, 2006) as in four of our cases, and those with higher BMIs may opt for bikes for a more comfortable neutral or “cruiser” style seating posture (Ma'Arof, 2012). These seating postures position the legs of the individual differently depending on the motorcycle model, providing a possible increased risk for amputations. This study has shown that motorcycle riders at greatest risk of fatality with lower limb/pelvis amputations are significantly older than the average victim with significantly higher BMIs. Obesity, which increases momentum, may lead to the selection of motorcycles where more comfortable sitting positions result in the legs being more exposed.

References

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