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Traffic accident victims and polytrauma patients: injury patterns, outcome and their influencing factors

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Accidents involving a motorized mobility
scooter: a growing problem.

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ABSTRACT

Background

The aim of the study was to analyse injury patterns, injury severity and mortality among victims of motorized mobility scooter (MMS) crashes in relation to trauma mechanisms and patient's age.

Methods

Data obtained from the trauma registry of the Trauma Centre West (TCW) was analysed. All MMS crash victims aged 18 years and older, admitted to hospitals in the trauma centre region during the period 2003-2013, were included.

Results

A total of 242 MMS crash victims were analysed, of whom 51% were aged 75 years and older. Severe trauma (Injury Severity Score ≥ 16) was diagnosed in 15% of all cases and was more common in victims who sustained a high-energy accident ($p < 0.001$) and patients 75 years and older ($p = 0.04$). Severe injuries after low-energy accidents mostly affected the extremities and particularly the legs in elderly patients. Severe injuries after high-energy accidents mostly involved the chest and head, especially in patients younger than 75 years. A total of 10 patients (4%) died during their hospital admission. Of those 5 patients were over 75 years old and sustained a low-energy accident.

Conclusions

Low-energy, as well as high-energy accidents involving the MMS, may result in serious injuries and sometimes death. Awareness by multidisciplinary treatment teams may help to avoid the underestimation of injury severity. MMS drivers need to improve their driving skills in order to reduce the number of MMS crashes.

INTRODUCTION

Halfway through 2006, there were an estimated 150,000 motorized mobility scooters (MMS) in the Netherlands. The Netherlands Social Support Act (WMO) dictates that municipalities loan mobility scooters to persons with limited physical capabilities who still want to remain mobile. As a result of this desire for mobility, the number of mobility scooters is expected to grow among this specific group of persons to around 600,000 in 2030.¹ With its low speed, the mobility scooter may seem a relatively safe mode of transport, but especially among older users, safe usage of the vehicle can be affected negatively by chronic illnesses and polypharmacy and by changes in physical and cognitive skills.¹⁻⁴ Annually around 1,200 people over 55 (of which more than half are over 75 years of age) visit Emergency Departments (ED) of Dutch hospitals for treatment after an incident with a mobility scooter.¹ Of these patients, around 380 (33%) are hospitalised. This is a high rate of hospitalisation, especially when it is considered that these accidents often are a low-energy impact and no other road users are involved⁵. In comparison, of all road traffic victims treated in EDs approximately 23% are hospitalised.⁶ As a result of co-morbidity - which is often quite extensive - and reduced physical reserves, it is considered that elderly trauma victims respond differently to trauma and a hospitalisation indication may arise more easily. The chance of complicated hospitalisation is also higher among the elderly, which harms the quality of life and the chance of survival.⁷ In addition, higher age is associated with an increased risk of (severe) injury after traffic accidents.⁸⁻¹⁰ The goal of this study is to describe the injury pattern, injury severity and chance of survival of hospitalised victims of mobility scooter incidents compared to incident type and age.

METHODS

All adult victims of MMS accidents who were hospitalised between 2003 and 2013 in one of the 11 hospitals in the Trauma Centre West (TCW) region were analysed. The data was obtained from the trauma registry of the TCW. The trauma registry prospectively gathers data concerning, among other things, injury (severity) and cause of injury of the hospitalised crash victims.¹¹

The injury diagnosis and severity are coded in the trauma register according to the Abbreviated Injury Scale (AIS) of 1998¹² and the Injury Severity Score (ISS).¹³ This study defines severe injury as an AIS score >2, rated per anatomical region (head, face, throat/neck, thorax, abdomen, back, upper and lower extremities and external). Injury severity may vary from slightly injured (AIS 1) to (almost) fatally injured (AIS

6). Polytrauma was defined as ISS ≥ 16 and mortality as death during hospitalisation. The type of accident was determined by two authors independently from each other, using the description of the accident mechanism, in which the estimated amount of energy transferred to the patient during the accident serves as a basis for establishing a categorisation of low-energy trauma (LET) and high-energy trauma (HET). For example, falling from a stationary or slowly moving (<10 km/hour) mobility scooter was regarded as a LET, while a collision or falling from a fast-moving (>10 km/hour) mobility scooter was a HET. Differences in patient characteristics between groups were analysed using the Fisher's exact test.

RESULTS

Between January 1, 2003, and December 31, 2013, 242 adult victims of MMS accidents were hospitalised in hospitals in the TCW region. The number of hospitalisations rose during this period from 3 in 2003 to 64 in 2013. Half of the victims were over 75 years of age, and in 151 (62%) of the cases the accident was the result of a LET. There was no relationship between age group and type of accident ($p=0.60$). There were almost equal numbers of male and female victims (126 and 116, respectively).

Injury severity

Severe injuries (AIS score >2) were found in almost half of all hospitalised victims. This percentage did not differ between age groups and between HET and LET (table 1). Polytrauma (ISS ≥ 16) was found in 35 victims (15%) and was more common among victims of a HET ($p<0.0001$) and among patients under 75 years of age ($p=0.04$).

Table 1. Injury demographics of hospitalised motorized mobility scooter accident victims.

Injury severity	Patients n (%) (n = 242)	Accident mechanism n (%)			Age n (%)		
		LET (n = 151)	HET (n = 91)	p	< 75 yrs (n = 119)	≥ 75 yrs (n = 123)	p
Severe injury *	121 (50)	76 (50)	45 (50)	1,0	60 (50)	61 (50)	1,0
Polytraumat†	35 (15)	12 (8)	23 (25)	$< 0,001$	23 (19)	12 (10)	0,04
In-hospital mortality	10 (4)	5 (3)	5 (6)	0,51	3 (3)	7 (6)	0,33

HET = high-energy trauma; LET = low-energy trauma.

* AIS > 2 .

† ISS ≥ 16 .

Injury pattern

More than 25% of all registered injuries were severe injuries (AIS score >2). The injury pattern differed between the patient groups (figure 1). Among patients hospitalised af-

ter a HET, more severe head injuries were found than among patients hospitalised after a LET. Among the elderly (> 75 years) hospitalised after a LET, mainly severe injuries were found to the lower extremities. Among younger patients (< 75 years) hospitalised after a HET, severe head and thorax injuries were more common.

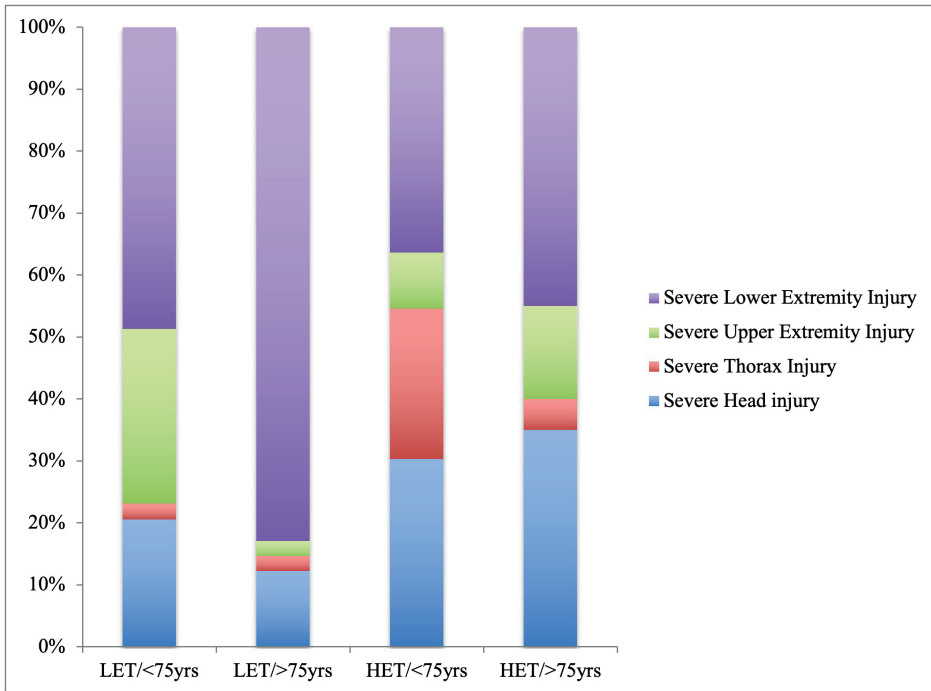


Figure 1. Distribution of severe injuries (AIS>2) per anatomical region (according to the AIS classification) of hospitalised motorized mobility scooter accident victims, by type of accident mechanism and age group.

Hospitalisation and mortality

The median hospitalisation for all MMS accident victims in both age groups and after both a HET and a LET was 6 days (range 1-65). Considerably more patients were admitted to the ICU after a HET than after a LET (21% resp. 5%, $p<0.0001$). Ten patients (4%) died during hospitalisation (table 1). The five patients who died after a LET were all older than 75 years. All patients who died had one or more severe injuries. In older patients mortality was the result of isolated lower extremity injuries, injuries to the spine or isolated head injuries. In the case of younger patients (< 75 years) mortality was the result of combined head and lower extremity injuries, isolated lower extremity injuries and after thorax injuries.

DISCUSSION

Motorized mobility scooter (MMS) drivers form a vulnerable group of road users, for whom accidents often result in unpredictable injury patterns and sometimes death. It can be difficult for both ambulance and hospital staff to adequately assess the severity of injuries after an accident.¹⁴⁻¹⁶ The circumstances of the accident play an important role in this. Injuries among drivers of an MMS after a low-energy accident can therefore easily be underestimated. This is reflected in our results: almost 10% of the patients hospitalised after a LET had multiple serious injuries and 3% of them died during hospitalisation. This mortality rate is therefore higher than for admitted victims of motor bike and moped accidents.¹⁷

The injury pattern among deceased MMS accident victims varied: half of the deceased patients had only extremity injuries and no thorax or head injuries. Unlike pointed out in studies involving cyclists and motorised two-wheelers, the results of our study do not allow us to conclude that helmet use by MMS drivers will lead to a relevant reduction in the number of fatalities.¹⁸

Studies concerning road traffic accidents have shown that high-energy accidents are associated with more severe injuries and higher mortality than low-energy accidents.^{4, 19} We did not find this difference in mortality between HET and LET in our study, possibly partly because of the low power of the study. It was striking that the five patients who died after a LET were all older than 75 years and that four of the five had not sustained multiple severe injuries. This emphasises that age and factors possibly related to victims of mobility scooter accidents such as chronic illnesses and polypharmacy, influence the risk of death road traffic users.²⁻⁴ Upon hospitalisation of this vulnerable group of patients, it is important to involve other specialists (such as the trauma surgeon, neurologist and geriatric specialist) at an early stage in the care and treatment to prevent underestimation of the sustained injuries.

In three-quarters of the MMS accidents, no other road users were involved, and it is the driver himself who loses control, falls, falls over or causes a collision.⁵ This is reflected in our results. Thus, it can be concluded that many MMS users are apparently insufficiently skilled at driving the vehicle. So, it can be advised that novice drivers of an MMS should follow a training programme to improve their driving skills.

CONCLUSION

Motorized mobility scooter (MMS) drivers are a vulnerable group of road users. Accidents with the apparently safe MMS are associated with unpredictable injury patterns and may lead to unexpected severe injury. Multidisciplinary treatment teams need to be aware of this in order to limit any negative consequences. In addition, preventive measures aimed at the driving skills of MMS drivers are necessary to reduce the number of MMS accidents.

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