

Injuries caused by motorcycle accidents – a 5-year survey of patients treated in Kuopio University Hospital

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Motorcycling has become increasingly popular in Finland in recent years. The aim of the present study was to analyse the type of injuries sustained in motorcycle accidents. All patients that were treated in Kuopio University Hospital during the years 2001 until 2005 because of a motorcycle accident were included in the study. Information about the injured person and kind of accident was obtained retrospectively from the patients' records. 131 patients were studied (average age 25.6 ± 15.5 years). More than 50 % of them were under the age of 20 years. The length of primary hospital stay was 5.4 ± 4.9 days and average sick leave 3 months. Most injuries occurred in the lower extremity (46 %) with the lower leg being most often affected (13 %), followed by knee (11 %) and thigh (9 %). Upper extremity injuries accounted for 28 % of all injuries. About two thirds of the injuries of the extremities were fractures, including 11 % open fractures in the lower extremity. The left leg was more often affected than the right leg.

Introduction

Motorcycle driving has become increasingly popular in Finland in recent years. The number of motorcycles has constantly increased from 60 000 in 1991 to 91 000 in 2001 (1). Motorcyclists account for about 5 % of all injured patients in Finland (1). Only little information is available about hospitalisations and injuries associated with moped and motorcycle accidents. This information would be valuable to plan preventive measures. Therefore the aim of the present study was to analyse the type of motorcycle related injuries of patients treated in Kuopio University Hospital from 2001–2005.

Materials and methods

The present retrospective study was carried out at Kuopio University Hospital. All patients that were involved in a moped or motorcycle accident during the years 2001 until 2005 and that were admitted to the ward were included in the study. The patients were

either referred directly to the hospital or via a local health centre. Patients that had primarily received (operative) treatment in another hospital were excluded from the study. Patients were identified via mechanism-of-injury code (V29, V29.2 and V29.9). 131 patients were included in the study. Patients' records were analysed to obtain information about the kind of accident, injured body region and kind of injury, duration of hospital stay as well as duration of sick leave. Injuries were classified as head injury (including concussion, facial wounds and fractures), neck injury (cervical spine distortions and fractures), thoracic injury (rib fractures, pneumo- and haemothorax, lung contusion), abdominal injury, spine injury (thoracic and lumbar spine fractures and contusions) and extremity injuries. The last were further divided into injuries of the clavicle/AC-joint, shoulder, upper arm, elbow, forearm, wrist and hand for the upper extremity and pelvis, hip, thigh, knee, lower leg, ankle and foot injuries for the lower extremity. If a patient had multiple injuries in the same body region it was only

counted as one. Three groups of patients were identified and analysed separately: young drivers under the age of 20 years, patients injured when driving motocross and polytrauma patients.

Results

131 patients were included in the study (13 females, 118 males; average age 25.6 ± 15.5 years) (table 1) with a total of 180 injuries (injury index 1.45 injuries/patient). The number of patients varied from 18 to 36 per year. More than 50 % of all patients were under the age of 20 years (figure 1). Most patients involved in a motocross accident were between 20 and 29 years old and polytrauma patients tended to be older as well.

The length of primary hospital stay was 5.4 ± 4.9 days and the total number 6.2 days, but some patients were then transferred to another facility (health centre, other hospital) (figure 1).

The most common accident mechanism especially in the younger age group was collision with a moving object, in most cases collision with a car (figure 2). Not all patients were tested for alcohol abuse, only if there was a reason for suspicion. 15 patients were tested negative and in the 10 patients, that had consumed alcohol before driving, the average alcohol level was 1.75 ‰ (table 1). Most accidents occurred in sum-

mer (July and August), motocross accidents were more common in spring and autumn (figure 3).

Most injuries occurred in the lower extremity (46 %) with the lower leg being most often affected (13 %), followed by knee (11 %) and thigh (9 %) (figure 4). Upper extremity injuries accounted for 28 % of all injuries. The head was affected in 11 % of the cases, thorax (6 %), abdomen (6 %), spine (3 %) and neck injuries (2 %) were less common. In motocross patients the incidence of head injuries was lower (3%) but thorax and abdomen injuries (each 10%) higher. In these patients clavicle and acromioclavicular joint injuries were by far the most common injury in the upper extremity (17% of all injuries) and knee injuries

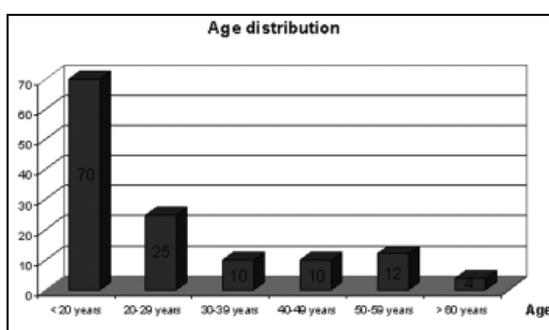


Figure 1: Age distribution of patients with injury caused by motorcycle accident.

Table 1: Patients characteristics and hospitalisation (a 107 patients home, 8 local health centre, 13 other hospital, 2 other ward, 1 exitus; b 67 patients home, 3 other hospital; c 22 patients home, 1 other hospital; d 4 patients home, 1 local health centre, 2 other hospital, 1 exitus).

	all	< 20 years	motocross	polytrauma
Number of patients	131 (13 F : 118 M)	70 (4 F : 66 M)	23 (1 F : 22 M)	8 (2 F : 6 M)
Age (years)	25.6 ± 15.5 (4-76)	14.7 ± 2.5 (4-19)	25.3 ± 11.8 (9-47)	32.1 ± 17.3 (13-55)
Speed (km/h)	57.5 ± 39.6 (0-280)	47.9 ± 15.3 (15-100)	?	106.7 ± 97.1 (50-280)
Alcohol (‰)	1.75 ± 0.64 (0.7-2.75) (10 patients, 15 neg.)	1.75 ± 0.35 (1.5-2.0) (2 patients)	-	-
Days in hospital (total)	6.2 ± 6.4 (1-34) ^a	5.6 ± 5.2 (1-29) ^b	5.1 ± 4.8 (1-18) ^c	13.5 ± 10.5 (1-30) ^d
Days in hospital (prim.)	5.4 ± 4.9 (1-28) ^a	4.9 ± 4.2 (1-24) ^b	4.3 ± 3.4 (1-13) ^c	12.8 ± 9.6 (1-28) ^d
Days in intensive care	6.7 ± 5.0 (1-16) (11 patients)	2 (1 patients)	-	7.6 ± 5.5 (2-16) (5 patients)
Sick leave (days)	93.5 ± 98.3 (8-549) (53 patients)	60.9 ± 23.7 (9-92) (12 patients)	100.2 ± 70.4 (8-236) (14 patients)	?

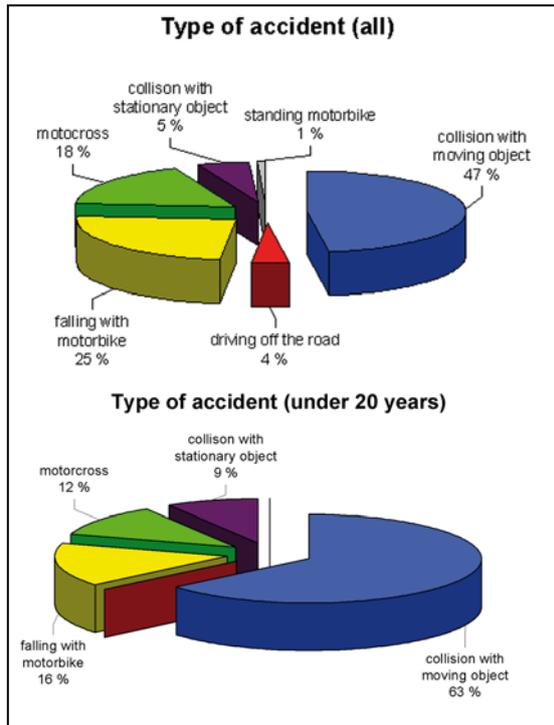


Figure 2: Type of accident in patients with injury caused by motorcycle accident (all patients and patients under the age of 20 years).

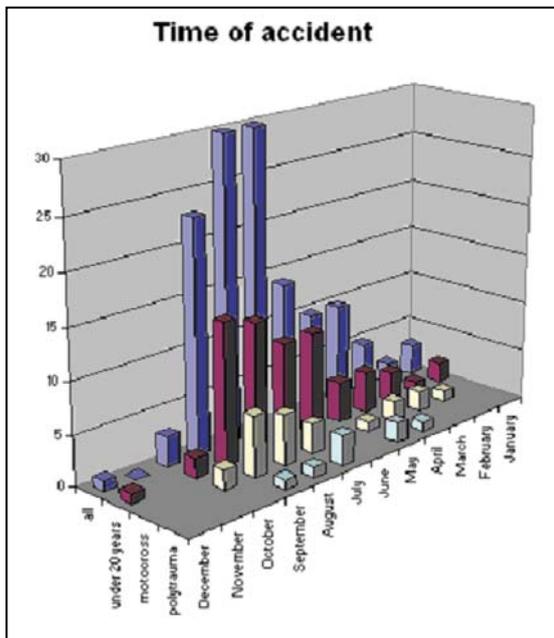


Figure 3: Distribution of motorcycle accidents during the year for all patients, patients under the age of 20 years, patients injured in a motocross accident and polytrauma patients.

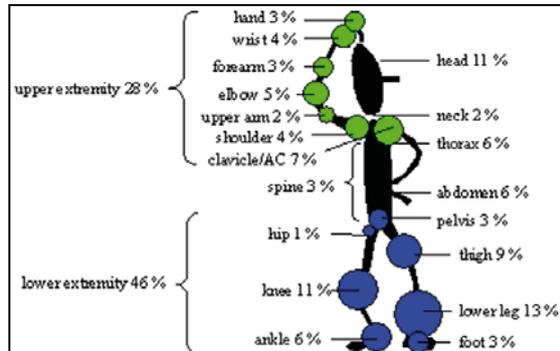


Figure 4: Location of injuries caused by motorcycle accident.

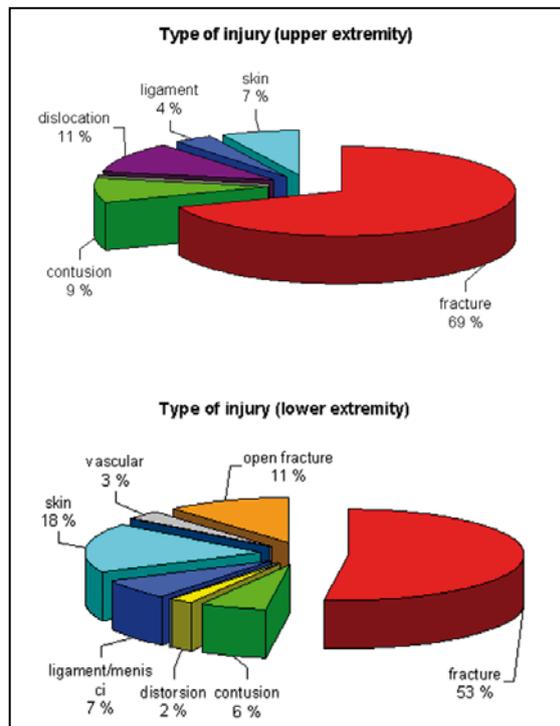


Figure 5: Type of injuries caused by motorcycle accident.

Table 2: Side of injury caused by motorcycle accident in upper and lower extremity.

Side of injury	all	< 20 years	motocross	polytrauma
Arm right	27	11	1	4
Arm left	24	13	5	4
Leg right	35	18	7	4
Leg left	45	29	7	7

dominated in the lower extremity (17%). Polytrauma patients had a higher percentage of thorax (13%), abdomen (8%), spine (8%) and neck (5%) injuries.

About two thirds of the injuries of the extremities were fractures, including 11 % open fractures in the lower extremity (figure 5). The left leg was injured more often than the right side whereas no difference regarding the side of injury was noted for injuries of the upper extremity or for injuries from motocross (table 2).

Discussion

The average age of the patients in our study was 25 years, which is 4–10 years lower than reported by other authors (2–4). More than 50 % of our patients were under 20 years old, whereas in other studies only 12–22 % were under 20 years old and most patients involved in motorcycle accidents belonged to the 20–29 years age group (25–40 %) (2,4,5). Stefan et al. (1) stated that 40 % of injured motorcycle riders in Finland are between 16–18 years old. They explained this difference from other countries regarding the age distribution of injured motorcyclists with the fact that in Finland people at the age of 16 are allowed to ride motorcycles with an engine capacity of 125 cc, whereas in most other countries these kind of motor vehicle are considered as an intermediate stage between mopeds and motorcycles and therefore more restricted driving regulations apply.

According to Stefan et al. (1) female drivers account for about 5 % of all injured motorcyclists in Finland. In our study 10 % of the patients were females, which is twice as high as this number. Figures for other countries regarding the percentage of injured female drivers vary between 1 and 10 % (1,2,4).

Regarding the distribution and type of injuries our findings are consistent with other studies (2,3). Wick et al. (2) reported exactly the same incidence of lower extremity injuries as in the present study (46 %) with the lower leg (including a high percentage of open fractures) and femur being most frequently affected. Upper extremity injuries accounted for 28 % of all injuries with clavicle and acromioclavicular joint being most often injured. Zettas et al. (6) found a high number of intraarticular fractures of the distal radius and therefore named this injury the “motorcycle radius”. These findings were not confirmed in our study, where wrist injuries occurred in only 4 %. Head injuries (11 %) were more frequent than thorax, abdomen

or spine injuries.

Injuries of the lower extremity affected more often the left side than the right side whereas no difference was found for the upper extremity. A study dealing with this question is a paper from Singapore by Imran and Vishvanathan (7). They observed a higher incidence of open fractures of the tibia in the right leg compared to the left leg and cite a study from Scotland that found that the right arm and leg were injured twice as often as the left side among motorcyclists that drive in left-lane traffic (8). They assumed that for riders who drive on the left lane the right leg is more vulnerable to injury because it is more exposed to the oncoming vehicles and to vehicles overtaking from the right. For right-side traffic one could expect just the opposite i.e. the left leg being more often injured. The observation that if motorcycles are not driven in road traffic (motocross riders) right and left leg were equally often injured supports this theory.

The total number of days in hospital (including days spent in hospital later on because of complications, metal removal etc.) was 6.2 days in our study. The average time spent primarily in hospital was 5.4 days, which is consistent with the figures found by Coben et al. (4). However Sinha et al. (5) and Wick et al. (2) reported clearly higher numbers (38.7 days and 35.4 days respectively). This might be due to the fact that patients included in these studies were more severely injured, although the average length of hospital stay was only 13.5 days for the polytrauma patients in our study. However one must keep in mind that not all patients were discharged home but some patients were transferred to another hospital or health centre some days after primary treatment so the total number will be higher.

The average duration of sick leave was more than 3 months, which in addition to cost of hospital stay demonstrate the significant morbidity and economic consequences associated with motorcycle-related accidents. Figures about the duration of sick leave in polytrauma patients could not be obtained because most of these patients were followed up in other hospitals. Most of them were probably not able to return to work.

More than 50 % of the patients involved in moped or motorcycle accidents were young male riders under the age of 20 years. Therefore this group should be the target of preventive measures, e.g. driver's education, legislative changes. Other preventive measures should aim at protecting the extremities especially the (left)

leg. Protective clothes or special boots as well as structural modifications on motorcycles like side air bags have been discussed (2). Ross (9) suggested the use of crash bars to protect the legs but Craig et al. (10) found those devices to be ineffective.

Conclusion

More than 50 % of the patients involved in moped or motorcycle accidents in Finland are young male riders under the age of 20 years. The average hospital stay is 5-6 days and duration of sick leave 3 months. Injuries involve most often the lower extremity with shaft fracture of the lower leg (including a high percentage of open fractures) or femur being the most common injury. Injuries of the lower extremity affect more often the left side than the right side whereas no difference was found for the upper extremity.

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