

# Investigating Traumatic Injuries to Occupants Involved in Rollover Crashes Who Were Admitted to a Community Hospital

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Received 2018 April 28; Accepted 2019 January 13.

## Abstract

**Background:** Traumas, especially the ones caused by motor vehicle crashes in developing countries are leading causes of death. **Objectives:** This study intends to examine traumatic injuries in occupants involved in roll-over crash over a year in a state-run community hospital.

**Methods:** The trauma pattern of 143 patients injured in traffic accidents, who were admitted to a community hospital, was investigated and reported for three months in a year.

**Results:** Upper extremity fractures were more common than that of lower extremity and fractures in the lumbar spine was more prevalent than thoracic fractures. Also, chest injuries were more common than abdominal injuries and serious head and face injuries along with brain damage were observed in approximately 9.9% of occupants. 1.41% of reported deaths were caused by rollover of motor vehicles.

**Conclusion:** This study stressed the importance of taking initial measures and appropriate diagnostic procedures based on the proposed pattern for proper treatment and saving the lives of patients. Moreover, the promotion of the so-called culture of driving well and compliance with traffic rules along with utilization of enhanced equipment in vehicles can help reduce accidents.

*Keywords:* Accidents, Emergency, Rollover, Trauma

## 1. Background

Traumas, especially the ones caused by motor vehicles accidents are the major causes of deaths in developing countries. In Iran, trauma is the leading cause of injuries in people under 50 years. (1) It is reported that motor vehicles are the most common cause of trauma (2) and trauma is the first burden of disease (3). In 2013, 1.25 million deaths related to traffic accidents were reported in the world. (4) The average mortality rate of accidents in the world is 18 deaths per 100,000 people. In Iran, this figure is 38 deaths per 100,000 people, which makes it one of the top three countries in terms of the mortality rate of traffic accidents in the world (5). Elsewhere, it has been reported that 70 people lose their life in traffic accidents each day in Iran (6). The highest mortality rates in Iran belong to spring and autumn respectively, though the results of a recent Zolala's study showed that this figure was declining (7). Given the absence of a national trauma registry system, the epidemiological statistics of traffic accidents are not accurate, and insufficient attention has been paid to this vital matter (8). In 2013, U.S. Department of Transportation Vehicles announced that in 65% of deaths caused by traffic accident in 2012 occupants of vehicles were involved (9). Rollover is a common traffic accident in the United States, and crash-related mortalities in this country are based on this type of crash. In this context, the highest number of deaths

belongs to occupants ejected from motor vehicles during crashes (10-13). There is a correlation between the intensity of car roof damage and severity of injuries in head, neck and spinal cord (12). Further, serious injuries including skull base fractures caused by head strike on car roof have been reported (13). Another common injury in rollovers is chest injuries, which are mainly in form of planar impact (14). Also, a statistical relationship has been reported between deformity at occupant's position and deteriorated head and neck injuries (15). So, the importance of adopting preventive measures to alleviate such injuries is stressed.

## 2. Objectives

In this study, we attempted to investigate the pattern of traumatic lesions in rollover patients admitted to a community hospital over a year to provide deeper insight about the accurate spot of lesions and help diagnosis and adoption of appropriate treatment procedures in the shortest period of time.

## 3. Methods

This is a prospective cross-sectional study in which the information of 143 patients admitted to the emergency department of a community hospital was collected for 3 months in a year. All patients who

were in doubt about the nature of accident and rollover were excluded from the study. In a checklist, variables such as early symptoms, treatments procedures performed at the accident scene, therapeutic interventions at the hospital and organ injuries were recorded for all patients separately. The demographic information of patients was also recorded and collected data were analyzed by SPSS software after coding.

#### 4. Results

Of 143 patients, 2 were excluded due to their doubt about the mechanism of accident. All 141 cases were transferred to the hospital by ambulance. In 101 patients (71.6%) a neck collar was inserted by emergency medical technicians. One case had artificial airway and one had both collar and the artificial airway. In 141 people, IV line had been used. 25 cases (17.7%) were displaced by the splint site. Two cases (4/1%) were intubated and oxygen therapy was performed for them by bag valve mask. Six patients (4.25%) were already treated with oxygen before entering the emergency ward. 11 cases (7.8%) had active bleeding on their arrival. 26 (18.4%) patients had limb movement disorder and in one case the pupil was not responsive to the light.

In 139 patients, fast sonography was performed and 19 cases (13.4%) had DPL. CBC was requested for 141 patients. Of 141 patients, 4 cases (2.8%) had chest radiography, 48 (34.04%) had pelvis and chest radiography, 4 (2.8%) had chest and spine radiography, and 79 (56%) had hip, spine and chest radiography. In 6 cases, no radiography was requested. For 103 patients (73%) brain CT Scan, for 1 case (0.7%) chest CT Scan, for 4 cases (2.8%) abdomen and brain CT Scan and for 6 cases (4.2%) abdomen, chest and brain CT scans were requested simultaneously. 2 of 141 patients (1.41%) lost their life. 25 patients (17.7%) were immediately discharged after preliminary measures, 56 cases (39.17%) were transferred to the department and the rest remained under supervision.

The mean age of patients was  $29.4 \pm 13.62$  and 2.8% had head injury, 1.4% had frontal fracture and 1.4% had temporal fracture. One case had ear bleeding and two had CSF leak from the ear. Two cases had brain structural damage, one had cerebral edema and one had SAH. In 5.6% of cases, face injury including orbital fractures, three cases of mandible fractures, two cases of maxillary fracture and two cases of broken nose were reported.

In examining the chest, four cases of clavicle fracture, three rib fractures, four cases of pneumothorax, seven cases of hemothorax and two cases of lung contusions were observed. In examining the abdomen, two cases of ruptured liver (1.4%), two cases of ruptured spleen (1.4%) and three cases of acetabular fracture (2.1) were reported.

A total of 15 cases had upper extremity fractures (10.6%), which consisted of three radial fractures, two ulna and radius fractures, seven broken arms and one metacarpal fracture. The lower limb fracture was diagnosed in four cases, out of which three were related to hip and one was related to fibula.

In vertebrae examination, 5 cases (3.5%) had cervical vertebrae fractures, one (0.7%) had thoracic vertebral fracture and 8 (5.6%) had fractures of the lumbar spine.

#### 5. Discussion

As we know, injuries caused by traffic accidents are on rise due to the rapid rate of motorization in developing countries. In Iran, traffic accidents constitute the leading causes of death and mortality. According to Soroush (the second metropolis of Iran), there were 850 cases of deaths caused by traffic accidents in the city of Mashhad during 2012 to 2014 (16).

The study of Kosari suggested that most injuries in traffic accidents were to head, neck and lower extremities (17). These figures demonstrate the importance of trauma caused by vehicles as an important health problem in Iran. In the present study, consistent with the literature, the majority of patients were young people (mean: 29.94 years) (17-19). The fact that all patients were transferred to the hospital by ambulance can contribute to the reduced mortality rate because it means that early treatment procedures were administered to all patients. According to this study, injury to head, face and chest and upper extremities were most common, which is consistent with other studies (12,13).

Upper limb fractures were more common than lower limbs and fractures in the lumbar spine were more frequent than thoracic. This indicates the importance of inserting collar and displacing patients with the minimum movement of cervical and lumbar spine vertebra, especially in patients involved in rollover crashes. That chest injuries were more common than abdominal injuries stresses the necessity of administering radiography and detailed examination.

Serious head, face and brain injuries were observed in about 9.9% of occupants, which highlighted the role of safety belt and airbag in reducing damages. According to this study, 1.41% of rollover crashes were fatal.

#### 6. Conclusion

This study stressed the importance of undertaking initial measures and appropriate diagnostic procedures based on the proposed pattern for proper treatment and survival of patients. Moreover, it is recommended to promote the so-called culture of driving well and compliance with traffic rules and

utilize safety equipment in vehicles to help mitigate accidents.

## Acknowledgments

None.

## Conflicts of interest

There are no conflicts of interest among the authors of this study.

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