

## Medicolegal investigation in a crushed injury in lower limb due to road traffic accident

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**Abstrak:** Prevalensi dan insidensi kecelakaan lalu lintas yang mengakibatkan cedera pada ekstremitas masih cukup tinggi sehingga angka kesakitan dan kematian meningkat setiap tahunnya. Cedera ekstremitas yang terjadi akibat kecelakaan lalu lintas menyebabkan kerusakan pada tulang, otot, persendian dan juga pada pembuluh darah, yang dapat menyebabkan perdarahan masif yang dapat mengakibatkan syok hemoragik dan berujung pada kematian. Kasus yang dilaporkan tentang seorang wanita berusia 41 tahun mengalami kecelakaan lalu lintas yang mengakibatkan kaki kirinya remuk. Menurut sistem medikolegal di Indonesia, setiap kasus kecelakaan lalu lintas harus dilakukan pemeriksaan secara simultan antara aspek medis klinis dan forensik klinis. Bukti medis dikumpulkan untuk menghasilkan laporan investigasi medikolegal. Dalam hal ini dilakukan analisis tentang bagaimana prediksi kejadian kecelakaan lalu lintas, dampak trauma, derajat kualifikasi cedera hingga perkiraan ancaman hukuman bagi pelaku yang menyebabkan cedera pada korban kecelakaan lalu lintas yang melibatkan ekstremitas.

Kata kunci: Kecelakaan lalu lintas, trauma anggota tubuh, investigasi medikolegal

**Abstract:** The prevalence and incidence of traffic accidents resulting in injuries to the extremities are still high enough so that the morbidity and mortality rates increase each year. Extremity injuries that occur as a result of traffic accidents cause damage to bones, muscles, joints and also in blood vessels, which can cause massive bleeding which can result in haemorrhagic shock and lead to death. A reported case of a 41-year-old woman suffered a traffic accident that resulted in her left leg being crushed. According to the medicolegal system in Indonesia, every case of a traffic accident must be made a simultaneous examination between clinical medical aspects and clinical forensics. Medical evidence was collected to produce a medicolegal investigation report. In this case an analysis of how predicted traffic accident events, the impact of trauma, the degree of qualification of injuries to the estimated threat of punishment for the perpetrators who caused injury to victims due to traffic accidents involving extremity.

Keywords: Traffic accident, limb trauma, medicolegal investigation

### Introduction

Road traffic accidents (RTA) is a very unexpected event that often occurs on the highway that can cause damage to objects, lives, bodies, disabilities and even death. Some factors of traffic accidents can be in the form of human negligence, road factors or vehicles.<sup>1</sup> Factors that influence traffic accidents can be divided into: (a) human factors in the form of road user behavior, as well as the ability and attitude of drivers, (b) road factors in the form of traffic engineering, road conditions and environmental influences, and (c) vehicle characteristics (number, type, usage and

load).<sup>1,2</sup> The explanation of the causes and patterns of injury and death are important in medicolegal investigations of RTA victims.<sup>1</sup> The body parts most frequently injured due to RTA are the head, thorax, abdomen and extremities.<sup>3</sup>

According to the World Health Organization (WHO) there are 1.24 million deaths each year worldwide due to traffic accidents.<sup>4</sup> In 2012 the RTA was ranked 9<sup>th</sup> as a cause of death and it is predicted that by 2030 it will be ranked 8<sup>th</sup>.<sup>5</sup> Traffic accidents can result in

physical damage until death. According to the Ministry of Health of the Republic of Indonesia in 2013 stated that from the number of accidents that occurred at least there were 5.8% of injured victims or around eight million people suffered fractures with the most types of fractures occurring in the upper limb by 36.9% and lower extremities by 65, 2%.<sup>6</sup> There is a difference in the pattern of injuries due to traffic accidents with injuries due to other violence and each case of a traffic accident will have a different pattern of injury, this will play a role in the process of medicolegal investigation.<sup>4</sup>

The injury suffered by RTA victims usually lies in the part that is in direct contact with the vehicle that hit it. In pedestrians, injuries will appear in the calf area when hit by the back. This injury is called primary injury. Secondary injuries to pedestrians are caused by the victim's body being thrown to the ground or shaken when an accident occurs.<sup>7,8</sup> Primary injuries to motorcyclists usually occur on the front or back of the body depending on the direction of the collision, and secondary injuries if the vehicle is reversed and if the victim is thrown from the vehicle.<sup>7</sup>

This article will discuss the prediction of traffic accidents, the impact of trauma, qualification of injuries to victims of traffic accidents involving extremity so as to provide a comprehensive picture of events that have befallen victims and assist the police investigation process.

### Case Report

A 41-year-old female patient was taken to the emergency room (ER) of Zainoel Abidin Hospital (ZAH) with severe injuries to lower extremities from the knee to the feet. From hetero-anamnesis obtained information from eyewitnesses, initially the victim was being ridden by her child on a trip on the left side of the road, and then suddenly a dump truck from the opposite direction hit the victim, which caused the victim and her child to bounce off the highway. During the emergency room, the victim was unconscious for more or less 15 minutes. In the vital sign examination, the consciousness of Glasgow Coma Scale (GCS) 15 was obtained, blood pressure was 120/70 mmHg, heart rate was 78 times / minute, respiration rate was 20 times /minute, body temperature was 36.5°C.

On the X-ray of the left feet, there were broken bones and soft tissue that was destroyed (figure 1). On forensic physical examination found a tear wounds that are wide open on the back of the left leg, in the visible wound of bones, muscle tissue, and blood vessels that are destroyed in irregular shape, uneven

boundary wounds, uneven edges with a lot of bleeding, in touch there are creaking of bones (crushed injury) (figure 2).



**Fig.1.** X-Ray in left feet looks broken bones and soft tissue

Based on these clinical conditions, the victim is then treated both pharmacologically and operatively in the form of primary hecting in open wounds in the frontal region, open reduction internal fixation in os ulna and radius fractures and bellows knee amputation in crush injuries in the region of the pedis sinistra. Medicolegal investigations begin from the time the patient enters the hospital until the end of the patient's care to determine the degree of qualification of the wound.

### Discussion

In Indonesia the most injuries are caused by traffic accidents. Most victims of traffic accidents suffered injuries in the lower limb by 63.8% and in the upper limb 47.8%. This pattern shows that the limb / limb dominates the injury as a result of a traffic accident.<sup>4</sup> In one study conducted by Kristanto et al (2009) of 7 victims of a traffic accident who were autopsied at the RD Kandou Manado hospital found that an extremity injury occurred to all victims. Injury to the lower limb / lower limb still tops the list for injuries due to traffic accidents.<sup>4,6</sup>

According to data from the Ministry of Health of the Republic of Indonesia in 2011, of the many fracture cases in Indonesia, fractures in the lower limb due to accidents have the highest prevalence high among other fractures at around 46.2% .<sup>6</sup> In this case the victim had an accident while riding, the front of the car crashed into the right side of the victim's body

which resulted in the right side of the victim's forehead injured and it seems the victim fell over (spinning) so that the victim's left leg was run over by a car tire and resulted in broken bones of the left leg. When the victim falls, the victim's right arm holds the weight of the body resulting in fractures of the radius and right ulna. If seen the form of injury to the victim's left leg can be said to have been caused by blunt force. Damage due to blunt trauma results in bruising of the face and thighs, open sores on the left leg, fractures in the radius and ulna and destruction of muscle tissue, blood vessels and bones in the left leg.<sup>9</sup>

Tibia fracture is the most common occurrence of all fractures in long bones, the annual incidence of open fractures in long bones is estimated to be 11.5 per 100,000 population with 40% occurring in the lower extremities.<sup>10</sup> Open fractures are caused by trauma due to high energy, most often found in direct collision, or fall from a motor vehicle. In this open fracture serious attention is needed, because if there is a tear in the skin it can cause infection either in the skin or in the bones, which can cause further complications such as sepsis and may even lead to death.<sup>2</sup>

As in this case, there is a crushed injury in the lower left extremity that causes massive bleeding, which can cause victims to lose more than 50% of blood within 3 hours or lose 150mL of blood per minute resulting in perfusion and oxygenation disorders in the body including perfusion and oxygenation in brain. This will lead to failure of the respiratory and cardiovascular systems as pillars of life.<sup>10,11</sup> State of heavy blood loss in the event of trauma can result in life-threatening hemorrhagic shock.

The management of patients with severe trauma to the lower extremities has a high difficulty because of high morbidity and high cost and the possibility of ending in death is quite large. However, with microsurgical techniques, repair of severe injuries to extremities can be carried out as reported by Guilaro et al., 2013.<sup>12</sup> In general, the handling of patients with vascular injuries is carried out as follows: (1) bleeding control, (2) damage control resuscitation, (3) evaluation and diagnostic tests, (4) strategies for minimizing ischemia, (5) operating principles for repair.<sup>13</sup> But in this case, the victim suffered a very severe injury that could not be repaired.

Traffic accidents are the most common cause of limb injury, but forensic examinations are often not carried out because they are considered not intentionally injuring others. However, if in the future the victim

feels disadvantaged, documentation of care is needed for the benefit of doctors, patients and their relationship with medicolegal consequences.<sup>14</sup>

With a very severe injury to the victim's left leg causing complicated problems from the clinical, surgical and medicolegal aspects. Particularly from the medicolegal point of view, this patient did not report this incident to the legal domain, but for the patient's benefit, medicolegal documentation is needed.<sup>15</sup> From a medicolegal point of view it is very important to give attention to the period of injury, duration of treatment, complications, because it is related to the degree of qualification of the wound. later.<sup>16</sup>

In the medicolegal system in Indonesia, the above case is classified as seriously injured because it causes victims to experience bleeding in the legs due to crush injury, and starting from the knee to the foot must be amputated because it was destroyed and afraid of endangering lives due to infection. The qualification formulation of injuries to the victim is crush injury causing severe open injuries and fractures in the lower extremities, causing the victim to lose a lot of blood, for fear of infection, the lower limb must be amputated as a result the victim has permanent disability.<sup>17,18</sup>

Article 90 of the Indonesian Criminal Code has provided a limitation that what is meant by serious injury is: (a) falling ill or receiving an injury that does not give any hope of healing at all or that poses a danger of death, (b) unable to continue to carry out his duties or daily work, (c) loss of one of the five senses, (d) getting a major disability, (e) suffering from paralysis, (f) impaired thinking for more than 4 weeks, and (g) a wound in a woman where it causes miscarriage. The punishment for the offender who injured someone can be seen in article 354 of the Indonesian Criminal Code:<sup>17,18</sup> (1) Anyone who intentionally injures another person, is threatened because he commits severe torture with a maximum imprisonment of eight years, and (2) If the act results in death, the guilty person is threatened with a maximum imprisonment of ten years.

## Conclusion

Traffic accidents can cause fractures, with an incidence reaching 37.5%. Traumatic fracture itself is predicted to be the cause of disability and death for decades to come. The medicolegal investigation aims to find medical evidence that can be used if there are legal problems in the future. In this patient, there are no lawsuits against the perpetrators, but in the future

there may be legal issues related to the injury suffered by the patient so that they need supporting documents, so the medical records that have been taken can be used as legal evidence.

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#### Conflict of Interest

The authors declare there is no conflict of interest.

#### Ethical Approval

This is a retrospective case report without the use of any samples from patient, so ethical approval can be waived.

#### Author Contributions

TS as a forensic medicine specialist and ethics-medicolegal consultant, he is responsible for the medicolegal investigation in this case and final editing in the manuscript preparation. KK as anesthesiologist and neuro-anesthesia consultant, she is responsible for clinical data management and making basic concept of the manuscript preparation.

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