



## Case Report

## Underbelly injury based identification of the driver in a three-rider motorcycle accident

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## ABSTRACT

This paper presents a three-rider motorcycle accident which took place in a suburb of Chongqing China. In the accident, the motorcycle impacted the terminal of a bridge footpath and led to two riders died and one rider injured. After the accident, one rider received injuries around the groin area including the underbelly area and the perineum area. Another rider suffered from injuries only on the perineum areas. In medico-legal judgments, injuries around the groin area also called groin injuries in victims of motorcycle accidents are usually regarded as “fuel tank injuries” which are commonly found in drivers. But, the injuries around the groin area are sometimes confused with the perineum injuries. Therefore, the perineum injuries are often wrongly reckoned as the “fuel tank injuries” and used to identify the drivers too. Actually, passengers can sometimes suffer from perineum injuries in many head-on impacting motorcycle accidents. It is of vital matters to understand the differences between groin injuries and perineum injuries so that the real driver who should be responsible for the accident can be recognized. In this paper, the three-rider motorcycle accident was presented and the injury information of the three riders was studied in order to distinguish the real driver from the riders. We consider that the groin injury has some differences with the perineum injury and the latter should not always be related to the driver especially in high-speed head-on impacting motorcycle accidents. In addition, the injury on underbelly areas is important to identify the driver.

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## 1. Introduction

In two-rider or three-rider motorcycle accidents, it is difficult to distinguish the driver from the passengers. However, being able to do so is important for medico-legal judgment [1]. The difficulty in the driver's identification is that all riders are usually thrown from the vehicle and have few characteristic injuries for each seated location. Valerie et al. reported that there is no statistically significant difference in the severity of injuries between motorcycle riders and pillions of matched pairs [2]. In fact, Injury around the groin area of the victim, known as “fuel tank injury” is one of the few characteristic findings [3]. But, the injuries around the groin area are often confused with the perineum injuries. According to previous reports, injuries around the groin area including the perineum area, known as fuel tank injuries, were always related to the driver but never to the passengers [1,3,4]. In 2007, Ihama et al. [5]

presented a rare case of a two-rider motorcycle accident in which the driver suffered from groin injury and the passenger met with the injuries on his perineum area. And the authors made much effort and successfully identify the driver through the traumatic testicular dislocation [5].

For a motorcycle, the surface of the fuel tank is always obliquely upward and forms an obtuse angle with the surface of the saddle. The “fuel tank injury” usually appears in relatively high-speed head-on motorcycle impacts. During this kind of impact, the motorcycle can fiercely be stopped by the external obstacle. However, because of the powerful inertia, the riders will maintain their initial speeds and continue to move forward with their straddle postures gliding sharply along the surface of the saddle and then strike heavily on the surface of the fuel tank. Consequently, the groin area of the driver who sits nearest to the fuel tank will be injured with high probability by the upper and bilateral surfaces of the fuel tank resulting in “fuel tank injuries”.

In a real two-rider motorcycle accident, it is really difficult to find the injury differences between the riders and then identify the driver. Our paper presents a rarer case of three-rider motorcycle

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accident. We study the injury information including the groin injury, the underbelly injury and the perineum injuries in this paper. It turned out that the driver was subjected to the groin injury including the underbelly injury, one of the passengers suffered from the injuries on the perineum, and no such injury was found in the other passenger. We consider that the groin injury has some differences with the perineum injuries and the latter should not always be related to the driver especially in high-speed head-on impacting motorcycle accidents. Besides, the injury on the underbelly area is important to identify the driver.

## 2. Case presentation

In a suburb of Chongqing China, three young men (rider A 19-year-old, rider B 19-year-old, rider C 21-year-old) were riding on Chinese type motorcycle with a 125 cc engine (JIANSHE) at midnight. The motorcycle carrying the three riders ran straight to a footpath of a bridge at the speed of 70 km/h and collided with the terminal of the footpath (Fig. 1). All riders were thrown from the motorcycle onto the road after the impact. Rider (A) was thrown to a place which was 3.6 meters away from the impact point (Fig. 1). Rider (A) was seriously injured and consequently taken to a hospital. Rider (B) was thrown to a place which was 19.9 meters away from the impact point (Fig. 1). Rider (B) died on the spot as a result of severe head trauma. Rider (C) was thrown to a place which was 28.0 meters away from the impact point (Fig. 1). Rider (C) also died on the spot because of severe head trauma.

At the time of the collision, it was at 23 o'clock with dim ambient light. The motorcycle collided with the terminal of the footpath at an impacting angle of approximately 90°. All riders had been wearing half helmets but none had a driving license. The three riders had not drunk alcohol before the accident. In addition, all riders had no previous history of groin or perineum bruise.

## 3. Results

After the accident, the motorcycle was violently deformed and the three riders were seriously injured. The detailed results were shown as below.

### 3.1. The damage of the motorcycle

On the motorcycle, the front wheel was broken to pieces (Fig. 2a), the front fork of the motorcycle was bent backwards badly (Fig. 2a), and the fuel tank was crushed severely (Fig. 2b). There is a slope on the surface of the saddle and the tail of the



Fig. 2. The deformation of the motorcycle after impact (a) front wheel and front fork of the motorcycle (b) the fuel tank of the motorcycle (c) the slope on the surface of the saddle.

saddle is higher than the front of the saddle (Fig. 2c). The terminal of the footpath had a dent on the impacting side.

### 3.2. External examination of the victim (rider A)

The external examination was performed in the hospital three days after the accident. The victim was able to respond although he was not fully conscious. Bruises can be obviously found around his groin area including the underbelly area and his perineum area (Fig. 3).

### 3.3. External examination of the decedent (rider B)

The external examination of rider B was performed 12 h post-mortem. The body was 157 cm in length and weighed 59 kg. The

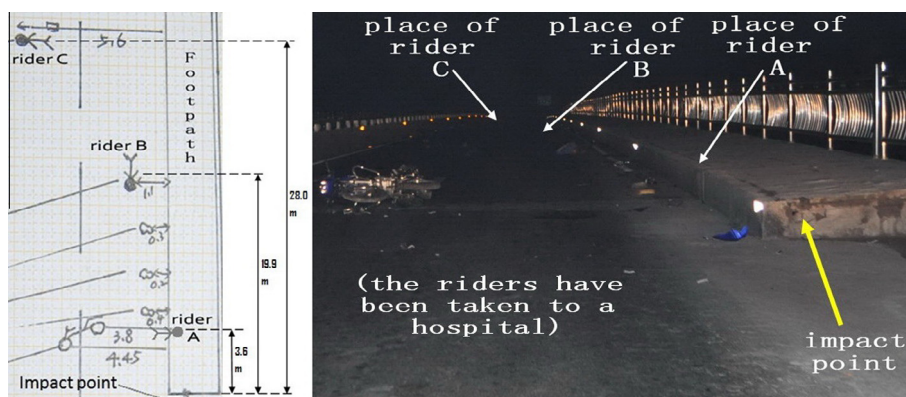


Fig. 1. The scene of the three-rider motorcycle accident.

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