Case Report

Analysis of Two Tire Marks on the Head and Clothing

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As a child was crossing a street, he was run over by a van. The driver of the van claimed that he had not seen the child crossing in front of him and stated that he was not at fault because the child went under the car between the left front and rear wheels. There were two tire marks on the child’s head and back of the trousers clearly indicating that the child was run over by a car. This kind of accident is rather simple, but if the police or examiner does not analyze the information regarding both the autopsy findings and vehicle investigation, the traffic accident reconstruction will be failed. In this case, we found two pathways of tire marks on the victim. One pathway was on the head and the other was on the trousers and they were almost paralleled. As one tire of a car could not make two paralleled pathways, we could conclude that the van ran over the child with the front and rear tire. It is clear that the child did not go under the car between the left front and rear wheels and he was not at fault. So, here we introduce the detail procedure of analysis of two tire marks on the victim.

Key words: Forensic science, Autopsy, Run over, Tire

Introduction

When a pedestrian is hit by the bumper and run over by tires of a car, important evidence may remain, like fractured bones or tire imprints on the skin of the body. Though this evidence is important, it may receive little consideration because autopsies and traffic accident information may not be shared easily in some jurisdictions. Nowadays, many cases regarding pedestrian accidents have been reported using computer simulation to analyze the movement of the human body after impact from the bumper and to analyze the injury of the pedestrian4-3. Many cases involving pedestrians being run over are reported, but analyzing the case by analyzing the tire marks left on the body by the car is not common4,5.

The case we will examine involves the death of a five-year-old boy. As the child was running across a street, an oncoming van hit him. The police first investigated this case and it was concluded that the child was at fault because the car had run over the child with only the rear tire. However, we reviewed both the autopsy results along with the analysis of the tire marks on the clothing and concluded that the vehicle had hit the child and then the front and rear tires of the car ran over him. This case illustrates that only when all the information is integrated can accurate reconstruction of the accidents occur.
**Case report**

A child was crossing a street in Seoul City from left to right (in point-of-view of the driver) and was run over by an oncoming van. The child was five years old. The police investigated this case and the police stated that the child was not erect when he went under the left side of the vehicle. The left rear tire impressed on the child's shoulder and head. There were several witnesses who saw the accident. One man stated, “When I heard a loud thud, I turned my head and saw that the child was lying behind the van and the van had stopped.” Another witness, who was a taxi driver said, “I saw the child with my rearview mirror. He was walking along the center line of the street and then ended up under the van as the van hit him. The child was between the left front and rear tires of the car.” The driver of the vehicle in question stated, “There was nothing in front of my car. When I heard the strange sound I felt my car shaking a little and I stopped the car immediately. As long as the child went between the left front and left rear tires I have no fault.” The investigation was carried out and the driver of the van was found ‘not guilty’ because the taxi driver’s statement was believed to be more detailed and practical.

**Autopsy Findings**

A complete autopsy was performed on the victim. The body weighed 14 kilograms and was 106 cm in height. In the external examination, there were wide abrasions on the right chin and upper shoulder. There were marks on the backside of the head. Internally, the cranial bone was fractured completely and the right temporal bone was depressed. The occipital bone, foramen magnum, frontal cranial fossa and basal bones were widely and fully fractured. The cause of death was head trauma based on the extensive skull fractures seen. There were fractures of the right scapula and left pelvis with associated hemorrhage. The right lung was lacerated resulting in a hemothorax. Toxicological testing was negative. So the cause of death was singled out to one incident: the impact of the vehicle during the accident.

**Investigative Findings**

The van was a 'Starex' model made by Hyundai Motors. The 4 tires installed in the vehicle were ‘Steel Radial 722’; serial number 215/65R15 manufactured by the Kumho Tire Company and the width of thread is about 16 cm (Fig. 1).

The front panel and underside floor pans of the vehicle were fully examined but there were no grazes on the outside of the vehicle, not even a scuffmark. The child was wearing a yellow shirt and beige trousers. The upper part of the shirt was bloody and the front side of the shirt was a little scratched. We assumed that the scratch marks on the shirt were made from the friction of the road. There were no visible tire marks on the shirt to be compared with the tire patterns of the van. On the trousers, there were clear tire marks on the backside going from the lower right to the upper left and left pelvic part is torn along the sewing line (Fig. 2).

The tire marks on the trousers were block and long stripe patterns. The trousers also had many long, narrow marks; like the teeth of a comb. The width of the blocks was 2 to 3 cm, the width of the long stripe was 0.5 cm and the gap between the narrow lines was 1 mm. Without a doubt, these tire patterns were considered to be the same as the tire patterns found on the tread of the tire (Fig. 3).

The tire marks on the head were very clear to
Fig. 2 The tire patterns on the trousers had several block and long stripe patterns and left pelvic part is torn along the sewing line.

Fig. 3 The tire patterns on the trousers (left figure) had several block and long stripe patterns. The widths of blocks are 2 and 3 cm and the gap between the narrow lines is 1 mm. Therefore, it is same pattern with the tread pattern of the tire (right figure).

Fig. 4 The tire patterns on the head (left figure) showed several paralleled lines and its widths are 2 and 4.5 cm. The dimensions and zigzag pattern are the same compare to the middle part of tread (right figure).

see. We printed the patterns of the tire onto a paper and compared them with each other. The pattern on the print we made had to be reversed or else the tire patterns on the skin would have been difficult to analyze. In Fig. 4, the widths of the red narrow and parallel lines are 2 cm and 4.5 cm and in the middle of this tire pattern, a zigzag pattern can be seen. The widths of the red parallel lines, which were matched to the groves of the tire, were the same as the tread patterns of the tires. Therefore we also determined that the tire marks on the head were same with the tire patterns of the van (Fig. 4).

Discussion
When a car hits a pedestrian, some fibers of the pedestrian’s clothing would be found on the bumper and this fiber often gives very useful information. In some cases, the fiber could mix with the paint of the car and remain on the front bumper. If the velocity of the moving vehicle was slow, however, this evidence would probably be nonexistent. In the case involving the five-year-old child, there was no evidence found on the exterior of the car. At the time of this accident there was some traffic, so the speed of the vehicle would have been slow. This may
explain why there was nothing found on the underside of the vehicle. Although the tire marks on the victim's head and clothing were the same with the tire patterns of the van, the driver was not held responsible for the accident because the statements of several witnesses support the driver. Normally, in case of an accident when someone is run over, some part of the body can easily be hooked under part of the car and the body moves complexly: like rolling, translation and twisting, etc. But this case is a little simpler. At that time, there are so many cars on the road and the velocity of the van was slow. If we consider his age and the fact that the lowest part of the van is above the surface of road 25 cm, we can assume that the van ran over the child with only the tires. So there is not any tear marks on the clothes except the left pelvic part of trousers. The torn part of trousers showed that a tension force was applied because it was torn along the sewing line. The torn trousers along the sewing line can happen when the tension force is applied in the normal direction to sewing line. If the tire compresses the inside of the left thigh of the trousers and rolls over the left thigh, the tire pushes the thigh toward the left side, so the tension force can be higher on the opposite side of the trousers.

The two tire pathways on the back side of the head and left thigh are inclined similar direction. It means that the child was run over twice by the tires because on tire can not make two departed pathways of similar direction. Also there was no reason for turning the steering wheel under the road conditions. The lower pathway of tire in Fig. 5 was made by left front tire first, and the upper pathway was made by left rear tire of the van. If the van ran over the head of the child first, the lower pathway would never happen. Whereas, in the case that the van ran over the left thigh of the child with left front tire first, the child would move a little voluntarily because he still alive. Therefore, when the van ran over the left lateral hip and thigh region, the child was alive and he pulled back a little with his hands and right leg and then the right shoulder and the head were run over by the left rear tire. In this process the two pathways of tire are made. So, the truth of this accident was uncovered clearly and the driver of the van had to pay a penalty and the child’s family could receive the compensation from government and Insurance Company. Also to prevent this kind of accident, proper safety guards along the road should be installed and the training program for safety should be continued9-13.

**Conclusion**

So we concluded that the child was not run over only by the rear tire, but by both the left front and rear tires of the van. Sometimes laboratories including our institution in forensic science fields, the departments dealing with autopsies and traffic accident investigation are thought to be two separate entities. Moreover,
some forensic scientists have no chance of examining a body or of even reviewing the autopsy report. As shown in the particular case we have discussed if we had ignored the evidence found from one entity, the true cause of the child’s death would have never been found. The possibility of never finding the truth is always apparent in forensic science, so we suggest that medical examiners and forensic scientists always work together to ensure a more efficient and accurate way of finding the cause of a death in a traffic accident.

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References


