CASE REPORT

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Unusual Contact Marks: Connecting the Hubcap to the Wheel of the Car

REFERENCE: Novoselsky Y, Tsach T, Klein A, Volkov N, Shor Y, Vinokurov A. Unusual contact marks: connecting the hubcap to the wheel of the car. J Forensic Sci 2002;47(3):630–632.

ABSTRACT: A case of homicide and attempted homicide is described. The comparison of tire-marks linked the suspect's vehicle to the scene of crime only with low certainty. However, the comparison of the pressure mark on the hubcap found at the scene, with the balance weight on one of the wheels of the suspect's car, connected the suspect to the scene of crime with high certainty.

KEYWORDS: forensic science, toolmarks, comparison, hubcap, physical match

The comparison of contact marks in forensic science deals primarily with toolmarks left on objects that are in physical contact with each other (1). It is possible to consider any object as a "tool," despite that our common approach is that "tools" are such classic items as screwdrivers, hammers, etc. Different production processes can leave marks that can be used later to determine the origin of the item produced. For example, if an item was produced as a single tool or if it was mass produced. The wear process creates exclusive marks that are added to the toolmarks examination process. Courts of law in Israel and abroad (1,2) assume that all tools leave marks. There are no two tools that leave the same mark (3,4). In the described case no comparison was made between classic workman's tools and their marks, but rather between contact marks of two objects—the hubcap found at a secondary scene of crime, and the balance weight on the wheel of the car.

Case Description

A driver of a car shot two tourists. One of them was killed by pistol shots, and the other was seriously wounded. Later, the driver parked his car, took out the backpacks of his victims, and set them afire. On returning to the highway, one of the hubcaps of the wheels of his car fell off. A policeman on duty later stopped the suspect's car for a routine inspection of documents. During the police investigation he partially recalled the registration number of a car and also the driver's name.

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Received 26 Sept. 2001, accepted 15 Nov. 2001.

To find further evidence connecting the car and its owner to the murder, the suspect car was apprehended by the police and brought for laboratory examination. Several laboratories in the DIFS tried to find evidence connecting the car to the scenes of the crime (the site of the murder and the luggage burning).

Examination of the Evidence

Evidence received by the Toolmarks and Materials Laboratory included pictures and plaster casts of the tire imprints. The distance was measured between the wheels of the car based upon the tire imprints, and trace materials from the floor of the car were compared with samples of dirt from the sites of the crime. In addition, the hubcap found at the site of the burning of the backpacks was also examined.

The results were consistent with the suspect's car, but it still was not possible to definitively link it to the crime.

The following observations were made during the examination of the suspect's car:

- On the back-right and the front-left wheels there were hubcaps of design and color similar to the hubcap found at the site of the burned backpacks.
- The front-right and the back-left wheels had no hubcaps.

Comparison examination of the hubcap and the weight yielded the following findings:

- The examination showed a matching in size and location between the balance weight and the inflation point in the wheel of the car and the pressure marks left on the wall of the hubcap (Fig. 1).
- There was a match (Fig. 2) between the marks found on the hubcap from the site and the marks found on the balance weight that was affixed in the rim of the front right wheel of the suspect's car.
- There was a difference between the marks left on the hubcap and rim of the back-left wheel, and the spare tire.

The hubcap was examined microscopically and the marks were compared to the marks on the silicon rubber cast prepared from the balance weight (Fig. 3).

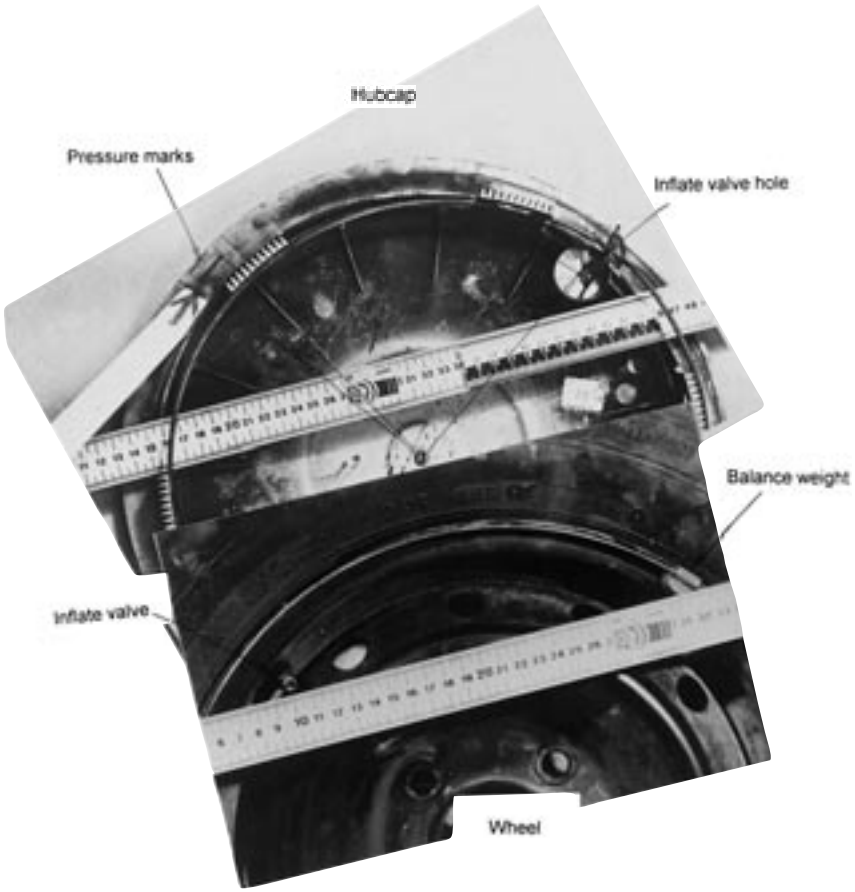

FIG. 1—*A match between the location and size of the pressure marks in the hubcap and the balance weight on the wheel.*

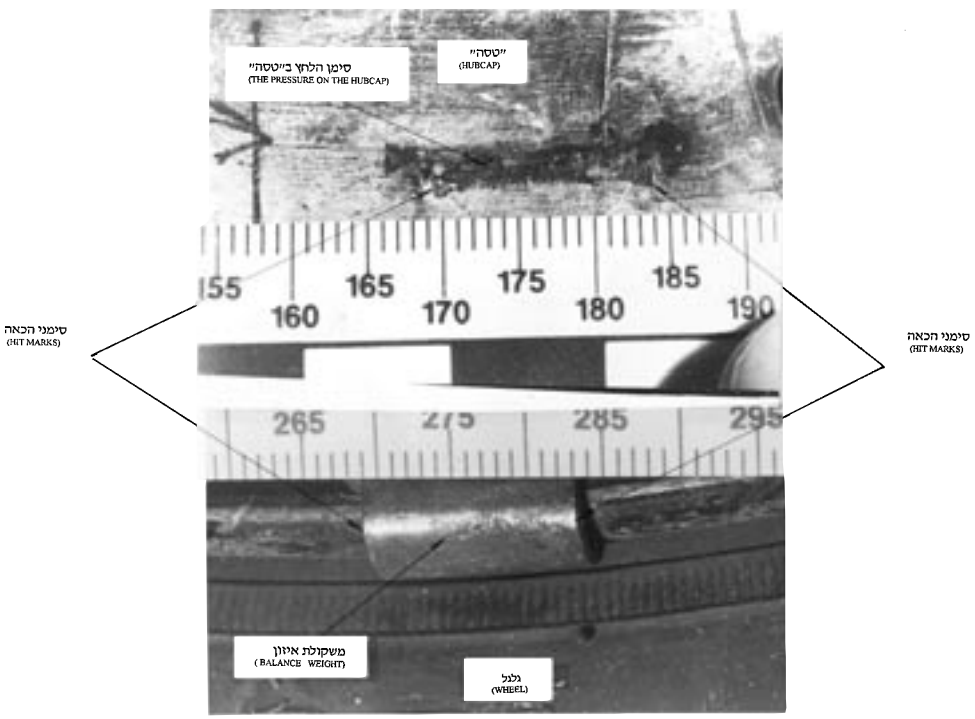

FIG. 2—*Regions of matching marks on the hubcap and the balance weight.*

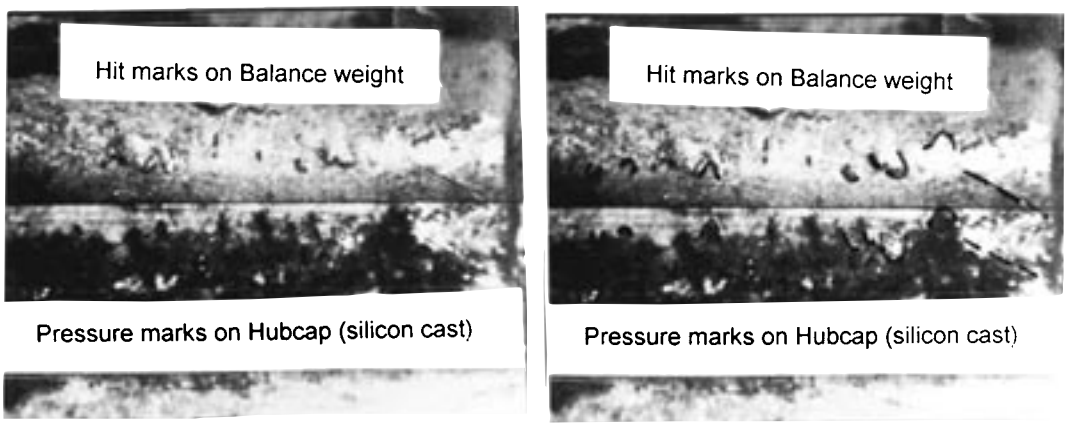

FIG. 3a—*A match between the microscopic features on pressure mark on the hubcap and the balance weight grip on the rim of the front-right wheel of the suspect's car.*

FIG. 3b—*Pointing on the matching area from Fig. 3*a.

The match found between marks left on the hubcap by the balance weight and the balance weight resulted in the conclusion that there is a very high probability that the hubcap found at the scene of crime, quite plausibly had once been mounted on the right-front wheel of the suspect's car.

The uniqueness of the present case lies in the comparison of unusual toolmarks that had been made by the pressure exerted between the balance weight and the hubcap. This was supported by:

- The location and size of the balance weight in relation to the circumference of the rim of the wheel. (This is determined by centralizing balance of the wheel. Weights are added according to sensors with no judgmental input from the machine operator.)
- The marks of a hammer on the mechanically regulating weight according to the dimensions of the wheel (attaching the balance weight to the wheel is usually accomplished by the blow of a hammer on the weight). The weight is composed of relatively soft material (lead) that maintains the deformation marks made on it. Discerning the marks on each of the weights is usually possible.

The suspect was eventually arrested and admitted to the murder, and his trial ended in conviction.

Acknowledgment

We should like to thank Dr. Jay Levinson of the Israel Police for his editorial assistance.

References

1. Kirk P. Crime investigation. Willey and Sons, London 1974;360–78.
2. Bergman P, Springer E. Toolmarks as legal evidence. Mishpatim, (In Hebrew). The student law review, Faculty of Law, The Hebrew University in Jerusalem 1988;18(1).
3. Saferstain G. Criminalistics Prentice Hall 6th ed. 1998.
4. Yosef Yaakov Nagar and Gabi Azrar against State of Israel. Israel Supreme (High) Court, verdict 38/88 (In Hebrew).

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