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Significance of analysis of the mechanism of fingermarks formation, sizes and location – casework examples

Summary

The aim of the article to present the role of analysing the manner of generating fingermarks in the investigative proceedings. These examinations are based on the analysis of the location of the marks on a given background and aim at providing the requesting party additional information about the circumstances of the investigated incident. The Author refers to two unusual cases, in which Voivodeship Police Command Forensic Laboratory issued expert opinions in the area of fingerprint identification. In the first case, at the initial stage of the proceedings the circumstances and recovered evidential fingermarks indicated a fatal accident or manslaughter by means of a firearm. In the other case at the preliminary stage recovered evidence did not allow identification of the perpetrator due to incorrectly selected exhibits. These cases would not be off special interest to us without the significant role of proper recovering of fingermarks and their analysis in a broader context than just identification.

Key words: manslaughter, suicides, firearm, fingermarks, fingerprint identification, mechanics of mark generation

Introduction

In Poland, the number of committed suicides has been on the increase in recent years. According to statistics, the most tragic year in this respect was 2014, when 6165 people took their own lives (Statistics Poland, 2007-2014). This rate amounted to 3530 in 2007. In the case of manslaugthers, the trend is reversed. In 2016, their number in Poland equaled 467, and in 2008, it reached 848 (Police Headquarters, 2008-2016).

Every year, forensic laboratories receive an increasing number of requests for identification of scene fingermarks originating from such incidents. In the vast majority of cases, the requesting authorities ask about the suitability of exhibits for identification and comparison with the submitted referential material. Fingerprint laboratories receive evidence in the form of both fingerprints lifted on foils and objects recovered in their entirety from the scenes. Foils are subjected to identification tests, whereas objects – in the first place – to the process of visualisation of latent impressions.

Methods using physical phenomena or chemical reactions are employed to visualise and enhance latent fingermarks. The selection of mark visualisation techniques is made depending on the type of substrate, mark deposit substance, time and environmental conditions in which the backgrouond was found. Striving to get the best results in detecting the marks, appropriate techniques are used in the appropriate sequences. After applying each of the techniques, the expert conducts detailed macroscopic examinations to determine if there are fingerprints on the substrate that can be initially qualified for identification. Fingerprint identification is a research method that allows to determine whether the evidential impressions and the comparative prints are compatible or not. The examination process consists in searching for and identifying sets of special features separately on each of the compared impressions and establishing the correlation between them.

In addition to that, detected marks may undergo additional tests to determine the mechanism of their formation. The analysis of mark location on the background can provide an answer to the question of how a given object was most likely held. This type of examination, performed upon consulting with the requesting authority, may provide additional information on the circumstances of the analysed incident and cast a new light on the matter or contribute to determining the most likely version of the events. The Author of the hereby article based his deliberations on two unusual cases examined by the Forensic Laboratory of the Voivodeship Police Headquarters in Łódź.

Description of incidents

Incident one

The course of the incident was typical for cases in the category of manslaughter or accidents involving the use of shotguns.

One early morning, residents of a small town spotted a car in the field. The location of the vehicle and visible deep ruts nearby might have indicated that the driver had driven along a dirt road, then he had got stuck in the mud and while trying to get out had driven into the field. Through the windows of the closed vehicle one could see a silhouette of a young man. His position suggested he was asleep in the driver's seat. Beside, in the area of the passenger's seat there was a double-barrel hunting shotgun and ammunition. The local police station was notified of alleged drunken hunter sleeping in a vehicle. Upon arrival, officers first of opened the door and secured the firearm for safety reasons. In the course of further actions, it was found that the young male lying in the seat was a 14-year-old boy and he was dead with a gunshot wound on his chest. The car was in an area far from the buildings, so there were no eyewitnesses. The boy's height and the length of his upper limbs raised doubts as to whether he would have been able to commit suicide by pulling the trigger from a shotgun, whose total length was 115 cm, and the distance from the muzzle to the trigger was approx. 80 cm. Moreover, as a result of police investigation, it was established that the boy was right-handed, while the features of the gunshot wound and body position indicated that the shoot had not been fired with a right hand. There were difficulties in reconstructing the exact position of the weapon in the vehicle because it had been hastily secured by the policemen upon arrival to the scene. The origin of the weapon or its owner were not established in this case. In connection with the above, it was extremely important to recover and investigate forensic traces.

A double barrel hunting shotgun (fig. 1), one cartridge (figs. 3, 4) and a cartridge case (fig. 2) were submitted for forensic examination with a request for finding and identification of latent fingermarks. The comparative material consisted of tenprint cards of police officers who had secured the weapon.

At this stage of the proceedings there was no tenprint card with comparative impressions of the deceased. In accordance with the request, it was necessary to determine whether the evidence submitted for examination included fingermarks, and subsequently whether they came from persons whose tenprint cards had been submitted as comparative material. In accordance with the examination procedure FINGERPRINT EXAMINATION – VISUALISATION OF MARKS No. Pb-14/15 / Daktyl, applicable in Łódź Police Forensic Laboratory, 2nd edition of 02/09/2016, accredited by Polish Centre for Accreditation, the exhibit underwent visual inspections. On its surface, no visible or fluorescent fingermarks were found. Consequently, the entire exhibit was subjected to cyanoacrylate fuming. After macroscopic examinations, two fingertip impressions were revealed on the surface of the barrel. They were qualified for further tests and were marked as 1-1 and 1-2 (figs. 5, 6).

The marks were detected in the recesses of the barrel and they came from small fragments of the finger. In the next step, the legibility of the revealed marks was enhanced by using Basic Yellow 40 contrasting reagent, which shows fluorescence when excited by

Fig. 1.

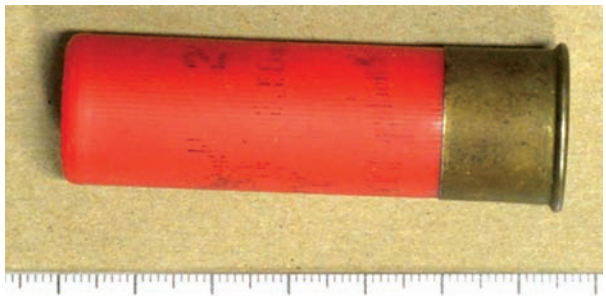

Fig. 2.

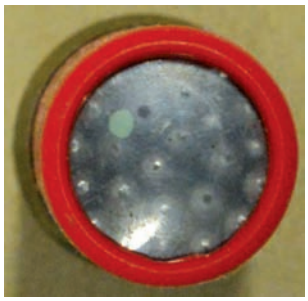

Fig. 3.

Fig. 4.

Figs. 1–4. Comparative material.

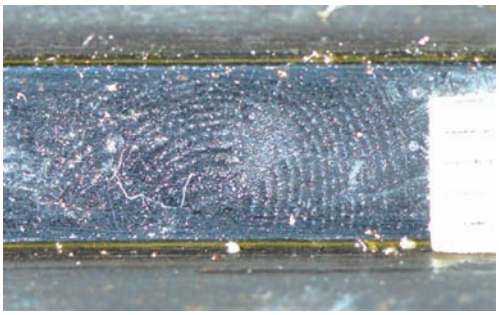

Fig. 5.

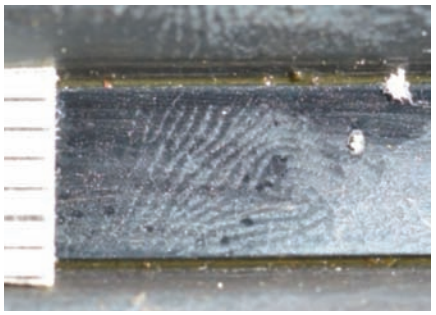

Fig. 6.

Figs. 5–6. Marks no. 1-1 (left) and 1-2 (right).

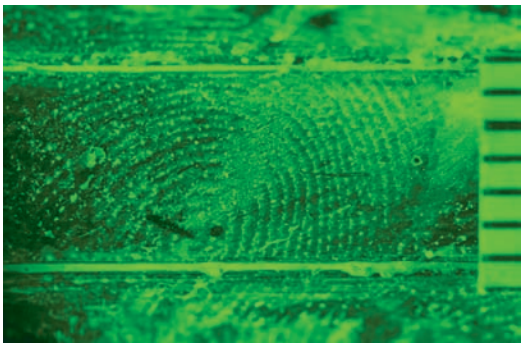

Fig. 7.

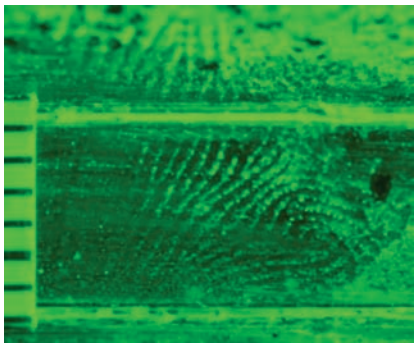

Fig. 8.

Figs. 7–8. Marks 1-1 and 1-2 following treatment with contrasting agent.

radiation in the 350-505 nm range (Rybczyńska-Królik, Pękała, 2006). The results are shown in figures 7 and 8.

On the remaining surfaces of the shotgun and on the surfaces of the cartridge and cartridge cases, no fingermarks were revealed. The comparative examination demonstrated that the revealed marks were not consistent with impressions from the police officers elimination tenprint cards. Fingerprints from the deceased were collected in the Department of Forensic Medicine and were sufficient to carry out the identification. Comparative tests have shown that one of the revealed marks (1-1) is consistent with the print of deceased right hand ring finger, while the other one (1-2) matches the print of the right hand index finger of the deceased. The expert's observations as to the location of the marks and the consultation with the authority requesting examinations led to issuing another request for forensic tests to determine whether on the basis of the revealed marks it was possible to identify the direction of the fingers setting and the hand grip. To answer that question, the evidential impressions were analysed to determine their location on the object. The axis of the barrel and the line defining the base of the pattern were used as the base to determine the angle of inclination. For the mark no. 1-1, the angle of inclination was 23°, while for the mark no. 1-2 it was 64°. The locations of marks on the background are shown in figures 9 and 10.

Based on the location of the fingermarks, the most likely arrangement of the fingers of the right hand and the grip of the hand on the barrel was determined. The ring finger of the right hand corresponding to the impression no. 1-1 is marked in yellow, while the right index finger corresponding to the impression no. 1-2 – in red (figs. 11-17).

Basing on the above findings, an experimental reconstruction was carried out. The actor had height and and body structure similar to the deceased. His right hand was placed on the barrel of the weapon in accordance with the most likely way of arranging the fingers of the right hand (figs. 11-17). In order to give the shot, the actor needed to turn his the torso in relation to the axis of the weapon and reach the trigger in this way. This method was confirmed by the entrance and exit wound of the projectile (figs. 18-19).

The experiment clearly demonstrated the possibility and method of the suicide shot. At the same time, on the upholstery of the right front door, a mechanical mark from the shotgun's butt was detected. Establishing the interrelationship between the evidence in this case allowed to determine the most probable version of

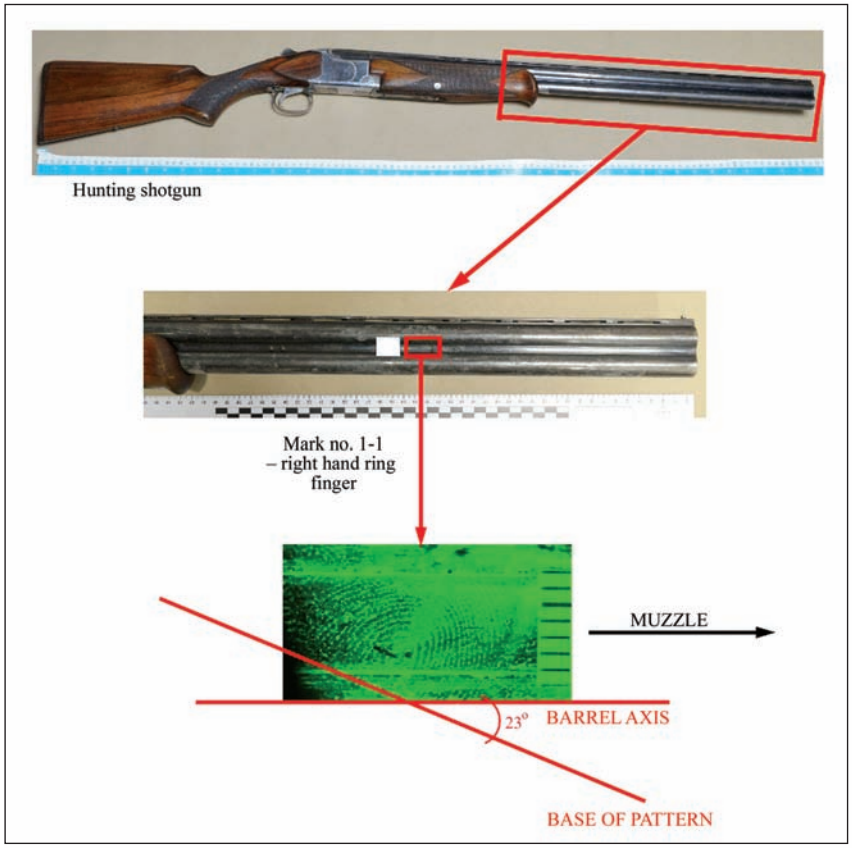

Fig. 9. Location of fingermark 1-1.

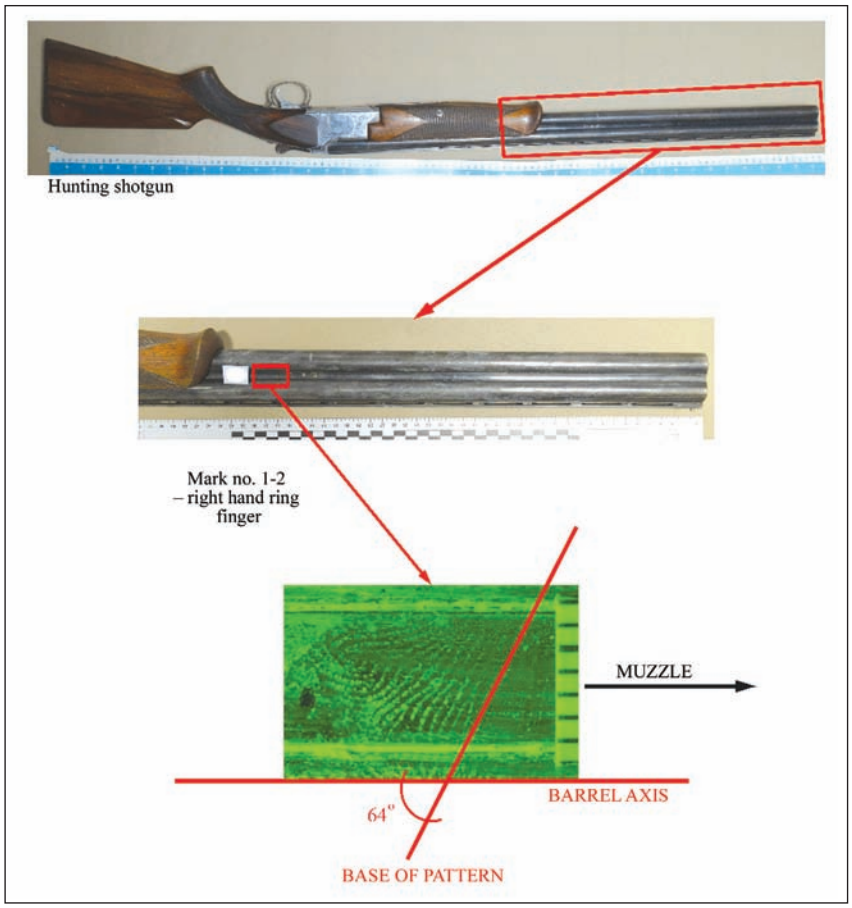

Fig. 10. Location of fingermark no. 1-2.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

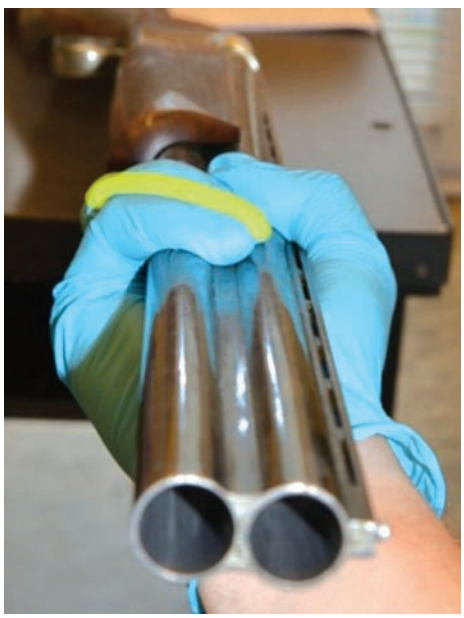

Fig. 15.

Fig. 16.

Fig. 17.

Figs. 11–17. The most likely positions of right hand fingers and grip of the barrel.

Fig. 18.

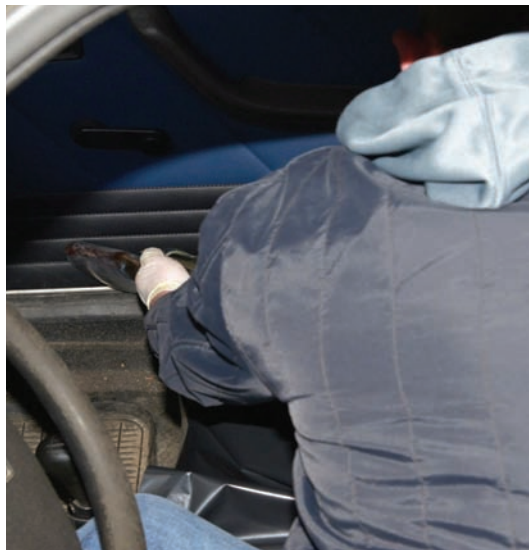

Fig. 19.

Figs. 18–19. Experimental reconstruction with an actor.

the course of the incident, which was, consequently, classified as suicide.

Incident two

The course of the described incident was typical for cases in the category of manslaughter with use of a knife.

A body of the 27-year-old woman was revealed in a flat. The corpse was partially dressed with a stub wound visible on a thigh. The woman, bleeding, probably moved around the flat, and therefore, during the inspection, numerous blood splatters were found. In a short time a man was detained – a cohabitant of the deceased. He was in a state of intoxication and claimed that he had had nothing to do with death because he had not been in her apartment on that day. However, he informed that he had stayed in it many times before and that his footprints could be found there. The man was arrested. During the autopsy, it was established that the fatality occurred as a result of a puncture wound inflicted in the thigh area with a sharp implement tool, resulting in cutting of the femoral artery and bleeding to death. The knife recovered at the scene corresponded with the stab wound. At this stage of the proceedings, the act was classified as manslaughter. Also in this case, it was extremely important to recover and investigate forensic evidence pointing to the perpetrator of the murder. It was important to reveal marks of high evidential value, indicating that the perpetrator had been preset in the apartment of the deceased during the murder or immediately after the murder (Kędzierski, 2007).

Material submitted for forensic examination included: a kitchen knife (fig. 20) and an OSB board with bloody marks (fig. 21), along with comparative material in the form of tenprint cards of the deceased and the detained male. According to the decision by the requesting authority the experts were to determine whether there were evidential fingermarks on the exhibits, and if so, whether they came from the persons whose tenprint cards had been submitted as comparative material, i.e. the detained male and the deceased.

The evidence was subjected to eye examination. A fingermark with brown-coloured substance deposit was found on the surface of the board. This mark, due to the insufficient number of specific features (minutiae) was unsuitable for identification at this stage. No visible or fluorescent fingermarks were found on the surface of the knife. In order to visualise the impressions, the entire body of evidence was exposed to the physicochemical methods described in the first part of the article. In addition, spots of the brownish substance were treated with a solution of Hungarian Red (Rybczyńska-Królik, Pękała, 2006) used to contrast blood stains. Its effect is based on the reaction of the components with proteins present in blood, resulting in formation of a purple complex, which is subsequently stabilised with 5-sulfosalicylic acid. After the application of the abovementioned method quality of the mark located on the surface of the board improved. This mark was given the number 1-1 (figs. 22, 23).

Identification examinations shown that the submitted mark no. 1-1 did not come from the deceased or the detained male. Further analysis of the revealed mark raised some doubts. The mark was quite large for a fingertip (fig 23). Its average height varies from 2 to 3 cm, in people with exceptionally large hands it reaches 3.5 cm. In addition, leaving a full copy of the thumb in the middle of a large flat surface is quite difficult due to the movement limitations of fingers and hands. These data were used as the basis for considering

Fig. 20.

Fig. 21.

Figs. 20–21. Exhibits in the case.

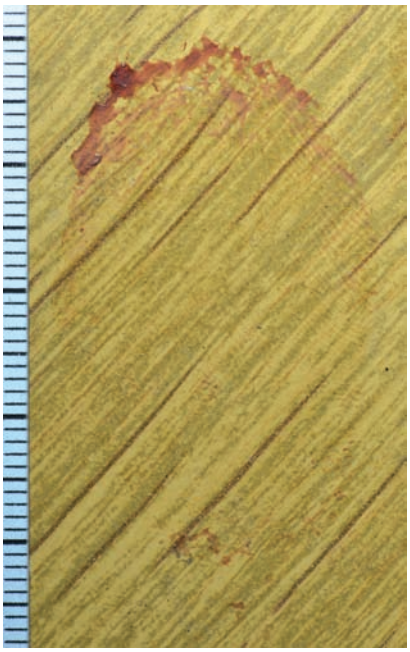

Fig. 22.

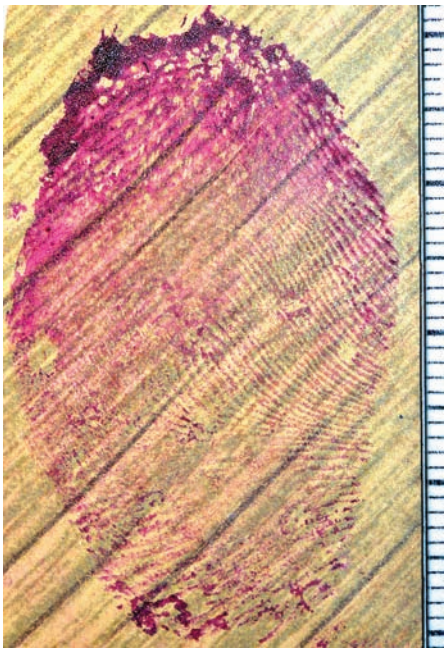

Fig. 23.

Figs. 22–23. Mark no. 1-1 before (left) and after (right) applying Hungarian Red.

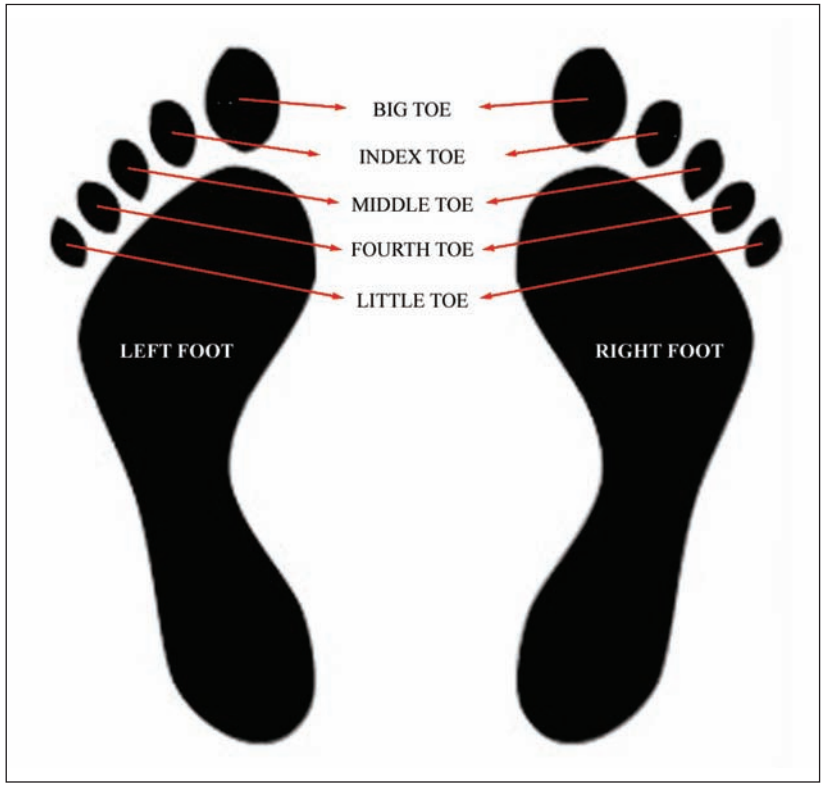

Fig. 24. Denomination of toes.

whether the print had come from a finger or from the big toe (Moszczyński, 1997). The requesting authority was contacted and comparative material in the form of prints of the detained man's and the deceased feet were collected. According to the subsequent decision, it was necessary to determine whether the recovered mark derived from a foot (fig. 24).

Comparative examinations were carried out and it was found that the mark is consistent with the right foot's print from the card under detainee's name. In addition to that, biological analyses indicated that the deposit was mad of victim's blood. On that basis it could be concluded that the perpetrator had been at the scene during the murder or immediately after. The questioning of the detained man in the context of the visualised and identified marks confirmed that after the crime, he had moved around the flat barefoot for fear of leaving shoeprints on the basis of which he might be identified.

Summary

An additional element that goes beyond the typical range of fingerprint identification, such as analysis of the revealed and identified marks in terms of their location on the background, may provide additional information on the circumstances of an incident. According to Sehn (1960), forensic traces constitute changes in objective reality, which as observable outcomes of the investigated incidents may be the basis for reconstructing and determining the course of these events in accordance with reality. The two cases presented above accurately reflected the meaning of the above definition. In the first case, a thorough examination of the evidence allowed to determine the most probable version of the course of the events. In the second one, however, the disclosed and protected mark of fingerprints was initially compared against incorrectly selected reference material and did not lead to identification. Only a thorough analysis in terms of the origin of the mark allowed selection of appropriate comparative material and issuing a positive opinion categorically indicating the perpetrator.

Source of figures: *Author*
Denominations of marks were changed for the need of the hereby article.

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