

**TRACE EVIDENCE ANALYSIS AND DIFFERENTIATION OF THE GRAPPLE
PATTERN OF SHOES BASED ON THE SPECIFIC IMPRINT THEY LEFT ON THE SKIN**

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ABSTRACT

We are representing a murder case of a two-month old child committed by his mother. She caused a severe closed head trauma by inflicting multiple kicks to the head of the child. After the murder she called her relatives and told them that the child had fallen and had hurt itself, so they took the baby to the hospital, where the doctors just declared the death. In the same time period the child's mother killed herself by jumping in front of a moving train. During the forensic autopsy of the body of the deceased child specific bruising in the right temporal - parietal area of the head was found, composed of multiple punctate elements with a line of demarcation around them. The above mentioned bruise corresponds to be obtained by the mechanism of the negative imprint from an object with a specific shape. Underneath the bruising is severe closed head trauma.

Keywords: *trace evidence, closed head trauma, grapple of shoes, specifically bruising.*

INTRODUCTION

In a large percentage of cases in the forensic practice on the bodies of injured and deceased individuals we observe the specific characteristics of the objects that affected them (1, 2). Most often, such traces remain from different blunt objects with a specific surface, enabling the identification of the acting subject (2). Such fingerprints on the bodies of the victims are a result from impact of objects from the surrounding lifestyle, from the cloths and footwear of the perpetrator and the victim, bite marks from human or animal teeth, specific parts of vehicles, etc (3, 4, 5). These facts determine the need for an analysis with comparison of the acting subject and the traces left of its influence (2). One method is photo superimposition, as in this case presented by us.

Materials and Methods

We were provided for testing a pair of black leather boots, which the mother was wearing when she committed suicide and a pair of pink lady slippers seized from the house of the same woman as follows:

Object № 1 - a pair of black leather boots № 37 with decorative stitching around the ankles and the front leather part. The boots have black rubber sole with current height of 3 cm in the rear part to 2 cm in front. The heel of the boots is with a slightly worn out surface. In the front part of the soles of the boots there is specific grapple pattern covering an area of about 14/10 cm, composed of separate elements protruding almost quadrant shape and size 0,6 / 0,6 cm. In the middle part and the front part for the inside of the soles, the grapple pattern is almost completely worn out. (Fig.1 and Fig.2).



Фиг.1



Фиг.2

Object № 2 – a pair of pink lady slippers with tassels (the left has two tassels, and the right external tassel missing). They are 26.7 cm in length, 8 inches in width at the rear and a maximum width at the front 10.7 cm. The sole is from white rubber with a specific grapple of parallel lines arranged in square elements with decreased middles sites and convex peripherals. Each of them is with size 0.3 / 0.3 cm. At the end of the tread at 0.5-0.7 cm from the outer edge there is a seam, which is decreased relative to the overall configuration of the tread. (Fig. 3 and Fig.4)



Фиг.3



Фиг.4

When examining the body of the child in the right temporal parietal region of the head was found bruising with a specific shape, size 12/10 cm. The center of the hematoma was composed of multiple punctate elements with diameters 0.2-0.3 cm and like a periphery arc around the bruising there was a demarcation line surrounding the punctate elements. (Fig.5)



Фиг.5

A comprehensive analysis was made of the above mentioned specific bruising found in the right temporal-parietal area of the head(size 12/10 cm, hematoma composed of multiple punctate

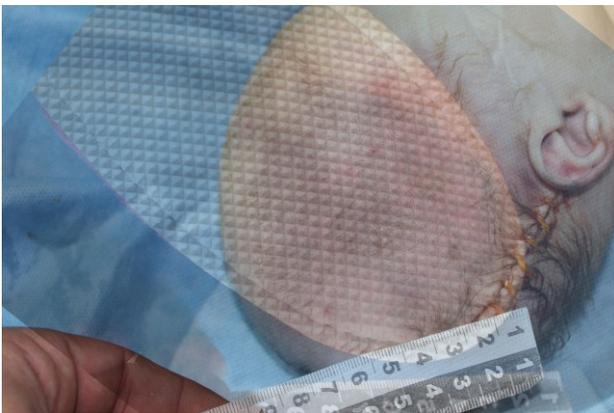
elements with diameters from 0.2 to 0.3 cm, periphery arc edge bruising with demarcation line surrounding the punctate elements).

The morphological characteristics of the foregoing bruising corresponds the same to be obtained by the mechanism of the negative bruises, as result of an impact of a blunt or semi-blunt object with symmetrically arranged hollow elements with diameters 0.2-0.3 cm which at the periphery are surrounded by a decreased part.

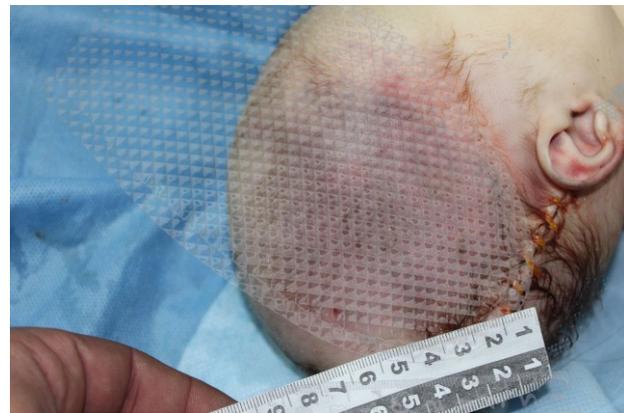
The initially conducted comparative study of the injury of the right temporal - parietal area of the head with specific characteristics of the sole pattern of the provided boots and domestic slippers of the mother of the child showed that existing bruising contains elements that exist in the configuration and shape of the sole of the women's slippers, as object № 2 in its front portion. Assessment of their mirror images of the bruises gives rise to the conclusion that they are from elements of the sole of the right slipper due to impact or strong pressing action.

The described objects are photographed with a digital camera CANON EOS-500D (18 Megapixel).

The photo processing was made with Adobe Photoshop ®. On the first stage of the experiment the grapple pattern of the right slipper was reversed as a mirror image in the horizontal and vertical planes to obtain an image corresponding to its surface which comes into contact with the surface of the body. The second stage consisted in magnitude unification of the bruising and the sole of the slipper. During the third stage the software processed images with rotation in two-dimensional space were superimposed, comparing the general configuration and the individual elements in the corresponding bruises and the grapple pattern. There was a match between the bruises and the specific characteristics of the arrangement of concave and convex parts of the sole pattern. (Figure 6 and Figure 7)



Фиг.6



Фиг.7

CONCLUSIONS

The mechanism of occurrence of the hematoma in the right temporal - parietal area of the head corresponds to a negative type of bruising. According to their location, they are a result of an impact of solid or semi-solid blunt object with specific characteristic of symmetrically arranged hollow elements with a diameter 0.2-0.3 cm, surrounded by a decreased part.

In this study was found that grapple pattern of the soles the provided women's boots did not match the characteristics of the above mentioned bruising.

In the forensic research of the babies' cadaver, grouped specific suffusions with typical form, disposal and alignment with repeated elements were established, which might be a result from impact and pressure-render effects of blunt objects with limited and specific relief of contact surface. These injuries in their morphologic complex correspond to be a negative imprint of the surface of shoe sole's grapple.

The comparative forensic study between the identified bruises and the tread pattern of women's slippers - object № 2 shows that the injuries contain elements that correspond to the specific shape configuration of the soles of the slippers. During the trace evidence analysis consisting in comparing the mirror image of the contact pattern grapple with the bruising and their location in the general configuration of the trace with photo superimposition of the software processed images rotated in two-dimensional space, was found matching between the characteristics of the bruise and the nature of the arrangement of the sole of the front part of the right lady slipper with its general configuration of convex and concave elements (object № 2). The general configuration and the segmental characteristics lead to the conclusion that the bruising were made due to an impact, by the aforesaid mechanism, with the sole of the right lady slipper - object № 2.

REFERENCES

1. Spitz and Fisher: Medicolegal investigation of death. Fourth edition, Illinois: Charles C Thomas Publisher, LTD, 2006;
2. Раданов С.: Съдебна медицина и медицинска деонтология. Трето основно и допълнено издание, С. изд. Сиела, 2006;
3. Siegel, J. A. (Ed.): Encyclopedia of forensic sciences (3 volumes). London: Academic Press, 2000;
4. Hilderbrand, D.S.: Footwear, the missed evidence. Temecula, CA: Staggs Publishing, 1999;
5. Bodziak, W.J.: Footwear impression evidence detection, recovery and examination, 2nd edition. Cleveland: CRC Press, 1999.