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TECHNICAL NOTE

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Lifting Shoeprints Using Gelatin Lifters and a Hydraulic Press*

ABSTRACT: A method for lifting two-dimensional dust footwear marks on rough or porous surfaces, such as cardboard or cloth, using a hydraulic press, was examined. It was found that exerting pressure on the lifter by the press usually improves the quality of the results. When the shoeprints were on rough or soft surfaces, the prints transferred to the gelatin lifters were better than those obtained by the conventional method. In other cases, using the press did not improve the results but was much simpler to apply. Based on the results of this study, the hydraulic press/gelatin lifter method (the "press method") is used at the authors' laboratory, depending on the surface from which the shoeprint is to be lifted. It is the authors' intention to apply the method to other surfaces after finding the optimal pressure for surfaces with loose fibers.

KEYWORDS: forensic science, gelatin lifters, footwear prints, shoeprints, hydraulic press, press method.

Several methods are described in the literature for lifting dust shoeprints, namely electrostatic lifting (1), lifting by means of an adhesive lifter (2) and lifting by a gelatin lifter (3). The advantages of these methods are their ability to remove background interferences caused by the surface on which the shoeprint is deposited. This is prominent especially on surfaces such as sheets of printed newspapers, on which the text is likely to conceal the fine details of the print. Lifting the dust traces to a separate medium usually eliminates these background interferences.

The gelatin lifters described in the literature collect less dust than the adhesive lifters (2). The gelatin layer is thicker than the adhesive layer of the lifter. Thus, the gelatin lifter penetrates deeper on a rough, three-dimensional texture. For this reason, a gelatin lifter is considered more suitable for lifting shoeprints on rough surfaces such as clothes and cardboard.

According to one of the gelatin lifters manufacturer's manual, placing the gelatin lifter on footwear prints is similar to taking fingerprints (3). The procedure reads "The upwardly slanted lifter is now carefully smoothed down, while rubbing with a thumb, so no air bubbles are locked in. After this, the lifter is pressed well over the whole surface" (3, p. 4). Bodziak, in his extensive textbook on shoeprints, writes: ". . . and avoid using excessive pressure, which might distort the impression" (1, p. 118).

In many cases, when using gelatin lifters according to the manufacturer's instructions, on smooth and hard surfaces (such as plastic sheets), visible traces of dust still remain on the exhibit (2). Thus, the efficiency of this recommended method is only partial. It was also suggested that placing the gelatin lifter on the print for a longer period of time (up to 20 min) yields better results than immediate lifting.[3]

The reason for avoiding pressure while placing the gelatin lifter on the dust print is due to the elastic nature of these lifters, so applying pressure can cause distortion in different directions (1). The purpose of this study was to examine the application of the hydraulic press for improving the quality of the shoeprints lifted by gelatin lifters.

Experimental

An adjustable pressure hydraulic press (Fig. 1) having a table of 30×30 cm^2 is used in the authors' laboratory for shooting distance estimation examinations (4). The same press was used in the present work for lifting dust shoeprints. Both upper and lower table boards of the hydraulic press were padded with 5-mm-thick polyurethane pads.

A rubber sole Source® pair of sandals was used for placing dust prints on four different types of surfaces:

1. Flannel cloth beneath which a 5-mm-thick sponge was placed.
2. "Masonite" (compressed cardboard).
3. Corrugated cardboard with an internal texture 2.8 mm thick and loose fibers.
4. Thin cardboard (thickness of 0.26 mm) without any visible internal texture.

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[3] John Birket, The Metropolitan Laboratory, FSS, London, UK, personal communication, 1999.

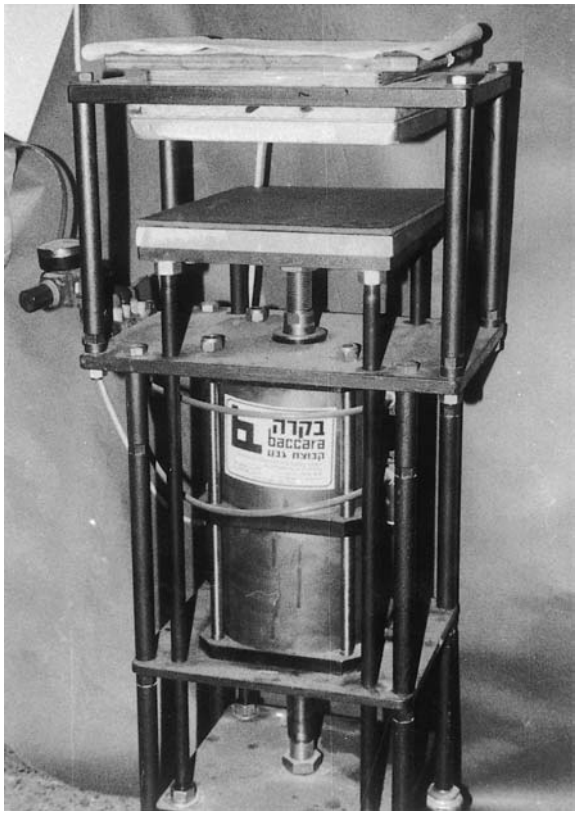

FIG. 1—*The hydraulic press used for the press method.*

Prior to the production of the prints, the soles of the sandals were cleaned by stepping on an adhesive lifter, followed by walking a distance of about 50 m outside the laboratory. The experimenter then trod on each surface with both his feet, side by side, producing a pair of dust shoeprints. As a result of the cleaning procedure, the shoeprints obtained were relatively faint. The supposition underlying these experiments was that the shoeprints impressed on the various surfaces were of similar quality and contained approximately the same amount of dust. Black gelatin lifters of 18 × 36 cm^2 (BVDA International BV, PO Box 2323, 2002 CH, Haarlem, The Netherlands) were used for lifting the dust shoeprints as follows:

1. On one footwear mark of each pair, a gelatin lifter was placed and left on the exhibit for about 20 min, exerting minimum amount of pressure, according to the conventional method described in the literature (3). Then the lifter was removed from the surface and photographed.
2. The hydraulic press/gelatin lifter method (the "press method") was employed for the second footwear mark of each pair. A gelatin lifter was placed on top of the shoeprint, and then both the exhibit and the lifter were placed on the hydraulic press table. Uniform pressure of 2 bars (approximately 2 kg/cm^2) was applied for a short period of time (5–10 s). The gelatin lifters bearing the shoeprints were photographed immediately following the lifting using the Projectina Light-Set® oblique illumination apparatus (Projectina AG, Dammstrasse 2, Postfach, CH-9435, Heerbrugg, Switzerland). All photographs were taken under the same photographic conditions.

Test prints were prepared using the same pair of sandals (Fig. 2), according to the procedure described by Bodziak (1, p. 294) and used routinely in the authors' laboratory. Red fingerprint powder (Dragon Blood®, Police Science Industry Ltd., 35-4 Akatsutsumi 5-Chome, Setagaya-Ku, Tokyo, Japan) was used for lightly dusting the soles of both sandals. Gloss transparent vinyl lifters (Industrial Self Adhesives Ltd., Robey Close, Linby, Nottingham NG15 8AA, UK), measuring 333 × 175 mm^2 and transparent celluloid sheets were used.

The results of both lifting methods were visually compared. Each shoeprint was evaluated according to the parameters listed below.

Results

Examples of prints, lifted from the various surfaces, are presented in Figs. 3–6. Each pair of photographs shows shoeprints that were lifted by both methods, side by side. On each substrate, the result of lifting using the press method was compared with the results obtained by the conventional method. The differences in the quality within each pair of lifted prints were evaluated according to the following parameters and summarized in Table 1:

1. Clarity and resolution of the shoeprint.
2. Quantity of the lifted extraneous material.
3. Lifting of the substrate texture.
4. Changes in the shoeprint's size.
5. Overall quality of the lifted print.

Flannel Cloth

The resolution of the lifted print was better when applying the press method, and its overall quality was much better. While prints lifted by the conventional method were usually partial, most prints lifted by the press method off flannel cloth were complete. Nevertheless, this method slightly increased the amount of extraneous material, such as fibers, lifted on the gelatin lifter. It also caused the

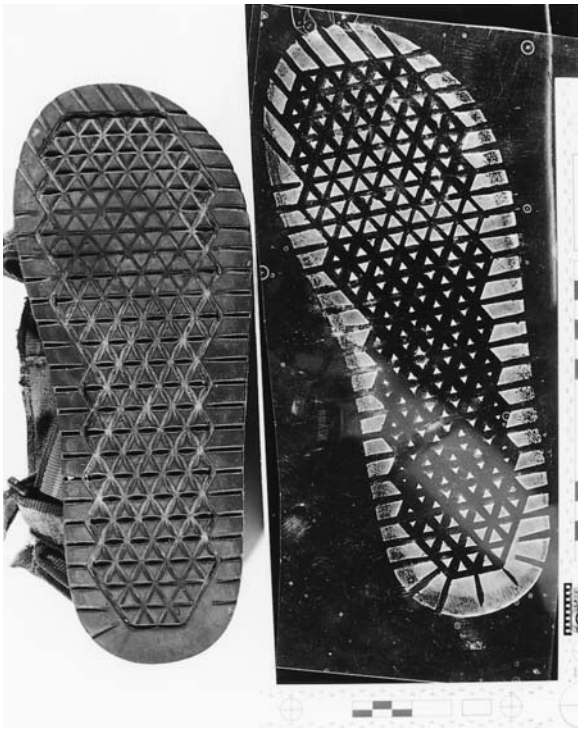

FIG. 2—*One sole and test impression of the sandals used.*

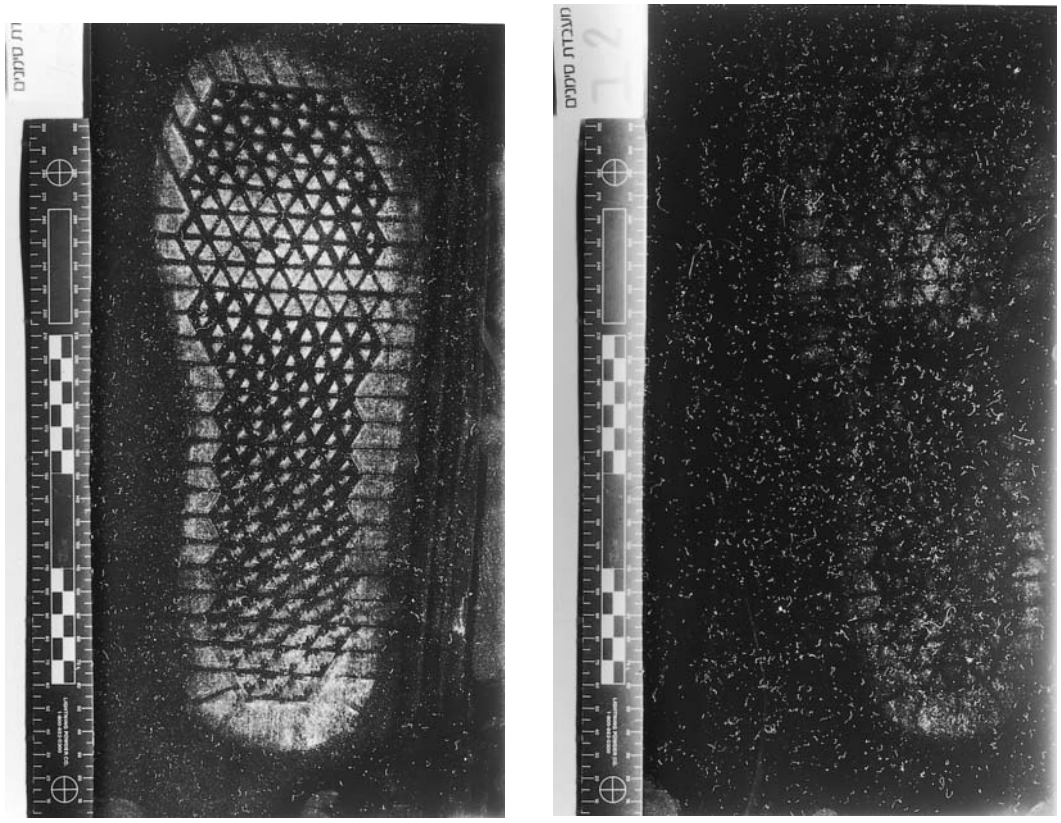

FIG. 3—*Two gelatin lifters bearing shoeprints lifted off flannel cloth: A. Employing the press method. B. Using the conventional method, without applying pressure.*

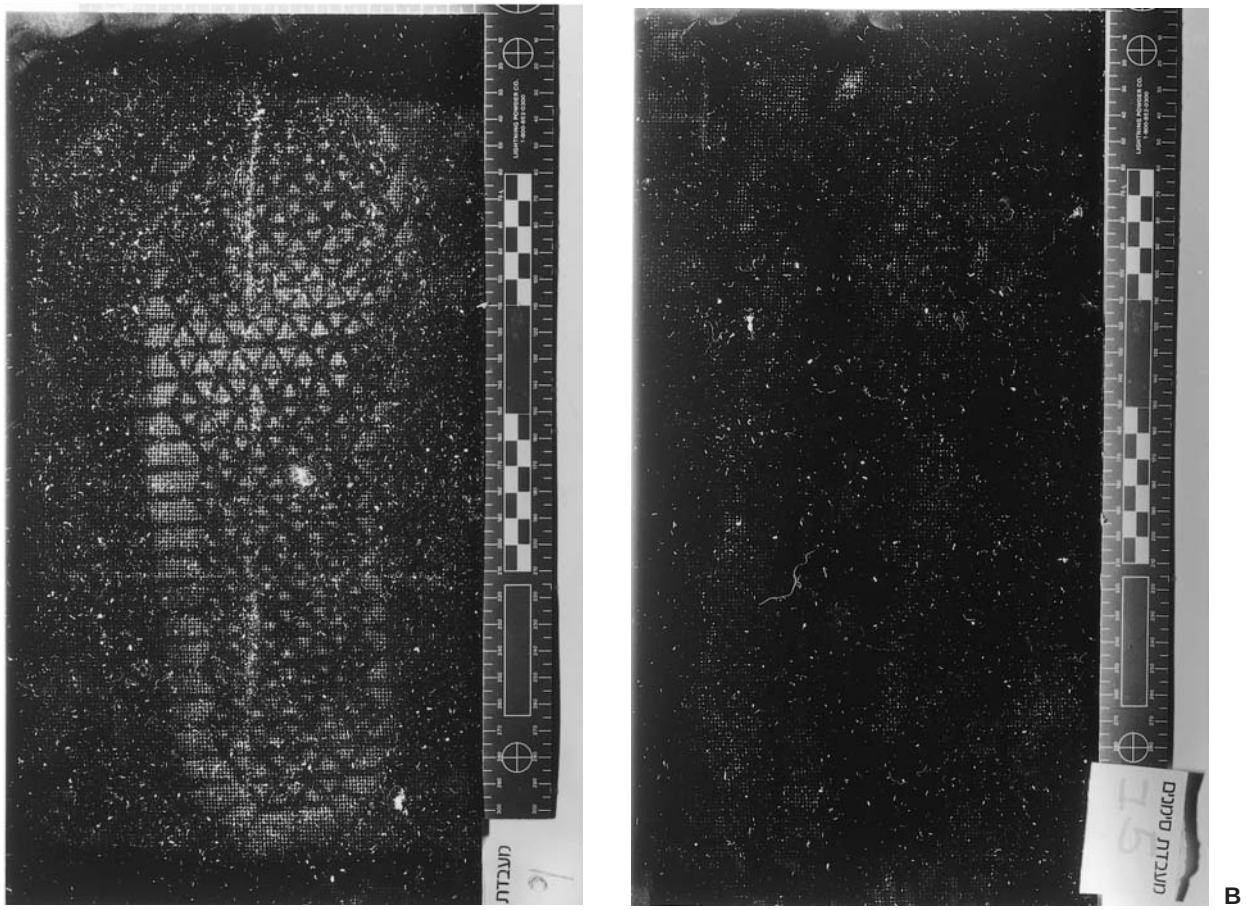

FIG. 4—*Two gelatin lifters bearing shoeprints lifted off Masonite (compressed cardboard): A. Employing the press method. B. Using the conventional method, without applying pressure.*

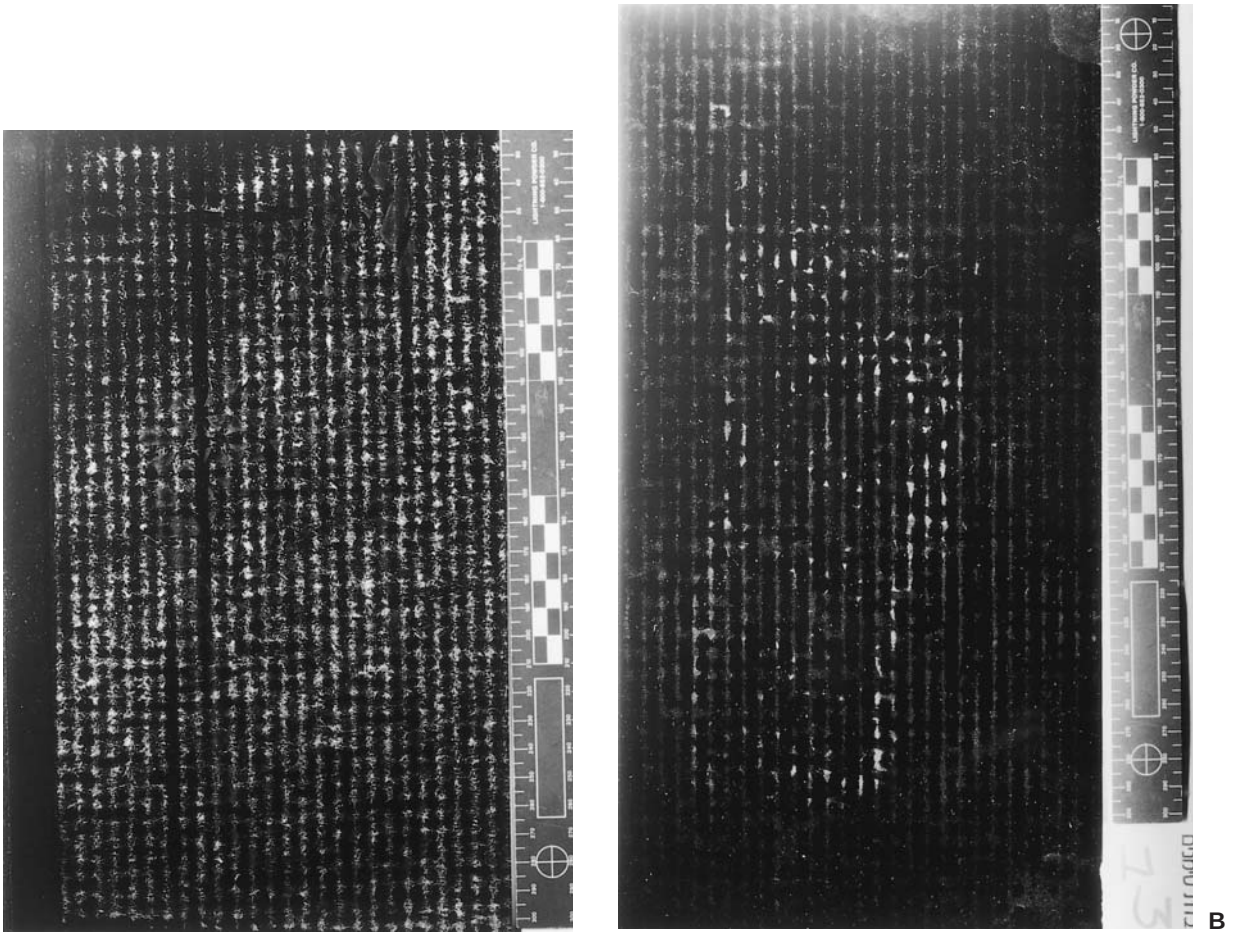

FIG. 5—*Two gelatin lifters bearing shoeprints lifted off corrugated cardboard: A. Employing the press method. B. Using the conventional method, without applying pressure.*

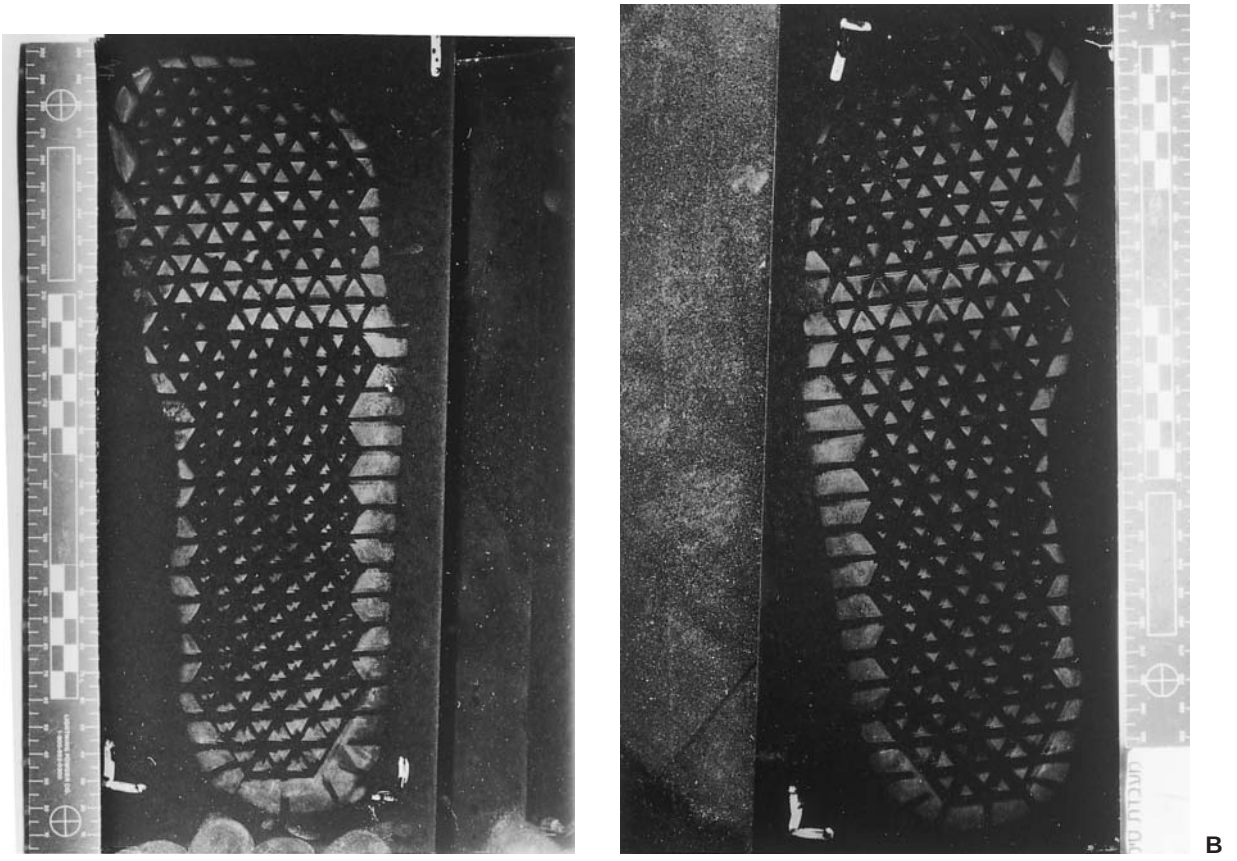

FIG. 6—*Two gelatin lifters bearing shoeprints lifted off thin cardboard: A. Employing the press method. B. Using the conventional method, without applying pressure.*

TABLE 1—*Results obtained using the press method as opposed to the conventional lifting method.*

No.	Description of Parameter	Flannel Cloth	Masonite	Corrugated Cardboard	Thin Cardboard
1	Clarity and resolution of shoeprint	Much better	Much better	Much better	Slightly better
2	Quantity of extraneous material	Slightly worse	Slightly worse	Worse	Similar
3	Lifting of the substrate texture	Similar	Worse	Worse	Similar
4	Changes of the shoeprint's size	Slightly worse	Similar	Worse	Similar
5	Overall evaluation of the results	Much better	Better	Slightly better	Similar

dimensions of the print to be somewhat larger than its original size (Fig. 3). Result: the advantage of the press method was dramatically illustrated when applied on flannel cloth. The lifted prints were much clearer, had higher resolution and were more complete. The mentioned disadvantages were only minor.

Masonite

The texture of the Masonite is quite dominant in the prints lifted by the press method, but a closer look reveals that the print is much more complete and of better resolution. The applied pressure also increased the amount of extraneous material on the lifter (Fig. 4). Results: The overall results of the press method were better, although meticulous observation of the print was needed.

Corrugated cardboard

When using the press method, the inner texture of the corrugated cardboard was visible on the gelatin lifter. No such artifact was observed in the other lifters. Nevertheless, where this inner texture was not apparent, it was possible to discern even small details, meaning the resolution of the prints was actually finer using the press method (Fig. 5). Result: Although the internal texture almost covered up all the area of the shoeprint lifted by the press method, a closer look revealed that many small details were recorded on the gelatin lifter.

Thin Cardboard

Here the differences between both methods were minor. No apparent differences were observed in the lifted prints' clarity or resolution, and the amount of the lifted extraneous material was negligible in both methods (Fig. 6). Results: No noticeable differences were seen in the quality or the size of the lifted prints. However, applying the press method was much easier and faster.

Discussion

Using the press method produced prints of better clarity and higher resolution than the conventional method on most substrates, especially when dealing with weak shoeprints. The time needed for obtaining a shoeprint using the press method is only a few seconds instead of the 20 min according to the conventional method.

The prints lifted from thin cardboard showed no apparent differences between the two methods. Better lifting of the shoeprints on the Masonite and flannel cloth (Figs. 3 and 4, respectively) was obtained when employing the press method rather than lifting by the conventional method. On the corrugated cardboard (Fig. 5), the shoeprints that were lifted by means of the press appeared at first slightly inferior. The internal texture of the cardboard was lifted together with a large quantity of fibers. After careful examination, one could discern that the smaller details of the shoeprint appeared among the marks of the internal texture. It was, therefore, possible to say that considering all the parameters, the results of the press method were better than the results where no pressure had been exerted.

On rough surfaces (such as Masonite) and porous surfaces (such as the flannel cloth), the gelatin lifter can reach a deeper tri-dimensional level on such exhibits using the press method; therefore, better lifting of the shoeprint was obtained than when employing the conventional method.

The authors found that exerting uniform pressure on gelatin lifters by the hydraulic press contributes significantly to the quality of the comparison of weak shoeprints imprinted on smooth and rough surfaces. Lifting shoeprints by the hydraulic press is relatively simple, convenient to operate, and very rapid. One of the disadvantages of the proposed press method is lifting when the examined items contain many loose fibers. A second drawback of this method is when the pressure is exerted on a soft tri-dimensional surface, causing the lifting of the internal texture and thereby decreasing the comparative quality of the lifted shoeprint. Nevertheless, based on numerous casework samples, we recommend using the press method for lifting dust shoeprints by gelatin lifters.

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