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Tool Mark Impressions

By: *Shawn L. Naccarato, DDS/CCSA and Steven L. Petersen, CCSI*
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A slightly different technique for collecting tool mark impression evidence.

In his textbook, *Criminalistics: An Introduction of Forensic Science (9th edition)*, Saferstein describes a tool mark as any impression, cut, gouge, or abrasion caused by a tool coming into contact with another object. Throughout the years many different materials have been utilized both in the field and in the laboratory setting to try to accurately replicate the class and/or individual details inherent in a particular tool mark or tool.

In recent years, the forensic community has utilized polyvinylsiloxane impression materials for obtaining tool mark impressions. These materials have been utilized successfully by the dental profession for many years for crown and bridge impressions, denture impressions, bite mark impressions, and other applications. Advantages of the polyvinylsiloxane materials include ease of use, accuracy, and dimensional stability over time while disadvantages include cost of materials and slow setting times at lower temperatures.

Crime scene investigators are intimately aware of the problems associated with attempts to accurately record tool marks at crime scenes both photographically and otherwise. The location of the tool mark, the surface containing the tool mark, and the characteristics of the tool creating the mark can all affect the investigator's ability to accurately reproduce the tool mark for future comparison.

The following paragraphs describe a modified technique for obtaining tool mark impressions utilizing polyvinylsiloxane impression material. While the marks utilized for this article were from a door located at the authors' workplace, the tool mark impression techniques described in this article have been successfully utilized at crime scenes by investigators with the Canyon County Sheriff's Office Forensic Services Team in Caldwell, Idaho.

Materials needed: See Figure 1

- A. Orthodontic wax rope: this material is inexpensive, re-usable, and can be obtained from most dentists or dental supply companies.
- B. Mizzy silicone emulsion spray: this material is available through most dental supply companies, comes in a 4oz bottle for approximately \$17.00, and produces a smooth, accurate, bubble-free surface with all impression materials when properly applied.
- C. AccuTrans brown casting silicone-polyvinylsiloxane (75ml tube) with AccuTrans automix dispenser from Coltene-Whaledent: the starter kit with dispensing gun and mixing tips costs approximately \$200.00.
- D. Fingerprint lift card.

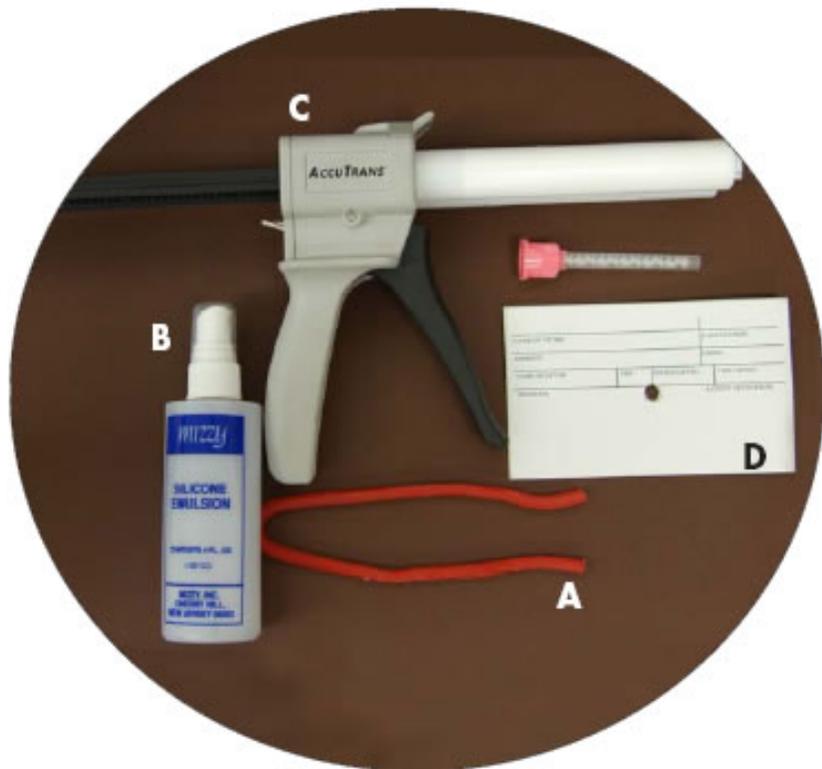
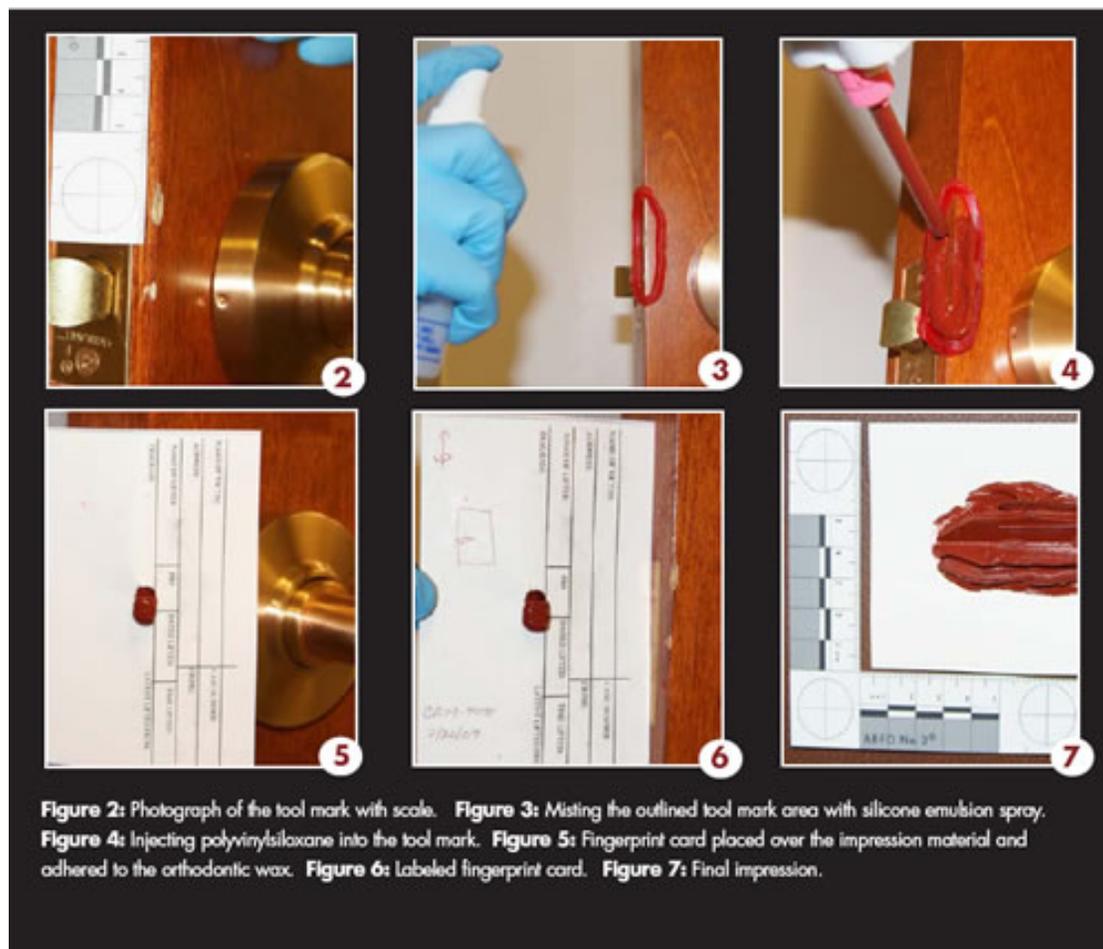


Figure 1: The necessary materials: orthodontic wax rope (A), Mizzy silicone emulsion spray (B), AccuTrans brown casting silicone-polyvinylsiloxane and dispenser (C), fingerprint lift card (D).

Procedure:

1. Obtain general, midrange, and closeup photographs without and with scale as necessary of the tool mark and its associated location (Figure 2).
2. Place a soft orthodontic wax rope as a border around the tool mark to control the flow of excess impression material and block out any undercuts that could interfere with smooth removal of the impression from the surface (Figure 3).
3. Place a small hole in the center of the fingerprint card (Figure 1).
4. Lightly mist the tool mark area with Mizzy silicone emulsion spray (Figure 3).
5. Place an AccuTrans cartridge in the automix dispenser and inject material into the tool mark (Figure 4).
6. Place the fingerprint card over the tool impression and depress it into the impression material until it contacts and lightly adheres to the orthodontic wax (excess impression material will extrude from the hole in the fingerprint card). Note: polyvinylsiloxane material flows more effectively into surface details when a slight force is applied to it (Figure 5).
7. Check for complete "set" of the material by periodically placing a fingernail into the material that has extruded from the hole in the fingerprint card. The material is completely "set" once the fingernail indentation in the material rebounds to normal contour immediately after removal of the fingernail from the material.
8. Place case number, orientation marks, date, and a sketch of the location (door, window, etc.) on the card prior to its removal from the surface (Figure 6).
9. Remove the impression from the surface and remove the wax rope from the impression for possible re-use on another impression (Figure 7).
10. Pour the impression in dental stone or acrylic if necessary for further evaluation.



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The Canyon County Sheriff's Office Forensic Services Team has found the aforementioned technique to be both practical and accurate for most tool mark applications. However, they have not been able to locate any research regarding the effects (if any) that Mizzy silicone emulsion spray could have on potential DNA evidence. Therefore, the proper collection of potential DNA evidence from the area on or near the tool mark prior to the application of silicone emulsion spray

is imperative.

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