E36 Dermoscopy in Forensic Medicine

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Learning Overview: The goal of this presentation is to demonstrate that dermoscopy is a simple, fast, and cheap technique useful in legal medicine that can substitute for DNA identification techniques in many situations.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by presenting a new technique for the identification and examination of stab wounds and gunshot wounds.

Dermoscopy is a technique initially used for the early detection and diagnosis of melanomas. As a useful tool, it was further developed to diagnosis other skin lesions that include skin cancers and inflammatory and infectious diseases. Per research, this work reports on the first use of dermoscopy in forensic medicine. For one year, the Forensic Medicine Department at the University Hospital of Rouen in France has been equipped with an immersion dermoscope (Heine® 20). It has been used systematically in many medicolegal situations. Three cases utilizing dermoscopy in forensic medicine will be discussed.

Fingerprints: The formal identification of bodies by the fingerprint method is an empirical method that has lost its beauty since the discovery and use of DNA. However, fingerprint analysis by dermoscopy coupled with photography allows a clear image of dermatoglyphs, even when there is no longer an epidermis or in cases of mummified skin. On very damaged bodies for which the traditional method of fingerprints (powders) is no longer possible, the dermoscope provides images of sufficient quality for identification. In addition, it is possible to observe the sweat pores, which are not currently a point of comparison, despite a recent study of interest in identification. Considering sweat pores, a square millimeter fingerprint fragment has tens to several hundreds of points for comparison. This is enough to certify an identity and to propose a new fingerprint analysis method. Dermoscopy allows high-quality fingerprints that are directly scanned and therefore easily comparable to a national fingerprint database.

Gun wounds: Dermoscopy directly visualizes the soot and grease traces at wound sites and makes it possible to quickly distinguish between the inlet and the outlet wounds without having to resort to a pathological examination. This is accomplished by using the dermoscope to identify grains of powder and other trace residues at the wound.

Stab wounds: Dermoscopy allows for a fast and precise analysis of stab wounds. It allows a more rigorous analysis of the ends and edges of wounds than is possible solely with a visual examination. This makes it possible to discern if the knife used possessed a single or double edge. The edges of the wound can adopt a bifid or unique wound characteristic that is easily analyzed by dermoscopy and can guide both the type of blade and the possible blade movements.

Several techniques are recognized and validated to obtain formal recognition of deceased subjects. In the case of very damaged bodies, the examination of the dentition is often not very conclusive. The realization of fingerprints is a well-established technique, but difficult or impossible to use in cases of hand alteration (drowning, mummification). In these cases, performing a DNA search is a destructive technique because it requires the removal of sufficient muscle (often psoas, as it is better preserved) or bone marrow (whole femur). In addition, it is a more complicated and expensive technique, requiring extra steps (lysis, elimination of proteins and acids, concentration of DNA, etc.). Dermoscopy allows visualization of the sweat pore. Thus, it makes it possible to obtain a much greater number of comparison points than with a conventional technique. Sweat pores have already been identified as a reliable element for identification. This technique allows a considerable reduction of the risk of misidentification because a multiple fold number of comparison points are available on a small surface ($1cm^2$). The comparison of the sweat pores is not currently used in France but is already in use by some foreign police departments.

Dermoscopy, Fingerprints, Forensic Medicine