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Review Article

Fingermark age determinations: Legal considerations, review of the literature and practical propositions

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ABSTRACT

The question of the age of fingermarks is often raised in investigations and trials when suspects admit that they have left their fingermarks at a crime scene but allege that the contact occurred at a different time than the crime and for legal reasons. In the first part of this review article, examples from American appellate court cases will be used to demonstrate that there is a lack of consensus among American courts regarding the admissibility and weight of testimony from expert witnesses who provide opinions about the age of fingermarks. Of course, these issues are not only encountered in America but have also been reported elsewhere, for example in Europe. The disparity in the way fingermark dating cases were managed in these examples is probably due to the fact that no methodology has been validated and accepted by the forensic science community so far. The second part of this review article summarizes the studies reported on fingermark dating in the literature and highlights the fact that most proposed methodologies still suffer from limitations preventing their use in practice. Nevertheless, several approaches based on the evolution of aging parameters detected in fingermark residue over time appear to show promise for the fingermark dating field. Based on these approaches, the definition of a formal methodological framework for fingermark dating cases is proposed in order to produce relevant temporal information. This framework identifies which type of information could and should be obtained about fingermark aging and what developments are still required to scientifically address dating issues.

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1. Introduction

Fingermarks have been used for more than a century for identification purposes during investigations and as evidence in court [1–3]. While the use of such marks for identification generally creates a strong link between a location or object and a person, there are no validated scientific methods for accurately determining the time of contact between the mark and the surface. However, this information is directly linked to the relevance of these marks (i.e., if they were left during the crime by an implicated person) [4,5], and thus can be crucial for the resolution of a case. This explains why suspects often raise alternative temporal explanations (legitimate or not) for the presence of their fingermarks at the crime scene.

After a survey of more than two dozen American court cases, it became clear that there was no consensus regarding how these courts admitted testimony related to the age of crime scene fingermarks. In fact, some expert witnesses were allowed to give relatively precise conclusions about the age of fingermarks while others stated that such specific age determinations could not be made (i.e., the age of the marks was indefinite). However, these conclusions raised controversies among the forensic science community because they were rarely based on systematic scientific research or tested comprehensively and validated before their implementation [6–11]. This uncertainty shows that the development and validation of a reliable fingermark dating methodology would be particularly important in forensic science casework.

Therefore, this article aims to address the issues associated with fingermark age testimony in legal proceedings and in the literature, show the limits of current approaches, and assess the potential of new developments in the formation of a framework for fingermark age determinations (sometimes referred to as "fingermark dating"). The first part focuses on court cases highlighting the practical issues; the second part critically reviews dating methods that have been proposed in the literature; and the third part proposes a pragmatic dating framework based on the modeling of aging parameters in order to identify the limits and requirements for the application of such methodologies in practice.

2. Legal considerations based on previous court cases

Although the fingermark identification community (e.g., International Association for Identification (IAI), the Scientific Working Group on Friction Ridge Analysis, Study, and Technology (SWGFAST)) as a whole rejects the notion of assigning a specific age to a particular fingermark, there are numerous examples of examiners providing such testimony in court (see Table 1). However, neither the IAI nor SWGFAST has formulated an official policy on this issue. Most of the standard fingermark texts emphatically state that it is essentially impossible to precisely determine the age of latent marks [12]. Champod et al. [13] actually recommend that "... an age estimation should never be based solely on the quality of a developed mark..." and that "...it is generally considered that the determination of the age of a latent finger or palm mark on a particular piece of physical evidence is not possible." A similar statement was made by the UK Home Office in their *Manual of Fingerprint Detection Techniques*, "It is however impossible to determine reliably the age of a fingerprint by observation of its reaction with a fingerprint detection process." [14]. Nonetheless, there are numerous reported instances of judges allowing or attorneys requesting expert witnesses to provide precise age determinations (with varying levels of success).

A relatively short review of 28 court cases where the age of fingermarks was implicitly or explicitly discussed [15–42] showed that age estimations were never supported by robust scientific procedures (even when limited experiments were attempted). They were often generally based solely on the experience of police officers and fingermark experts and were stated in the form of subjective evaluations of the quality and contrast of the developed marks (e.g., cases 9, 11, 15, 17, 23). On several occasions, the experts actually stated that it was impossible to estimate the exact age of fingermarks, but nevertheless provided the court with a personal opinion based on their experience (e.g., cases 10, 14, 17, 28). In a significant number of the court cases reported in Table 1, the experts identified the mark(s) as being "fresh" (with estimates ranging from 2 h up to 1 week). In most of the cases cited in Table 1, the appellate court upheld the original ruling (e.g., cases 1, 8, 10, 15, 18, 22, 24, 27, 28), while in other cases the court reversed the original decision (e.g., cases 4, 12, 14), often basing its ruling on the qualifications of the expert witness or lack of a sufficiently specific age estimation for the fingermark(s).

Although Professor Andre Moenssens states emphatically that "It is not possible to determine accurately how long a latent impression will remain on an object or how old an impression is," he also concludes that "At best, print age is the studied opinion of an expert based on the extent of his own experience and investigation." [12]. The central question then appears to be how much weight should be given to such opinions. Judges are often inclined to allow such testimony to be presented the jury. This outcome is due to the role of the trial judge as being a "gatekeeper" concerning the admissibility of evidence. Judges tend to allow such testimony into evidence under the expectation that vigorous cross-examination will properly test the expert witness's opinion. Ultimately, the judge determines the admissibility of the witness's testimony, and the jury decides the proper value or weight to his/her testimony in reaching a verdict.

In some situations it is left up to the defence attorney to prove alternative explanations for the presence of the fingermark(s). On the other hand, in *State v. Scott*, the court noted that, "The burden is not upon the defendant to explain the presence of his fingerprint but upon the State to prove his guilt." [27]. In *State v. Cline*, the court quoted *United States v. Baller* [43] (which debated the admissibility of voice spectrograms), "...it is better to admit relevant scientific evidence in the same manner as other expert testimony and allow its weight to be attacked by cross-examination and refutation." [39] With specific regard to fingermark age testimony, the *Cline* court stated that "... while the age of a latent print cannot be established with complete accuracy, experienced examiners can proffer an opinion regarding the age of a latent print based on the examiner's experience and investigation." [39] In *Ivey v. State*, the court emphasized the need to determine that fingermarks "...could have been made only at the time the crime was committed." [44] These cases (as well as those examples