v. 12, n. 2, p. 133-136, 2023
ISSN 2237-9223

REVISTA BRASILEIRA DE CRIMINALÍSTICA

DOI: http://dx.doi.org/10.15260/rbc.v12i2.551

Method to develop latent fingerprints on hard and smooth surfaces impregnated with dirt

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Recebido em 03/12/2020; Revisado em 22/02/2023; Aceito em 18/03/2023

Resumo

A ciência forense tem se desenvolvido significativamente ao longo do tempo em busca de melhores resultados. Assim, diversas técnicas de levantamento de impressões digitais latentes em locais de crime foram elaboradas utilizando agentes reveladores, tanto físicos quanto químicos. Os tipos de superfície mais comuns encontrados em tais situações são os duros e lisos, como vidro e metal. Esta nota busca demonstrar a técnica mais adequada para a coleta de impressões digitais em superfícies duras e lisas que estejam impregnadas de sujeira, uma vez que as técnicas padrão (uso de cianoacrilato e pó para revelação de impressões digitais) são impossíveis por não conseguirem atingir as substâncias excretadas ou mesmo destruir as impressões digitais. Após a aplicação da técnica, foram alcançados resultados satisfatórios que permitiram a realização de testes de comparação de impressões digitais (destacados pelos resultados mostrados em fotografias), representando uma solução fácil e prática que permite o desenvolvimento satisfatório de impressões digitais, muito importante para a evolução das técnicas científicas aplicadas.

Palavras-Chave: Papiloscopia; Perícia Criminal; Impressões digitais.

Abstract

Forensic science has developed significantly over time in search of better results. Therefore, several techniques for lifting latent fingerprints at crime scenes were elaborated using developing agents, both physical and chemical. Most common types of surface encountered in such situations are hard and smooth ones, such as glass and metal. This note seeks to demonstrate the most appropriate technique for lifting fingerprints from hard and smooth surfaces that are impregnated with dirt, as the standard techniques (the use of cyanoacrylate and fingerprint powder for revealing prints) are impossible due to not being able to reach the excreted substances or even destroy the prints. After applying the technique, satisfactory results were achieved that allowed fingerprint comparison tests to be carried out (highlighted by results shown in photographs), representing an easy and practical solution that enables the satisfactory development of fingerprints, greatly important to the evolution of the scientific techniques applied.

Keywords: Papilloscopy; Criminal Expertise; Fingerprint.

1. INTRODUCTION

Since the early days of criminal investigation, technical evidence has always had the greatest weight and value at the time of legal conviction and subsequent trial [1]. Therefore, forensic science has developed technologically over time, seeking the best possible methods to produce scientific evidence of materiality of the event and the identification of persons involved in criminal acts.

In this context, expertise in the recovery of fingerprints has evolved significantly, now having a wide range of possibilities in the use of developing agents, both physical and chemical, to obtain latent fingerprints at crime scenes [2-5]. A fingerprint fragment lifted from a crime scene often can lead to the identification of perpetrators and the subsequent resolution of the case. Scientific evidence of the position of the hands is often able to demonstrate the dynamics of a crime in a way that is reliable and closer to the truth.

Among the possibilities of surfaces (from where fingerprints are lifted) found at crime scenes, hard and smooth surfaces stand out not only because they are

common, such as metallic, acrylic or glass surfaces, but also because they have a great potential for high quality development of fingerprints. When it comes to these kinds of materials, to obtain the best results the most common developing technique is the application of cyanoacrylate (superglue as Superbonder for instance) in its gaseous form [6-8] using a specialized torch or airtight tank, when the object can be transported to the laboratory, and subsequent use of powders in accordance with the color of the backing card [9,10]. However, if these aforementioned surfaces are impregnated with dirt (dust, mud etc.), the technique detailed above will be completely compromised, seeing as the cyanoacrylate crystallization will not be able to reach the reactive substances (amino acids, fatty acids and fats) [11] excreted by the friction ridges without becoming contaminated. Likewise, the direct application of powder becomes completely inadvisable, especially as traces of fingerprints can be destroyed by the mechanical action of the brush in contact with dirt particles.

Oftentimes this impregnation of dirt allows the shape of the hands or fingers that touched the surface to be seen. When this occurs, it would be highly recommended to use the technique detailed in this note. The most common examples of this type of case are the external surfaces of vehicles, which are often dirty with dry mud or earth, as well as the external surfaces of dusty windows or other hard and smooth objects covered by dirt.

Initially, an attempt was made to use cyanoacrylate applied with a vaporizer (Cianowand Sirchie – Cat. SCW100), but it polymerized over the dirt, not allowing satisfactory visualization of the papillary lines.

Subsequently, powder was used directly applied to the site, which ended up destroying the slightest possibility of revelation, since the powder ended up mixing with the dirt, causing greater friction between the materials.

After several attempts with satisfactory results, using the techniques mentioned above, as well as various frequencies and types of forensic lights, we arrived at the most favorable possibility of visualizing fingerprints with the technical conditions and sufficient quality to perform fingerprint comparison tests.

2. MATERIAL AND METHODS

2.1. Material and tools

To practice the technique, we used: a vehicle (Fiat Fiorino), a fingerprint brush (Sirchie), fingerprint lifting tape (Sirchie), SILK BLACK fingerprint powder (Sirchie - Cat. No. 101L) and white backing cards for collecting fingerprints (Sirchie).

2.2. Demonstration of the techinique

The technique is quite simple:

1. Once the position of the hand or fingers on the suspect surface is seen, a transfer of the print should be made with adhesive plastic tape, the same used for lifting fingerprints;
2. Upon completion of the previous step, the transfer of the print will be visually free from dirt, which is when the suitable fingerprint powder should be applied, according to the type and color of the backing card, allowing for a satisfactory development of the fingerprint.

2.2.1 Example - Vehicle

Upon visual survey of the entire external surface of the vehicle, likely fingerprints were observed near the vehicle's hood; adhesive tape was applied to the area (Figure 1); the tape was removed and discarded, and developing powder was applied to visualize the fingerprint fragment, proceeding to the transfer of said fragment (Figure 2).

Figure 1. Decal of the dirty surface.

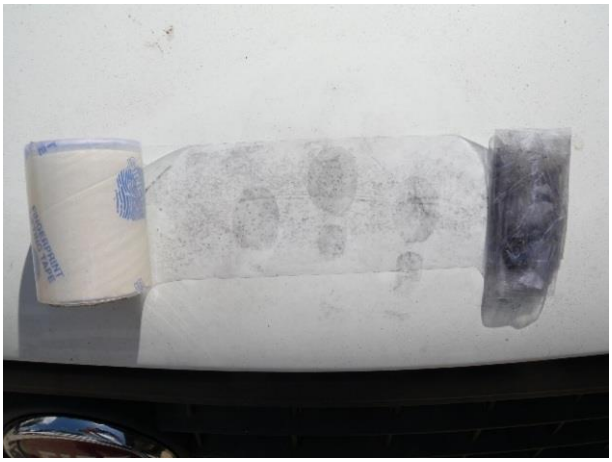

Figure 2. Decal with the application of powder.

3. RESULTS

Satisfactory results were achieved, as illustrated by

Figures 3-5 below. Likely fingerprints were developed corresponding to the index, middle and ring finger of the right hand of the individual who touched the hood of the car. The marks that were previously visible only by their outline can now be viewed in their minutiae.

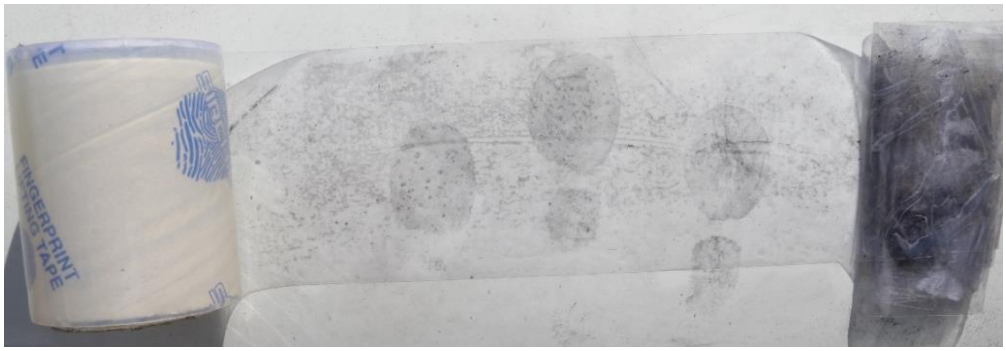

Figure 3. Satisfactory result obtained.

Figure 4. Expansion of the result obtained.

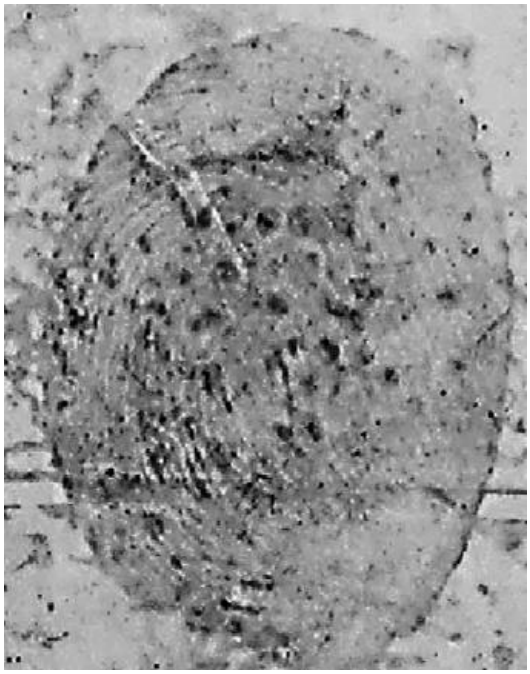

Figure 5. Fragment revealed in conditions of confrontation.

4. DISCUSSION

With the surface impregnated with dirt, it was expected that the excreted substances would be degraded or inaccessible [12,13], however, some components, perhaps sebaceous material [14,15], can still be found beneath the dirt.

Firstly, it is noted that one of two possibilities may have occurred:

1. The fingerprint may have been made before the adhesion of dirt. In this case, the substances excreted by the friction ridges are located underneath the dirt. Thus, when the dirt is withdraw, the developing material (powder) will reach the excreted substances, developing the fingerprint;
2. The fingerprint may have been made over the dirt. In this case, it is likely that the pressure exerted by the touch on the dirty surface caused the excreted substances to penetrate the dirt and adhere to the hard surface, even though it is "protected" by the layer of dirt. Thus, when the dirt is withdraw, there will still be some substances excreted by ridges that may be developed.

The practice shows that the use of adhesive plastic tape can remove surface dirt without completely destroying the fingerprint fragment produced by excreted substances, while also allowing the fragment to be viewed with the application of a suitable developing powder.

5. CONCLUSIONS

The results shown by the photographs speak for themselves, meaning that there is a real possibility of fingerprint development under the conditions described above. It is vital to stress that all procedures should be photographed, step by step, thus ensuring the integrity of the trace and the chain of custody.

The examples reproduced in the trials of this work are extremely frequent in the practice of criminal forensics. In the case of hard and smooth surfaces impregnated with dirt, this note has demonstrated an easy and practical solution that allows for a satisfactory development of fingerprints, greatly important to the evolution of the scientific techniques applied.

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