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Evaluation of Fingerprint Visualization on Various Soft Surfaces

Chumber Shekhar[1], Nigah Sobal[2]
[1]Assistant professor, Department of forensic medicine, GianSagar Medical College Ramnagar, Rajpura, Punjab, India
[2]Assistant professor, Department of Anatomy, Dr B R Ambedkar State Institute of Medical Sciences, Mohali, India

Corresponding author
Dr. Chumber Shekhar, Assistant professor, Dr B R Ambedkar State Institute of Medical Sciences, Mohali, India

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KEYWORDS

Fingerprint, Visualization, Soft Surfaces

ABSTRACT:

Aim:Evaluation of Fingerprint Visualization on Various Soft Surfaces.

Materials and methods: Five distinct soft surfaces with varying compositions were considered in the research. The prints were preserved by drying them afterwards. Every time an imprint was made of the right thumb, it was dried and cleaned. An ink-on-paper control print and an iPhone picture were both used. The samples were then examined using Video Spectral Comparator.

Results:The images were instantly made visible after the first fingerprinting deposit. It was impossible to determine how long it would take for the caulking to dry, thus the surface was not consistent. It had a thick texture and a white tone. Oblique and transmitted light both revealed it. Optimal viewing of the clay surface print was achieved in the post-deposit oblique left light.

Conclusion: The VSC is effective on most surfaces, although gel lifters are more suited to surfaces that can hold moisture. Techniques that visualize fingerprints on various surfaces have not been the subject of considerable study. The composition and kind of materials used determine the assessment.

Introduction

Forensic investigations have long relied on fingerprints as the gold standard for identifying victims, suspects, and witnesses. Each person's fingerprint is a one-of-a-kind identification because each one is made up of a unique pattern of ridges and furrows that are randomly created between six and twenty-five weeks during a woman's pregnancy. Fingerprints discovered at crime scenes may be either patent or latent, the most prevalent kind [1]. It is common to see ongoing method advances for seeing such prints, since the latter requires appropriate optical, physical, and/or chemical visualization techniques to be visible to the naked eye. The characteristics of the substrate, such as its porosity and dampness, still have a significant impact on how to best see the latent impressions. Forensic examinations of soft surfaces may reveal a wide range of variations due to the wide variety of chemical and physical types present. The variation in surface reactivity under various methodologies allows for distinction, which in turn reduces assessment bias. All the materials are visualized in different ways since they have different qualities. Forensic evidence, such as fingerprints, is often lifted with a gel lifter for simpler transport to the lab. Gel lifters are effective on a wide variety of surfaces, including porous ones like cardboard and paper. For a comprehensive examination, photographs taken after fingerprints have been lifted using gel lifters may be examined. After the first thumbprint deposition and again after two weeks, pictures are taken using the Video Spectral Comparator device. Investigation documentation often makes use of the VSC. Light may be used to examine the papers using this device. The article demonstrates a non-destructive technique for collecting and chemically identifying the latent prints in the first literature resource [2]. The second study by Simon Bunter reveals how long an outside surface may retain a fingerprint. According to the study, non-porous surfaces do not maintain many food and linseed oil prints for more than 2.5 years. This research aims to evaluate several soft surfaces for fingerprint visualization.

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Materialsandmethods

This investigation took place in the forensic medicine division. To determine which methods and materials work best for collecting and displaying fingerprints on different types of soft surfaces, one must conduct an evaluation of fingerprint visualization on these surfaces. Criteria for the assessment should include how well it works in forensic or investigative settings, how long it lasts, and how clear it is. Five distinct soft surfaces with varying compositions were considered in the research. While some samples dried quickly, others exhibited a higher moisture content. Except for modeling clay, all the other materials had an equal distribution of the liquid component. To ensure that all samples were exposed to the same time period, they were all placed on the transparent sheet at the same time on the same day. With sterile popsicle sticks, they were dispersed evenly. The prints were preserved by drying them afterwards. Every time an imprint was made of the right thumb, it was dried and cleaned. An ink-on-paper control print and an iPhone picture were both used. The samples were then examined using a video spectral comparator. Various lighting conditions were used to get the images. A variety of materials were used, including clay, dentifrice, adhesive caulk, nail color, and crafter's acrylic.

Evaluation Criteria:

Clarity: Measure how well fingerprints are visualized in terms of ridge details, patterns, and overall clarity.

Durability: Assess the longevity of the visualization. Consider whether the technique withstands handling, environmental conditions, or washing.

Applicability: Determine the practicality of the technique on different soft surfaces and its relevance to real-world forensic scenarios.

We used SPSS 25.0 to analyse all of the data.

Table1:Material used for testing

Types	Material
I	Toothpaste
II	Paint
III	Nail Polish
IV	clay
V	Caulk

Table2:The illumination of thumbprints in various media

Types	Material	Light
I	Toothpaste	Visible light
II	Paint	Traditional floodlight
III	Nail Polish	UV radiation
IV	clay	Angular left illumination
V	Caulk	Transmitted and oblique light

Results

A variety of materials were used, including clay, dentifrice, adhesive nail color, caulk, and crafter's acrylic. We used the Video Spectral Comparator to see all the surfaces. Various alternating light sources were used for visualization. (Table 1)

The images were instantly made visible after the first fingerprinting deposit. It was impossible to determine how long it would take for the caulking to dry, so the surface was not consistent. It had a thick texture and a white tone. Oblique and transmitted light both revealed it. Optimal viewing of the clay surface print was achieved in the post-deposit oblique left light. It was challenging to photograph and study the nail polish under UV light due to its white color and shiny qualities. Physical elements also contributed to the paint's uneven distribution. Normal floodlights made it the most visible. The blue toothpaste was easy to apply and remove from sheets. Using transmitted light, it may be seen. (Table 2)

Discussion

The Video Spectral Comparator can show all the surfaces that were utilized. While this machine's primary use is in forensic document analysis, recent studies have shown that its multiple alternating light sources may also be used to see fingerprints on a variety of soft surfaces. Forensic investigators will find this very helpful when they discover a fingerprint on an unusual surface at a crime scene.

The fingerprint's surface is important since it may facilitate the employment of faster and better approaches when fingerprints are discovered at a crime scene. Gel lifters were used to gather latent fingerprints from various surfaces, and the original paper produced their chemical structures. In order to reduce surface disturbance, the pictures were acquired at various depths using ATR-FT-IR with a differential-angle ATR accessory. Based on the findings, forensic studies of interesting objects have a lot of promise [3–5]. Another study found that

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fingerprints could be analyzed without the use of fingerprint powder boosters, which means that the prints were of high quality and could be used for identification purposes [4]. Although the caulking surface was visible in our investigation, it exhibited some unevenness due to the difficulty in determining the drying duration. It had a strong texture and a white color. Oblique and transmitted light both revealed it. Optimal viewing of the clay surface print was achieved in the post-deposit oblique left light. It was challenging to photograph and study the nail polish under UV light due to its white color and shiny qualities. Physical elements also contributed to the paint's uneven distribution. Normal floodlights made it the most visible. The blue toothpaste was easy to spread over sheets. Using transmitted light, it may be seen. With the help of the Video Spectral Comparator, you may observe each material in detail. According to this research, this machine may be used to evaluate prints on various soft structures using alternating light, which is a popular use in forensic science [5]. When forensic investigators discover a print on an unusual surface at a crime scene, this will be very helpful. It will make it easier to distinguish between recognized and unfamiliar prints and improve contrast overall.

Conclusion

The VSC is effective on most surfaces, although gel lifters are more suited to surfaces that can hold moisture. Techniques that visualize fingerprints on various surfaces have not been the subject of considerable study. The composition and kind of materials used determine the assessment.

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