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An Overview of Common Dermatoses Affecting Fingerprint Biometrics

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Abstract

Biometric technology has evolved rapidly over the past decade and fingerprint verification is a common means of identifying and authenticating individuals in important sectors like banking, airport, national identity, law enforcement and many more. However it poses a challenge for those who have skin diseases affecting fingertips. This paper is an overview of various dermatoses affecting fingertips thus highlighting the importance of exempting such individuals from fingerprint biometrics and offering an alternative method for identification.

Keywords: Dermatoses; Biometrics; Fingerprint

Introduction

Biometrics are unique physical and biological characteristics, used to identify and authenticate individuals in a reliable and fast way. The security and convenience that it offers makes it the most reliable and widely used method in airports, banking, building access, smartphone security, law enforcement, forensic and other fields to authenticate a person's identity [1,2]. Here measurement and analysis of human body characteristics such as finger prints, retina and iris of eyes, voice patterns, facial patterns and hand measurements are done. Among all these, finger print recognition is one of the oldest and most widely as it is user friendly, cost-effective, difficult to fake and convenient making it a secure and useful tool for authentication and identity verification.

A finger print appears as a series of ridges with valleys and pores between them. Minutia is a point where ridges bifurcates or ends. The number and location of minutiae is unique to each person and their individual fingers and it is captured for finger biometrics [3]. However it poses a challenge for those who have skin problems affecting hands as if the structure of papillary lines are damaged it is impossible to locate the minutiae.

Dermatoses Affecting Finger Biometrics

Hand eczema

Figure 1: *Hand eczema.*

It is the most common dermatoses leading to failure of finger biometrics. Hand eczema is a chronic inflammatory non-infectious disease involving hands with a relapsing course. The condition presents with erythema, pain, vesicles, and oozing in the acute phase, as well as erythema, dryness, pruritus, scaling, fissuring and hyperkeratosis in the chronic phase (Figure 1). It is more common in females than males. The most common type of

hand eczema is irritant contact dermatitis, followed by atopic eczema and allergic contact dermatitis. Exposure to soaps, detergents, chemicals, oil, paints, dust and many such irritants can trigger the relapse. It is commonly encountered in housewives, health care workers and industrial workers who are constantly exposed to these triggers. Scaling, fissuring and obliteration of finger ridges caused by eczema will lead to abnormal white lines and fingerprint dystrophy and loss of minutiae points imposing a challenge to capture finger biometrics. Regular use of topical corticosteroids for these chronic eczemas can also lead to ridge atrophy affecting minutiae points [4-8].

Fingertip eczema

Figure 2: *Fingertip eczema.*

The etiology of this condition is unknown. It is characterized by dryness, scaling, fissuring and tenderness of the fingertips, with occasional episodes of vesicle formation (Figure 2). Effacement of papillary lines and reduced dermal ridges caused by this condition can hinder a normal fingerprint verification [4,5].

Dyshidrosis or Pompholyx

It is an idiopathic condition characterized by highly pruritic blisters typically present on the palms and soles, as well as the lateral aspects of fingers and toes. It affects teenagers and adults and in most cases it is refractory to treatment. Repeated episodes lead to damage to papillary line structure leading to rejection of fingerprint biometrics [7].

Hyperhidrosis

Hyperhidrosis of palms is the excess secretion of sweat in amounts greater than needed for normal homeostatic thermoregulation [9]. It is a common reason for failure of fingerprint capture in young people.

Psoriasis

Palmo-plantar psoriasis can exist alone or rarely may be part of generalized psoriasis. Patchy or diffuse thickening and scaling of the entire surface of palms or discrete areas can be involved [10]. In a study conducted by khandpur et al, involvement of the fingers was seen in 44% of the patients with palmoplantar psoriasis [11] Chronicity of the disease can lead to damage to papillary lines of fingertips making it stressful for patients to clear a finger biometrics.

Epidermolysis bullosa

Is a rare group of hereditary bullous disorders characterized by fragile skin and blister formation in response to minor mechanical trauma. Repeated episodes of blistering and scarring of finger tips can lead to ridge dystrophies. Severe variants of the disease can lead to mitten –like deformity caused by fusion of digits by a thin membrane of scar tissue producing pseudosyndactyly [12].

Miscellaneous

Other causes like burns to finger tips leading to scars, occupation related mechanical abrasion and scarring as seen in carpenters, construction field workers all can lead to damage to fingertip papillae affecting fingerprint biometrics.

Uncommon and temporary causes of dermatoses of finger tips include infections like pyoderma, scarlet ever, secondary syphilis, hand foot mouth disease, herpes infection, tinea manuum, and verruca vulgaris and so on. These conditions are treatable and papillary line structure is restored after treatment of the disease.

Conclusion

As fingerprints can be damaged by the various conditions mentioned above, it can prevent users affected by these dermatoses from accessing secure areas or systems, which may have a detrimental impact in many aspects. This highlights the importance and need to exempt them from fingerprint biometrics and allowing to use alternate secure methods to authenticate their identity.

References

1. Bhat GM, Mukhdoomi MA, Shah BA, Ittoo MS. Dermatoglyphics: in health and disease - a review. Int J Res Med Sci. 2014; 2: 31-37.
2. Plateaux A, Lacharme P, Rosenberger C, Jøsang A. One-Time Biometrics for Online Banking and Electronic Payment Authentication. Availability, Reliability, and Security in Information Systems. Lecture Notes in Computer Science. 2014; 8708: 179-193.
3. Ashok J, Shivashankar V, Mudiraj PVGS. An overview of biometrics./ (IJCSE) Int J Computer Sci Eng. 2010; 02: 2402-2408.

4. Drahansky M, Dolezel M, Urbanek J, Brezinova E, Kim TH. Influence of skin diseases on fingerprint recognition. J Biomed Biotechnol. 2012; 2012: 626148.
5. Agarwal US, Besarwal RK, Gupta R, Agarwal P, Napalia S. Hand eczema. Indian J Dermatol. 2014; 59: 213-224.
6. Martin D, Březinová E, Orság F, Lodrová D. Classification of skin diseases and their impact on fingerprint recognition. BIOSIG 2009: biometrics and electronic signatures. Gesellschaft für Informatik e.V. 2009; 173-176.
7. Lofgren SM, Warshaw EM. Dyshidrosis: epidemiology, clinical characteristics, and therapy. Dermatitis. 2006; 17: 165-181.
8. Lee CK, Chang CC, Johar A, Puwira O, Roshidah B. Fingerprint Changes and Verification Failure Among Patients With Hand Dermatitis. JAMA Dermatol. 2013; 149: 294-299.
9. Romero FR, Haddad GR, Miot HA, Cataneo DC. Palmar hyperhidrosis: clinical, pathophysiological, diagnostic and therapeutic aspects. An Bras Dermatol. 2016; 91: 716-725.
10. Broggi G, Failla M, Palicelli A, Zanelli M, Caltabiano R. Palmoplantar Psoriasis: A Clinico-Pathologic Study on a Series of 21 Cases with Emphasis on Differential Diagnosis. Diagnostics (Basel). 2022; 12: 3071.
11. Khandpur S, Singhal V, Sharma VK. Palmoplantar involvement in psoriasis: a clinical study. Indian J Dermatol Venereol Leprol. 2011; 77: 625.
12. Boeira VL, Souza ES, Rocha Bde O, Oliveira PD, Oliveira Mde F, Rêgo VR, et al. Inherited epidermolysis bullosa: clinical and therapeutic aspects. An Bras Dermatol. 2013; 88: 185-198.