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Review Article

Dermatoglyphics in common: genetic disorders and cancers

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ABSTRACT: This review article offers information to deal with fingerprints within the most prevalent genetic disorders and cancers. Dermatoglyphic refers to the formation of present ridges in some body parts like fingers, palm, soles, and toes; these ridges unchanged throughout life. There are three sorts of fingerprint patterns: Arches, loops, and whorls. The most pattern of dermatoglyphics is related to genetic disorders as in Down syndrome and Klinefelter's syndrome and applied in medicinal studies and also useful within the diagnosis of the many genetic disorders and a few sorts of cancers. Ridge count one among the foremost important parameters which will be advantaged for determine some genetic disorder and cancers like thalassemia, carcinoma, thyroid, and cervical cancers, but there are controversial from studies to studies not confirmed altogether research. Another parameter could also be differences in some sorts of cancers and statistically significant, for instance in early diagnosis of prostate cancer.

Keywords: Dermatoglyphic; Fingerprint patterns; Ridges; Diagnosis; ATD angles.

1. INTRODUCTION

Dactylography or the fingerprint machine relies on the examination of stratum ridges and their configurations [Dermatoglyphics (Derma = skin + Glyph = carving)] in the fingers, palms, and sole [1]. The two most significant capabilities of fingerprints which shape the premise of identity are the distinctiveness and staying power of the friction ridge skin [2]. Dermatoglyphics has been used extensively in fields of medicine as a non-invasive diagnostic device and an early assessment of danger for specific medical conditions [3]. In the latest years, interest within the clinical utility of dermatoglyphic evaluation has increased a few of the clinicians [4]. They are formed, especially at some stage in the second one trimester of being pregnant, had been used as markers of developmental disturbances [5]. The improvement laid low with a couple of genes throughout embryogenesis results within the formation of a perpetually particular pattern persisting at some point in the lifespan of an individual. However, certain congenital and acquired conditions can affect the integrity of dermatoglyphics [6].

Three the most important patterns in the human fingerprints include-loops, whorls, and arches [7, 8]. The function pattern of epidermal ridges develops in mammals at some point in fetal lifestyles and stays

unchanged during life [9]. Studies based on dermatoglyphics located that the complexity of fingerprint styles could determine the genotypic developments of physical aptitude [10].

2. DERMATOGLYPHICS IN DOWN SYNDROME AND KLINEFELTER SYNDROME

Cummins in 1926 first delivered the term "dermatoglyphics", which refers to the take a look at the naturally taking place styles of the floor of the palms and feet. Over the past a hundred and fifty years, dermatoglyphics has been a useful device in expertise fundamental questions in biology, medicine, genetics, and evolution, in addition to being the excellent and most broadly used approach for non-public identification [11]. Relation of dermatoglyphics traits with some of the illnesses like Down's syndrome, Alzheimer's disease, a couple of types of sclerosis, and schizophrenia has been studied [12].

Down syndrome (DS) is the most not unusual motive of intellectual retardation. The frequency of DS patients is ready 1:800 and is mainly because of the presence of an extra replica of chromosome-wide variety 21 [13]. However, Klinefelter Syndrome (KS) is suggested to be the most not unusual sex chromosome disorder within the males. It has a prevalence of 150/100,000 males. The primary pathology is the presence of a further X-chromosome in a male [14]. Considering the mothers' fingerprints, we suspected that girls with a higher frequency of arches and a lower frequency of whorls had a stronger opportunity of bearing trisomy 21 babies. On the alternative hand, in fathers of trisomy 21 children, we considered that there could be an opportunity of significant variations of cases within the sample had been increased [15]. On the opposite hand, dermatoglyphics investigations indicated that in Down syndrome, simian line, ulnar loops, whorl [16]. There were significant differences in radial loops and whorls ($p < 0.05$), and there were very highly significant differences in arches ($p < 0.001$) in Klinefelter syndrome patients as compared to controls [17]. Also, a significant increase of whorls in Klinefelter's syndrome patients (66.7%) as compared to controls (35.0%) was observed. A study reported an identical finding on Japanese patients with Klinefelter's syndrome [18].

3. DERMATOGLYPHICS OF CYSTIC FIBROSIS

Cystic fibrosis (CF) is an autosomal recessive disease within the white population, which frequently results in early death if left untreated [19]. There are differences within the populations, ethnicities, and countries in terms of distribution and mutation status. In Caucasian, one out of each 3,500 newborn children suffers from the disease, and one out of 30 of them has a severe mutation for the CFTR gene [20]. Kobylisky et al. reported significant differences in fingerprint pattern types. They showed that arches' fingerprint patterns were higher in CF females in contrast to higher loop patterns in CF males [21]. However, dermatoglyphics studies haven't yet been undertaken on CF patients, and therefore the findings of this study can only be compared with publications concerning other monogenic diseases, either recessive or dominant [22].

Palm prints give more information than the fingerprint. Dermatoglyphic characteristics help identify of CF [23]. A search of clinical examination of the hands revealed some small whitish plaques on the palms, alongside mild wrinkling [24]. The high sweat salt concentrations as in CF-associated aquagenic keratoderma contributes to an increased water holding capacity of the attractive layer a rise of natural moisturizing factor (NMF) would end in higher water holding capacity of the human epidermis but would require time for synthesis and transport [25].

4. DERMATOGLYPHIC PATTERNS IN HEMOPHILIA AND BETA-THALASSEMIA

Hemophilia, the most severe hereditary chronic bleeding condition, is an X-linked recessive disease with a prevalence of around 1 in 5000 newborn boys around the world (10 in 100,000 people) [26]. The two main sorts of hemophilia are A and B. Hemophilia A (also referred to as classic hemophilia) and hemophilia B (also referred to as Christmas disease). About 9 out of 10 people that have hemophilia have A. Although the two types have very similar signs and symptoms, mutations in several genes cause them. Hemophilia affects males far more often than females [27]. The study showed that the amount of loop fingerprints altogether fingers of hemophilic patients is lower, and therefore the numbers of whorl and unknown types altogether fingers are above normal persons. So, it is often applied as a simple, inexpensive, and proper screening method for the diagnosis of hemophilic patients, particularly patients with spontaneous point mutation [28].

Beta-thalassemias are a gaggle of hereditary blood disorders characterized by anomalies within the synthesis of the beta chains of hemoglobin, leading to variable phenotypes starting from severe anemia to clinically asymptomatic individuals [29]. The high prevalence is present in populations within the Mediterranean, Middle-East, Transcaucasus, Central Asia, Indian subcontinent, and much East. It's also relatively common in populations of African descent. The very best incidences are reported in Cyprus (14%), Sardinia (12%), and southeast Asia [30].

Several reports on the genetic diversity of people with reference to fingerprints have focused on the association between fingerprints and various diseases [31]. There is a well-documented relationship between dermatoglyphics and specific syndromes of genetic origins. Since beta-thalassemia may be a major genetic disease in West Bengal, India, therefore, rapid diagnosis of major beta-thalassemia alongside certain preventive measures is of utmost significance [32]. Dermatoglyphics was helpful for the diagnosis of beta-thalassemia patients worldwide [33]. Also, from the best research showed that there's a significant difference in mean of AFRC and TFRC in the thalassemic patient in comparison with control [34]. On the other hand, supported the results of some researchers from India showed that they were found that whorls were the most frequent pattern on digit IV in patients and controls, with statistical significance in both hands, right (p-value 0.042) and left (p-value 0.010). Ulnar loops had preponderance over other patterns on digit V in both the groups, but the difference was statistically significant in the left (p-value 0.033) [35]. While other research conducted that Loop patterns are more in male thalassemias in third and fifth digits. Whorls pattern, Furuhata's index, Dankmejer's index, total finger ridge count, and absolute finger ridge count are higher in thalassemic of both sexes [36]. However, the study found there was no significant difference in the ridge count between patients and the control group (p > 0.05). However, there was a significant difference in the patterns between patients and the control group (p < 0.05). The number of whorl patterns in β-thalassemia major patients was 53,5%, it was greater than that in normal individuals (20,5%). Loop patterns were less frequent in β-thalassemia major patients (34%) compared to normal individuals (75,5%). Arch patterns had no significant difference between patients and control group (p > 0.05) [37].

5. BREAST CANCER AND DERMATOGLYPHICS

Cancer may be a collection of diseases discriminate by the abandoned progress and spread of abnormal cells; it's the second leading explanation for death after cardiovascular diseases [38]. Carcinoma is one of the well-known malignant tumors among women. In spite of attempts to classifying carcinoma consistent with its histological and molecular properties [39]. The results of the study indicated statistically significant changes in finger ridge count and fingertip pattern in cases of carcinoma breast as compared to the control group [40].

There was a big increase within the occurrence of whorl patterns and the total finger ridge count among the breast carcinoma patients [41]. Other research showed that it had been observed that radial and ulnar loops, whorls, and arches in left showed statistically significant differences. Among the quantitative parameters' abridge count, and ATD angle showed statistically significant difference [42]. Seltzer et al. reported the low frequency of the arches within the carcinoma breast patients as compared within the controls (cases-5.6% vs. control 10.0%). Abbasi et al. reported a decrease in the frequency of the arches. Sridevi et al. reported a big decrease within the arch pattern on digits II, III, and IV [43]. The number of whorl patterns and therefore the breakdown by classification group didn't differ significantly between the carcinoma and normal.

Additionally, no significant difference was found within the dermatoglyphics patterns of the ladies with carcinoma with and without a case history of carcinoma [44]. Nevertheless, digital dermatoglyphic patterns were analyzed between the patients and the control group of people, which showed statistical differences [45]. However, the results showed increasing within the number of arches, radial loops, ulnar loops, and whorls in the cancer group as compared with the control group. This increase didn't reach a significant level (P≤0.05) [46]. The ATD angle and, therefore the b-c ridge count was increased in carcinoma patients as compared with the healthy subject [47]. Palmar dermatoglyphics may have a future role in identifying women at increased risk with carcinoma [48]. Presence of an ulnar or radial whorl or an arch on six or quite six fingertips, including an absence of a radial loop and central whorl, is strongly related to carcinoma breast [49]. The pattern of fingerprints could also be a useful gizmo within the future in identifying and also screening of carcinoma [50].

6. RELATIONSHIP BETWEEN FINGERPRINT PATTERN AND SOME OTHER CANCERS

In the thyroid cancer subjects had a lower total digital ridge count (TDRC) and a reduced number of papillar ridges between the a-d triradii, than the control subjects [51]. However, in cervical cancer which showed a significant increase in the frequency of whorls & total finger ridge count in both hands & increases in the frequency of arches in left, whereas there was a significant decrease in ATD angle, t-d ridge count & frequency of ulnar loops in both hands of females having carcinoma of the cervix as compared to controls [52]. On the opposite hand, the results obtained seem to demonstrate that dermatoglyphics isn't an honest diagnostic tool for cervical cancer [53].

Dermatoglyphic patterns may have a task in identifying individuals either with or in danger for developing oral leukoplakia and oral epithelial cell carcinoma [54]. It had been observed that there was a significant difference between the 2 groups in terms of their B-C ridge counts (p < 0.05) in both hands. Also, the A-B ridge count showed a significant difference between the groups on the left (p < 0.05), and also there was a significant difference within the ATD angles of the proper hand (p < 0.05) between the groups. The results might be of importance in the early diagnosis of prostatic adenocarcinoma [55].

The studies upon the opposite figures (TFRC and therefore the position of the axial tri-radius) don't show any differences. It seems to us that the dermatoglyphic studies of men with bronchial carcinoma differ from controls [56]. The mean number of loops and therefore the mean number of total ridge count was found to be higher just in case of subjects with potentially malignant disorders and oral carcinoma in comparison with controls. Arches were seen predominantly in patients with carcinoma. The right ATD angle was lower in subjects without deleterious habit and potentially malignant disorders. These findings were highly significant statistically [57]. In both hands of patients with carcinoma cervix, there was a substantial reduction in the frequency of ulnar loops & t-d ridge count as compared with controls. At the same time, there was no

significant difference between patients & controls within the frequency of radial loops, arches, interdigital area patterns & a-b, b-c, c-d ridge counts [58].

7. CONCLUSIONS

From this review, it can be reached the subsequent conclusions:

1. There are a variety of genetic disorders and diseases acquired, which would be the impact of dermatoglyphic patterns.

2. Dermatoglyphics is also used as a diagnostic test for a particular condition and disease.

Conflict of Interest: The author declares no conflicts of interest.

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