Ameloglyphic, Dermatoglyphic, Sweat Pore Analysis of Hidrotic Ectodermal Dysplasia: A Rare Case Report

N S Venkatesh Babu¹, Sai Kishore Mettukuri²
¹Professor and Head, Department of Pediatric and Preventive Dentistry, V S Dental College and Hospital, Bengaluru, Karnataka, India, ²Post Graduate Student, Department of Pediatric and Preventive Dentistry, V S Dental College and Hospital, Bengaluru, Karnataka, India

Hidrotic ectodermal dysplasia (ED) is an autosomal dominant genetic disorder characterized by the triad of features such as nail dystrophy, generalized hypotrichosis, and palmoplantar hyperkeratosis. Physical development and life expectancy are not affected. Dermatoglyphics and ameloglyphics have been considered as casement of congenital abnormalities and other conditions. Young adults and children with hidrotic ED need to be evaluated early by a dentist to determine the oral outcome. Stipulated, appropriate care needs to be provided throughout the child’s growth to maintain oral function. According to this study ameloglyphics was found to be beneficial over dermatoglyphics in timely diagnosis and treatment planning.

Keywords: Ameloglyphics, Dermatoglyphics, Ectodermal dysplasia

INTRODUCTION

Ectodermal dysplasia (ED) is defined by the national foundation as a genetic disorder in which there are congenital birth defects of two or more ectodermal structures (Hickey, 2001). Tissues affected are the hair, skin, eccrine glands, nails and teeth. The disorders are diffuse, congenital and non-progressive.¹

Thurman published the first report of a patient with ED in 1848.¹ However, the term was coined in 1929 by Weech.² Freire-Maia and Pinheiro detailed many varieties of ED.³ Common EDs are X-linked recessive hypohidrotic ED (Christ-Siemens-Touraine syndrome) and hidrotic ED (Clouston syndrome).⁴

Hidrotic ED type 2 or Clouston syndrome is an autosomal-dominant genetic disorder, which affects the skin and its derivatives, characterized by the major trifecta of generalized hypotrichosis, palmoplantar hyperkeratosis, and nail dystrophy.⁵ Other ectodermal derived structures may also be affected. Physical development and life span are unaffected.⁶

Fingerprints are unique over the lifetime to all individuals. Studies of fingerprints reveal vital genetic and medical information about an individual. Dermatoglyphic studies have been carried out on leukemia, breast cancer, syndromes, etc. and in dentistry it is proving to be an undeniable tool for primary investigations of oral pathosis.

Odontogenesis is genetically harmonized. The formation of enamel is a systematic and dynamic process in which the enamel rods run the entire length of enamel in an undulating and entwine path, which forms a specific pattern on tooth surface which are idiomatic for each tooth in an individual.⁷ ⁸

Dermatoglyphics, ameloglyphics have been considered as window of congenital abnormalities and other conditions. Well-timed diagnosis is very important as this unclog early dental, corporal, social as well as psychological reclamation. This article aims to present clinical features and diagnostic methods of ED through a case report.

CASE REPORT

A 14-year-old male patient reported to the Department of Pediatric and Preventive Dentistry with the chief complaint of lack of esthetics and difficulty in mastication.
The patient also complained of heat intolerance but was irked mainly due to the discolored teeth. Past medical history was not significant. He was the first child and the only affected member in the family.

On general physical examination, the patient had frontal bossing, sunken cheeks (Figure 1), thick averted lips, pigmentation of the face and dystrophic nails (Figure 2). Sparse hairs on scalp and eyebrow region (Figure 3) were present.

On intra oral examination, all permanent teeth were found to be conical in shape and hypoplastic in nature (Figure 4). Midline diastema was present (Figure 5). Underdeveloped alveolar ridge and clinically normal salivary secretion were found. Orthopantamogram revealed poor bony support of 46 (Figure 6).

**Methodology**

Dermatoglyphic studies were carried out using hand imprints. The hand impressions were taken using shingar kajal ink. The patient was asked to smear his hand with ink and impressions were taken on a white sheet. The imprints were evaluated using hand-magnifying lens and results were recorded in terms of type of epidermal ridges at fingertips, position of tri radii line, and “atd” angle. “Atd” angle is an angle formed by the tri axial radius and the tri radii at the base of the index finger (a) and little finger (d).

![Figure 1](image1.png)

Figure 1: (a) Facial view and profile view showing (b) Frontal bossing and sunken cheek

![Figure 2](image2.png)

Figure 2: Finger showing nail dystrophy

![Figure 3](image3.png)

Figure 3: (a and b) Scalp and eyebrow region showing sparse hair

![Figure 4](image4.png)

Figure 4: (a and b) Maxillary and mandibular teeth

![Figure 5](image5.png)

Figure 5: Midline diastema

![Figure 6](image6.png)

Figure 6: Orthopantamogram
For ameloglyphics teeth were etched with 10% orthophosphoric acid for 20 s (Figure 7), followed by application of thin layer of acetone over a piece of cellulose acetate film, and placed immediately over the etched surface of the tooth without any finger pressure for 20 min (Figure 8). The acetone dissolves a layer of cellulose acetate, and the solute was allowed to settle down along the irregularities on the enamel surface. The film was gently removed after 20 min and observed under magnifier.9

A skin punch biopsy was performed, and sweat pores were counted from excisional skin biopsy samples taken from scalp and sole.

**DISCUSSION**

Until date, there are no studies available in the literature evaluating the parameters such as dermatoglyphics, ameloglyphics and sweat pore analysis in children with hidrotic ED.

Dermatoglyphic findings of palmar lines (proximal crease, distal crease and the nar crease lines) pattern were found to be normal (Figure 9).

Position of triradii at a, b, c, d, s, t were found to be normal. The atd angles for both right and left hand were found to be 43° and 39° respectively (Figure 10), which was in normal range (45°). Total finger ridge count was found to be 131, which was in normal range (125-150).

According to the present case study dermatoglyphics didn’t give much information regarding the extent of alteration occurring in ectodermal derivatives such as enamel and supporting bone.

Eight types of ameloglyphic patterns are observed in normal individuals which are: Wavy (branched), wavy (unbranched), linear (branched), linear (unbranched), whorl (open), whorl (closed), loop, and stem-like.10 According to the present study, ameloglyphic findings showed irregular enamel rods and didn’t follow definitive pattern as seen in normal individuals.
Amelogenins are multi-functional proteins formed by AMEL genes (X and Y), which play a key role in formation and repair of teeth and bone. Amelogenins are responsible for postnatal development of bone (bone remodeling), which occurs in adjacent periodontal ligament. It also helps to recruit mesenchymal stem cells for periodontal ligament regeneration; apart from amelogenesis. Any defect in the amelogenesis of enamel infers defective amelogenin formation, which in turn negatively affects the periodontal ligament and surrounding alveolar bone formation. In the present case study, this explains occurrence of generalized enamel hypoplasia and poor bony support of 46.

Ameloglyphics is primarily used as a tool for personal identification in forensic dentistry. In the present case study, it was used as it was inexpensive, easy to perform, and did not require any special training.

Sweat pore analysis of sole showed marked hyperkeratosis, moderate acanthosis with the normal layer. Skin analysis of scalp showed relatively thinned out epidermis with reduced pilosebaceous units and normal sweat glands.

Both ameloglyphics and skin biopsy analysis showed deviation from normal children.

Comprehensive esthetic and prosthetic rehabilitative treatment procedures were planned for the child.

CONCLUSION

Young adults and children with hidrotic ED need to be evaluated early by a dental professional to determine the oral outcomes of the condition. Stipulated, appropriate care needs to be provided throughout the child’s growth cycle to maintain oral functions. According to this study, ameloglyphics was found to be beneficial over dermatoglyphics in timely diagnosis and treatment planning. Further studies are required to standardize the technique of ameloglyphics and its application in different fields of dentistry.

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