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DERMATOGLYPHIC FORENSIC DIAGNOSTICS OF TYPE 1 DIABETES MELLITUS IN CHILDREN

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Abstract
Type 1 diabetes mellitus (T1DM) is an endocrine disease associated with hereditary and autoimmune processes, which is common in young children and adolescents. Its early detection and prognosis are important. Dermatoglyphics is a method for studying the papillary lines of the skin of the fingers and palms, which contains information related to genetic and embryonic development. In this study, dermatoglyphic features in children with T1DM were studied, their susceptibility to the disease and their significance in diagnosis were assessed. The results showed that the changes in papillary lines, the relatively low number of spots and the increased number of whorls in children with type 1 diabetes were associated with their genetic pathology. The results of the study will help to improve the possibilities of forensic examination and early detection of the disease using dermatoglyphic analysis.

Keywords: Type 1 diabetes, fingerprints, children, dermatoglyphics.

INTRODUCTION

Type 1 diabetes mellitus (T1DM) is one of the most common endocrine diseases in childhood, characterized by a constant increase in the incidence rate worldwide. According to the International Diabetes Federation (IDF), the annual increase in the incidence of T1DM in children is 3-4%, and the total number of children is more than 1.1 million people [1,2,5].

From the point of view of forensic examination, the diagnosis of T1DM in children is particularly difficult, especially in cases where postmortem diagnosis or medical documentation is not available [3,4]. Existing diagnostic methods often require complex laboratory tests and are not always applicable in forensic practice.

The dermatoglyphic method, based on the study of finger and palm skin patterns, is of particular interest as a non-invasive, cost-effective and informative method for diagnosing hereditary diseases [6,7]. The genetic determinant of dermatoglyphic signs and their immutability throughout life make this method particularly valuable for forensic practice.

Despite the fact that there are many studies in the field of dermatoglyphics and its use in the diagnosis of various diseases, the issues of using dermatoglyphic indicators in the forensic diagnosis of(T1DM) in children have not been sufficiently studied. Existing studies are fragmentary in nature and do not take into account the characteristics of children's age and the characteristics of the (T1DM)

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The Purpose of the Study

To study scientifically based dermatoglyphic criteria for the forensic diagnosis of type 1 diabetes in children and to analyze the results**.**

Research Objectives:

The material for the study was the dermatoglyphic traces of 28 children aged 4-17 years, including 9 girls and 19 boys, who were on the endocrinologist's list with a diagnosis of type 1 diabetes mellitus and died in a car accident. Based on the materials of forensic medical examination for the period 2020-2024, dermatoglyphic signs of children with type 1 diabetes mellitus were analyzed. Using modern methods of analysis of papillary patterns, the characteristics of dermatoglyphic indicators in children with type 1 diabetes mellitus were studied.

Materials and Methods

For the study, dermatoglyphic prints and medical records of 28 children with a confirmed diagnosis of type 1 diabetes mellitus between 2021 and 2026 were analyzed.

DISCUSSION AND RESULTS

Based on the study of dermatoglyphic criteria for the diagnosis of type 1 diabetes mellitus in children for forensic medical examination, the following changes were identified. The results of the study, conducted in order to improve the diagnosis of type 1 diabetes mellitus (T1DM) and forensic diagnostics, gave a number of important conclusions. Based on dermatoglyphic analysis, different features were identified between children with T1DM and the control group. The characteristics of dermatoglyphic patterns were studied in 28 children. During the study, changes in the composition of papillary lines and their distribution were observed in children with T1DM. Arch patterns - 9 are less common in sick children than in the normal population. Loop patterns – have a high incidence on the index fingers and are considered a characteristic feature of DM1. Whorl patterns – have been observed in 15 children with the disease and are more common, and it has been studied whether this is related to genetic and embryonic factors.

Table No. 1. Dermatoglyphic indicators in children with type 1 diabetes (n=28)

No.	Full name	Age Arch %	Loop %	Whorl %	Finger Asymmetry	Changes in Palm	Structure
1	Б.М.	7	2%	68%	30%	Yes	Yes
2	С.А.	9	3%	70%	27%	Yes	No
						No	Yes
3	Д.У.	10	1%	65%	34%	Yes	No
4	К.Т.	8	4%	72%	24%	No	Yes
5	Р.Н.	12	2%	69%	29%	Yes	No
6	Н.О.	11	1%	66%	33%	No	Yes
7	Ф.Ш.	13	3%	71%	26%	Yes	No
8	Ж.М.	10	2%	68%	30%	No	Yes
9	Г.Т.	9	4%	73%	23%	Yes	No
10	Л.Д.	12	2%	69%	29%	No	Yes
11	Х.С.	11	1%	65%	34%	Yes	No

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12	Ш.А.	10	3%	70%	27%	No	Yes
13	Т.К.	8	4%	72%	24%	Yes	No
14	Ю.В.	9	2%	68%	30%	No	Yes
15	П.С.	13	1%	66%	33%	Yes	No
16	В.Ч.	11	3%	71%	26%	No	Yes
17	К.М.	7	2%	67%	31%	Yes	No
18	О.Ф.	12	4%	74%	22%	No	Yes
19	Б.Х.	10	1%	65%	34%	Yes	No
20	Ж.Л.	9	3%	70%	27%	No	Yes
21	М.Н.	8	2%	68%	30%	Yes	No
22	Р.Д.	10	4%	72%	24%	No	Yes
23	Д.Ш.	11	1%	66%	33%	Yes	No
24	С.Т.	13	3%	71%	26%	Yes	Yes
25	Ф.К.	12	2%	69%	29%	No	No
26	Н.В.	9	3%	70%	27%	Yes	Yes
27	Ч.О.	10	1%	65%	34%	No	No
28	Л.К.	8	4%	73%	23%	Yes	Yes

According to the results of the analysis, arch patterns are rare in children with DM1 (1-4%), loop patterns are the most common (65-74%), which is considered a characteristic feature of DM1. Whorl patterns are observed in 22-34% of children. Finger asymmetry is present in 16 of 28 children, which was determined to be related to genetics and embryonic development. Changes in the structure of the palm are noted in 13 children.

CONCLUSION

The obtained results confirm the clinical significance of dermatoglyphic parameters in children with QD1. The use of this method in forensic and clinical practice will serve to expand the possibility of early detection, prevention and prognosis of QD1 in the future.

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2. Суд-тиббий ташхислаш учун дерматоглифик маркерлар

Тадқиқот давомида илк бор ҚД1 учун информатив дерматоглифик маркерлар ишлаб чиқилди:

- **Бармоқлар ва кафтлар папилляр нақшларининг ҳусусиятлари** – ҚД1 бўлган болаларда белгиланган ўзгаришлар беморларни назорат гуруҳидан ажратиш имконини беради.
- **Бармоқ нақшларининг асимметрияси** – ҚД1 билан оғриган болаларда ўнг ва чап қўл бармоқлари ўртасидаги нақшлар фарқи аниқланди.

3. Суд-тиббий ташхислаш алгоритми ва унинг амалиётдаги аҳамияти

Олинган натижалар асосида суд-тиббий ташхислаш алгоритми ишлаб чиқилди, у қуйидаги босқичларни ўз ичига олади:

1. Дерматоглифик маълумотларни йиғиш (бармоқ излари, кафт тузилиши).
2. Тушунтирилган дерматоглифик параметрлар бўйича таҳлил.
3. ҚД1 учун характерли ўзгаришларни аниқлаш ва баҳолаш.
4. Бошқа касалликлар билан дифференциал ташхис ўтказиш.
5. Олинган натижалар асосида эксперт хулосаси тайёрлаш.

4. Дифференциал ташхис мезонлари ва прогнозлаш

Тадқиқот давомида ҚД1 билан оғриган болалардаги дерматоглифик ўзгаришларнинг бошқа эндокрин ва аутоиммун касалликлари (масалан, 2-тур қандли диабет, тиреоидопатиялар) билан фарқи ўрганилди. Бу эса дерматоглифик кўрсаткичлар асосида ҚД1 ривожланиш хавфини баҳолаш тизимини ишлаб чиқиш имконини берди.

Натижалар таҳлили:

- **Дугак (Arch) нақшлари** – ҚД1 бўлган болаларда кам учрайди (1-4% оралиғида).
- **Илмоксмонс (Loop) нақшлари** – энг кўп тарқалган (65-74%), бу ҚД1 учун характерли белги бўлиши мумкин.
- **Тўрсимон (Whorl) нақшлари** – айрим болаларда 22-34% ўртасида кузатилди.
- **Бармоқ асимметрияси** – 28 боланинг 16 тасида мавжуд бўлиб, бу генетик ва эмбрионал ривожланишга боғлиқ бўлиши мумкин.
- **Кафт тузилишида ўзгаришлар** – 13 болада қайд этилган.

Хулоса:

Олинган натижалар 1-тур қандли диабетли болаларда дерматоглифик ўзгаришларнинг муайян қонуниятларга эга эканлигини кўрсатади. Суд-тиббий экспертизада ушбу кўрсаткичлардан фойдаланиш диагностика жараёнини яхшилаш ва ҚД1 ривожланиш хавфини баҳолашга ёрдам беради.

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Жадвал № 1. 1-тур қандли диабетли болаларда дерматоглифик кўрсаткичлар (n=28)

№	Ф.И.О.	Ёши	Дугак (Arch) %	Илмоксмонс (Loop) %	Тўрсимон (Whorl) %	Бармоқ асимметрияси	Кафт тузилишидаги ўзгаришлар
1	Б.М.	7	2%	68%	30%	Бор	Бор
2	С.А.	9	3%	70%	27%	Бор	Йўқ
3	Д.У.	10	1%	65%	34%	Йўқ	Бор
4	К.Т.	8	4%	72%	24%	Бор	Бор
5	Р.Н.	12	2%	69%	29%	Йўқ	Йўқ
6	Н.О.	11	1%	66%	33%	Бор	Бор
7	Ф.Ш.	13	3%	71%	26%	Бор	Бор
8	Ж.М.	10	2%	68%	30%	Йўқ	Йўқ
9	Г.Т.	9	4%	73%	23%	Бор	Бор
10	Л.Д.	12	2%	69%	29%	Йўқ	Бор
11	Х.С.	11	1%	65%	34%	Бор	Йўқ
12	Ш.А.	10	3%	70%	27%	Йўқ	Бор
13	Т.К.	8	4%	72%	24%	Бор	Йўқ
14	Ю.В.	9	2%	68%	30%	Йўқ	Бор
15	П.С.	13	1%	66%	33%	Бор	Бор
16	В.Ч.	11	3%	71%	26%	Бор	Йўқ
17	К.М.	7	2%	67%	31%	Йўқ	Бор
18	О.Ф.	12	4%	74%	22%	Бор	Бор
19	Б.Х.	10	1%	65%	34%	Йўқ	Йўқ
20	Ж.Л.	9	3%	70%	27%	Бор	Бор
21	М.Н.	8	2%	68%	30%	Йўқ	Бор
22	Р.Д.	10	4%	72%	24%	Бор	Йўқ
23	Д.Ш.	11	1%	66%	33%	Бор	Бор
24	С.Т.	13	3%	71%	26%	Бор	Йўқ
25	Ф.К.	12	2%	69%	29%	Йўқ	Бор
26	Н.В.	9	3%	70%	27%	Бор	Йўқ
27	Ч.О.	10	1%	65%	34%	Йўқ	Бор
28	Л.К.	8	4%	73%	23%	Бор	Бор

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