Abnormalities of the Eyelashes in Turner's Syndrome

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Abstract

Turner's syndrome (TS) is a sex chromosome disorder caused by a partial loss, complete absence or structural abnormality of one X chromosome in females. Special ocular features are often found. Some of the abnormalities are only cosmetic, such as the abnormalities of the eyelashes. The present prospective study with 12 TS and 12 control patients demonstrates the higher number of eyelashes as well as the greater vertical distance between the roots of the eyelashes in patients with TS compared with the control group. Increased awareness of this ophthalmological abnormality could be an additional diagnostic tool for early clinical suspicion of TS diagnosis.

Keywords
- Turner's syndrome
- ophthalmological
- eyelashes
- lymphedema

Introduction

Turner's syndrome (TS) is a sex chromosome disorder caused by a partial loss, complete absence, or structural abnormality of one X chromosome. It only affects females. It has been estimated to occur in 1:2.000 live female births.[1] Ocular and ocular adnexal abnormalities in TS such as refractive status of the eye, amblyopia, strabismus, glaucoma, nystagmus, presenile cataract, red–green deficiency and hypertelorism, epicanthus, downslanting palpebral fissure and ptosis have been described extensively before.[1–5] Some abnormalities are only cosmetic, such as abnormalities of accessory visual structures, such as the eyelashes. Collier in the 1960s, for the first time, described abnormalities regarding eyelashes and summarized these as a special form of hypertrichosis.[6] Many girls with TS are cared for in the university outpatient clinic. Since the ocular abnormalities were always in our focus, we decided to study those systematically.

Methods

We conducted a prospective study of 12 girls (age 8–14 years) with confirmed TS (10 girls with karyotype 45,X and 2 girls with 45,X/46,XX mosaic). The control group consisted of 12 age-matched girls with nonsyndromic variants of growth and pubertal development. All patients were seen at the Division for Pediatric Endocrinology at Dr. von Hauner Children's Hospital based at the University Hospital Munich (LMU). Written consent for the publication of the data and photographs of the eyes was obtained from the parents of all participants. The photographs of the eyes were taken by a professional photographer according to a standardized procedure (unchanged camera settings, position, and exposure). To count the exact number of eyelashes, we magnified the pictures by 453%. To determine the maximum vertical distance between the roots of the eyelashes, the photographs were enlarged by 703%. In both eyes, the eyelashes of the middle part of the lower eyelid in an area of 1 cm were counted, and the maximal vertical distance between the roots of the eyelashes was measured in millimeters. Number and maximal vertical distance were used for statistics. Due to the more favorable depiction of the lower lid on the photograph, the lower lid was used to determine the parameters. Statistical analysis was performed using IBM SPSS Statistics, version 27.0.1.0 (IBP Corporation, Armonk, New York, United States). Due to the nonnormal distribution of the values, the comparative analyses were performed using the nonparametric Mann–Whitney's *U* test. Statistical significance was considered at *p*-values less than 0.05.

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Table 1 Number of eyelashes and maximal vertical insertion distance between the roots of the eyelashes of patients with Turner's syndrome (1–12) and control group (A–L) with medians

Patient	Number of eyelashes		Vertical distance between the roots of the eyelashes	
	Right lower lid (*n*)	Left lower lid (*n*)	Distance right lower lid (mm)	Distance left lower lid (mm)
1	32	37	0.2	0.17
2	40	48	0.15	0.15
3	68	67	0.22	0.21
4	60	59	0.17	0.15
5	48	39	0.23	0.20
6	53	62	0.22	0.18
7	66	61	0.20	0.13
8	66	70	0.16	0.18
9	48	50	0.20	0.14
10	51	46	0.19	0.19
11	51	50	0.20	0.21
12	44	48	0.12	0.15
Median	**51**	**50**	**0.20**	**0.18**
A	40	35	0.11	0.12
B	37	36	0.24	0.16
C	29	31	0.14	0.11
D	36	40	0.17	0.12
E	42	48	0.13	0.12
F	40	57	0.18	0.17
G	44	46	0.13	0.09
H	39	42	0.16	0.18
I	45	47	0.14	0.13
J	39	41	0.15	0.14
K	53	50	0.16	0.16
L	43	40	0.12	0.11
Median	**40**	**41.5**	**0.15**	**0.13**

Results

Patients with TS had, on the right lower eyelid, a median number of 51 (range: 32–68) eyelashes compared with 40 (range: 29–53) in the control group (►**Table 1**). On the left eyelid, the median number was 50 (range: 37–70) in TS and 41.5 (range: 31–57) in the control group. The median vertical distance between the roots of the eyelashes in patients with TS was 0.2 mm (range: 0.12–0.23) on the right and 0.18 mm (range: 0.13–0.22) on the left eyelid. In the control group, the respective medians were 0.15 (range: 0.11–0.24) on the right and 0.13 (range: 0.1–0.18) on the left side. Patients with TS had significantly more eyelashes on the lower lid on both sides, compared with the control group (right $p < 0.005$ and left $p < 0.014$) (►**Fig. 1A–D**). The vertical distance between the roots of the eyelashes is also significantly greater in patients with TS than in the control group (right $p < 0.014$ and left $p < 0.006$).

From a clinical descriptive perspective, the eyelashes of patients with TS present with typical appearance that includes the following aspects (►**Fig. 2**): The eyelashes point upward, are concave in shape, and slightly longer and thicker than the eyelashes of control patients.

Discussion

As in other genetic diseases, some symptoms are present at birth, while others develop during life. Many of the symptoms in TS, such as short stature, epicanthus, ptosis, deformation of the outer ear, low hairline or short neck, have no effect on the general health. However, these morphological phenomena can have an impact on quality of life. Ocular symptoms are common in TS but probably underestimated and thus likely underdiagnosed.

Clinical inspection alone can determine the increased density of eyelashes in girls with TS compared with healthy girls. A possible etiological explanation could be fetal lymphedema, which is associated with tension and stretching of the skin. This phenomenon is more pronounced in the upper half

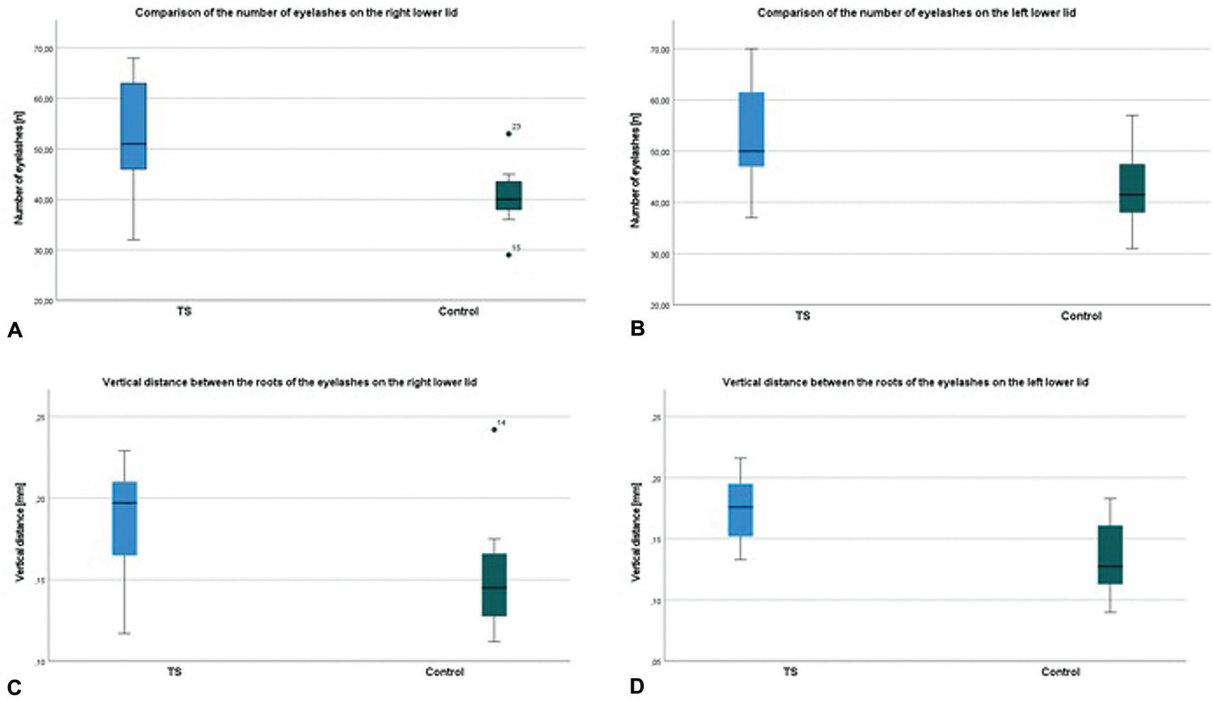

Fig. 1 (A–D) (**A**) Comparison of the number of eyelashes on the right lower lid. (**B**) Comparison of the number of eyelashes on the left lower lid. (**C**) Vertical distance between the roots of the eyelashes on the right lower lid. (**D**) Vertical distance between the roots of the eyelashes on the left lower lid.

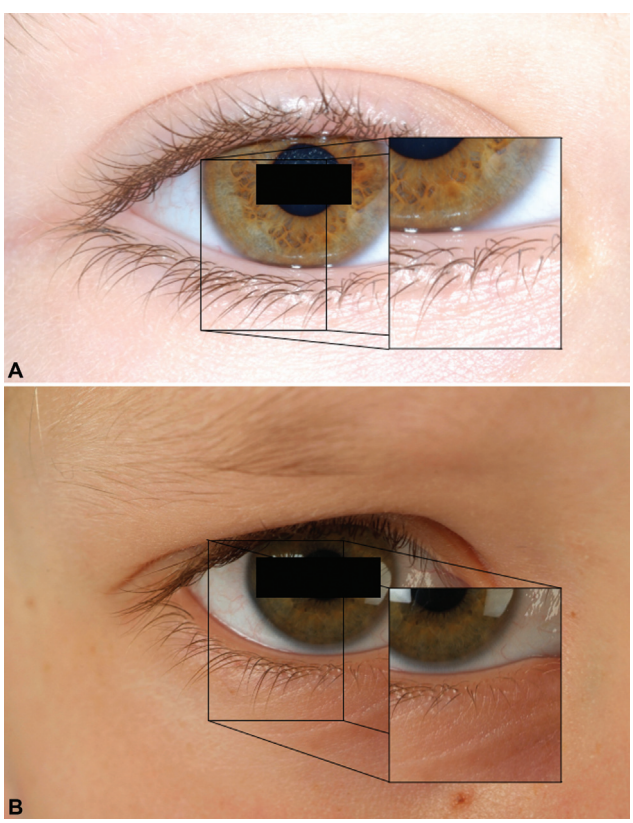

Fig. 2 (A–B) Representative matched pair (upper image Turner's syndrome and lower image control) with different vertical eyelash distances. The distances are marked in an enlarged section of the image with two opposing black arrowheads.

of the body and thus responsible for the typical phenotype of hands, arms, chest, neck, head, and face.[7] We hypothesize that skin extension of the eyelids results in a higher number of eyelashes and a greater vertical insertion distance.

Similar, but not the identical ocular adnexal findings, such as increase in number of eyelashes together with ptosis and neck webbing due to intrauterine lymphedema can be found in the lymphedema-distichiasis syndrome.[8] The difference with the latter syndrome is that in the latter, the eyelashes grow out of or adjacent to the sebaceous gland openings and cause symptoms due to rubbing of the ocular surface.

With this study, we were able to demonstrate a specific phenotype of eyelashes (number and insertion distance) in patients with TS. These differences were found to be statistically significant.

Conclusion

With this observation, we could expand the phenotypic features of TS in terms of accessory visual structures. Although this anomaly of the eyelashes is a variable phenomenon, it could help draw more attention to the discrete clinical features of TS.

Ethical Standard

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national guidelines on human experimentation and with the Declaration of Helsinki of 1975, as revised in 2008. All

participating families gave their written consent for the photographs, the analysis, and the publication.

Conflict of Interest

None declared.

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