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Case Report

Ophthalmological Manifestations in a Patient with Hypohidrotic Ectodermal Dysplasia

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Abstract

Hypohidrotic ectodermal dysplasia is a rare genetic disorder characterized by defective development of the ectodermal structure, resulting in anhidrosis/hypo hidrosis, hypotrichosis, and hypodontia. This condition is usually an X-linked recessive disorder that predominantly affects males. Various ophthalmological manifestations have been reported in the literature. We present the ophthalmological manifestations in a case of hypo hidrotic ectodermal dysplasia.

Keywords: *Hypohidrotic Ectodermal Dysplasia; Hypotrichosis; Hypodontia*

Introduction

Ectodermal dysplasia is a group of hereditary disorders, where there are developmental defects of the ectoderm and involve at least two of the following structures: skin, hair, teeth, nails, sweat glands, and thyroid [1]. Hypohidrotic ectodermal dysplasia (HED) is a rare genetic disorder characterized by hypohidrosis, hypotrichosis, and hypodontia [2,3]. There are other ectodermal structures that could be involved, for example, anterior pituitary, adrenal medulla, central nervous system, melanocytes, external ear, lacrimal gland and duct, conjunctiva, cornea, and meibomian glands [4].

The most frequent subtype of DEH is the X-linked recessive type that mostly affects males, with an incidence of 1 per 50,000 inhabitants to 1 per 100,000 inhabitants [5]. At present time, with the molecular identification of the genes involved, almost ten forms produced by mutations in various genes has been classified [6]. The most involved is the ED1, located on chromosome X-q12-13.1, which encodes ectodysplasin A, a member from the tumor necrosis factor family that plays an important role in the formation of ectodermal structures. Mutations have been found in the EDAR, EDARADD and WNT10A genes, also responsible for hypohidrotic ectodermal dysplasia and anhidrotic ectodermal dysplasia [7,8].

At the ocular level, congenital cataracts are the most common ocular finding of ectodermal dysplasia. Other reported complications include strabismus, corneal abnormalities, chorioretinal atrophy, Rieger anomaly, canalicular and punctual atresia [9-11].

Case Report

This is a 22-year-old male patient who reports poor vision in both eyes, predominantly in the right eye, which has become more pronounced in the last year. He has a genetic diagnosis of X-linked Hypohidrotic Ectodermal Dysplasia and atopic dermatitis since he was 4 months old, same as his brother who has the same diagnosis, and his sister has atopic dermatitis. There is no consanguinity between the parents.

On physical examination, the patient showed dry skin, thickening of the skin of the eyelids, absence of eyebrows, few eyelashes, areas of alopecia on the scalp, and hypodontia; however, the patient showed facial hair in the region of the beard (Image 1). The nails, palms and soles showed no alterations. On ophthalmological examination, he had visual acuity in the right eye of counting fingers at 1 meter from both eyes, a refractive error in the right eye of -10.50 of sphere with -3.00 x 55 of cylinder, while in the left eye of -12.00 of sphere with -3.50 x 175 of cylinder. This achieves a better corrected visual acuity of 20/200 in the right eye and 20/50 in the left eye on the Snellen chart.

Image 1: *A 22-year-old male patient with a hypohidrotic ectodermal dysplasia diagnosis. A. There is thickening of the skin of the face and eyelids, absence of eyebrows and few eyelashes. B. Missing permanent teeth. C. Frontal prominence, full lips with sparse hair, but presence of facial hair. D. Patchy alopecia.*

With fluorescein staining, a tear meniscus less than 0.1 mm, immediate tear film breakup time, and superficial punctate keratitis in the interpalpebral sector can be appreciated. A Schirmer test is performed, finding a measurement of 1 mm before and after the use of topical anesthetic. On examination with the slit lamp, the right eye was observed with a central anterior subcapsular cataract and cortical opacities. In the left eye, a mostly transparent lens is observed, but with some very discrete cortical opacities (Image 2).

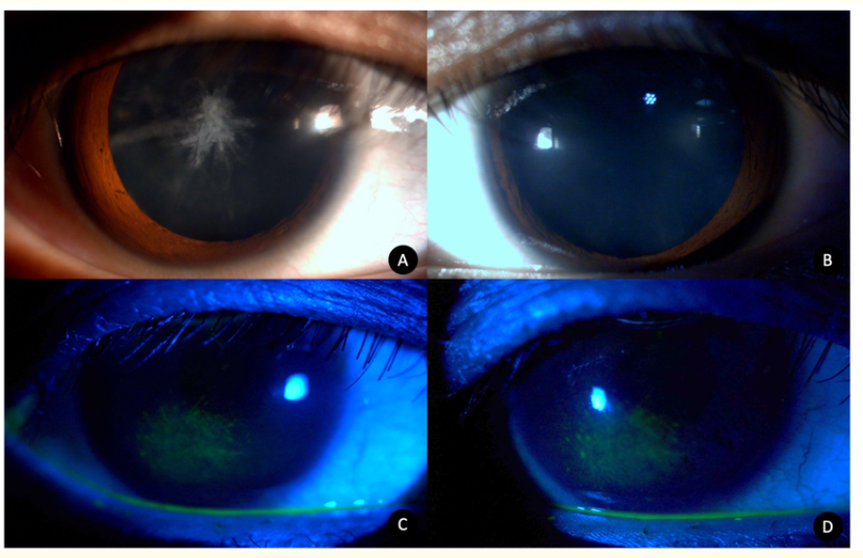

Image 2: *Clinical photograph of both eyes in color and with fluorescein staining. A. Right eye with presence of opacity in the lens corresponding to an anterior subcapsular cataract. B. Left eye with clear lens. In both photographs sparse eyelashes are observed. C and D. Fluorescein staining with punctate staining in the interpalpebral sector.*

Topical treatment with 0.4% sodium hyaluronate 6 times a day has been started in both eyes until the ocular surface improves. Corneal topography was performed with Pentacam® equipment, where grade 1 keratoconus data were observed according to the Amsler-Krumeich classification in both eyes (Image 3). The right eye presents a central keratometry K1 of 52.3 D, average keratometry of 46.6 D, I/S difference of +6.9, distance from the apex of the cone to the center of the cornea of 1.4 mm, thinnest pachymetry of 495 microns, frontal elevation of 15 microns, posterior elevation of 47 microns, and an irregular astigmatic bow. In the left eye there is a central keratometry K1 of 51.2 D, average keratometry of 46.5, I/S difference of +5.4, distance from the apex of the cone to the center of the cornea of 0.96 mm, thinnest pachymetry of 521 microns, frontal elevation of 15 microns, posterior elevation of 47 microns and an irregular astigmatic bow.

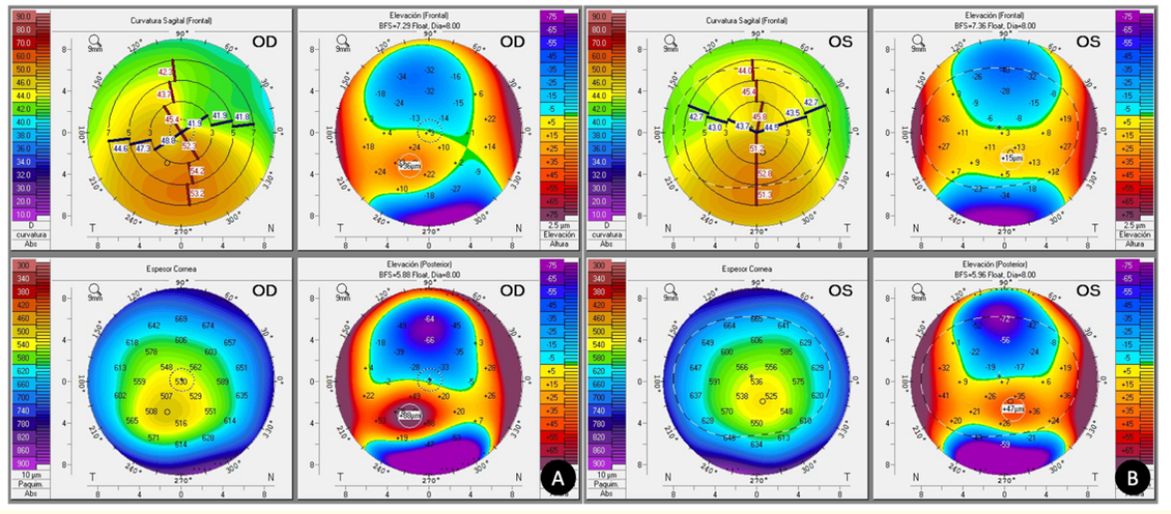

Image 3: *Corneal topography with Pentacam®. A. Right eye, B. Left eye.*

Biometry with interferometry is performed with the IOL Master 700® equipment, where the axial length of the right eye is measured to be 27.33 mm while that of the left eye is 27.53 mm. The calculation of the intraocular lens with the Panacea system is performed by taking the keratometry of the central 4 mm and considering the difference in anterior and posterior corneal curvature, Radii Ratio (B/F) which was 82.2%. Due to the asymmetry of the astigmatic bow, it was decided to place an enVista MX60® monofocal lens with a calculated power for emmetropia of +6.00D. One month after the procedure, the patient presents a best corrected visual acuity of 20/25 in the right eye with a residual refraction of +0.50 sphere and -3.75 x 50 cylinder (Image 4).

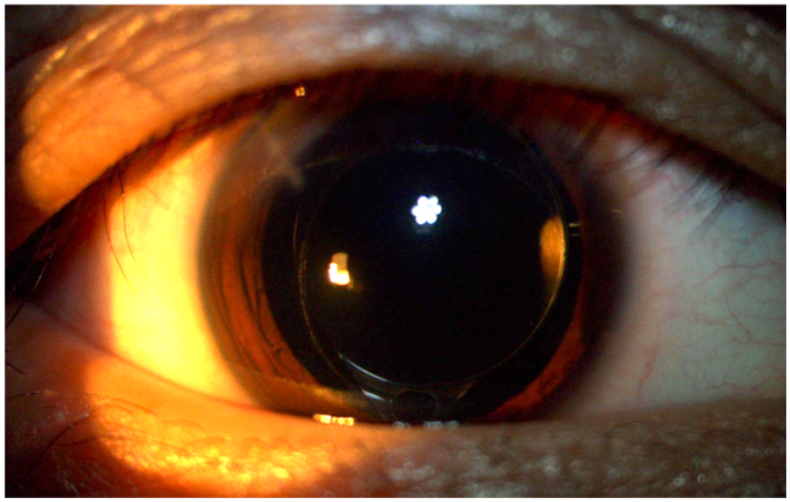

Image 4: *Intraocular lens is observed in the pocket one month after phacoemulsification.*

Discussion

Ectodermal dysplasia describes a large and complex group of disorders characterized by abnormal development of the skin and its appendages (hair, nails, teeth, and sweat glands).

It is estimated that around 7 in 10,000 births are affected by a form of ectodermal dysplasia [12]. The hypohidrotic/anhidrotic type is the most common ectodermal dysplasia (80%). Also called Christ-Siemens-Touraine syndrome [13].

The most common phenotype is hypohidrotic ectodermal dysplasia. Clinically is characterized by presenting hypotrichosis, with a thin, fragile, and light-colored hair. It can be generalized hypotrichosis or with a patchy mosaic distribution of body hair. Eyebrows and eyelashes may be absent. The skin is thin, pale, dry and scaly. The skin around the eyes and mouth presents linear wrinkles and hyperpigmentation. Some patients may show dysmorphic features such as a prominent forehead, forehead bumps, rings under the eyes, hypertelorism, epicanthus, depressed nasal bridge, protruding lips, and prognathism. They also characteristically present hypohidrosis, which can lead to episodes of hyperthermia. In addition, they present hypodontia or anodontia, with small, conical, and widely spaced teeth [14].

Wohlfart., *et al*. found in a case series that 39% of male pediatric patients with HED had bilateral superficial punctate keratitis secondary to chronic dry eye, but not in girls with HED. 79% presented a decrease in tear film breakup time. Likewise, children had a significant absence of the Meibomian glands [15].

Ocular tissues of ectodermal origin may be affected in ectodermal dysplasia. Landau., *et al*. mention that the most common reported ocular manifestations of DEH are dry eye (13%), blepharitis (10%), allergic conjunctivitis (10%), cataracts (7%), distichiasis or trichiasis (7%), lacrimal duct obstruction (40%) and lacrimal agenesis (33%). Mucocele, ectropion and infantile glaucoma have also been reported [16-18].

Hypohidrotic ectodermal dysplasia is also associated with skin abnormalities, such as dry skin (> 90%) and atopic dermatitis (47 - 84%), as in our patient [19]. On the other hand, keratoconus is a multifactorial ecstatic condition of the cornea, where various biochemical, physical, biomechanical, genetic, and environmental factors play an important role in its development [20]. Thereby, it has been found up to 35% of patients with keratoconus tend to atopy (asthma and eczema) [21].

Cataracts can affect up to 25% of patients with atopic dermatitis and occur in young people. They are typically anterior or posterior subcapsular. They occur due to increased oxidative damage to the lens, chronic use of corticosteroids, and mechanical trauma from eye grinding [22]. In our patient, thanks to the fact that the corneal ectasia occurred in the lower sector, a good refractive result was obtained after cataract surgery.

Conclusion

The development of both cataract and keratoconus could be related to both atopic dermatitis and hypohidrotic ectodermal dysplasia itself. These last two entities can coexist and generate earlier complications. For this reason, it is important that patients with this condition must be always evaluated by a dermatologist and an ophthalmologist as well to detect this type of disease early, which can lead to low vision and reduced quality of life.

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