Utility of optical coherence tomography in a case of bilateral congenital macular coloboma

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Macular coloboma is a congenital defect of the retina and choroid in the macular region. It may appear due to an intrauterine inflammation or a developmental abnormality. Familial hypomagnesemia with hypercalciuria and nephrocalcinosis (FHHNC) is a result of malformation of the renal tubule. Its combination with ocular manifestations may be genetic, specifically in case of claudin-19 (CLDN-19) gene mutations. The combination of FHHNC and ocular manifestations is not always present in these patients. Optical coherence tomography (OCT) helps us diagnose this condition by allowing us to evaluate and confirm the absence of retina layers without histological examination. Although genetic testing is necessary to diagnose mutational alterations of the CLDN-19 gene, in our case, it was not necessary to diagnose the FHHNC patient with macular coloboma, since the diagnosis of ocular damage had been already accurately established by the OCT.

Key words: Macular coloboma, nephrocalcinosis, optical coherence tomography, renal hypomagnesemia with ocular involvement

Macular coloboma is a congenital defect of the retina and choroid in the macular region. It is characterized by a clearly defined oval or rounded area of about 3–6 disc diameters in the central area of the fundus where we can ophthalmoscopically observe a rudimentary or absent retina, choroid, and sclera with the appearance of an atrophic pigmented scar in the area.

Several articles describe patients with macular coloboma associated with systemic diseases, such as Down syndrome,[1] skeletal and renal disorders.

Familial hypomagnesemia with hypercalciuria and nephrocalcinosis (FHHNC) appears due to a malformation of the renal tubule. The combination with ocular manifestations may be genetic, specifically with claudin-19 (CLDN-19) gene mutations.[2]

We present a case of a patient with bilateral macular coloboma and FHHNC, confirmed by optical coherence tomography (OCT).

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Case Report

We present a male patient, who was diagnosed with polyuria, polipsia, and enuresis at the age of 6.

The following alterations were detected in the blood analysis: hypomagnesemia, normopotassemia, hypermagnesiuria, hypercalciuria, incomplete renal tubular acidosis, hypocitraturia, and mild kidney failure. In addition, there was nephrocalcinosis demonstrated by renal ultrasound. The patient presented progressive renal dysfunction that led to kidney transplant at the age of 17.

He was referred to our hospital for ophthalmologic evaluation at the age of 18; previously, he had been monitored by other ophthalmology and nephrology units.

In the ophthalmological examination, the patient showed a visual acuity of 20/200 in the right eye and 20/40 in the left eye not improving even if using a pinhole.

The slit lamp examination showed a slight opacity in the posterior capsule of the lens of the right eye (which did not justify the visual acuity of 20/200) and the examination of the anterior pole of the left eye did not reveal any remarkable alteration. The intraocular pressure was 18.00 mmHg (millimeters of mercury) in both eyes.

On the examination of the right ocular fundus, a lesion is observed (through the lens opacities), occupying the macular region that simulates an area of atrophy or scarring [Fig. 1], which was of similar characteristics at the left ocular fundus [Fig. 2]. In both images, only the bare sclera appeared with the absence of choroidal vessels and retinal structures.

OCT demonstrated the absence of retinal and choroidal structures in both eyes. In the macula of the right eye, we could identify neurosensory retina atrophy and bare sclera with the absence of choroidal vessels [Fig. 3]. In the OCT of the left eye, we could observe the cup-shaped lesion with the complete absence of retina and choroid [Fig. 4].

In both eyes, there is an increase of backscatter due to the bare sclera.

Thus, the existence of macular coloboma is confirmed by OCT.

HIV, toxoplasma, rubella, herpes and syphilis serologies were all negative on blood serologies.

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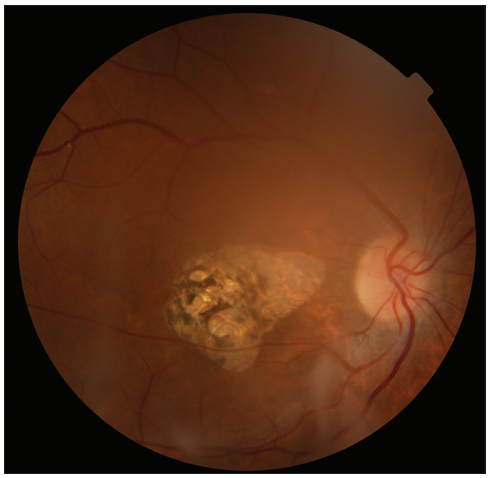

Figure 1: Ocular fundus of the right eye, there is a lesion occupying the macular region (it is seen through the lens opacities)

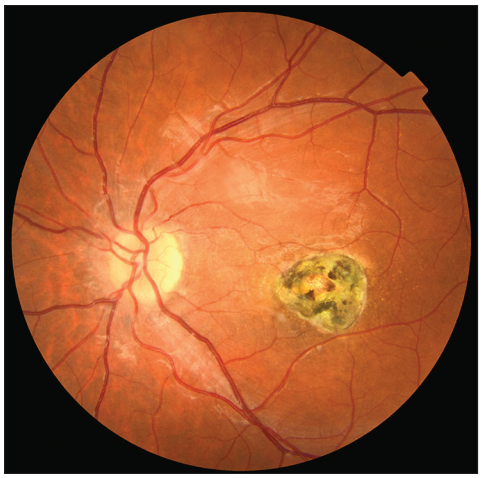

Figure 2: Ocular fundus of the left eye, there is a lesion occupying the macular region that simulates an area of atrophy or scarring

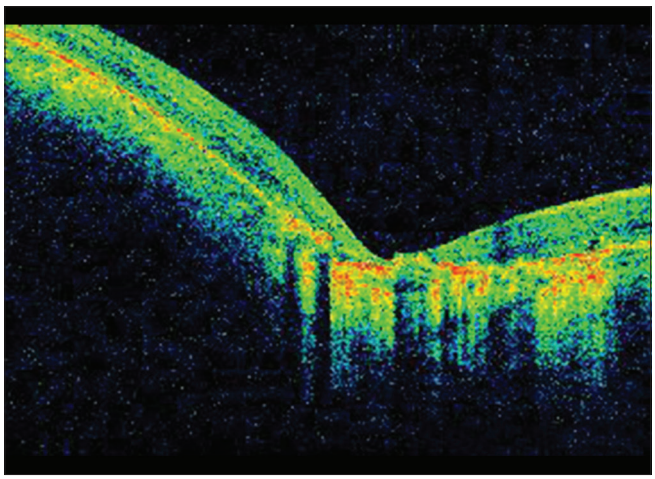

Figure 3: In the optical coherence tomography of the right eye we can find neurosensory retina atrophy and bare sclera with the absence of choroidal vessels

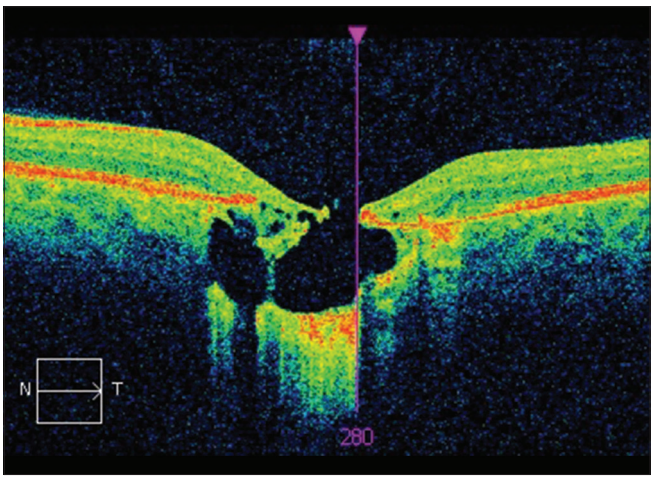

Figure 4: In the optical coherence tomography of the left eye we can find the lesion with the shape of a cup and with the complete absence of retina and choroid

Discussion

FHHNC is progressive kidney dysfunction that seems to be located in the ascending limb of loop of Henle. In the same entity, a distal acidification disorder is also present. This disorder could be explained by both a defect in the tubular transfer of ammonia and disorder in hydrogen ion secretion in the medullary collecting duct, probably caused by medullary interstitial nephropathy.[3]

The protein necessary for magnesium absorption in the ascending limb of loop of Henle is the paracellin-1 (PCLN-1). This protein is located in the tight junction of the kidney cells. Mutational alterations of the PCLN-1 gene are responsible for the FHHNC. When it was revealed that PCLN-1 is a member of the protein family called CLDNs, PCLN-1 was renamed CLDN-16 gene. CLDNs act as selective barriers to cations specifically in the tight junctions regulating permeability of divalent and monovalent cations.[4]

The connection between FHHNC and ocular manifestations is not always present in these patients. The combination with visual impairment seems to be related to the presence of mutational alterations in the CLDN-19 gene, and the ocular manifestations cannot be observed in patients with CLDN-16 gene mutations. This difference could be explained due to that CLDN-19 gene is expressed prominently in the fetal retinal pigment epithelium, performing its function not only in the renal tubular tight junctions but also in the retina, producing severe chronic kidney disease, and ocular abnormalities,[2] whereas the expression of CLDN-16 in the pigment epithelium is much lower.[2,5]

There are few mutations of the CLDN-19 gene. The original study by Konrad *et al*.[2] included seven Spanish patients from different families in which the same homozygous mutation was detected, p.G20D (c. 59G > A), in the CLDN-19 gene, which they called Spanish/Hispanic mutation.

With regards to the diagnostic evaluation of macular coloboma, we must add that the histological confirmation of the absence of choriocapillaris and retinal pigment epithelium is required. Therefore, the ocular fundus examination is not enough for diagnostic confirmation of coloboma because there

are several pathologies that can produce similar scars in the ocular fundus such as posterior uveitis or macular dystrophies among others.

In our particular case, the negative serological tests and the presence of renal dysfunction (due to FHHNC) suggest the diagnosis of macular coloboma, which is confirmed by performing OCT.

The incorporation of OCT as a diagnostic technique has allowed us to obtain good resolution images of retinal sections with a thickness of 10–20 μ. This helps us diagnose this condition by allowing us to evaluate and confirm the absence of these layers without histological examination.[6] In our patient, the absence of retinal structures including choroid and retinal pigment epithelium (leaving bare sclera) is confirmed with OCT. Furthermore, this helps us differentiate from other causes of macular dystrophies or diseases, such as macular degeneration secondary to inflammatory processes where these layers are preserved.

In our case, genetic testing was not necessary for confirmation of macular coloboma in a patient with FHHNC, because the diagnosis of ocular damage was accurately established by the OCT, nevertheless, we recognize that to confirm the diagnosis of FHHNL, genetic testing can be useful and make the diagnosis more firm.

Therefore, OCT can be a very suitable diagnostic tool for the confirmation of macular coloboma. It is a quick and noninvasive test that gives us histologic information about the affected layers of the retina.

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Conflicts of interest

There are no conflicts of interest.

References

1. Hayasaka Y, Hayasaka S. Bilateral congenital macular coloboma in a boy with Down syndrome. Eur J Ophthalmol 2004;14:565-7.
2. Konrad M, Schaller A, Seelow D, Pandey AV, Waldegger S, Lesslauer A, *et al.* Mutations in the tight-junction gene claudin 19 (CLDN19) are associated with renal magnesium wasting, renal failure, and severe ocular involvement. Am J Hum Genet 2006;79:949-57.
3. García-Nieto VM, Claverie-Martín F, Loris-Pablo C. Familial hypomagnesaemia with hypercalciuria and nephrocalcinosis. Its history. Nefrologia 2014;34:5-10.
4. Angelow S, El-Husseini R, Kanzawa SA, Yu AS. Renal localization and function of the tight junction protein, claudin-19. Am J Physiol Renal Physiol 2007;293:F166-77.
5. Peng S, Rao VS, Adelman RA, Rizzolo LJ. Claudin-19 and the barrier properties of the human retinal pigment epithelium. Invest Ophthalmol Vis Sci 2011;52:1392-403.
6. Oh JY, Yu YS, Hwang JM, Park KH. Optical coherence tomographic finding in a case of macular coloboma. Korean J Ophthalmol 2007;21:175-7.