

Cataract development in a young patient with lathosterolosis: a clinicopathologic case report

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PURPOSE. To report a unique case of cataract in a young patient with lathosterolosis, a singular defect of cholesterol biosynthesis, and to report the clinical results and histopathologic findings after cataract surgery.

METHODS. A 7-year-old patient with lathosterolosis, a rare defect of cholesterol biosynthesis, presented with a complex phenotype, including severe mental retardation, liver disease, multiple congenital anomalies, and bilateral posterior subcapsular cataracts. After a severe metabolic decompensation, a worsening in the lens opacity of the left eye occurred. The authors thus performed cataract surgery and made a histopathologic analysis of aspirated lenticular samples. The following examinations were performed at 1 day, 1 week, 3 months, 6 months, 12 months, and 24 months: refraction, biomicroscopy, and fundus evaluation. Visual acuity was not assessable due to lack of patient collaboration. The postoperative follow-up period was 24 months.

RESULTS. Histopathologic findings on lenticular fragments revealed the presence of fibers disposed in a honeycomb, samples with homogeneous eosinophilic lens fibers, and other fragments characterized by bulgy elements referable to cortical fibers with degenerative characteristics. After surgery, biomicroscopic evaluation revealed no significant inflammation and good intraocular lens centration at the various control visits. No intraoperative or postoperative complications occurred. No posterior capsule opacification occurred 2 years after surgery.

CONCLUSIONS. Lathosterolosis may lead to dysmetabolic cataract development; this unique case of cataract in such a patient has been successfully managed with surgery. Clinical results were excellent, and no complications occurred either intra- or postoperatively. (*Eur J Ophthalmol* 2009; 19: 139-42)

KEY WORDS. Cataract surgery, Dysmetabolic cataract, Lathosterolosis

Accepted: July 23, 2008

INTRODUCTION

Lathosterolosis is a singular defect of cholesterol biosynthesis due to the lack of lathosterol-5-desaturase (SC5D), the enzyme that catalyzes the conversion of lathosterol to 7-dehydrocholesterol in the cholesterol synthetic pathway. Cholesterol is an abundant lipid in eukaryotic membranes, implicated in different structural and functional capacities, and its partial or complete lack as well as the

accumulation of precursors may lead to a group of malformative syndromes of recent identification (1). Lathosterolosis is a rare disorder that leads to developmental abnormalities, including mental retardation, and to date has only been identified in two patients (2, 3). The first case to be identified (2) was managed by medical equipment of the Departments of Pediatrics and Pathology of the University of Modena, and ophthalmic evaluation was carried out by our group (Department of Ophthalmology,

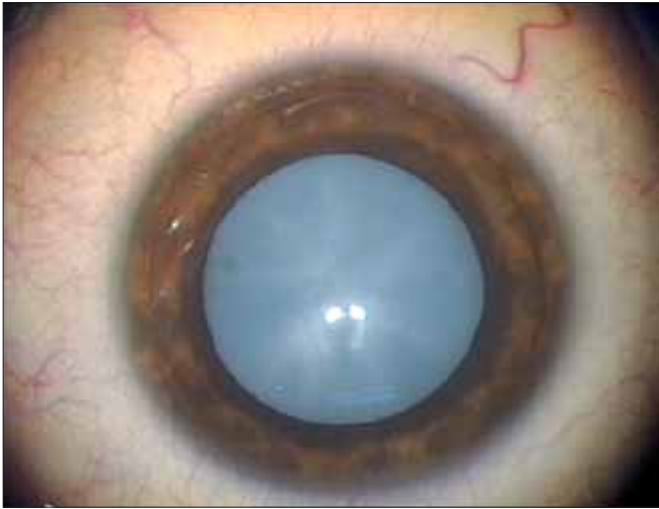


Fig. 1 - Preoperative view of lathosterolosis dysmetabolic cataract.

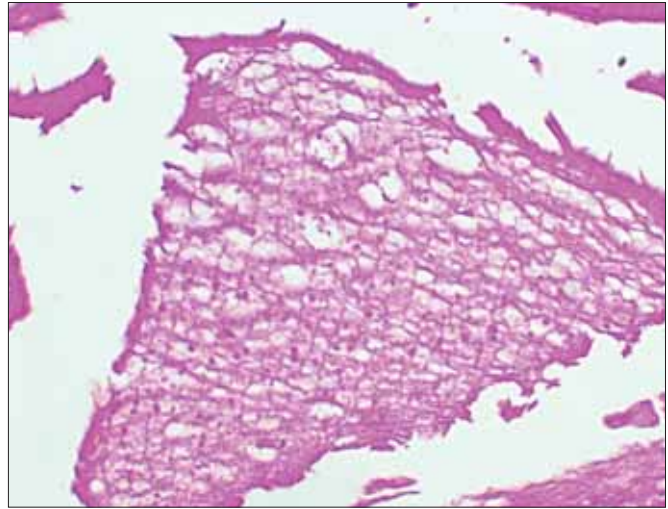


Fig. 2 - Fragments of lens characterized by the presence of fibers disposed in a honeycomb.

University of Modena). This is the first case of dysmetabolic cataract described in a patient with lathosterolosis; this article reports the clinical results of cataract surgery, as well as the histopathologic findings on lenticular samples obtained during surgery.

Case report

The patient was a 7-year-old girl diagnosed with lathosterolosis at age 2 years, through gas chromatography/mass spectrometry method for plasma sterol profile that revealed a peak corresponding to cholest-7-en-3-ol (lathosterol). The biosynthesis of cholesterol in her fibroblasts was defective, showing a block in the conversion of lathosterol into 7-dehydrocholesterol. Physical examination revealed dysmorphic features, including severe microcephaly, receding forehead, anteverted nares, micrognathia, prominent upper lip, high arched palate, hexadactyly, and syndactyly of the left foot. Severe psychomotor delay became increasingly evident with age; conductive deafness was found at the auditory evoked potentials. She also had liver disease with signs of cholestasis (2). At the first ophthalmic evaluation, carried out in June 2005, the patient presented with bilateral posterior subcapsular cataracts at biomicroscopy and bilateral pale optic nerve head at fundus examination. In November 2005, after a severe gastroenteric rotavirus infection with subsequent metabolic decompensation, a marked worsening in the lens opaci-

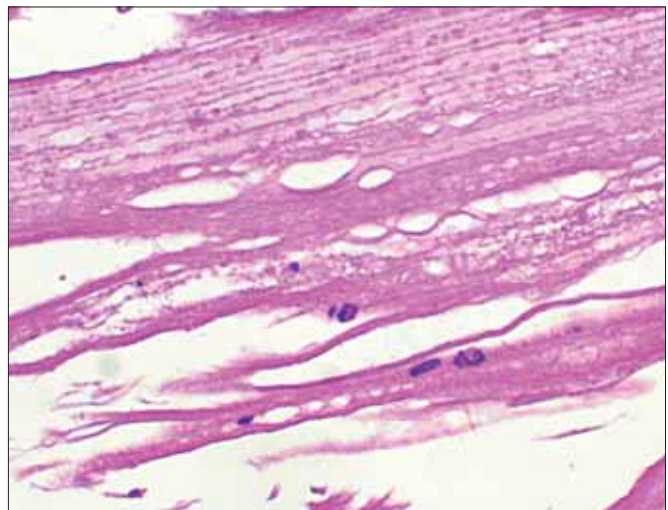


Fig. 3 - Fragments characterized by bulgy elements referable to cortical fibers with degenerative characteristics.

ty of the left eye occurred (Fig. 1). There was no history of ocular trauma reported by the parents, and echo B-scan examination revealed normal vitreous-retinal structures. A marked subconjunctival jaundice was evident at biomicroscopy, due to a severe intrahepatic cholestasis. After metabolic improvement, the patient was encouraged to have surgery for left cataract extraction. Surgery was performed on February 2006, under general anesthesia. Axial length and intraocular lens (IOL) power were calculated on the surgery bed,

through immersion biometry using the SRK/T formula. We performed a bimanual microphacoemulsification mainly working in aspiration mode; an acrylic hydrophobic flexible IOL was inserted (Acri.Smart 48S; Acri.Tec, Berlin, Germany) and manual posterior continuous curvilinear capsulorhexis (PCCC) and optic entrapment of the IOL were performed (4). No intraoperative or postoperative complications occurred. After surgery, refraction was +0.75 sph with an astigmatism of +0.50 (90°) diopter, remaining stable during the follow-up; biomicroscopic evaluation revealed absence of significant inflammation and good IOL centration; no posterior capsule opacification occurred 2 years after surgery. Visual acuity was not assessable due to lack of patient collaboration; however, we noted a better orientation of the proband during subsequent control visits, and the parents referred a greater confidence and autonomy in her daily life.

The lens samples obtained during surgical removal were sent to the Department of Pathology and routinely processed and stained with hematoxylin-eosin and PAS; then they were examined under a light microscope. Histologic examination revealed lens fragments with the presence of fibers disposed in a honeycomb, samples characterized by the presence of homogeneous eosinophilic lens fibers, and other fragments characterized by bulgy elements referable to cortical fibers with degenerative characteristics (Figs. 2 and 3). These findings were compatible with cortical dysmetabolic cataract.

DISCUSSION

The only existing patient with lathosterolosis to undergo cataract surgery is our proband, as the other identified case (3) died at 18 weeks of age with diffuse intracellular storage. The relationship between abnormal cholesterol metabolism and disturbed morphogenesis has been extensively studied in recent years (5, 6), and it has been questioned whether cholesterol deficiency or increased levels of intermediate sterols are responsible for the abnormal functioning of the pathway in these syndromes. The prototypical example is the Smith-Lemli-Opitz syndrome (SLOS), a complex malformation syndrome including the presence of congenital cataracts (5). Our proband presented with bilateral subcapsular posterior cataracts, with rapid worsening in the left eye

after a severe metabolic decompensation. Histopathologic examination confirmed the presence of a dysmetabolic cortical cataract. We do not know the exact pathologic mechanism involved; in two cases of dysmetabolic cataracts in patients with SLO syndrome, a dysfunction or rupture of the lens capsule leading to acute osmotic shifts has been advocated (7). We can hypothesize the same pathogenetic mechanism for our case. For cataract extraction we used a bimanual microphacoemulsification technique, working mostly in aspiration mode, in order to reduce the surgical stress and to allow withdrawal of lens samples. Clinical data suggest good surgical success, as biomicroscopy revealed no significant ocular inflammation, perfect IOL centration, and no signs of PCO during the follow-up. Refraction evaluation revealed a minimal hyperopic astigmatism that remained stable at subsequent control visits. We conclude that lathosterolosis is a complex malformative syndrome that can lead to dysmetabolic cataract development. This unique case of cataract in such a patient has been successfully managed with cataract extraction and IOL implant. Surgery has been demonstrated to be safe and effective, with excellent clinical results and no intra- or postoperative complications.

The authors have no proprietary interest.

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REFERENCES

1. Gondré-Lewis MC, Petrache HI, Wassif CA, et al. Abnormal sterols in cholesterol-deficiency diseases cause secretory granule malformation and decreased membrane curvature. *J Cell Sci* 2006; 119: 1876-85.
2. Brunetti-Pierri N, Corso G, Rossi M, et al. Lathosterolosis, a novel multiple malformation/mental retardation syndrome due to deficiency of 3 β -Hydroxysteroid- α 5- Desaturase. *Am J Hum Genet* 2002; 71: 952-8.
3. Krakowiak PA, Wassif CA, Kratz L, et al. Lathosterolosis: an inborn error of human and murine cholesterol synthesis due to lathosterol-5-desaturase deficiency. *Hum Mol Genet* 2003; 12: 1631-41.
4. Grieshaber MC, Pienaar A, Stegmann R. Posterior vertical capsulotomy with optic entrapment of the intraocular lens in congenital cataracts prevention of capsule opacification. *J Cataract Refract Surg* 2005; 31: 886-94.
5. Kelley RI, Hennekam RCM. The Smith-Lemli-Opitz syndrome. *J Med Genet* 2000; 37: 321-35.
6. Villavencio EH, Whalterhouse DO, Iannaccone P. The Sonic hedgehog-Patched-Gli pathway in human development and disease. *Am J Hum Genet* 2000; 67: 1047-54.
7. Goodwin H, Brooks BP, Porter FD. Acute postnatal cataract formation in Smith-Lemli-Opitz syndrome. *Am J Med Genet* 2008; 146A: 208-11.

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