Figure 1 Intraoperative picture. Injection towards optic nerve head. Branch of the occluded central retinal vein just penetrated by the cannula.

After a standard vitrectomy with detachment of the posterior hyaloid, the vessel wall was pierced with a glass cannula (Micron Ophthalmic, Margate, Florida, USA) as described by Weiss *et al.*² and 1 ml (200 µg/ml) rt-PA was injected successfully (fig 1). Formation of an epiretinal membrane at the injection site could be detected 3 weeks postoperatively. Angiographic examination 3 days postoperatively did not show improved arteriovenous passage time. In addition, the patient's postoperative vision did not change, and despite intensive photocoagulation and cryotherapy in the early postoperative period, the globe had to be removed 9 months later because of painful phthisis.

The entire specimen was immersed for light microscopy. Gross findings included numerous haemorrhages scattered throughout the retina. Histological examination confirmed the diagnosis of a CRVO with subretinal fluid, pre-retinal haemorrhage, optic atrophy and loss of ganglion cells. Unfortunately, we could not detect the thrombus histologically.

In the surgically treated area of the retina, we found a thickened venous wall due to the longstanding occlusion. The internal limiting membrane was interrupted and the vessel wall was in contact with an epiretinal membrane (fig 2).

Comment

This is the first case to show the histological changes after surgical REVL in a human eye.

In other patients, we could not be certain whether the intravenous injection had succeeded using this sophisticated surgical method. Beyond the expected histological findings after CRVO without a thrombus but typical fluorescein angiography in this case, we could identify the injection site histologically

Figure 2 Histological findings at the site of puncture: epiretinal membrane (asterisk), interrupted ILM (arrow) and thickened venous wall (haematoxylin and eosin; 200×).

and confirm that the vein had been successfully punctured.

In this case, REVL did not prevent neovascular glaucoma despite successful rt-PA injection in a venous branch close to the papilla. Clinical, histological and angiographic findings suggest that the occlusion was not influenced by the injection and we conclude that rt-PA injection after 7 weeks of CRVO is too late.

Nicolas Feltgen, Hansjuergen Agostini, Claudia Auw-Haendrich, Lutz I Hansen

Department of Ophthalmology, University of Freiburg, Freiburg, Germany

Correspondence to: Dr Nicolas Feltgen, Department of Ophthalmology, University of Freiburg, Killianstrasse 5, 79106 Freiburg, Germany; nicolas.feltgen@uniklinik-freiburg.de

The necessary ethics committee approval was secured for this study from the ethics committee of the University of Freiburg, Elsaesser Strasse 2m, Haus 1A, D-79110 Freiburg, Germany.

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Detection of a congenital cystic eyeball by prenatal ultrasound in a newborn with turner's syndrome

Congenital cystic eyeball was first described in 1939 as a rare ocular malformation caused by

partial or complete failure of the optic vesicle to invaginate during fetal development.¹ Only 35 cases have been reported. We present the clinical and histopathological findings in a newborn with Turner's syndrome and a congenital cystic eye.

Case report

A healthy 19-year-old woman underwent amniocentesis revealing a 45XO fetal karyotype, consistent with Turner's syndrome. She had good prenatal care, no significant illness or exposures during pregnancy, and family history was noncontributory. At 33 weeks gestation, prenatal ultrasound revealed a severely hypoplastic heart, a duplicated left kidney, and a large cystic orbital mass (fig 1A).

The infant was born at 38 weeks with characteristic stigmata of Turner's syndrome including webbed neck, broad chest, widely spaced nipples, and pedal lymphedema. The cystic right orbital mass showed partial transillumination (fig 1B). The differential diagnosis included epithelial cyst, orbital cystic teratoma, microphthalmos with cyst, encephalocele, and congenital cystic eye. The left eye was normal.

Ultrasonography and MRI revealed a predominantly cystic but partially solid orbital mass, with no discernable globe (fig 1C). MRI also demonstrated dysplasia of the pons and midbrain. After counseling regarding the infant's poor prognosis, the family withdrew life support and the patient expired.

Histopathology confirmed the diagnosis of cystic eyeball. A cavity lined by mixed fibroglial tissue was observed (fig 2A) with primitive muscle tissue inserting into the cyst wall (fig 2B). A segmental differentiation of sclera, choroid, retinal pigment epithelium, and retina were noted occupying 5% of the posterior wall (fig 2C). Fibroglial tissue with opening to the subarachnoid space was found posteriorly with tissue resembling brain. Primitive optic nerve with surrounding channels was identified (fig 2D). No cornea, iris, ciliary body, or lens was distinctly identified. Immunostaining with

Figure 1 (A) Prenatal fetal ultrasound at 33 weeks' gestation revealed a cystic mass in the right orbit. (B) External photograph of the patient shows the large right cystic orbital mass with partial transillumination. (C) Both cystic and solid (asterisk) components to the mass are appreciated on T2 weighted MRI studies. No globe is discernable on the right side. Parental/guardian informed consent was obtained for publication of this figure.

Figure 2 (A) Histopathology shows a cystic cavity which has been ruptured anteriorly (low power). (B) Higher power view with trichrome stain shows the cyst wall to be primarily fibroglial tissues with an area of primitive muscle (arrow) inserting into the cyst wall. (C) Areas of choroidal and retinal pigment epithelium tissue differentiation were identified (shown), and primitive tissue resembling retina was also seen (not shown). (D) Primitive optic nerve (arrow) with surrounding channels (arrowheads) was identified. No lens, ciliary body, iris, or cornea tissues were identified.

neural markers GFAP, NSE, and NF confirmed the glial proliferation with neural elements.

Comment

The etiology of congenital cystic eyeball is unknown, and no risk factors have been identified. There is no identifiable globe in this condition, unlike microphthalmos with cyst. Histologically, congenital cystic eye shows a cavity lined by neuroglial tissue. Nonocular abnormalities have been reported in association with congenital cystic eye, including intracranial anomalies as part of an "ectodermopathy", but these patients had a normal karyotype.²

Turner's syndrome results from X chromosome monosomy (45XO), mosaicism, or an abnormality in one X chromosome. Numerous ocular abnormalities have been associated with Turner's syndrome including strabismus, ptosis, hypertelorism, epicanthus, cataracts, glaucoma, anterior segment dysgenesis, retinal neovascularisation, keratoconus, and uveitis.³ One patient with Turner's syndrome has been reported to have ectopic orbital brain tissue, which bears similarity to our case, but that patient had a normal globe.⁴

Prenatal ultrasound has detected ocular abnormalities in utero including microphthalmos, anophthalmos, cataracts, retinoblastoma, and an epithelial orbital cyst.⁵ In our case, prenatal imaging detected the cystic eye.

To our knowledge, congenital cystic eyeball has not been previously reported in a patient with 45XO. Cystic eye should be added to the list of ocular anomalies found in association with Turner's syndrome.

**Marsha C Kavanagh, Diamond Tam,
Jennifer J Diehn, Anthony Agadzi,
Edward L Howes, Douglas R Fredrick**

Department of Ophthalmology, University of California at San Francisco, San Francisco, California, USA

Correspondence to: Marsha C Kavanagh, M.D., Department of Ophthalmology, University of California, San Francisco, 10 Koret Way, K302, San Francisco, CA 94143-0730, USA; mcheung26@yahoo.com

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Adjunctive hyperbaric oxygen in pseudomonas keratitis

Hyperbaric oxygen (HBO) has been reported as an adjunctive treatment for various corneal conditions.^{1,2} We report a case of contact-lens associated *Pseudomonas* keratitis which we treated adjunctively with hyperbaric oxygen.

Case report

A 30-year-old female presented with pain and progressive blurring in the left eye. She was wearing daily disposable contact lenses when she was splashed with muddy water in the face whilst mountain-biking.

Left visual acuity on presentation was 6/12. A 4 mm × 4 mm superior corneal ulcer with underlying infiltrate was noted. Corneal scrapings were obtained before commencing hourly topical gentamicin 0.9% and cephalothin 5%. A heavy growth of *Pseudomonas aeruginosa* sensitive to ceftazidime, gentamicin, ciprofloxacin, imipenem, piperacillin, ticarcillin and tobramycin was cultured.

On the second day of admission, visual acuity deteriorated to count fingers with increased corneal infiltrate and oedema. Topical ciprofloxacin and tobramycin in addition to oral moxifloxacin and intravenous ticarcillin were added while topical gentamicin was ceased.

On the third day, there was no improvement so we commenced daily adjunctive hyperbaric treatment. This consisted of 90 minutes at 2.0 atmospheres absolute pressure (2 ATA) breathing 100% oxygen in a monoplace chamber (Vickers Medical, Sidcup, UK). Twenty-four hours later, visual acuity improved from count fingers to 6/24. Cephalothin and intravenous ticarcillin were ceased over the next two days. On the sixth day, visual acuity

improved to 6/9 and hyperbaric therapy was ceased.

Topical antibiotics were continued for a total of 6 weeks at which point her visual acuity recovered to 6/6. There was mild scarring and thinning superiorly but she reported her vision was essentially normal.

Comment

Pseudomonas keratitis is a well documented complication of soft contact lens wear³ and is associated with poor outcomes including loss of the eye.⁴ In view of its virulence and the rapid clinical progression we decided to use HBO.

Well established as adjuvant treatment in certain bacterial infections⁵ HBO restores normoxia to hypoxic tissues or establishes hyperoxia in normoxic tissues. In vitro and in vivo animal experiments show HBO to be efficacious against *Pseudomonas aeruginosa*.^{6,7} Pharmacologically, HBO also prolongs the post-antibiotic effect of tobramycin against *Pseudomonas aeruginosa*.⁸

HBO is known to be effective in treating *Pseudomonas aeruginosa* in malignant otitis externa in humans.⁹ However, we are aware of only two reports describing the use of HBO in human corneal pathology. One is from the French literature in 1970 but further details are not available to us.¹ The other was a report of 32 patients with corneal disorders including "keratitis, traumatic injuries & ulcerations" treated with hyperbaric oxygen. The rationale was that "tissue oedema, hypoxia and ischaemia in these conditions are improved by hyperoxygenation" and it was found to be "beneficial in most of these cases".²

The optimal dose of oxygen is unknown. In vitro studies suggest at least 1.6 ATA oxygen⁶ is required for efficacy against *Pseudomonas aeruginosa* and in vivo studies showed efficacy at 2.0 ATA.⁷ Higher oxygen concentrations may be used but this is limited to 3.0 ATA by systemic toxicity.¹⁰ Intermittent therapy also limits oxygen toxicity¹⁰ and improves bacterial clearance in vitro and in vivo compared with continuous exposure.⁶ The treatment protocol in our case was that used locally for osteomyelitis. Given that the cornea gains most of its oxygen supply via direct diffusion from the atmosphere, we used a monoplace or hood system that delivers oxygen both systemically and directly to the cornea.