Long-term Follow-up of 14 Eyes With Bilateral and Multiple Ciliary Body Cysts: Prognosis of this Rare Entity

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Purpose: To describe the long-term outcomes of eyes with bilateral and multiple ciliary body cysts (CBC).

Methods: This retrospective study included patients with multiple and bilateral CBC diagnosed by high-resolution ultrasound biomicroscopy (UBM) over a 20-year period and followed by a single glaucoma specialist from 2000 to 2020. All patients underwent complete ophthalmic examination including dynamic indentation gonioscopy, retinal nerve fiber layer (RNFL) measurement by optic coherence tomography and automated perimetry.

Results: Seven patients (14 eyes) with bilateral and multiple CBC were included with a mean follow-up of 98 ± 39 months. Four eyes of 2 patients had complete angle closure at first examination and 3 of them underwent trabeculectomy with good visual outcomes. Four eyes of 2 patients had a reversible angle-closure at first examination and underwent a ultrasound biomicroscopy-guided laser peripheral iridotomy (LPI) which reopened the irido-corneal angles. Two of these eyes needed intensification of hypotensive drops during the follow-up. Among the 6 eyes (3 patients) with open angle at first examination, all had had LPI at last follow-up visit, 5 had normal RNFL and visual field and 1 received an additional hypotensive drop because of RNFL progression.

Conclusion: Our long-term cohort of bilateral and multiple CBC demonstrates that this rare entity may have a good prognosis if LPI is performed before extension of peripheral anterior synchiae. Irreversible angle closure required trabeculectomy in 75% of cases in our cohort with however good visual outcomes.

Key Words: glaucoma, ciliary body cysts, ultrasound biomicroscopy, angle-closure glaucoma

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Cysts of the ciliary body should be suspected when smooth elevations of the iris are seen. They can be suspected when a lumpy appearance of the iris root with variable angle width is seen in gonioscopy, but theses cysts are mostly nowadays diagnosed by ultrasound biomicroscopy (UBM). Cysts which can be epithelial or stromal, primary or secondary to penetrating or surgical trauma, will not be discussed in this article which focuses on ciliary body cysts (CBC). The main differential diagnosis of CBC is uveal melanoma and other tumors of the iris and the ciliary body. CBC can be single, multiple, unilateral, or bilateral. These cysts are very uncommon and their prevalence is variable: from 26.87% to 54.3% depending on the studies.

A Japanese team using UBM concluded to that CBC could be detected in >70% (bilaterally in 68%) of subjects between 20 and 29-year-old with no gender predisposition.

The cysts seem to be located predominantly in the inferior or temporal sectors and the incidence and the number of cysts seem to decrease with age. Refractive error and gender do not seem to affect the incidence of multiple CBC. A Chinese study showed a positive correlation between intraocular pressure (IOP) and the presence of multiple cysts among 119 myopic eyes undergoing routine examination. A positive correlation between IOP and the number and size of the cysts was also demonstrated by this study. Multiple CBC can cause an anterior displacement of the iris root or an anterior rotation of the ciliary body, causing a narrowing of the anterior chamber and a pseudoplateau iris configuration with or without secondary angle-closure glaucoma.

The prevalence of multiple and bilateral CBC is not described in the literature, but multiple and bilateral CBC are very uncommon. Even if isolated case reports of multiple and bilateral CBC are described in the literature, the prognosis of multiple and bilateral CBC is not well described. In this study, we describe the long-term outcomes of 7 patients (14 eyes) with bilateral and multiple CBC with a mean follow-up of 98 ± 39 months (8.2 ± 3.3 y).

To the best of our knowledge, long-term follow-up of eyes with multiple and bilateral CBC has not been described before in the literature.

METHODS

This retrospective study included patients with multiple and bilateral CBC followed by a single glaucoma specialist from 2000 to 2020 in Paris, France. The tenets of the declaration of Helsinki were followed.

Inclusion criteria were multiple and bilateral CBC diagnosed by high-resolution UBM using 50 MHz Probe (Aviso, Quantel Médical, Clermont-Ferrand, France). The circumference of the ciliary body was divided into 4 sectors (superior, inferior, nasal, temporal). At least 2 cysts in each sector of both eyes were required to diagnose multiple and bilateral CBC. The anterior chamber depth and the lens vault were measured at first visit. Exclusion criteria were: primary congenital glaucoma; CBC associated with iridocorneal dysgenesis, inflammatory glaucoma, traumatic glaucoma, history of intraocular tumor, history of intraocular surgery (other than uncomplicated cataract surgery
RESULTS

Seven patients (14 eyes), 5 females and 2 males, mean age 57 ± 14 years, with bilateral and multiple CBC were included. There was no family relationships between the cases. Three patients (6 eyes) were initially diagnosed in another center. Main characteristics of the 14 included eyes are presented in Supplemental Table 1. (Supplemental Digital Content 1, http://links.lww.com/IJG/A476). No patient had alpha-2 adrenergic agonists treatment. All patients were white. The mean follow-up was 98 ± 39 months (8.2 ± 3.3 y). The mean duration of the disease from initial diagnosis was 104 ± 43 months (8.7 ± 3.6 y). The mean anterior chamber depth was 2.25 ± 0.20 µm and mean lens vault was 1068 ± 340 µm in UBM. Figure 1 shows typical UBM images of multiple and bilateral CBC with open angle (patient 1).

Two male patients (4 eyes) (patients 5 and 6) had at first examination complete angle closure secondary to extensive PAS. One patient (patient 6) had LPI before on both eyes which showed during the follow-up progression of the preexisting RNFL glaucomatous damage and his right eye showed a progression of the visual field defect and underwent trabeculectomy. A glaucomatous damage of the RNFL occurred during the follow-up in both eyes of patient 5 and both eyes underwent trabeculectomy. Among the 3 eyes which underwent trabeculectomy during the follow-up: mean preoperative and mean postoperative IOP were 23.7 ± 6.4 mm Hg and 13 ± 2.6 mm Hg, respectively; visual acuity was 0 in Log-MAR scale before surgery and at last-follow up visit after surgery for each eye; visual field showed a moderate glaucomatous defect (according to the classification of Mills et al[16]) in the right eye of patient 6.

Four eyes (patients 4 and 7) had a narrow angle at first examination. LPI was performed for these 4 eyes which opened the irido-corneal angles. LPI was UBM-guided to make sure that LPI was outside a cyst. Patient 7 showed during the follow-up on both eyes IOP < 21 mm Hg, normal and stable RNFL thickness and normal visual fields without hypotensive drop. Patient 4 had a RNFL glaucomatous damage with a normal visual field at first examination bilaterally; both eyes showed a progression of the RNFL damage during follow-up; a visual field defect appeared in the left eye; both eyes had intensification of hypotensive drops during the follow-up (dual therapy at first visit and triple fixed-combination of hypotensive drops at last follow-up visit).

Among the 6 eyes (patients 1, 2, 3) with open angle (Fig. 3) at first examination: patients 1 and 2 already had LPI before on both eyes and were treated by a single (patient 1) or a dual hypotensive drop therapy (patient 2); both patients underwent selective laser trabeculoplasty on both eyes in order to maintain IOP under 21 mm Hg; normal and stable RNFL thickness and normal visual fields were observed during the follow-up. Among the 3 patients with open angle at first examination, patient 3 did not have LPI before; she underwent UBM-guided LPI bilaterally during the follow-up because her irido-corneal angles tended to narrow in darkness; a hypotensive drop was prescribed during the follow-up because a significant alteration of the RNFL thickness with normal visual field in her left eye occurred. Among these 6 eyes, patient 1 developed loss of vision secondary to senile cataract and underwent standard phacoemulsification on both eyes without per nor postoperative complications (no malignant glaucoma in particular).

Patients in the “Angle closure” group were significantly younger than in the groups “Open angle” and “Narrow angle” (respectively 40; 61 and 65-year old; $P=0.017$, Kruskal-Wallis test). The sex ratio (male/male+female) was significantly higher in the “Angle closure” group than in the groups “Open angle” and “Narrow angle” (respectively 1; 0.61 and 0.65; $P=0.007$, $\chi^2$ test). Visual acuity at last visit, IOP at first visit, IOP at last visit and CCT were not statistically different between the 3 groups ($P=0.054$, 0.21, 0.19, and 0.11, respectively; Kruskal-Wallis test).

The presence of RNFL damage at last visit was significantly higher in the group “Angle closure” than in the groups “Open angle” and “Narrow angle” (respectively 100%; 17% and 25%; $P=0.023$, $\chi^2$ test). However, RNFL thickness at last visit, RNFL loss between first visit and last visit and visual field damage at last visit were not significantly different between the 3 groups (respectively $P=0.22$, Kruskal-Wallis test; $P=0.051$, Kruskal-Wallis test; $P=0.93$, $\chi^2$ test).

DISCUSSION

To the best of our knowledge, this study is the first work reporting a long-term follow-up of a cohort of bilateral and multiple CBC.

The exact pathogenesis of CBC remains undefined. The traction theory[17] suggests that a CBC may represent a separation of the nonpigmented and pigmented epithelia of the ciliary body resulting from traction from the lens ligaments during fetal life. The constant working of the zonule during accommodation may increase the size of the cysts in children and young adults. Conversely, presbyopia and weakening of lens ligament tension in older subjects could explain the lower incidence of cysts with age.

A Brazilian review of the literature[18] about glaucoma secondary to CBC discussed treatment modalities: most patients had LPI or pilocarpine drops which were nevertheless in most cases ineffective to widen the irido-corneal angle; some patients were treated by iridoplasty which sometimes enabled IOP control; a limited number of patients underwent trabeculectomy. However, this study only describes isolated case reports of multiple and bilateral CBC; the literature lacks information about the prognosis of this rare entity.
Our work shows that the prognosis of multiple CBC highly depends on the presence of PAS: all the eyes with PAS at first examination showed a progression of the optic nerve damage during the follow-up and 3 eyes out of 4 required filtering surgery. Nonpenetrating deep sclerectomy is obviously not adequate in these cases of irreversible angle closure.

FIGURE 1. Ultrasound biomicroscopic images of bilateral and multiple ciliary body cysts (patient 1). The red arrow indicates the scleral spur. A, Right eye: radial sections (1, 3, 5, 6) showing an open angle and multiple ciliary body cysts causing inconstant and incomplete pseudoplateau iris configuration (sections 3 and 6); transverse sections (2, 4) showing typical cysts between ciliary processes. B, Left eye: radial sections (1, 2, 3, 6) showing an open angle and multiple ciliary body cysts causing inconstant and incomplete pseudoplateau iris configuration (sections 1 and 6); transverse sections (4, 5) showing typical cysts between ciliary processes.
trabeculectomy was thereby performed in each case. However, the prognosis is good since these eyes kept very good vision and stable visual field after surgery. Patients in the “Angle Closure” group were significantly younger. This could be due to the fact that their CBC are symptomatic because complicated by ocular hypertension and/or glaucoma. Conversely, patients with multiple CBC but open angle can be unnoticed for many years.

Multiple CBC can cause angle closure which may be reversible if LPI is performed when needed. However, in 2 eyes with reversible angle closure at first examination, even if LPI was performed, we observed progression of the RNFL loss. This observation can be explained by damage of the TM caused by previous irido-trabecular contact. However, in multiple CBC the iris root is pushed forward as in iris plateau syndrome, therefore suppressing the pupillary block by LPI may not be always sufficient. Argon LPI may be useful in these cases.

In our study, only patient 2 (2 eyes) had long-term prescription of topical 2% pilocarpine (1 drop before sleeping) to prevent elevation of IOP during sleeping because these eyes had narrow angles in darkness despite LPI. Peripheral iridoplasty could have been discussed in this case to avoid long-term used of pilocarpine which can cause posterior synechia. In eyes with open angle after LPI, medical therapy was in most cases enough to keep a normal IOP and to preserve the optic nerve despite the age-related growth of the lens. Even if laser iridocystotomy has been described, we only performed standard LPI in order to avoid hypothetical inflammation or IOP spike after cystotomy.

Dynamic indentation gonioscopy should be performed frequently during the follow-up of these eyes with multiple and bilateral CBC to be sure that the iridocorneal angle remains open with the age-related lens growth.
CONCLUSION

This first long-term cohort of bilateral and multiple CBC suggests the necessity to early detect multiple CBC to perform LPI before PAS, and thereby irreversible angle closure occur. Multiple CBC with irreversible angle closure required trabeculectomy in 75% of cases in our cohort with however good visual outcomes. The prognosis of multiple CBC with open angle after LPI seems to be much better with a control of IOP and/or glaucoma in most cases with only a topical medical therapy. Retrospectively, PAS extension in multiple and bilateral CBC suggests that this rare entity must be referred to glaucoma specialists to perform appropriate treatment when necessary.

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