

Risk factors for development of phthisis bulbi in patients with posttraumatic ciliochoroidal detachment

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Background: Ciliochoroidal detachment (CCD) is one of the most severe traumatic ocular injuries that aggravates the course of post-traumatic process, usually results in phthisis bulbi and eye destruction, and is found in 9.0% to 30.8% of ocular trauma patients.

Purpose: To determine the risk factors for the development of phthisis bulbi in severe ocular trauma patients with CCD based on the analysis of clinical course and treatment outcomes.

Materials and Methods: We retrospectively reviewed the charts of 77 patients (77 eyes) with severe ocular trauma complicated by CCD who underwent treatment at the Filatov Institute during 2013 to 2015. The Aviso Ultrasound Biomicroscopy Unit (Quantel Medical, France) with 20-MHz and 50-MHz short focus probes had been used to evaluate the position of the ciliary body and the height of the detachment.

Results: Phthisis bulbi was found to develop in 80% of patients with annular CCD, in 45.0% of patients with penetrating corneal and scleral injuries complicated by retinal detachment, and in 27.5% of patients with ocular contusion followed by rupture of ocular tunics and retinal detachment.

Conclusion: Extent of CCD and specific types of ocular injury (a penetrating corneoscleral injury complicated by retinal detachment as well as an ocular contusion with rupture of the ocular tunics) are the main risk factors for the development of phthisis bulbi in severe ocular trauma patients with CCD.

Key words: ocular trauma, ciliochoroidal detachment, risk factors, phthisis bulbi

Introduction

Ciliochoroidal detachment (CCD) is one of the most severe traumatic ocular injuries that aggravates the course of post-traumatic process, usually results in phthisis bulbi and eye destruction, and is found, according to different authors, in 1.0% to 9.0% of ocular trauma patients [1-4]. Reported CCD rate data vary widely, at least in part due to variation in the techniques used for detecting the CCD. The use of sensible diagnostic methods (i.e., those based on ultrasound platforms with 20-MHz and 50-MHz high frequency short focus probes; contact-free droplet echography) have resulted in narrower ranges of detection rates (with mean values of up to 30.8%) [1].

Since CCD causes serious sequelae, and the methods available for treatment of posttraumatic CCD are insufficiently effective, posttraumatic CCD can lead not only to reduced visual acuity, but also to incapacitation of the patient [2, 5].

The purpose of the study was to determine the risk factors for the development of phthisis bulbi in severe ocular trauma patients with CCD based on the analysis of clinical course and treatment outcomes.

Materials and Methods

We retrospectively reviewed the charts of 77 patients (77 eyes) with severe ocular trauma complicated by CCD who underwent treatment at the Filatov Institute during 2013 to 2015. Targeted treatment for CCD was an exclusion criterion.

The age of most of the patients (77.9%) was 20 to 50 years. They had experienced ocular contusion (50.6%) and penetrating globe injuries (49.4%). Most of the patients (58.4%) were observed early (within a month) after a traumatic event. The Aviso Ultrasound Biomicroscopy Unit (Quantel Medical, France) with 20-MHz and 50-MHz short focus probes was used to evaluate the position of the ciliary body and the height of the detachment.

Results and Discussion

The analysis of clinical course of CCD secondary to trauma showed that severe damage to different ocular structures had been observed in all affected eyes of the study. The most common types of ocular damage were corneal and scleral damage (injuries, scars and opacities), iris damage, lens damage, ocular hemorrhage and retinal detachment, which were found in 31.2%, 49.3%, 70.1%, 70.1% and 67.5% of patients, respectively. Uveitis was diagnosed in 42.9% of patients. Among the patients observed for more than a month, the initial stage of phthisis bulbi was found in 33.8%. The extent of CCD also varied among patients. CCD involved 100%, up to s, up to 1/2, and up to j, of the circumference of the globe in 70.1%, 6.5%, 15.6% and 7.8% of patients, respectively. In most of patients (51/77, or 66.2%),

visual acuity was light perception with inaccurate light projection or worse, and 40 of these 51 patients had annular CCD. Visual acuity was light perception with accurate light projection, 0.01 to 0.09, 0.1 to 0.2, and 0.3 or better in 20.8%, 7.8%, 2.6% and 2.6% of patients, respectively.

In 75.3% of patients, hypotony of different degrees was observed in the affected eye at all observation time points: the intraocular pressure (IOP) was less than 12.0 mmHg, 12.0 mmHg, and 13.0 to 15.0 mmHg in 27.3%, 32.4% and 15.6% of patients, respectively. This was significantly lower than that for the fellow eye.

Axial length (AD) measurement was performed in fellow eyes of 61 patients with CCD and the AD in the affected eye was found to be less than that in the fellow eye in the vast majority (78.7%) of them. Most of CCD patients with reduced axial length in the affected eye (65.6%) had annular CCD.

All severe ocular trauma patients with CCD underwent either surgical treatment (81.8%) or medical treatment (18.2%). Debridement of corneal and scleral lesions was performed in 10.4% of patients and was followed by transiliary vitrectomy in 7.8% of patients. Lens-related surgeries, transiliary vitreoretinal surgeries and repeat vitreoretinal surgeries were performed in 11.7%, 20.8% and 14.3%, respectively, of patients. Vitreoretinal surgeries were performed mostly in patients with annular CCD.

In most (54.8%) of severe ocular trauma patients with CCD, surgical treatment was performed within a month after a traumatic event. In 70.4% of patients, vitreoretinal surgeries were performed within two months after a traumatic event.

Later clinical outcomes in 70 severe ocular trauma patients with CCD were analyzed following medical or surgical treatment (not involving targeted treatment for ciliochoroidal detachment). The observation periods ranged from 2 months to 2.5 years after a traumatic event. Visual acuity remained unchanged in most of patients with (a) annular CCD (71.4%; light perception with inaccurate light projection or worse), CCD involving (b) up to 1/2 of the circumference of the globe (72.7%), and (c) up to j of the circumference of the globe (100% of patients). The affected eye of 22.8% of patients was able to perceive the shape of objects in the direct line of sight (with the visual acuity of 0.01 to 0.3).

Of 61 CCD patients (61 eyes) in whom the IOP was measured in the late post-trauma period, in 46 (75.4%), marked hypotony persisted.

Varying degrees of hypotony were observed in 76.75%, 60.0% and 60% of patients who had CCD involving the entire circumference, up to 1/2 of the circumference and up to j of the circumference of the globe, respectively.

At the late observation time point, the extent of CCD remained unchanged, increased from s to the entire circumference, increased from 1/4 to s of the circumference, reduced from s to j of the circumference, reduced from the entire circumference to j of the circumference of the globe in 81.2% (including unchanged annular CCD in 68.8% of patients), 6.2%, 3.2%, 3.1%, and 3.1%, respectively. Additionally, reattachment of CCD was observed in 3.1%.

Table 1. Difference in axial length between fellow eyes in patients with varying extent of ciliochoroidal detachment developed in the late observation period

CCD extent, quadrants of the circumference	Number of patients	Difference in axial length between fellow eyes, mm									
		0	1	2	3	4	5	6	7-9	10 and more	
1/4	5			3				1		1	
1/2	7	1		2	2		1	1			
3/4	3	2				1					
4/4 (annual CCD)	40	3	2	6	5	3	7	4	8	2	
Total patients	55	6	2	11	7	4	8	6	8	3	

Table 2. Development of phthisis bulbi in patients with severe ocular traumas complicated by CCD

Type of traumatic ocular injury	Number of patients	%
Ocular contusion with retinal detachment	1	2.5
Ocular contusion with hemorrhage	1	2.5
Ocular contusion with rupture of the ocular tunics and hemorrhage	4	10.0
Ocular contusion with rupture of the ocular tunics and retinal detachment	11	27.5
Penetrating corneal and scleral injury with hemorrhage	2	5.0
Penetrating corneal and scleral injury with IOFB	1	2.5
Penetrating corneal and scleral injury with retinal detachment	18	45.0
Perforating corneal and scleral injury with retinal detachment	1	2.5
Blast injury with retinal detachment	1	2.5
Total patients	40	100.0

In the late observation period, difference in axial length between fellow eyes was found in 89.1% of patients subjected to this examination. This rate in patients with annular CCD was 92.5% (Table 1).

The data presented demonstrate that, in most of ocular trauma patients with CCD, the IOP remained low, and a significant difference in axial length between fellow eyes developed at the late observation time point. Phthisis bulbi developed in 72.7% of 55 patients with this disorder. Eleven point four per cent of 70 patients observed in the late observation period had their eye enucleated.

Patients with traumatic retinal detachment following penetrating corneal and scleral injuries and those with rupture of ocular tunics and traumatic retinal

detachment following ocular contusion were the two most common categories (45% and 27.5%, respectively; Table 2) of patients who developed phthisis bulbi during the late observation period.

Conclusion

The analysis of data obtained enabled us to determine the main risk factors for the development of phthisis bulbi in patients with severe ocular traumas complicated by CCD.

The first risk factor is annular CCD which usually (68.8% of cases) remained unchanged in extent during the late observation period. In 80.0% of patients with annular CCD, the affected eye developed phthisis bulbi, a significant difference (≥ 2 mm) in axial length between fellow eyes developed, and marked hypotony persisted during the late observation period.

Two other risk factors for the development of phthisis bulbi in patients with severe ocular traumas complicated by CCD are related to the nature of ocular injury. Most

commonly, phthisis bulbi was observed following a penetrating corneoscleral injury complicated by retinal detachment (45.0%) and following an ocular contusion with rupture of the ocular tunics and traumatic retinal detachment (27.5%). Consequently, these types of injuries can be considered risk factors for the development of phthisis bulbi in patients with severe ocular traumas complicated by CCD in the late post-trauma observation period.

The analysis of data on the clinical course and outcomes of treatment of severe ocular trauma patients with CCD was performed for the patients who had not undergone targeted treatment for CCD. The findings demonstrate that CCD is one of the most severe traumatic ocular injuries, aggravates the course of post-traumatic process, and usually results in phthisis bulbi and eye destruction.

Therefore, development of improved surgical techniques for posttraumatic ciliochoroidal detachment is of the most importance.

References

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