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Traumatic hyphema in children and adolescents – aetiology and treatment

Pourazowy wylew krwi do komory przedniej u dzieci i młodzieży – przyczyny i leczenie

Beata Urban[1], Alina Bakunowicz-Łazarczyk[1], Marta Michalczuk[2]

[1] Department of Pediatric Ophthalmology and Strabismus, Medical University of Bialystok, Poland
Head: Professor Alina Bakunowicz-Łazarczyk, PhD, MD
[2] Department of Pediatric Ophthalmology and Strabology University Children Hospital of Bialystok, Poland
Head: Professor Alina Bakunowicz-Łazarczyk, PhD, MD

Abstract: Purpose: Retrospective analysis of patients with traumatic hyphema, including type of injury, treatment and visual outcome.
Material and methods: We analysed a cohort of patients after blunt trauma, who were examined and treated between 2011––2015. In each case, the baseline and ultimate visual acuity was determined, followed by slit lamp examination, intraocular pressure measurement, indirect binocular ophthalmoscopy of the fundus, ultrasound scan and OCT Visante. The type of treatment as well as duration of inpatient treatment and late complications were assessed for each case.
Results: 45 patients (45 eyes) with traumatic hyphema due to blunt ocular trauma were enrolled. 42 of them were boys (93.3%), and 3 were girls (6.7%). The age range was 2.5–17.5 years (mean age of 11.92 ± 3.75 years). Upon admission, 10 (22.2%) children had full visual acuity (1.0). The most common injuries concomitant with hyphema included iridodialysis, corneal oedema, mydriasis and corneal erosion. Secondary hemorrhage occurred three days following injury in only one (2.2%) patient. The mean duration of inpatient admission was 4.3 days (ranged from 2 to 8 days). At the last follow-up visit, 36 (80%) patients had a full visual acuity of 1.0.
Conclusions: Visual outcomes improve with earlier treatment commencement. Conservative management was sufficient to resolve traumatic hyphema in reported cases.

Key words: hyphema, treatment, children, adolescents.

Abstrakt: Cel pracy: retrospektywna analiza przypadków pacjentów z pourazowym krwistkiem z uwzględnieniem przyczyny urazu, metod leczenia i późnych następstw urazu narządu wzroku.
Materiał i metody: badania wykonano u pacjentów, którzy doznali urazu tępego narządu wzroku i byli hospitalizowani w latach 2011–2015. Oceniano ostrość wzroku podczas przyjmowania do kliniki i podczas wypisywania z niej, wykonano badanie w lampie szczelinowej, oftalmoskpię, pomiar ciśnienia wewnątrzgałkowego, badanie ultrasonograficzne i badanie optycznej tomografii komputerowej Visante. Przeanalizowano skuteczność leczenia, czas trwania hospitalizacji i późne powikłania.
Wyniki: badaniami objęto 45 pacjentów (45 oczu) z pourazowym krwistkiem: 42 chłopców (93,3 %) i 3 dziewczynki (6,7%). Średni wiek pacjentów wynosił 11,92 ± 3,75 roku (od 2,5 roku do 17,5 roku). Podczas przyjmowania do kliniki 10 pacjentów (22,2%) miało ostrość wzroku 1,0. Krwistkowi towarzyszyły: irydodializa, obrzęk rogówki, mydriaza pourazowa i erozje nabłonka rogówki. Ponowne krwawienie wystąpiło po 3 dniach od urazu i tylko u 1 pacjenta (2,2%). Czas trwania hospitalizacji wynosił od 2 do 8 dni (średnio 4,3 dnia). Podczas ostatniej kontroli 36 pacjentów (80%) miało pełną ostrość wzroku.
Wnioski: w większości przypadków stan miejscowy ulega poprawie, jeśli leczenie zostanie wdrożone szybko. Jeśli dochodzi do absorpcji krwistka, terapia zachowawcza jest skuteczna.

Słowa kluczowe: wylew krwi do komory przedniej, leczenie, dzieci, młodzież.

Introduction

Ocular trauma is a prominent cause of visual disability, which contributes, depending on population, up to 65% of cases of unilateral blindness worldwide. In most studies, the largest affected groups are children or young adults, so the socioeconomic implications of this condition are even more serious (1–3). Hyphema is a common finding in cases of mechanical ocular injury. Blood in the anterior chamber can accumulate after a blunt or lacerating trauma. Traumatic hyphema is a diagnostic and therapeutic emergency (4, 5) which typically requires local, conservative management (6–9). Surgery is spared for complicated cases, yet it needs to be studied further. Major complications of hyphema include secondary hemorrhage, secondary glaucoma, corneal staining and visual acuity decrease (10, 11).

In our retrospective study we aimed to determine the aetiology of hyphema following blunt ocular trauma in childhood, to evaluate its complications and treatment outcomes as well as to identify prognostic factors for visual outcomes.

Material and methods

The research was carried out at the Department of Pediatric Ophthalmology and Strabismus, Medical University of Bialystok,

Poland its the protocol was approved by the local Internal Review Board. Medical records of consecutive patients with traumatic hyphema seen at University Children Hospital between January 1, 2011, and December 31, 2015, were retrospectively reviewed. 45 eyes of 45 patients after blunt trauma were enrolled. The study cohort included 42 boys (93.3%) and 3 girls (6.7%). The age range was from 2.5 years to 17.5 years (mean age of 11.92 ± 3.75 years). Patients with prior ocular trauma, pre-existing ocular conditions affecting the visual acuity, as well as those with a history of previous intraocular surgery were excluded.

The following data was recorded: patient age, sex, injury location, visual acuity upon admission and at the end of the follow-up, intraocular pressure (assessed with Tono-Pen), extent of hyphema, its grading, rebleeding and clearance time, corneal clarity, as well as other ocular abnormalities upon admission and at the end of the follow-up. All patients had slit lamp examination and binocular indirect ophthalmoscopy performed. Additionally, if clinically indicated, ocular ultrasound and/or OCT Visante were also performed. We analysed implemented treatment modalities, the duration of inpatient admission and late complications (sequelae).

Results

The most common place of injury in our study group was home (57.8%), followed by school (42.2%). Twenty one patients sustained a right eye injury (46.7%) and 24 a left eye injury (53.3%). The vast majority of cases presented between April and August (35 cases – 77.8%) with only 10 cases occurring between September and March (22.2%). The most common causes of injury were: shot with a plastic bullet from a toy gun (9 cases – 20%), and strike with a ball during a sport acitvity. Table I summarises the causes of blunt injuries.

Cause of injury/ Przyczyna urazu	Number of cases (%)/ Liczba przypadków (%)
Small plastic or rubber bullet/ Mała plastikowa lub gumowa kulka	9 (20%)
ball/ piłka	9 (20%)
wood/ drewno	6 (13.3)
impact/ zderzenie	6 (13.3)
animal/ zwierzę	2 (4.4%)
Other (chestnut, plum, bottle cup, plastic bottle etc.)/ Inne (kasztan, śliwka, korek, plastikowa butelka)	9 (20%)
Unknown/ Nieznana	4 (8.9%)

Tab. I. The most common causes of eye injury.
Tab. I. Najczęstsze przyczyny urazów.

Forty two children were taken to hospital within the initial 12 hours following the injury (93.3%) and only in 3 children aged 2.5–4 years parents allowed 1 to 3 days before going to hospital (6.7%). Upon admission, 10 children had a visual acuity of 1.0 (22.2%), in 14 patients it was decreased to hand movements or worse (31.1%). Conservative management led to the ultimate visual acuity of 1.0 in 36 patients (80%). Most hyphemas were small, involving less than one-third of the anterior chamber volume. The most common injuries concomitant with hyphema included: corneal erosion (11 eyes), mydriasis (5 eyes), corneal oedema (2 eyes) and iridodialysis (2 eyes). In all patients, ultrasound scan of the injured eye was normal. Intraocular pressure (IOP) was below 21 mmHg in all cases. The mean duration of inpatient admission was 4.3 days (ranged from 2 to 8 days), and all children were discharged as soon as hyphema resolved. Secondary hemorrhage occurred on day 3. following injury in only one patient (2.2%). All patients were ordered to a complete bed rest with head elevation and a patch on both eyes. Medical treatment included topical corticosteroids, troxerutin eyedrops, intravenous Cyclonamine (Etamsylate) and cycloplegics. The mean follow-up period was 9.6 months and at the last appointment 36 patients (80%) had the full visual acuity of 20/20. Table II shows the sequelae of ocular trauma observed in our cohort.

Ocular abnormality/ Rodzaj zmiany	Number of eyes (%)/ Liczba oczu (%)
Mydriasis/ Mydriaza	5 (11.1%)
Iridodialysis/ Irydodializa	2 (4.4%)
Choroidal rupture within the macula/ Pęknięcie naczyniówki w plamce	1 (2.2%)
Macular hole/ Otwór w plamce	1 (2.2%)
Post-traumatic retinopathy/ Retinopatia pourazowa	1 (2.2%)

Tab. II. Clinical sequelae of ocular trauma with hyphema.
Tab. II. Nastepstwa urazów narządu wzroku z krwistkiem.

Discussion

Traumatic hyphema in a paediatric patient still poses a clinical dilemma for an ophthalmologist. There choice of optimum management remains controversial, as there are no standardised treatment guidelines (7, 9). It is usually seen in children or young adults with an incidence of approximately two per 10.000 children per year (11). Higher incidence in boys was reported with the boy to girl ratio ranging from 2:1 to 6:1 (4, 12). The above is in line with our findings – our cohort consisted of 42 boys (93.3%) and only 3 girls (6.7%). Similarly, Rocha et al., reported that 85.7% of children with traumatic hyphema were male (13). Our observation of the highest incidence in late spring and summer (35 cases; 77.8%) is in agreement with the one by Ghafari et al. whose 11 cases (39.3%) of hyphema occurred in summer (4). Sports injuries account for 60% of traumatic hyphemas (8), yet in our cohort only 20% of patients got injured when playing ball games.

Hyphema can be a sign of an unfavorable visual prognosis (14, 15). Along with the presence of blood, one or more potential major ocular injuries can lead to a significant vision reduction (7). In a child-based study, Gupta et al. observed that the absence of the red reflex could reflect the severity of the injury whereas hyphema was the main reason for its absence (10). In our cohort, 10 eyes (22.2%) initially had the full visual acuity

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visual acuity of 1.0 and in 14 eyes the visual auity was hand movement or worse (31.1%). After treatment, 12 eyes (20%) achieved the visual acuity below 1.0. Decreased visual acuity in three patients was caused by the observed post-traumatic fundus abnormalities (Tab. II). Rocha et al. (13) reported similar findings of their prospective evaluation of thirty-five children with traumatic hyphema, concluding that there is a statistically significant positive association between the unsatisfactory ultimate visual acuity (below 20/30) and the posterior segment injury and severity of hyphema. In young children, the follow--up is crucial, as the factors potentially leading to amblyopia or strabismus may be either prevented or resolved over that period. Posterior wound location, sometimes seen in traumatic hyphema, may cause severe damage to the photoreceptors within the retina and the optic nerve, thus indicating poor visual prognosis (14).

In our study, most hyphemas were small, involving less than one-third of the anterior chamber volume. Objective grading is critical in hyphema, because a sudden increase in its thickness may be indicative of rebleeding. Similarly, immediate IOP measurement and a dilated fundus exam (to rule out traumatic retinal tears, dialyses, and detachment) should also be performed as early as possible following the resolution of hyphema.

Traumatic hyphema constitutes an emergency in ophthalmology. In children, more protective and preventive measures should be implemented. Some of them appear controversial, for example: use of various medications (e.g., cycloplegics or myotics, systemic or topical steroids, antifibrinolytics, analgesics, and antiglaucoma medications); patching/ shielding; the patient's activity level; outpatient vs. inpatient management; and medical vs. surgical management. All patients from our cohort were ordered to a complete bed rest with head elevation wearing a patch on both eyes. Medical teatment included topical corticosteroids, troxerutin eyedrops, intravenous Cyclonamine (Etamsylate) and cycloplegics. Surgery or antifibrinolytics were not used in any case.

In most cases of hyphema the blood is absorbed spontaneously. However, sometimes a secondary hemorrhage may occur. Recurrent hemorrhage (the appearance of fresh blood in the eye after the initial trauma), which occurs in 2% to 38% of cases, increases the time to visual recovery and has been associated with poorer visual outcomes (6). Secondary hemorrhage typically occurs within three to five days after the initial bleeding, due to the clot lysis and the pulling force affecting the damaged vessels. It is generally thought to be associated with less favourable visual prognosis, although the outcome may depend more directly on the extent of the hyphema and the severity of concomitant ocular injury (6). Complications resulting from secondary hemorrhage include corneal blood staining, peripheral anterior synechiae, elevated intraocular pressure, and development of optic nerve atrophy (7). It may also lead to the permanent loss of vision. In our study, though, secondary hemorrhage occured in only one patient (2.2%), on day 3. following the injury. At discharge, after the 8-day inpatient treatment, he had no trace of blood within the anterior chamber. The complete bed rest with head elevation wearing a patch on both eyes may be what contributed to such low incidence of secondary haemorrhage in our cohort. Coats et al. studied outpatient management of traumatic hyphemas in 25 children below 16 years of age. They were recommended inactivity at home with frequent office visits to monitor progress and complications (9). All patients received protective eye shields and topical steroids. Authors observed that 3 patients (12%) suffered a rebleed and one required surgery for clot evacuation, but their final visual acuity was either 20/30 or better. Gharaibeh et al. having analysed 20 randomized and 7 quasi-randomized studies in 2643 subjects with traumatic hyphema found no statistically significant difference in the effect of a mono- versus binocular patch, and outpatient treatment versus a complete bed rest in an inpatient setting, as well as head elevation versus lying flat, on the risk of secondary hemorrhage or time to rebleed, due to the small cohort and low incidence of complications, therefore the scientific evidence in this regard is inconclusive (7). Walton et al. advise a routine use of topical cycloplegics and corticosteroids, systemic antifibrinolytic agents or corticosteroids, and a rigid shield. They recommend activity restriction (quiet ambulation) and interdiction of non-steroidal anti-inflammatory agents (6). If patient compliance (with medical treatment regimen or activity restriction), follow-up, or increased risk for complications (e.g., history of sickle cell disease, haemophilia) are not an issue, outpatient management can be offered. Indications for surgical intervention include e.g. corneal blood staining or severely elevated intraocular pressure persisting despite the maximum tolerated medical therapy (6, 16).

Conclusions

The choice of therapeutic modality in children with hyphema, whether to include corticosteroids, cycloplegics, or non--drug interventions (such as binocular patching, bed rest, or head elevation), should remain individualized, as there is no strong scientific evidence to support the benefits of any. Since these multiple interventions are rarely used in isolation, further research to assess the additive effect of their different combinations might be of value.

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Reprint requests to (Adres do korespondencji):
Beata Urban, MD
Department of Pediatric Ophthalmology and Strabismus,
Medical University of Bialystok, Poland
17 Waszyngtona Street
15-274 Bialystok
e-mail: urbanbea@umb.edu.pl

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