Traumatic hyphaema: a retrospective study of 314 cases

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Abstract

A retrospective study was made of 314 consecutive cases of traumatic hyphaema in a mixed urban and rural Scottish population. Secondary haemorrhage occurred in 4.1% of cases and was not associated with a worsening of final visual acuity. There were no identifiable risk factors for secondary haemorrhage. Poor visual outcome was in most cases attributable to retinal pathology. The use of antifibrinolytic agents does not appear to be necessary in such a population, and the importance of detecting associated retinal detachment is emphasised.

Traumatic hyphaema is regarded as a sign of ocular trauma requiring, in most centres, admission to hospital. It is almost invariably associated with damage to the anterior segment and frequently to the posterior segment.¹⁻⁵ Hospital treatment aims at promoting resolution of the anterior chamber clot, prevention of further haemorrhage and associated complications, and identification and treatment of any posterior segment injuries.

Secondary haemorrhage has come to be considered the single most important complication of traumatic hyphaema, and in recent years a wealth of literature from North America and Scandinavia has been produced as attempts have been made to prevent its occurrence.⁶⁻¹³ As a result of this work antifibrinolytic agents have been found effective in reducing secondary haemorrhage and are now widely used as prophylactic treatment.

It has not been the policy in our unit to use antifibrinolytic agents on patients with traumatic hyphaema. Our impression has been that re-bleeding is an infrequent occurrence and that when it does occur it is not associated with a significant deterioration in visual prognosis. Furthermore we have tended to regard posterior segment damage as the most important consideration in these patients.

To establish whether these impressions were correct the following retrospective study was performed.

Material and methods

The Princess Alexandra Eye Pavilion receives the majority of emergency ophthalmology referrals from Lothian Region, population approximately 750 000. Our policy is to admit all patients with traumatic hyphaema and, where possible, prescribe bed rest for several days until most of the hyphaema has resolved. However, children are rarely, if ever, maintained on strict bed rest; the most that can be achieved is preventing excessive exertion and further possible eye trauma. Furthermore, many adult patients are mobilised as early as the second day after injury, and so bed rest is not applied rigidly during the danger period for rebleeding.

Although patients with microscopic hyphaema are not routinely admitted, some are admitted at the discretion of the examining doctor, and therefore a number were included in the study.

During the period 1 March 1981 to 29 February 1988, 375 patients were admitted with traumatic hyphaema. The case records of 334 (89%) of these patients were available for review.

Twenty (6%) of the 334 were excluded on the grounds that they did not fulfil the criteria of hyphaema secondary to blunt trauma (for example, post-operative, following penetrating injury, or secondary to rubeosis iridis or other pathology) leaving a total of 314 cases.

The following information was extracted from the notes; name, date of birth, age, sex, date of injury, date of admission and medical history, mechanisms of injury, visual acuity, size of hyphaema, intraocular pressure, abrasion and other ocular injuries, funduscopy findings, complications, duration of hyphaema, length of stay in hospital, gonioscopy findings, final visual acuity, and length of follow-up.

For the purposes of the study the size of the hyphaema was classified as follows: grade 1, those filling up to 25% of the anterior chamber; grade 2, up to 50%, grade 3, up to 75%; grade 4, 75% and over.

Results

Data were collected over a seven-year period on a total of 314 patients. The annual incidences are shown in Figure 1. Distribution according to age showed a peak incidence among those aged 10-19 years (Fig 2); 78% of all patients were under 30 years of age. There was a marked preponderance of males (male:female ratio 5.4:1). The mean follow-up period was five months.

Mechanisms of injury are summarised in

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Figure 1 Annual incidence of traumatic hyphaema.

Figure 2 Age distribution of patients with traumatic hyphaema.

Table 1. Sporting injuries accounted for 39.2% of all cases, criminal assault 20.7%, accidents in the home, 17.8%, and accidents at work 9.9%.

Various associated injuries and complications are listed in Table 2. Traumatic mydriasis was the commonest feature, present in 55.7% of cases. Intraocular pressure was raised (above 25 mmHg) in 22% of patients at presentation. In all but three cases the intraocular pressure was normal by the time of discharge. Of the three exceptions two required anterior chamber wash-out for 'blackball hyphaema', and the third had a more prolonged duration of raised pressure, requiring continued β blocker treatment. This patient was lost to follow-up after only two months and had only minimal angle recession on gonioscopy.

Gonioscopy was performed so infrequently that no conclusion could be reached as to the prevalence of angle recession. However, of the 20 eyes examined 15 had some degree of angle recession. The size of hyphaema at presentation is shown in Table 3. The table also shows the incidence of rebleeding, associated with each grade of initial hyphaema. The numbers of grades 3 and 4 hyphaema are too small, as are the rebleed rates, to show any statistically significant association between size and risk of secondary haemorrhage.

Thirteen patients (4.1%) suffered secondary haemorrhage in hospital. No factor studied was associated with an increased risk of rebleeding, including age, sex, mechanism, of injury, or grade of initial hyphaema. In all cases rebleeding occurred between two and four days after the injury. The secondary bleed was small in 11 cases. In two cases the anterior chamber became entirely filled with blood. However, all cases resolved with further bed rest, and only one of the patients with the total hyphaema required acetazolamide for control of raised intraocular pressure. The final visual acuity was 6/9 or better in all but one case, in which vision was reduced owing to macular scarring.

A further seven patients presented with apparent secondary haemorrhage – a history of sudden pain and reduction in vision occurring two to four days after blunt trauma to the eye. All patients in this group regained 6/12 vision or better. Both patients who required anterior chamber washouts were in this group.

Only 3 patients were observed who developed glaucoma as a delayed or late complication. One of these, discussed above, was lost to follow-up. Of the remaining two, one was a young woman who sustained an initially large hyphaema which

Table 1 Mechanism of injury

Mechanism of injury	No	%
Accident in the home	56	17.8
Accident at work	31	9.9
Sport		
Football	45	14.3
Squash	31	9.9
Badminton	16	5.1
Tennis	10	3.2
Golf	7	2.3
Hockey	4	1.3
Rugby	4	1.3
Volleyball	2	0.6
Cricket	1	0.3
Martial Arts	1	0.3
Other Sports	2	0.6
Total	123	39.2
Assault		
Missile	34	10.8
Other	31	9.9
Total	65	20.7
Play*	32	10.2
Unspecified	7	2.2

*Group of children: injury occurred during unsupervised play; exact mechanism of injury unclear.

Table 2 Complications of blunt trauma associated with hyphaema

Complications	No	%
Immediate		
Traumatic mydriasis	175	55.7
Corneal abrasion	132	42
Comotio	36	11.5
Lid laceration	23	7.3
Vitreous haemorrhage	15	4.8
Choroidal rupture	14	4.5
Rebleed	13	4.1
Fracture	8	2.5
Iridodialysis	11	3.5
Retinal haemorrhage	9	2.9
Corneal laceration	3	1
Dislocated lens	3	1
Retinal tear	2	0.6
Retinal detachment	1	0.3
Optic nerve damage	1	0.3
Delayed/late		
Cataract	15	5.1
Recurrent iritis	7	2.2
Glaucoma	3	1
Late retinal detachment	3	1
Macular scar	3	1
Corneal staining	1	0.3

Table 3 Size of hyphaema and incidence of rebleed

Grade	No of cases	No of rebleeds	%
1	244	10	4
2	47	2	4
3	9	1	11
4	8	0	0
Total		13	

settled with conservative management, but she was readmitted eight days after the initial injury because of an acute 'ghost cell' glaucoma. This again settled with conservative management. The final patient suffered angle recession of greater than 180° and required trabeculectomy six months after the injury to control the intraocular pressure.

Sixteen patients developed lens opacities, though the exact nature and extent was rarely recorded. Three patients required lens extraction; one required extracapsular extraction and vitrectomy for a dense cataract with associated vitreous haemorrhage (Table 4, patient 1). A second had lensectomy following anterior chamber washout of a 'blackball' hyphaema, and a third had lensectomy and anterior vitrectomy for a dislocated lens.

Details of patients requiring retinal detachment surgery or prophylaxis for retinal breaks are given in Table 4. Of 15 patients who suffered a

Table 4 Details of patients requiring retinal surgery

Patient	Retinal Injury (Visual acuity at initial examination following injury)	Location	Period between injury and diagnosing of retinal injury	Treatment	Final visual acuity	Other features
1	Retinal tear (PL)	Superonasal	>One week	Vitrectomy and endolaser	HM	Orbital FB removed. Macular choroidal rupture. Vitrectomy and endolaser combined with extra-capsular lens extraction (cataract)
2	Retinal horseshoe tear with traction (6/6)	Superotemporal	3 weeks	Cryopexy and encircling band	6/9	
3	Disinsertion (6/5)	Inferotemporal	4 weeks	Cryopexy and encircling band	6/6	
4	Tractional detachment: no tear/hole found (6/9)		11 months	Cryopexy and encircling band	6/24	
5	Disinsertion (6/9)	Superotemporal	3 months	Cryopexy and encircling band	6/60	Had complained of field defect from time of injury
6	Disinsertion (CF)	Superotemporal	Immediate	Cryopexy and encircling band	6/60	Amblyopic eye

CF=counting fingers. PL=perception of light. FB=foreign body.

vitreous haemorrhage only one was found to have an underlying retinal tear. This patient required vitrectomy and endolaser treatment to the tear. One other patient developed gradual condensation of vitreous haemorrhage with tractional retinal detachment (Table 4 patient 4).

Comotio retinae was present in 36 patients – peripherally in 29 cases, at the macula in 7. Three of these developed macular scars.

Five patients suffered blow-out orbital fractures, three others suffering malar and other orbital rim fractures.

Corneal blood staining occurred in only one patient, who presented with a total hyphaema due to secondary haemorrhage. Final visual acuity was 6/12, following anterior chamber washout.

Although the hospital policy was to give no topical treatment unless specifically indicated, 64 patients received topical steroids, nine ocular hypotensive treatment, and 13 both during their stay. Surgical intervention for associated problems was uncommon: one trabeculectomy, two lens extractions, five retinal procedure, and two anterior chamber washouts. Choroidal rupture, occurring in 4.5% of patients, was the single most frequent cause of reduced vision. The mean duration to resolution of hyphaemas was 2.6 days (range 1–10), and the mean hospital stay was 4.8 days (range 1–15).

Table 5 shows the visual acuity, with the cause of reduced vision, for those patients with a final vision worse than 6/12.

General medical and drug histories were unremarkable except in the single case of a child with acute lymphatic leukaemia. Patients had not been questioned about the use of aspirin.

Discussion

The data gathered from our series of 314 patients are generally in keeping with those of major studies previously reported^{1–5 8 14–19} with regard to age and sex distribution, mechanism of injury, frequency of associated ocular trauma, and size of hyphaema. The annual incidence was fairly constant, and the patients were predominantly young and male. In recent years sporting injuries have become a major cause while accidents at work have become relatively less frequent.^{20 21} In our series sport related injuries are four times commoner than work related injuries. Football, squash, and badminton appear to be the most dangerous.

The pattern of anterior segment damage was in keeping with that of previous series.^{5 22} After corneal abrasion, traumatic mydriasis was the most common abnormality found at initial examination. Although gonioscopy was carried out only on a minority of patients, it is known that some degree of angle recession occurs in the great majority of eyes sustaining hyphaema as a result of blunt trauma.²³ However, it is also recognised that glaucoma secondary to angle recession is rare and occurs only when recession is present over more than 240° of the angle.^{22–24}

Table 5 Causes of reduction in visual acuity

Final visual acuity	No of patients	Patient	Cause of decreased visual acuity
PL	1	1	Previous poor VA: Fuchs's heterochromic iridocyclitis with cataract
HM	3	1	Initial post-traumatic VA was HM: nil found. Amblyopia
		2	Choroidal rupture: required vitrectomy, endolaser and cataract extract
		3	Table 4, patient 1
CF	2	1	Macular scar following commotio
		2	Choroidal rupture
6/60	2	1	Choroidal rupture
		2	Retinal detachment
6/36	2	1	Retinal detachment
		2	Cataract
			Patient had rebled. No obvious cause of decreased visual acuity. Acuity prior to rebleed not recorded
6/24	3	1	No cause found
		2	No cause found
		3	Retinal detachment and choroidal rupture
6/18	3	1	Comotio at macula; residual scarring
		2	Cataract
		3	No cause found

CF=counting fingers. HM=hand movement. PL=perception of light.

That such secondary glaucoma is rare seems to be confirmed by our finding of only one such case in our series.

The incidence of secondary haemorrhage in hospital (4.1%) is in keeping with rates found in a larger number of European studies^{6-8 17-19} of patients treated conservatively (5-10%). These figures are considerably lower than those found in most of the American series (16-38%).^{1 2 9-11 16 25} This discrepancy has been recognised for some time, though no convincing explanation has been found. It has been noticed that rebleed rates were higher in populations with larger proportions of black patients.²⁶ In North American series in which the ethnic distribution is similar to Northern European studies the rebleed rates have been close to European rates.^{4 12} This discrepancy remains unresolved and is likely to remain so until a large controlled study taking account of ethnic variation is performed.

Various treatments to reduce the incidence of rebleeding have been assessed: bed rest, patching of one or both eyes, miotics,³ mydriatics,¹⁸ steroids,^{3 18 27 28} and antifibrinolytic agents. Vitamins C and K and even snake venom have been advocated.¹ However, only antifibrinolytic agents have been shown by randomised, prospective studies to be effective in both Europe and North America,^{6-8 9-11 13} though several recent studies have shown no benefit.^{15 29} Even in European studies where rebleed rates are low in placebo and conservatively treated groups antifibrinolytics have been shown to reduce the incidence further. Aminocaproic acid (100 mg/kg four times a day for five days) has become the treatment of choice for traumatic hyphaema in North America and tranexamic acid (25 mg/kg three times a day for five days) in Europe. Side effects such as nausea, vomiting, and hypotension occur in up to 50% of patients taking aminocaproic acid;²⁹ the incidence and severity of side-effects are said to be much lower with tranexamic acid. Although it is considered that full mobilisation is allowed when patients are 'protected' by antifibrinolytics, it must be pointed out that the efficacy of bed rest has never been demonstrated in a controlled study.²⁻⁴

The high incidence of side effects means the use of these drugs can be justified only if a clear benefit can be demonstrated. Although antifibrinolytics do seem to reduce the rebleeding rate, the question must also be asked: does rebleeding have significant consequences? The evidence is conflicting, reports ranging from a dramatic worsening of visual prognosis when rebleeding occurs, especially if the rebleed is prolonged and is accompanied by a marked rise in intraocular pressure,^{1 3 7 17 30} to no difference in prognosis.^{11 15 16 25} It has been suggested that it is the size of the hyphaema rather than its primary or secondary nature that correlates with prognosis. Hence the finding that prognosis is poorer with secondary haemorrhage could be explained by secondary haemorrhages tending to be larger than primary ones.²⁴ However, this would only apply if large hyphaemas and raised intraocular pressure were the principal cause of poor vision. Studies have repeatedly shown that it is not the number of rebleeds that determine the overall visual outcome but the frequency of associated

ocular injuries, in particular posterior segment injuries. In our study rebleeding was not associated with a worsening of visual prognosis, even in those patients who presented late with 'black ball' secondary bleeds and who required anterior chamber washouts. In terms of final visual acuity the use of antifibrinolytics would therefore not have benefited any of our patients who subsequently rebled.

The posterior pole complication most frequently responsible for poor visual acuity was choroidal rupture (Table 5). Retinal tears and/or detachment appear to occur with some frequency, and are a preventable cause of visual loss. Table 4 shows that the presence of a tear or detachment is not always immediately obvious, perhaps because in some cases the detachment takes some time to develop. However, retinal tears or holes occur at the time of injury³¹ and will be missed unless looked for. Although retinal detachment may occur many years after trauma, 80% will occur within two years, almost invariably owing to peripheral retinal damage sustained at the time of injury.³² Our findings of a predominance of oral disinsertions is in keeping with Cox and colleagues' classic description of detachment in ocular trauma,³² though in our series most were superotemporal rather than superonasal.

Hyphaema, therefore, is just one feature of a constellation of ocular injuries that follow blunt trauma. In a predominantly Caucasian Northern European population such as ours secondary rebleed is uncommon and is not associated with a worsening of visual prognosis. There were no features which allowed identification of those at risk of rebleeding in our study. Corneal blood staining sufficient to cause impairment of vision was not seen. Poor visual acuity was in general due to posterior segment damage, the diagnosis of which was often delayed. Secondary glaucoma was found to be a rare complication. Our conservative approach to traumatic hyphaema therefore seems justified.

While the overwhelming concern with hyphaema and secondary haemorrhage is understandable (certainly in those American centres with large numbers of black patients, in whom rebleeding seems to be more common³⁰) there is a danger of neglecting other important aspects of blunt ocular trauma. Posterior segment damage can occur without an associated hyphaema.⁵ Efforts should be made to detect and treat retinal breaks, dialyses, or holes which may not be obvious until full examination with the binocular indirect ophthalmoscope and scleral indentation have been carried out. Gonioscopy should be performed at some stage in the follow-up period (once is enough, as angle recession is constant once present²⁴) to detect eyes with 180° or more recession, bearing in mind that even within this group only a minority will develop glaucoma.^{23 24}

Although it is our policy to admit all patients presenting with traumatic hyphaema our finding of a group of patients presenting with secondary haemorrhage suggests that a number of patients sustaining hyphaema never attend hospital. The visual outcome in these patients was in fact very good. Since bed rest, our only consistent treatment, is of doubtful benefit, a case could be made

for allowing patients who present with hyphaema to go home with instructions to minimise physical activity and to return promptly should they develop symptoms of a rebleed. The patient could be discharged from review as soon as the examiner was satisfied that he had adequately examined the peripheral retina, and that gonioscopy had ruled out excessive angle recession.

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