Reminder of important clinical lesson

Choroidal rupture and optic nerve injury with equipment designated as 'child-safe'

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Summary

Blunt ocular trauma from a child's plastic foam-covered toy baseball bat caused traumatic optic neuropathy and choroidal rupture in a 9-year-old child. The examination revealed a visual acuity of 6/60, a relative afferent pupillary defect, optic nerve swelling, commotio retinae and retinal haemorrhages. There was no orbital fracture or intraorbital haematoma on CT scanning. Optical coherence tomography showed macular oedema and disruption of the retinal pigment epithelium and Bruch's membrane. The child was admitted for intravenous methylprednisolone and discharged on topical steroid treatment. At 1 month follow-up, visual acuity had improved to 6/12. Optic nerve swelling had resolved and the fundus had two crescent-shaped choroidal rupture scars. Choroidal rupture and optic neuropathy can be secondary to indirect trauma, and even when the mechanism of injury is with a piece of equipment designated as suitable for children, serious ocular injury can occur.

BACKGROUND

Blunt ocular trauma is the most common eye injury to attend emergency departments. This is a prime example of the requirement for a dilated fundus examination in any child presenting with a history of trauma, even when the trauma was caused by a toy designated as safe for children. If there are superficial injuries that may explain the reduction in vision, sight threatening injuries may remain undiagnosed if the fundus is not examined. In addition, there have been recent concerns raised with the use of high-dose steroid treatments in the management of traumatic optic neuropathy (TON) with lack of clinical evidence of any benefit. Finally, secondary complications from choroidal rupture can result in choroidal neovascularisation requiring long-term monitoring and treatment.

CASE PRESENTATION

A 9-year-old boy attended the emergency department having been struck in the orbital region of the head by a foam-covered safety baseball bat (figure 1A,B). He complained of reduced vision and ocular pain. On examination, vision acuity had reduced to 6/60, a relative afferent pupillary defect was present and ocular movements were full. On slit-lamp biomicroscopy examination, there was a moderate corneal abrasion, red blood cells in the anterior chamber and a small hyphaema. Anterior chamber depth and intraocular pressure was normal with no evidence of aqueous leakage. Dilated fundus examination revealed the vitreous to be clear of pigment; however, there was optic nerve swelling with flame haemorrhages, commotio retinae and subretinal haemorrhage in the macular region.

INVESTIGATIONS

CT scanning excluded orbital fracture or intraorbital haematoma and the optic nerves were normal and

(a)

(b)

Figure 1 (A) Photograph of the 'safety' foam-covered toy baseball bat. (B) Close-up of the foam coating and plastic core.

symmetrical. Optical coherence tomography scanning showed macular oedema and disruption of the retinal pigment epithelium and Bruch's membrane.

DIFFERENTIAL DIAGNOSIS

- ▶ Globe penetration.
- ▶ Retinal tears.

TREATMENT

The child was admitted for immediate intravenous methylprednisolone 1 mg/kg and topical cyclopentolate 1% and discharged on steroid eye drop treatment.

OUTCOME AND FOLLOW-UP

After 1 month follow-up, visual acuity had improved to 6/12 and only a subtle relative afferent papillary defect could be detected. The optic nerve swelling had resolved and no optic nerve atrophy was evident. The retina showed two crescent-shaped pigmented choroidal rupture scars with no evidence of choroidal neovascularisation (figure 2). Optical coherence tomography scanning showed disruption of the retinal pigment epithelium layer with scarring and no subretinal fluid (figure 3). The child will be reviewed on a regular basis in the outpatient clinics for evidence of secondary complications.

DISCUSSION

Blunt ocular trauma is the most common eye injury presenting to emergency rooms and can be caused with a toy designated as suitable for children such as a plastic foam-covered baseball bat. Often in cases with young children it is not apparent what caused the injury. A common pitfall that occurs is the false reassurance from an examination in the emergency room. An obvious minor injury, such as the corneal abrasion, can explain the reduction in vision and unless a detailed examination of the back of the eye is performed a potentially sight-threatening injury can be missed. This may be complicated further, by the corneal abrasion hindering the view of the fundus at the time of the injury. Patients should therefore be monitored until a full clinical examination can be performed.

During blunt trauma, the ocular globe undergoes mechanical compression and then sudden

Figure 2 Fundus photograph of the retina showing the two crescent-shaped choroidal ruptures around the macula.

Figure 3 Optical coherence tomography scan of the choroidal rupture showing the scarring and disruption to the choroid and retinal pigment epithelium.

hyperextension. The different layers of the eye are affected differently by this insult, the sclera can resist these forces and the retina is protected because of its elasticity; however, the middle layers have neither the tensile strength nor the elasticity to resist these forces. A choroidal rupture is therefore a break in the choroid, Bruch's membrane and the retinal pigment epithelium. Approximately 5–10% of patients presenting with blunt ocular trauma develop a choroidal rupture and the early presence of deep subretinal haemorrhages should raise the suspicion of its presence. Most eyes have a single rupture, but up to a quarter of cases have multiple ruptures running concentric to the optic nerve and approximately 80% of these occur temporal to the disc, with two-thirds involving the macula.¹ If the macular region is involved it may have a poor visual prognosis and over the long term is associated with the development of choroidal neovascularisation.² If choroidal neovascularisation develops, different treatment modalities have been reported, including the use of photodynamic therapy³ intravitreal recombinant tissue plasminogen activator (r-TPA) and gas injection⁴ and intravitreal anti-vascular endothelial growth factor therapy.⁵

TON occurs when the force of the impact is transmitted via the bones to the optic nerve.⁶ There have been no large randomised controlled trials on the treatment of TON, current management remains controversial and based on indirect evidence from the treatment of head and spinal injuries.^{7–9} Most recently, there have been concerns raised about the use of high-dose steroid treatments in traumatic cases with evidence of retinal ganglion cell death.^{10 11} A recent Cochrane review on the available evidence found no significant benefit in visual acuity after the use of high-dose steroids over observation alone.¹² Given the potential complications of administering high-dose steroids, this uncertainty for clinicians means each case encountered needs to be assessed on an individual basis. The patient and parents need to understand the lack of clinical evidence to provide informed consent.

In summary, all patients presenting with blunt ocular trauma should have a fundus examination to exclude damage to the retina or optic nerve even if the injury involves an object designated as safe for children.

Learning points

- ▶ Blunt ocular trauma is the most common presentation of ocular injury to ophthalmology.
- ▶ Serious intraocular injuries can occur even with equipment designated as 'child safe'.
- ▶ All cases with a history of trauma require ophthalmological assessment to exclude serious intraocular damage that can be missed by in an acute setting and follow-up to exclude secondary complications.
- ▶ Acute complications of blunt ocular trauma include optic neuropathy and choroidal rupture, secondary complications can include choroidal neovascularisation.
- ▶ There is a lack of evidence-based medicine for the use of high-dose steroids in the management of traumatic optic neuropathy.

Competing interests None.

Patient consent Obtained.

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