fluid.² Viral causes including hepatitis C have been postulated.²⁻⁴

Bisphosphonates have been associated with many ocular adverse effects, the majority being inflammatory; anterior and posterior uveitis, episcleritis, scleritis, and optic neuritis.⁵ Blurred vision is well documented and listed by the World Health Organization as a "certain" ocular adverse effect of bisphosphonates⁵ although, the cause of this has not been identified.

Drug induced immunological or toxic reaction have been hypothesised to be responsible for an acute inflammatory reaction in the case of pamidronate.⁶

Unfortunately, most ophthalmic toxicology data rely on voluntary post-marketing surveillance systems and case reports.⁵ Applying the World Health Organization Causality Assessment Guide⁷ this case of acute retinal pigment epitheliitis is a possible adverse reaction of zoledronate as there was a plausible time relation to drug administration and absence of other drugs or chemicals or of concurrent disease that could explain the adverse effect.

The main limitations of our report are that this is a single case, the eyes were not examined until 1 month after the drug infusion and subsequent onset of symptoms including no examination before the bisphosphonate infusion, and the patient did not undergo a re-challenge test.

Further reports from similar cases are required to confirm these findings. It is important that ocular symptomatology occurring in association with the use of novel medicines is diagnosed and data drawn to the attention of physicians.

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Retinal haemorrhages in a preterm infant following screening examination for retinopathy of prematurity

Examination induced retinal haemorrhage in preterm infants is uncommon. It may occur independently of retinopathy of prematurity (ROP) associated neovascularisation. Retinal haemorrhages due to ROP tend to occur on the surface of the neovascular ridge, which represents an arteriovenous shunt formed by the anastomosis of primitive retinal vessels.¹ However, ROP related retinal haemorrhages occurring posteriorly,² as well as vitreous haemorrhage,³ have also been described in advanced disease. Other common causes of retinal haemorrhage in infancy such as birth⁴ and shaken baby syndrome should be excluded. Retinal haemorrhage in a premature infant after RetCam photography has been reported.⁵ We report retinal haemorrhages in a premature infant immediately following examination for ROP.

Case report

A 1416 g, 33 week gestation infant was transferred to our centre after developing necrotising enterocolitis at 6 days old. Ventilatory support was required briefly following subtotal colectomy at 50 days old. In accordance with Canadian screening guidelines,⁶ this infant had significant risk of developing ROP based on birthweight criteria. However, he was referred by the attending neonatologist for his first ROP screening at 45 weeks postconceptional age. Initial examination, conducted by a paediatric ophthalmology fellow, showed no ROP in the left eye and two areas of right eye vitreous haemorrhage (superonasally and inferonasally). No retinal haemorrhages were seen. On examination by the staff ophthalmologist 10 minutes later, a moderate number of intraretinal dot and blot haemorrhages and a few flame haemorrhages were observed in the right posterior pole, predominantly peripapillary (fig 1). There was no vascular tortuosity or disc swelling. The left eye remained normal. Both examinations were performed with a lid speculum and Flynn scleral depressor (Bausch and Lomb, Rochester, NY, USA) to rotate the eye.

Figure 1 Intraretinal haemorrhages, predominantly peripapillary.

Figure 2 RetCam II fluorescein angiography showing peripheral areas of telangiectasia.

RetCam II (Clarity Medical Systems, Inc, Pleasanton, CA, USA) images showed no additional bleeding. Investigations to screen for intrauterine infections and coagulopathy were normal. Intracranial haemorrhage was absent.

To facilitate visualisation, RetCam fluorescein angiography was performed the following day under general anaesthesia to look for vascular anomalies underlying the areas of vitreous haemorrhage as well as those not immediately visible on standard examination. This demonstrated 3 clock hours of telangiectasia peripherally in the right eye (fig 2) consistent with zone 3 immature retinal vasculature without leakage. Inferionasally, there appeared to be peripheral retinal vascular fronds directed towards the vitreous haemorrhage. Subsequent RetCam examinations documented resolution of the retinal haemorrhages with persistence of the vitreous haemorrhage at 14 weeks. No demarcation lines or ridges were seen.

Comment

RetCam photography has been implicated in the development of retinal haemorrhages in a premature infant. A 50 day old infant, status post 25 week prematurity, developed two episodes of unilateral retinal haemorrhages following RetCam examination on two separate occasions.³ Immature fragile retinal vessels, made more susceptible to rupture by hypoxia and poor central control of circulatory autoregulation, were postulated as likely mechanisms. A 24 week premature infant with bilateral stage 3 zone II ROP examined at 35 weeks postconceptional age, developed multiple flame-shaped intraretinal haemorrhages after intravenous sedation and cardiopulmonary resuscitation (CPR).⁷ While the authors suggested the role of CPR, they cautioned that pre-existing ROP and immature retinal vasculature might have predisposed to vessel rupture. In both cases, it may be that the premature retinal vasculature, particularly in the setting of ROP, functions differently from that in older infants. Examination induced retinal haemorrhages appear to have a predilection for areas posterior to the vascularised avascular retina junction occurring in moderate numbers without subretinal involvement. Our patient's vitreous haemorrhage may have occurred at a time when the vascular abnormalities were more active and the vessels more immature. It has been suggested that poor vascular autoregulation in sick neonates, or the absence of a mature autonomic system in preterm infants, can expose

maximally dilated fragile arterioles to direct arterial pressure.⁶ This theory has been used to explain the presence of intracranial haemorrhages in ill neonates. Likewise, in the setting of ROP related vasculopathy, the stress of an ophthalmological examination with the accompanying variations in intraocular pressure and scleral distortion might result in retinal haemorrhages.

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Retinoblastoma and optic nerve enhancement on MRI: not always extraocular tumour extension

Neoadjuvant chemotherapy is useful in the management of extensive forms of retinoblastoma with radiologically detectable optic nerve invasion at diagnosis.¹ Magnetic resonance imaging (MRI) can detect various degrees of optic nerve invasion as enhancement extending from an intraocular tumour into the optic nerve. However, pretreatment false positive MRI findings based on inflammation occur occasionally.² We describe a case of unilateral retinoblastoma and false positive MRI findings of extensive optic nerve involvement.

Case report

A 3 year old girl presented with retinoblastoma of the right eye. Ophthalmic examination revealed a large exophytic growing

Figure 1 A 3 year old girl with unilateral retinoblastoma of the right eye. MRI findings on admission. (A) Axial T2WI (TR/TE, 3000/120) shows an exophytic growing tumour mass combined with a V-shaped retinal detachment and hyperintense (proteinaceous) subretinal fluid. Compared to the normal optic nerve, the affected site shows absence of cerebrospinal fluid in the optic nerve sheath. (B) Contrast enhanced axial fat suppressed T1WI (TR/TE, 575/13) (level corresponding (A)) shows an enhancing tumour mass of the right eye with marked enhancement and thickening of the intraorbital part of the optic nerve (arrows), in continuity with the intraocular mass, being suspicious for extensive tumour invasion.

tumour, a shallow anterior chamber, rubeosis iridis, and an elevated intraocular pressure. T2WI showed a hypointense subretinal tumour mass with similar signal intensity (SI) compared to both optic nerves (fig 1A). No delineation of the ipsilateral optic nerve with surrounding cerebrospinal fluid was possible. On additional short tau inversion recovery (STIR) MRI, the optic nerve showed an increased SI from the postlaminar part to the orbital apex. Contrast enhanced T1WI showed enhancement of the tumour mass (tumour volume 2.1 cm³). Thickening and marked enhancement of the entire intraorbital part of the optic nerve was seen, being suspicious for extensive tumour invasion (fig 1B). Based on these findings, retinoblastoma with

extensive optic nerve invasion was diagnosed, and one course of etoposide-carboplatin chemotherapy was administered. Follow up MRI (fig 2), 4 weeks after admission, disclosed a tumour mass reduction (tumour volume 0.5 cm³, 77% volume reduction), a decrease in range of contrast enhancement of the optic nerve, without evident normalisation of signal pattern on T2WI and STIRWI. Enucleation was performed using an altered surgical approach by the neurosurgeon and ophthalmologist, which allowed 15 mm of optic nerve to be removed under direct vision. Histopathology revealed a largely necrotic intraocular retinoblastoma, without any degree of optic nerve invasion. Normal architecture of the optic nerve was only disturbed at the lamina cribrosa, with

Figure 2 Follow up MRI study and histopathological findings after one course of chemoreduction therapy performed 4 weeks after initial presentation. Axial T2WI (TR/TE, 2200/120) (A) and contrast enhanced axial fat suppressed T1WI (TR/TE, 475/14) (B) show a marked reduction in intraocular tumour volume. The optic nerve shows persisting abnormalities on T2WI (A), with a decrease of enlargement and contrast enhancement (arrow), which was interpreted as residual optic nerve invasion (B). (C) Immunohistochemical staining with CD-45 antibodies for lymphocytes shows positive staining (dark cells) throughout the optic nerve. (CD-45; original magnification 40× objective) (D) Detail of the optic nerve shows endothelial proliferation in a vessel wall (arrows) with total obliteration of the lumen. (Haematoxylin and eosin stain; original magnification 40× objective.)