

Doppler ultrasonography to aid diagnosis of orbital capillary haemangioma in neonates

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Abstract

Purpose To illustrate the use of Colour Doppler Ultrasonography to aid the differential diagnosis of orbital masses in neonates.

Methods Three cases are reported of neonates presenting with undiagnosed orbital masses as isolated findings, causing lid swelling and proptosis and prompting a differential diagnosis of an orbital vascular lesion, rhabdomyosarcoma or other tumour. Colour Doppler Ultrasonography in expert hands using a small footprint linear 10–5 transducer proved an atraumatic, rapid and accurate way of confirming a vascular lesion at the first clinic visit. This reassured the family and ophthalmologist alike, and obviated the need for biopsy or cross sectional imaging requiring anaesthetic. All three lesions were orbital capillary haemangiomas with characteristic ultrasonographic findings.

Results Illustrations are provided to illustrate the features of the capillary haemangiomas when visualised with Colour Doppler Ultrasonography.

Conclusions The use of ultrasonography in very young infants can help exclude malignancy, without the need for cross sectional imaging or biopsy under anaesthetic. However, close observation remains mandatory. Repeat scanning is easily performed with no adverse effects, in potential contrast to other imaging modalities.

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Three cases are reported of neonates presenting with undiagnosed orbital masses as isolated findings, causing lid swelling, proptosis or discoloration of the lids, and prompting a differential diagnosis of an orbital vascular lesion, rhabdomyosarcoma or other tumour. Colour Doppler ultrasonography in expert hands using a small footprint linear 10–5 transducer proved an atraumatic, rapid and accurate way of confirming a vascular lesion at the first or second clinic visit. This reassured the family and ophthalmologist alike, and in two cases obviated the need for further investigation. All three lesions were orbital capillary haemangiomas, and characteristic multiple microvascular channels with high flow were seen clearly on Doppler ultrasonography.

Case reports

Case one

A 2-month-old, otherwise healthy male infant was brought to clinic by his parents who had noticed a small swelling of the left upper lid which had shown a gradual increase in size over the preceding 2 weeks. A Magnetic Resonance Imaging scan (MRI) was planned, but during the first visit to the paediatric ophthalmology clinic, it was possible to arrange a colour Doppler ultrasound scan of the lesion. This showed a well defined lesion of homogenous texture and intermediate echogenicity (Figure 1). An area of calcification was shown, felt to be a phlebolith. The lesion was highly vascular with extensive flow demonstrable (Figure 2). These findings were consistent with a capillary haemangioma, and further imaging was felt to be unnecessary. The lesion was

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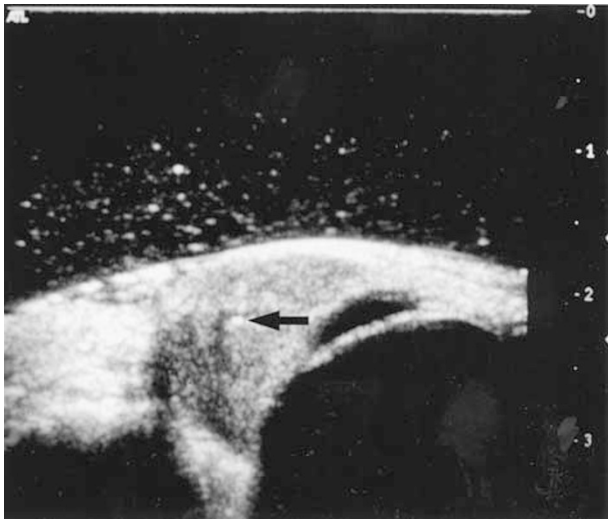


Figure 1 Ultrasound scan of haemangioma showing intermediate echogenicity, homogenous texture and a phlebolytic (arrow).

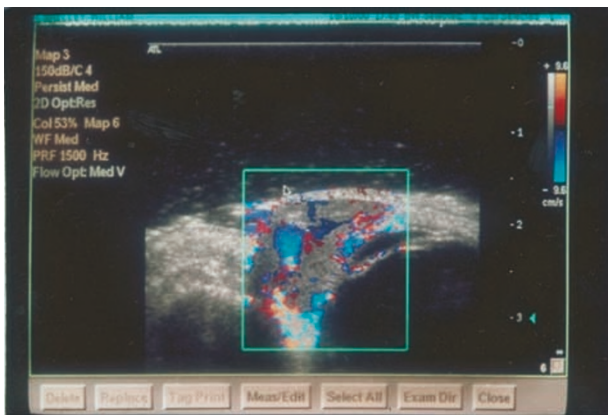


Figure 2 Colour Doppler picture of the same lesion. Multiple vascular channels showing moderate to high flow (blue and red). The pulse repetition frequency (PRF) has been set at 1500 Hz to maximise detection of vessels. The resultant aliasing artefact can be avoided by reducing the PFR.

watched carefully, and required intralesional steroid injection when it was felt to be occluding the pupil.

Case two

A 6-week-old baby was seen in the clinic, with a 3-week history of swelling below the left eye, and a bluish tint of the lids. A Colour Doppler Ultrasound at the first clinic visit confirmed the vascular nature of the lesion, and the patient has been managed with observation and amblyopia treatment only (Figure 3).

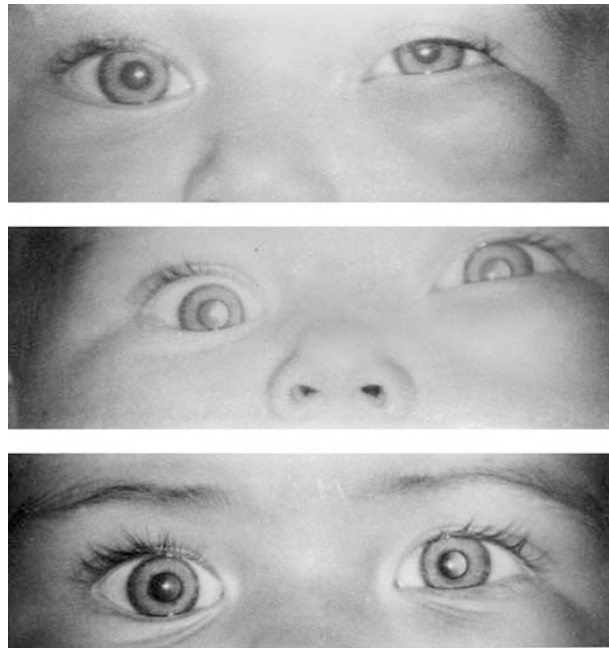


Figure 3 Resolution of capillary haemangioma with time in case 2.

Case three

A 4-week-old girl presented with a 2-week history of increasing right proptosis with swelling and a bluish discoloration of the lids (Figure 4). A Computerized tomography scan (CT) showed a mass in the medial aspect of the right orbit, possibly arising from the medial rectus. She was referred to the paediatric oncologists and a further CT scan with contrast showed strong enhancement of the lesion (Figure 5). At this stage, a Colour Doppler Ultrasound showed the lesion to have a high vascularity consistent with a capillary haemangioma. The patient was managed with oral and then intralesional steroids, and the lesion continues to resolve (Figure 4).

Comment

A variety of imaging techniques is available for the investigation of orbital masses, including CT, MRI and ultrasound scanning. In the young patient, MRI requires sedation or anaesthesia for a successful examination because of image degradation caused by movement. Moreover, the small tissue volumes involved frequently result in poor resolution and low signal to noise ratio. The examination is time consuming, costly, and availability is limited. CT scanning imposes a radiation burden with its attendant risks, and involves intravenous contrast injection if a diagnosis is to be made with any certainty. When first

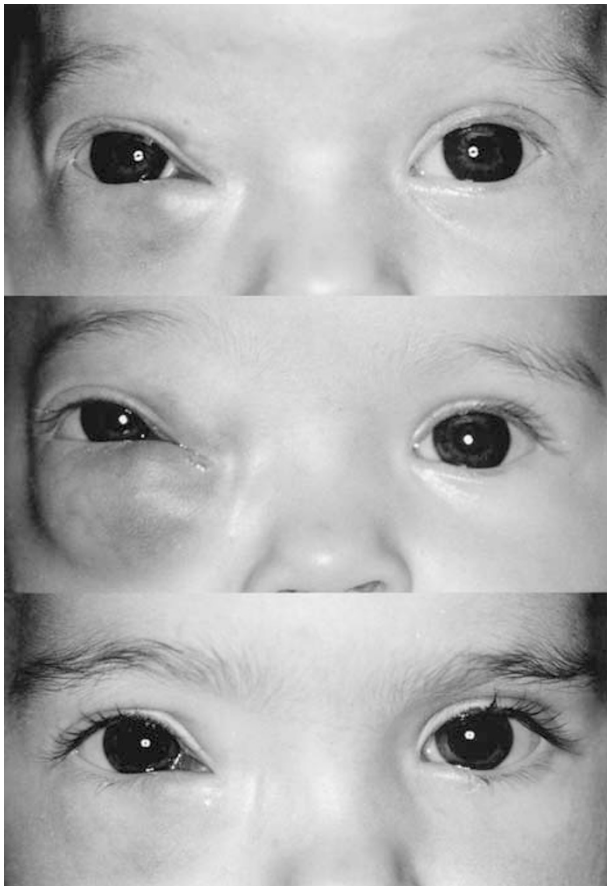


Figure 4 Orbital mass in case 3 at presentation at 4 weeks old, at 8 weeks old and at 1 year of age.



Figure 5 CT scan of case 3 showing strongly enhancing orbital mass.

introduced for imaging the orbit, CT was felt to be inferior to echography at visualising lesions of the superior or inferior wall of the orbit, although its superiority at imaging the orbital apex was acknowledged. With the advent of coronal scanning, and higher resolution techniques, concerns of missing lesions in the orbit have reduced.¹

Ultrasound is a proven technique in orbital imaging. A combination of A and B mode ultrasonography in experienced hands can accurately locate and diagnose many orbital pathologies.² B scan allows topographic echography, that is assessment of the position and shape of a lesion, and description of its borders. A scanning can also show the internal architecture of a structure, its reflectivity and sound attenuation characteristics (quantitative echography), and also enables demonstration of compressibility, mobility and vascularity (kinetic echography). Lesions in the posterior orbit however are difficult to visualise with ultrasound, as higher frequency sound used to enhance resolution is unable to penetrate the deeper tissues.³

During ultrasound examination, the internal structure of capillary haemangiomas may be irregular, reflecting a varied histological structure. Internal reflectivity is usually high, but may also vary, because of the predominance of dense capillaries.^{2,4} There is weak sound attenuation because of the high blood flow, and usually an irregular shape with diffuse borders. Ultrasonography can also show the compressibility of these soft, vascular lesions, which is less obvious or absent in lesions such as cavernous haemangiomas and solid tumours.⁵ The characteristic marked internal blood flow can be detected both by A mode and Doppler scanning.

Colour Doppler Imaging (CDI) is a non-invasive single investigation which combines imaging of structure and vascularity, using colours to code for the direction and velocity of blood flow within the structure being examined. Capillary haemangiomas usually show high velocity flow in multiple vascular channels. Phleboliths may be seen, although these may be less common in deep (retroseptal) lesions.⁶ The presence of a high vessel density (more than five per square centimetre) and a high peak arterial Doppler shift (exceeding 2k Hz) has been shown to be typical in these lesions. This may help to distinguish these lesions from other soft tissue masses.⁷ Embryonal rhabdomyosarcomas, for example, do show evidence of perfusion, but discrete vascular channels are difficult to visualise, and large vessels are not seen.⁸

Conclusion

The use of ultrasonography in very young infants can help exclude malignancy at the first clinic visit,

without the need for cross sectional imaging or biopsy under anaesthetic. The investigation, in skilled hands, is quick, non-invasive, and atraumatic. Considerable reassurance to parent and doctor can be afforded if the investigation can be scheduled to coincide with the outpatient visit. However, close observation remains mandatory. Repeat scanning is easily performed with no adverse effects, in potential contrast to other imaging modalities.

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