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Original Article

The value of color Doppler imaging and intralesional steroid injection in pediatric orbital capillary hemangioma

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Abstract

Background: To evaluate color Doppler imaging (CDI) as the primary imaging modality in the diagnosis of pediatric orbital capillary hemangioma.
Methods: This is a retrospective study of 36 consecutive cases of orbital capillary hemangiomas between January 2006 and July 2011. Data on demographic details, clinical findings, gray-scale ultrasonography, CDI characteristics, treatment, and follow-up period were reviewed.
Results: The mean age of onset was 7 weeks. Twenty-nine (81%) lesions presented as eyelid masses, whereas seven (19%) presented as exophthalmos. Nineteen (53%) tumors were located on the upper eyelid, seven (19%) on the lower eyelid, six (17%) in the medial canthus, and one on both upper and lower eyelids. Ultrasonography depicted a heterogeneous, well-defined, irregular tumor with a low or moderate echogenicity. All lesions presented with abundant color blood flow on CDI. The intralesional blood flow had a mean peak systolic velocity of 37.5 ± 24.5 cm/second, and a mean resistance index of 0.69 ± 0.16, representing a shift in the pulse Doppler toward high velocity and high resistance. After a single intratumoral injection of betamethasone, 18 cases (50%) resolved. Additionally, 15 (42%) and four (11%) cases resolved after two injections and three injections, respectively. Only three (8%) masses persisted after three injections within the follow-up period.
Conclusion: The blood flow characteristics of CDI play a vital role in the differentiation of orbital capillary hemangiomas from other orbital lesions. The availability and lack of adverse effects of CDI enable its utilization in the early clinical diagnosis of pediatric orbital capillary hemangioma.

Keywords: capillary hemangioma; color Doppler imaging; orbital; pediatric; ultrasonography

1. Introduction

Capillary hemangiomas are benign vascular neoplasms that affect up to 5% of infants in the 1st year of life. Often referred to as infantile hemangiomas, or strawberry hemangiomas, these distinct vascular lesions are the most common eyelid and orbital tumors of infancy. The morbidity is 1–2% in neonates.[1] It occurs more commonly in premature and low-birth-weight babies.[2]

The natural history of capillary hemangioma is rapid growth in the 1st year of life with later spontaneous gradual involution over several years.[3] It is difficult to discriminate the capillary hemangioma from other fast-growing pediatric neoplasms. The diagnosis of capillary hemangioma is usually based on the clinical presentation, and imaging modalities such as computed tomography (CT) and magnetic resonance

Conflicts of interest: The authors declare that there are no conflicts of interest related to the subject matter or materials discussed in this article.

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imaging (MRI). However, most soft-tissue masses have no specific characteristics that are visible on MRI to determine whether they are benign or malignant.[4] Color Doppler imaging (CDI) is recently described as a reliable, noninvasive, nonradiating, and inexpensive imaging tool for diagnosing vascular tumors in children.[5,6] However, reports about the applications of CDI in periocular capillary hemangiomas are sparse.[7,8] In this study, we review 36 cases of pediatric orbital capillary hemangioma and describe the applications of CDI as the primary imaging modality in the diagnosis of the capillary hemangioma.

2. Methods

This retrospective study comprised 36 children with orbital capillary hemangiomas seen between January 2006 and July 2011 at our hospital. The Ethics Committee of Tianjin Medical University (Tianjin, China) approved the study, and all participants were informed about the scope of the study and gave their written informed consent.

In all patients, we based the diagnosis of an orbital capillary hemangioma on the age at onset, the clinical presentation and demonstration of typical characteristics on CDI,[4,9] whereas other imaging modalities such as CT or MRI were used according to the clinical appearance.[8]

All the studied children underwent a comprehensive ophthalmologic examination upon presentation. The clinical appearance was characterized based on the location, size, and color of the lesion, ocular motility, ptosis, intraorbital pressure, exophthalmos, and response to Valsalva maneuver (it resulted in lesion enlargement and surface color changes).

All patients had color Doppler ultrasonography (US) including color Doppler flow imaging (CDFI) and color Doppler power imaging (CDPI) for confirmation of the diagnosis. All of the patients received CDI examination by one experienced sonographer, using a Philips IU22 scanner (Royal Philips, Amsterdam, Netherlands) with a 5–12 MHz linear-array transducer. Each child was sedated with diazepam (0.5 mg/kg), then placed in a supine position, with closed eyes covered with sterile coupling gel. The transducer was placed directly on the eyelid. First, using gray-scale US, the findings were characterized according to tumor volume, shape, position, and echogenicity. US revealed variable internal reflectivity: high reflectivity from fibrous septae, moderate echoes from vascular channels, and low reflectivity from areas of endothelial proliferation.[10] Later, CDFI was used, and the results were recorded according to the position and color blood flow signals. After that, pulse Doppler examination was performed, with the transducer placed where the fastest blood velocity was detected, with the acoustic beam aligned parallel to the direction of the blood vessel. The findings were recorded as peak systolic velocity (PSV) and vascular resistance index (RI). Finally, the CDPI was assessed.

According to the analysis of the color blood flow, the cases were divided into four grades: A = no color blood flow (no color blood flow signals after checking the whole mass); B = moderate color blood flow (1–4 color blood flow signals were detected after checking 1 random plane of the mass); C = abundant color blood flow (more than 4 color blood flow signals were detected after checking 1 random plane of the mass, but they were also countable); D = suffuse color blood flow (uncountable color blood flow signals in the whole mass). The blood flows of all cases were evaluated on the basis of this criterion.

MRI scans were performed on a 1.5-T MR system (Siemens, Erlangen, Germany). The imaging protocol included T1-weighted axial, sagittal, and coronal fat-suppressed imaging, T2-fast spin–echo (SE), axial, sagittal, and coronal fat-suppressed imaging, and T1-weighted SE imaging with gadolinium injection. CT scanning was used in some cases because of limited access to MRI. Slice thickness was 3 mm. Sixteen MRI scans were performed on a 1.5-T MR system. Ten patients had CT scanning because of limited access to MRI.

All patients received intralesional injections for cosmetic reasons upon request by their parents. After an intratumoral injection of betamethasone (3.5–7 mg), dexamethasone (2.5 mg), and lidocaine (10 mg), the lesion was compressed with padding and bandage for 2 hours. If the lesion did not resolve within 1 month, additional injections were administered. The interval between injections was 4 weeks, and all patients had a predetermined maximum of three injections to minimize corticosteroid side effects. Each case was followed up for 6 months or more and received CDI examination during the follow-up period.

3. Results

The demographic details and clinical findings of 36 patients are summarized in Table 1. Of the thirty-six cases reviewed in this study, 17 (47%) were male and 19 (53%) were female. There were twenty (55%) right eyes and 16 (45%) left eyes. The mean age at onset was 7 weeks (range 0–24 weeks). Clinically, 29 (81%) cases presented with eyelid swelling and seven (19%) presented with exophthalmos. Twenty-one (58%) cases had positive Valsalva maneuver. We also found nine (25%) cases with brightly erythematous eyelid surfaces, referred to as strawberry appearance. Nineteen (53%) lesions were located on the upper eyelid, seven (19%) on the lower eyelid, six (17%) in the medial canthus, and in one case on both upper and lower eyelids. Extraocular movement was restricted in five (14%) cases, and seven (19%) cases had high intraorbital pressure.

All patients received CDI examination. The CDI findings of 36 patients are summarized in Table 2. In 15 cases (42%), US depicted the lesions in the subcutaneous tissue of the eyelid. Eighteen (50%) lesions were located in the periocular tissue and extended to the posterior of orbit, and three (8%) lesions were located in the retrobulbar space. Twenty lesions (56%) were well-defined masses, whereas 16 masses (44%) had indistinguishable borders. Twenty lesions (56%) were irregular, whereas five (14%) lesions and six (17%) lesions were circular and flat, respectively. Compared to the periorbital