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Periocular Infantile Hemangiomas: Clinical Spectrum, Complications, and the Emerging Role of Sclerotherapy using 3% Sodium Tetradecyl Sulphate

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ABSTRACT

Periocular infantile hemangiomas are common benign vascular tumors of infancy that may lead to significant ocular morbidity, particularly amblyopia, during the critical period of visual development. Although most lesions undergo spontaneous involution, a subset requires early intervention to prevent functional and cosmetic complications. Recent advances in understanding the biology of infantile hemangiomas have expanded therapeutic options beyond observation and systemic therapy. Sclerotherapy using agents such as sodium tetradecyl sulphate has emerged as a minimally invasive and effective treatment modality for selected periocular lesions. This review discusses the epidemiology, pathophysiology, clinical features, diagnostic approach, complications, and current management strategies of periocular infantile hemangiomas, with special emphasis on the role of sclerotherapy.

Keywords:
Periocular hemangioma, infantile hemangioma, sclerotherapy, sodium tetradecyl sulphate, amblyopia

INTRODUCTION

Infantile hemangiomas are the most common benign vascular tumors of childhood, affecting approximately 4–5% of infants [3,4]. Periocular involvement is of particular clinical significance due to the potential for visual axis obstruction, refractive errors, and amblyopia. These lesions are characterized by endothelial cell proliferation and aberrant angiogenesis, typically becoming evident within the first few weeks of life [1,2].

The natural course of infantile hemangiomas consists of a rapid proliferative phase followed by gradual involution, with up to 90% of lesions regressing by the age of eight years [1,37]. Despite this favorable prognosis, periocular hemangiomas may result in serious ocular and systemic complications, necessitating timely diagnosis and appropriate management.

EPIDEMIOLOGY AND RISK FACTORS

The reported incidence of periocular infantile hemangiomas is approximately 5.4 per 100,000 children under 19 years of age, with a birth prevalence of 1 in 1,586 live births [7]. These lesions are three times more common in females and are frequently observed in preterm infants and those with low birth weight [6–9].

Several prenatal and perinatal risk factors have been identified, including multiple gestations, advanced maternal age, placental abnormalities, in vitro fertilization, chorionic villus sampling, amniocentesis, maternal vaginal bleeding during pregnancy, progesterone therapy, and positive family history [8–11]. Although infantile hemangiomas are more frequently reported in Caucasian populations, race has not been established as an independent risk factor [12].

PATHOPHYSIOLOGY

Infantile hemangiomas are vascular neoplasms with a complex cellular composition, including endothelial cells, pericytes, and stem cells [15–17]. Studies have demonstrated dysregulation of angiogenic pathways, including overexpression of vascular endothelial growth factor (VEGF) and altered Notch signaling [18,24].

Hemangioma stem cells have been shown to exhibit multipotent differentiation capacity, contributing to tumor growth during the proliferative phase and subsequent involution [15,16]. Hypoxia and hypoxia-inducible factor-1 (HIF-1) signaling also play a critical role in the pathogenesis of these lesions [27]. The unique immunohistochemical expression of GLUT-1 distinguishes infantile hemangiomas from other vascular tumors [23].

CLINICAL PRESENTATION

Periocular infantile hemangiomas may be classified based on depth (superficial, deep, or combined) and distribution (focal, segmental, or multifocal) [35,36]. Superficial lesions present as bright red, raised papules or nodules, while deep lesions may appear as bluish or purplish discoloration or cause painless eyelid or orbital swelling [3,38].

Unilateral involvement and upper eyelid predilection are common [7]. Segmental facial hemangiomas warrant evaluation for PHACES syndrome, which is characterized by posterior fossa malformations, hemangiomas, arterial anomalies, cardiac defects, eye abnormalities, and sternal defects [39]. The risk of PHACES syndrome in infants with large segmental facial hemangiomas ranges from 20% to 30% [40,41].

DIAGNOSIS AND IMAGING

Most periocular hemangiomas are diagnosed clinically. Imaging is reserved for deep lesions, orbital involvement, or when associated anomalies are suspected. Ultrasonography typically reveals well-circumscribed hyperechoic masses with high-flow, low-resistance vascular patterns [42,43].

Computed tomography shows homogenous, well-defined lesions with rapid contrast enhancement, while magnetic resonance imaging demonstrates isointense to hyperintense lesions with flow voids and marked post-contrast enhancement [44–47]. MR angiography may reveal feeding vessels and high-flow characteristics.

COMPLICATIONS

The most common and serious ocular complication of periocular infantile hemangiomas is amblyopia, which may result from visual axis occlusion, induced astigmatism, or strabismus [36,48–53]. Other ocular complications include ptosis, proptosis, telangiectasia, ulceration, scarring, and facial disfigurement [35,48].

Large segmental hemangiomas may be associated with systemic complications, including cerebrovascular anomalies and cardiac defects, particularly in PHACES syndrome, necessitating multidisciplinary evaluation and management [40,41].

MANAGEMENT STRATEGIES

Given the variable natural history of periocular hemangiomas, management decisions must be individualized. Observation is appropriate for small, non-threatening lesions with low risk of complications [54]. However, early intervention is indicated in lesions posing a risk of amblyopia, functional impairment, or significant cosmetic deformity.

Treatment modalities include systemic therapy (e.g., beta-blockers), intralesional corticosteroids, laser therapy, surgical excision, and sclerotherapy [12,54]. Each approach has distinct indications, benefits, and limitations.

ROLE OF SCLEROTHERAPY

Sclerotherapy has emerged as an effective minimally invasive treatment option for selected periocular hemangiomas. The procedure involves intralesional injection of a sclerosant, such as sodium tetradecyl sulphate, leading to endothelial injury, thrombosis, fibrosis, and subsequent lesion regression.

Sodium tetradecyl sulphate is widely used due to its favorable safety profile, ease of administration, and cost-effectiveness. Advantages of sclerotherapy include outpatient treatment, minimal blood loss, preservation of surrounding tissues, and low morbidity. Reported complications are generally mild and include pain, localized inflammation, tissue necrosis, and rarely, anaphylaxis.

Sclerotherapy may be used as a primary treatment for superficial or accessible lesions, as an adjunct to other therapies, or to reduce lesion size prior to surgical intervention.

CONCLUSION

Periocular infantile hemangiomas represent a clinically significant subset of vascular tumors due to their potential impact on visual development. While many lesions regress spontaneously, early recognition and appropriate intervention are crucial in preventing irreversible visual impairment. Sclerotherapy using sodium tetradecyl sulphate offers a safe, effective, and minimally invasive therapeutic option for selected periocular hemangiomas and should be considered as part of a multimodal treatment approach.

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CONFLICT OF INTEREST

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