Commentary: Congenital corneal anesthesia

Congenital corneal anesthesia (CCA) is a rare clinical entity characterized by the absence of corneal sensations. The underlying pathology in CCA is the hypoplasia of trigeminal nerve nucleus with a spectrum of trigeminal nerve involvement. The corneal sensory denervation results in an inhibition of the lacrimation and blink reflex with a reduction in the trophic support required for spontaneous epithelial repair. This predisposes the patient to corneal injury and leads to a delay in the spontaneous healing of the corneal epithelium postinjury.[1,2]

CCA may manifest as isolated corneal involvement or associated with other somatic malformations and neurological disorders.[1] The disease classically presents in infants between 8 and 12 months of age with a bilateral absence of tearing, reduced blinking, recurrent episodes of redness mimicking conjunctivitis, and a characteristic absence of pain.[1,3] On examination, a lustreless ocular surface is observed with interpalpebral corneal involvement in the form of erosions, ulcers, or opacities. Neurotrophic keratopathy exhibits a spectrum of disease severity and may manifest as dry geographic spots on the cornea, recurrent epithelial detachments, or frank stromal lysis with perforation and secondary infections. Slit-lamp examination demonstrates a sparse distribution or complete absence of corneal nerves, though a normal neural pattern has also been observed.[1,2,4] Corneal sensations are severely reduced or absent along with altered ocular surface stability and decreased tear secretion, as evidenced by a reduced Schirmer test, decreased tear meniscus height, and tear break up time.[3,4]

Before establishing a diagnosis of CCA, it is essential to rule out other conditions that may adversely affect corneal innervation, including keratomalacia, HSV keratitis, leprosy, or cerebellopontine angle tumors involving the trigeminal nerve.[1] CCA associated with systemic malformations and complex neurological disease may be diagnosed on the basis of a comprehensive systemic as well as ocular examination. Sporadic isolated CCA is a diagnosis of exclusion, based on a constellation of signs and symptoms in the absence of any other definitive pathology. There is no confirmatory diagnostic test, though various ancillary investigations may be performed including neuroimaging, nerve conduction studies, and in-vivo confocal microscopy (IVCM).[4,5] Gopal *et al*. describe the use of IVCM to objectively demonstrate a decreased density of sub-basal corneal nerve fibers in cases of CCA which correlates with the subjective decrease in corneal sensation.[5] IVCM is a noninvasive imaging modality which provides a quantitative and qualitative analysis of the corneal sub-basal nerve plexus and has been used to objectively assess the loss of corneal nerve fibers in systemic peripheral neuropathies and demyelinating disorders.[6,7] It helps to detect corneal small nerve fiber damage prior to observed anomalies in electrophysiology and quantitative sensory testing.[6] IVCM is a useful adjunct to support the diagnosis of CCA; however, it is technician-dependent and there is no universal method at present to allow for consistent image acquisition and standardized analysis.[8] Moreover, there is a wide spectrum of clinical involvement in CCA and the applicability of IVCM in different morphological variants of the disease is yet to be evaluated. The disease manifests in infancy and early childhood when the patients are unlikely to be cooperative for the examination. Older children cooperative for examination are more likely to present with disease sequelae and scan acquisition may not be feasible in the presence of corneal scarring and epithelial defects. In addition, IVCM cannot differentiate between a congenital absence of corneal nerve fibers or acquired nerve fiber loss due to different ocular or systemic pathologies.

The management of CCA is targeted towards the prevention of inadvertent corneal damage resulting from corneal hypoesthesia and self-inflicted corneal trauma. Counseling the parents with an emphasis on preventing the child from inflicting self-injury is crucial, and protective glasses as well as elbow splints may be prescribed. Frequent topical lubrication helps to maintain ocular surface stability. Prophylactic paramedian tarsorrhaphy may be performed especially in cases with severe involvement of the fellow eye.[2] Neurotrophic ulcers and infective keratitis need to be managed appropriately with a combination of conservative and surgical measures. The prognosis of keratoplasty in cases of CCA is extremely dismal with a high risk of graft failure and recurrent epithelial defects.[2] Affected children are at risk to develop amblyopia due to the frequent involvement of visual axis by the corneal lesions and timely occlusion therapy should be prescribed when required.

To conclude, CCA is a diagnostic dilemma and IVCM may be a useful ancillary investigation to objectively quantify a reduction in the sub-basal nerve fiber density. The sensitivity and reproducibility of IVCM in cases of CCA need to be further validated in large case series across different variants of CCA. Successful management of CCA mandates lifelong monitoring with an emphasis on protecting the ocular surface from inadvertent trauma in the absence of normal protective mechanisms of the eye.

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