Glaucoma Associated With Granulomatous Diseases

A review of the diagnosis and treatment of sarcoidosis.

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Left unchecked, sarcoidosis can lead to secondary glaucoma. This article reviews the diagnosis and treatment of this granulomatous disease.

BACKGROUND

The term *granuloma* refers to a collection of immune cells, usually macrophages, that attempt to wall off a substance that the body perceives as foreign (whether infectious or not) and is unable to dispose of.[1] Secondary glaucoma (SG) has been associated with anterior uveitis (67%) and granulomatous disease (92%).[2] Sarcoidosis is a chronic, progressive, inflammatory disorder of unknown etiology that presents with an exaggerated cellular immune response to a presumed antigen, leading to the formation of granulomas in multiple organ systems.[3] Secondary glaucoma from sarcoidosis has a reported prevalence of 9.6% over a 10-year period.[2]

In the absence of a causative agent or definitive diagnostic tests,[3] the diagnosis of sarcoidosis is based upon a constellation of findings, both clinical and radiologic, as well as on histopathology and the exclusion of other granulomatous diseases.[4] Ocular involvement occurs in 30% to 60% of patients. Bilateral hilar lymphadenopathy or pulmonary infiltrates are visible on chest radiographs. Biopsy, when feasible, reveals noncaseating epitheliod cell granulomas and allows differentiation from infection or malignancy. Serum angiotensin-converting enzyme (ACE) levels are not disease specific but reflect the systemic burden of inflammation. In patients with normal chest radiographs, a combination of elevated ACE levels and abnormal gallium scans—the latter of which can localize inflammation in

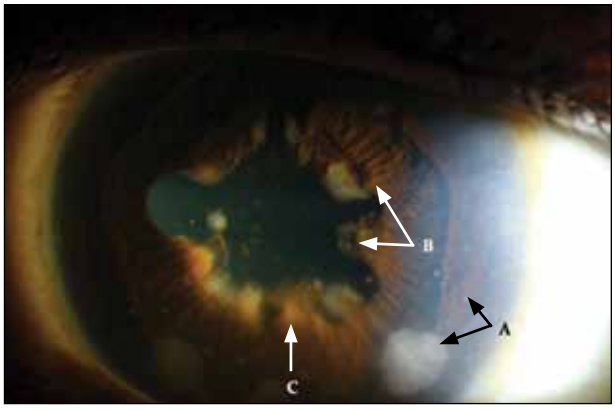

Figure. A 28-year-old black man has been diagnosed with disseminated sarcoidosis. A workup reveals an elevated ACE level of 277 µg/L (normally 40 µg/L) and purified protein derivative (-). Computed tomography shows pulmonary nodules, and a biopsy of his earlobe finds granulomatous dermatosis. An ocular examination finds +2 cells and panuveitis with vitreous snowballs. Findings in this case typical of granulomatous disease in a patient with sarcoidosis include multiple mutton fat keratic precipitates—large and small—on the corneal endothelium (A), multiple posterior synechiae between the iris sphincter and anterior lens capsule (B), and the presence of a Koeppe nodule on the iris sphincter at 6 o'clock (C).

the body— aids in the diagnosis of sarcoidosis.[5]

Ocular sarcoidosis can overlap with tuberculosis. In addition to taking a thorough history, clinicians can differentiate tuberculosis from sarcoidosis with tuberculin skin testing, findings of retinal vasculitis, and a Schirmer test of at least 10 mm.[6]

OCULAR EXAMINATION

Ocular findings in cases of sarcoidosis include cell and flare; conjunctival and episcleral injection; mutton fat keratic precipitates; corneal epithelial microcystic edema; the occurrence of nodules within the iris stroma (Busacca nodules), the pupillary sphincter (Koeppe nodules), or the angle; iris stromal atrophy; iridolenticular adhesions; and posterior subcapsular opacification (Figure). Gonioscopy is critical for determining the mechanism of IOP elevation. Dynamic gonioscopy with indentation will enable the clinician to differentiate between appositional and synechial closure. Phlebitis and vitritis accompanying snowball vitreous opacities are common.[4]

ETIOLOGY OF ELEVATED IOP

The mechanism of elevated IOP is multifactorial. This complication can occur in the setting of a closed or open angle or a combination thereof. The treatment algorithm (ie, YAG iridotomy) depends upon a careful ocular examination.[7] Inflammatory cells can lead to the formation of posterior synechiae between the iris sphincter and the anterior lens capsule, resulting in pupillary block and forward bowing of the iris (iris bombé) with secondary angle closure, which may be appositional or lead to the formation of peripheral anterior synechiae. Alternatively, inflammatory cells, protein, and cytokines can infiltrate the trabecular meshwork, thereby increasing outflow resistance. The presence of inflammatory precipitates on the trabecular meshwork can lead to trabeculitis. Chronic "Schlemm canalitis" due to the infiltration of inflammatory cells around the wall of Schlemm canal has led to occlusion and fibrosis with secondary open-angle glaucoma.[8] Ironically, not only can the IOP rise due to the underlying disease, but it can also increase in steroid responders due to steroid-induced changes in the trabecular meshwork that decrease aqueous outflow.

TREATMENT

After an initial workup establishes a noninfectious etiology, the mainstay of treatment is the timely and judicious use of topical corticosteroids. Averting the long-term sequelae of developing SG lies in early diagnosis and treatment with steroids to control inflammation and in close follow-up, the goal of which is minimizing structural changes to the angle. A baseline visual field test should be obtained to serve as a reference for the onset or progression of glaucomatous disease. Despite medical and surgical intervention, progressive visual field loss and optic nerve damage occurred in 33% of patients with SG referred to a uveitis service.[2] Steroids should subsequently be slowly tapered to reduce the risk of IOP elevation. If further control of inflammation and IOP is needed, the clinician should seek a consultation with a uveitis specialist or rheumatologist regarding the institution of nonsteroidal immunotherapy and concomitant initiation of aqueous suppressants. Cycloplegia will help prevent the formation of or break posterior synechiae and stabilize the blood-aqueous barrier to decrease leakage of inflammatory mediators, cells, and plasma proteins.

When surgical intervention is required, steroid treatment during the perioperative period is critical to quiet the eye prior to any incisional procedure. These agents should also be administered aggressively postoperatively. Trabeculectomy in the setting of uveitis has a greater risk for failure when the inflammation is active, but the procedure's success rate has been noted to increase with the use of antimetabolites. Tube shunt surgery has provided a more favorable outcome in such patients.[7]

CONCLUSION

The successful treatment of sarcoidosis with uveitis and SG begins with early diagnosis, the prompt and aggressive institution of topical corticosteroids, and close monitoring to avert the long-term sequelae of developing SG. The IOP can be elevated in the presence of open or closed angles or a combination thereof through a variety of mechanisms. The treatment algorithm depends upon a thorough ocular examination, including dynamic gonioscopy. ■

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