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Retinal and Choroidal Imaging Update

Retinal imaging in uveitis

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Abstract

Ancillary investigations are the backbone of uveitis workup for posterior segment inflammations. They help in establishing the differential diagnosis and making certain diagnosis by ruling out certain pathologies and are a useful aid in monitoring response to therapy during follow-up. These investigations include fundus photography including ultra wide field angiography, fundus autofluorescence imaging, fluorescein angiography, optical coherence tomography and multimodal imaging. This review aims to be an overview describing the role of these retinal investigations for posterior uveitis.

Keywords: Retina, Uveitis, Imaging, Differential diagnosis

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Introduction

Retinal imaging is very useful in diagnosing pathologies and monitoring inflammatory diseases of the posterior segment. The most commonly used retinal imaging techniques in uveitis include fundus photography, fundus fluorescein angiography (FFA), fundus autofluorescence (FAF), optical coherence tomography (OCT) and ultrasonography for posterior segment inflammatory conditions.

The current review aims to be an overview describing the role of each of these ancillary ocular imaging in the posterior segment uveitis diagnosis, evaluation and progression monitoring.

Color fundus photography

Color fundus photographs help in documenting the retinal and/or choroidal lesions and serves as a useful permanent document for monitoring the progression or regression of the disease by thumb nailing the images of different visits. Parnell et al.[1] showed a good agreement between the retina specialists for interpretation of retinal photographs distinguishing presumed ocular histoplasmosis and multifocal choroiditis without the need for any additional ancillary tests. However, a recent study reported a limited utility of fundus imaging alone in distinguishing different conditions in uveitis, using open software source.[2]

Nevertheless, fundus photography is routinely useful in most of the cases of posterior uveitides for documenting the lesions at baseline and follow up (Fig. 1). Stereo photographs may be useful in cases with exudative retinal detachment, optic disk edema, macular and choroidal neovascularization. The documentation by color photography is particularly useful in monitoring retinitis, choroiditis, macular edema, epiretinal membranes, parasitic infections like toxocariasis, cysticercosis, onchocerciasis; masquerade syndromes, retinal vasculitis, and also for assessing media clarity in eyes with vitritis.[3]

Fundus fluorescein angiography

Fundus fluorescein angiography (FFA) is useful in differentiating active from inactive uveitis and also confirming the diagnosis of co-existent pathologies like cystoid macular edema, choroidal neovascularization, subtle retinal vasculitis,

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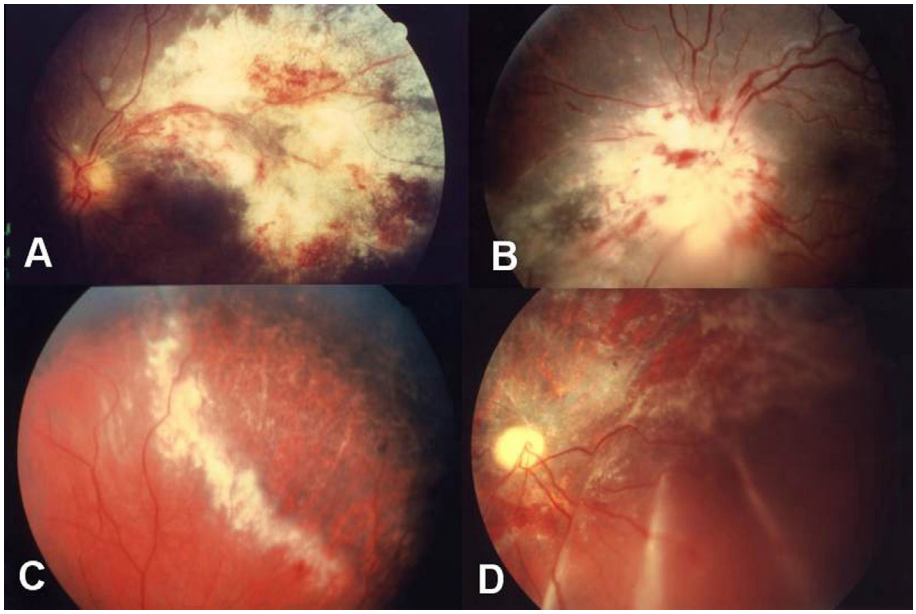

Figure 1. Cytomegalovirus (CMV) retinitis is characterized by a necrotizing retinitis with superficial hemorrhages and absent or mild intraocular inflammation. (A) Along the vascular arcades. (B) At the optic disk. (C) At the periphery of the retina. (D) Healed CMV retinitis associated with retinal detachment.

to monitor response to therapy, and identifying the areas of capillary non-perfusion as well as retinal neovascularization.

The small molecules of free unbound fluorescein dye leak out even from minimally inflamed retinal vessels including capillaries, thus making it an investigation of choice for retinitis and retinal vasculitis.[4] Illjima et al.[5] reported following characteristics of acute ocular toxoplasmic retinochoroiditis that include a hyperfluorescent lesion with central hypofluorescence (double ring sign); the arterial occlusion passing through the necrotic lesion showing a dark silhouette; venous dilation and leakage and optic disk staining with dye leak.

Staining and leakage of dye from retinal vasculature (arteries, veins or capillaries) either focal or diffuse indicating active retinal vasculitis occurs in several inflammatory conditions including syphilis, toxoplasmosis, tuberculosis, sarcoidosis, systemic lupus erythematosis, Behçet's disease, Birdshot chorioretinopathy, acute retinal necrosis, idiopathic retinal vasculitis, aneurysms and neuroretinitis (IRVAN), frosted branch angiitis, and Eales' disease (Figs. 2 and 3) FFA is particularly useful in the diagnosis and evaluation of the subclinical retinal capillary involvement and monitoring response to therapy during the follow-up in disease like Behçet's.[6]

FFA has been commonly used in the past to document the characteristic ''petalloid'' pattern of parafoveal hyperfluorescence in eyes with uveitic cystoid macular edema (CME).[4] CME has been angiographically graded into the following grades by Miyake[7]:Grade 0: no sign of fluorescein leakage; Grade I: slight fluorescein leakage into cystic spaces but not enough to enclose the entire fovea centralis; Grade II: complete circular accumulation of the fluorescein in the cystic space but its diameter is smaller than 2 mm; and Grade III: the circular accumulation of fluorescein is larger than 2.0 mm in diameter.

In 1984, Yannuzzi[8] proposed a slightly different classification as follows:Grade 0: no perifoveal hyperfluorescence; Grade 1: incomplete perifoveal hyperfluorescence; Grade 2: mild 360 degree hyperfluorescence; Grade 3: moderate hyperfluorescent area being approximately 1 disk diameter across; and Grade 4: severe 360° hyperfluorescence with the hyperfluorescent area being approximately 1.5 disk diameter across.

Few recent studies compared FFA and OCT for macular edema and reported OCT to be equivalent or superior to FFA in diagnosing macular edema.[9,10] A recent study compared both FFA and OCT and reported discrepant results in 4% of 112 enrolled eyes. The discrepancy was seen in 50% of eyes with Birdshot chorioretinopathy and occurred more frequently in intermediate uveitis. The authors concluded that both FFA and OCT were complementary and that revealed different pathophysiologic aspects of uveitic diseases.[11] In addition, a recent report by MUST Trial Research group[12] compared these two modalities and found only moderate agreement between these. Overall OCT was able to diagnose edema in 90.4% of cases compared to FA or biomicroscopy that gave useful information only in 77% and 76% respectively. Also OCT had a limitation in terms that it was not able to pick up macular leakage and thus in cases where treatment may need to be modified based on that finding, FFA is recommended in addition to OCT.[12]

FFA is still the most commonly used investigation in the evaluation of retinal ischemia, associated macroaneurysms, central retinal vein or artery occlusion in eyes with retinal vasculitis. FFA helps in demarcating the areas of capillary non-perfusion commonly associated with occlusive retinal periphlebitis seen in tuberculosis, sarcoidosis, Behçet's disease, Tuberculoprotein hypersensitivity (Eales disease), and idiopathic vasculitis.[13–16]

Although FFA is not an ideal investigation for evaluating the choroid, one can get some information on choriocapillaris perfusion manifested as early choroidal hypofluorescence or non-perfusion in several choroiditis entities, including Vogt–Koyanagi–Harada disease and inflammatory choriocapillaropathies, like serpiginous choroiditis (Fig. 4), acute posterior multifocal placoid pigment epitheliopathy (APMPPE), and