How to Differentiate Myopic Choroidal Neovascularization, Idiopathic Multifocal Choroiditis, and Punctate Inner Choroidopathy Using Clinical and Multimodal Imaging Findings

by Rosa Dolz-Marco, MD, PhD, and K. Bailey Freund, MD

The field of retina appears to encompass more diagnostic dilemmas than other ophthalmic subspecialties. In some patients, particularly young myopic women, differentiating myopic choroidal neovascularization, spontaneous hemorrhage associated with lacquer crack, and multifocal choroiditis can be problematic.

In this installment of Practical Retina, Rosa Dolz-Marco, MD, PhD, and K. Bailey Freund, MD, from the Vitreous Retina Macula Consultants of New York, provide a useful and straightforward guide to differentiate these conditions using multimodal imaging. They also highlight the increasing utility of optical coherence tomography angiography.

Prompt recognition by retina specialists is crucial, as the treatments for these conditions can be markedly different.

Evaluating and managing macular disease related to degenerative (or pathologic) myopia is common in the daily practice of most retinal specialists. Patients may present with visual symptoms related to non-emergent causes, such as diffuse or patchy atrophic degeneration, transient subretinal hemorrhage related to lacquer crack formation, tractional maculopathies, and myopic schisis within a posterior staphyloma. Although these entities are often observed or managed electively, a prompt diagnosis of myopic choroidal neovascularization (CNV) is critical for preserving vision. This goal may be difficult in some patients, particularly young myopic women in their thirties and forties, who present with findings that may suggest an alternative diagnosis of an inflammatory white dot syndrome, such as idiopathic multifocal choroiditis (MFC) or punctate inner choroidopathy (PIC). Whereas some experts consider MFC and PIC to be distinct disorders, we lump them together due to their overlapping demographic, clinical, and multimodal imaging features. Eyes with both myopic CNV and MFC may present with a tilted optic disc, myopic crescent, posterior staphyloma, peripapillary atrophy, diffuse or focal pigmentary changes, and CNV. The overlap between myopic CNV and MFC (with or without CNV) highlights the importance of a multimodal imaging approach, as management may be influenced by one’s assessment of the underlying disease process. Herein, we review differentiating features of each disease based on a practical multimodal imaging approach (Table).

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Myopic CNV, also known as a Fuchs spot, is often considered in the context of pathologic myopia (refractive error > 6 diopters). However, the diagnosis of myopic CNV can be made with any degree of myopic spherical error when there is no other disease associated with CNV present. Clinically, myopic CNV appears as a small, greyish lesion frequently showing a ring of hyperpigmentation (Figure 1A). Fluorescein angiography (FA) typically shows well-defined or “classic” pattern, with early hyperfluorescence and late leakage (Figure 1C). Optical coherence tomography (OCT) may show minimal subretinal fluid associated with subretinal hyperreflective material, representing a type 2 (subretinal) neovascular lesion overlying a flat retinal pigment epithelium (RPE). The recognition of a communication between the neovascular complex and the choroidal circulation may be best identified on a dense raster OCT scan pattern over the involved area (Figure 1E). In our experience, true myopic CNV occurs primarily in eyes with posterior staphyloma associated with a very thin choroidal thickness. Fundus autofluorescence may be useful to rule out old, punched-out inflammatory lesions and to identify the hyperautofluorescence of the pigmented ring surrounding the neovascular lesion. With OCT angiography (OCTA), it is now possible to image blood flow within subretinal hyperreflective material representing myopic CNV while avoiding invasive, dye-based angiography. However, further study is needed to determine the sensitivity and specificity of using this new imaging technique for this purpose.

In eyes with myopic degeneration, OCT and OCTA can help differentiate spontaneous subreti-
nal hemorrhage from hemorrhage associated with CNV. When CNV is absent, OCT should show only the hyperreflective subretinal hemorrhage and/or hyporeflective fluid over a flat and intact retinal pigment epithelium. These spontaneous hemorrhages tend to resolve within several weeks without intervention, often leaving a new lacquer crack in their place.1,2 Indocyanine green angiography

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<thead>
<tr>
<th>TABLE Review of Differentiating Features of Each Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnosis</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Fundus examination</td>
</tr>
<tr>
<td>Fluorescein angiography</td>
</tr>
<tr>
<td>Indocyanine green angiography</td>
</tr>
<tr>
<td>Fundus autofluorescence</td>
</tr>
<tr>
<td>Structural OCT</td>
</tr>
<tr>
<td>OCT angiography</td>
</tr>
</tbody>
</table>

**CNV** = choroidal neovascularization; **OCT** = optical coherence tomography; **RPE** = retinal pigment epithelium
Practical Retina

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ICGA) or FA may also be useful to rule out the presence of CNV\(^{1-2}\) (Figure 2).

IDIOPATHIC MULTIFOCAL CHOROIDITIS

The typical chorioretinal inflammatory lesions occurring in MFC are seen clinically as single or multiple yellow-greyish spots that may progressively evolve into punched-out atrophic scars with a variable degree of pigmentation\(^3\) (Figure 1B). On FA, inflammatory lesions show early hyperfluorescence and late staining. Late staining of the optic nerve, not typical of myopic degeneration, can be a clue to an inflammatory etiology (Figure 1D). Fundus autofluorescence may be useful to show the extent of the lesions and monitor their status. Acute lesions appear hyperautofluorescent, and, as the inflammation subsides, hypoautofluorescent atrophic lesions may appear. ICGA may be useful to demonstrate the extent and number of lesions, which are often greater than what is observed clinically.

Patients with MFC are at high risk for developing CNV, which occurs in up to 60% of cases.

Figure 3. Multimodal imaging of inflammatory lesions in a 39-year-old myopic female diagnosed with idiopathic multifocal choroiditis. (A) Color photograph shows multiple small lesions in the peripapillary area. The arrowhead indicates one of the active yellowish lesions. (B) Fundus autofluorescence shows subtle hyperautofluorescence of the acute lesion (arrowhead). (C) Fluorescein angiography shows late staining of the active lesion (arrowhead). (D) Indocyanine green angiography demonstrates late hypofluorescence (arrowhead). (F-G) Spectral-domain optical coherence tomography (SD-OCT) corresponding to the green arrow in the near-infrared reflectance on panel E, at baseline (F) and at 2-weeks follow-up (G). (F) The OCT scans show an acute subretinal pigment epithelium (RPE) lesion (arrowhead) with choroidal hypertransmission and nasal ellipsoid zone disruption. (G) After resolution of acute inflammation, there is reduced choroidal hypertransmission, but persistent mild atrophy of the RPE and outer retina persist. Choroidal thickness beneath the lesion is reduced.
Figure 4. Optical coherence tomography angiography (OCTA) for differentiating acute inflammatory lesions from those associated with choroidal neovascularization in an eye with idiopathic multifocal choroiditis. (A) Color photograph shows multiple yellowish-grey lesions within the macula. (B) Fundus autofluorescence shows mottled hypo- and hyperautofluorescence of the lesions. (C) En face OCTA reconstruction. (D) Structural OCT scan over the lesion within the green box in panel B shows hyperreflective material below and above the retinal pigment epithelium (RPE). (E) Cross-sectional OCTA of the same lesion in panel D demonstrates abnormal flow above the RPE, representing type 2 neovascularization. (F) Structural OCT scan over the lesion within the yellow box in panel B shows hyperreflective material below the RPE. (G) Cross-sectional OCTA shows the absence of abnormal flow beneath the RPE. The flow overlying the RPE layer represents projection of the flow signal from the more superficial retinal circulation (projection artifact).
When CNV occurs, it frequently shows a well-defined “classic” FA pattern, with OCT showing a predominantly type 2 lesion pattern with hyperreflective material mostly above the RPE that is difficult to distinguish from that described above for myopic CNV.

Early in its course, MFC may present with a few or even just a single lesion within the macula that is difficult to distinguish from myopic CNV. High-quality OCT is very helpful in identifying these lesions, which appear as material of intermediate hyperreflectivity beneath a smooth RPE elevation resembling a druse. These lesions are often associated with choroidal hypertransmission\(^5\) (Figures 1 and 3). If these lesions do not progress to CNV and/or subretinal fibrosis, they will typically resolve as the acute inflammation subsides leaving to varying degrees of RPE and outer retinal atrophy. When the inflammatory lesions are active, there is often a focal transient mild thickening of the underlying choroid that helps to identify the inflammatory nature of the presentation. Areas of ellipsoid zone disruption may surround the sub-RPE elevations and represent another clue to the diagnosis of MFC, as does the presence of inflammatory cells in the vitreous overlying the acute lesions and/or optic nerve.

In some cases, either due to the degree of inflammation or to a delay in treatment, the RPE can become disrupted over the acute inflammatory lesions of MFC with hyperreflective material accumulating in the subretinal space (Figure 4). These lesions are at high risk for neovascular conversion, as has been recently demonstrated with OCT angiographic techniques.\(^6\)

In summary, distinguishing the inflammatory lesions related to MFC and myopic CNV may be challenging, particularly in young patients with overlapping risk factors and clinical findings. An accurate and prompt diagnosis is important, as management may require different therapeutic approaches. Whereas MFC may require the use of immunomodulatory or immunosuppressant drugs to control associated intraocular inflammation, CNV either related to myopia or MFC may respond best to intravitreal anti-vascular endothelial growth factor therapy. A multimodal imaging analysis can often provide the necessary information for making a correct diagnosis in these challenging cases.

REFERENCES


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