CASE IN POINT

The Role of Diagnostic Imaging in Macular Telangiectasia Type 2

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While uncommon with subtle findings, macular telangiectasia type 2 can be diagnosed with careful retinal examination and selective use of diagnostic imaging.

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Macular telangiectasia type 2 (MacTel2) is an uncommon, bilateral, and asymmetric condition that typically presents between the ages of 40 and 60 years without sex predilection.[1-9] Its estimated prevalence ranges from 0.02 to 0.10%.[2,8] The disease can manifest in either a nonproliferative or proliferative phase; the latter is far less common. The etiology of MacTel2 is poorly understood, but it is believed to have neurodegenerative as well as vascular components.[1-6,8-10] We present a case of MacTel2 and highlight the role of diagnostic imaging in early diagnosis prior to development of classic funduscopic features.

CASE PRESENTATION

A 66-year-old White male with a 10-year history of type 2 diabetes mellitus (T2DM) presented to the eye clinic for an annual eye examination. The patient was taking metformin, and 6 months prior to presentation, his hemoglobin A_{1c} was 7.4%. He had a history of mild nonproliferative diabetic retinopathy in the left eye without diabetic macular edema. He reported no ocular concerns.

On examination, best-corrected visual acuity (VA) was 20/20 in each eye. Slit-lamp examination was notable only for bilateral mild nuclear sclerosis. Dilated fundus examination showed a blunted foveal reflex consistent with the appearance of a macular pseudo-hole in the right eye and was unremarkable in the left eye (Figure 1).

Macular optical coherence tomography (OCT) revealed an intraretinal cyst without thickening in the temporal fovea of both eyes with mild disruption of the underlying ellipsoid zone in the right eye (Figure 2). A presumptive diagnosis of MacTel2 vs diabetic

FIGURE 1 Fundus Photograph Showing Blunted Foveal Reflex

FIGURE 2 Macular Optical Coherence Tomography Showing Intraretinal Cyst
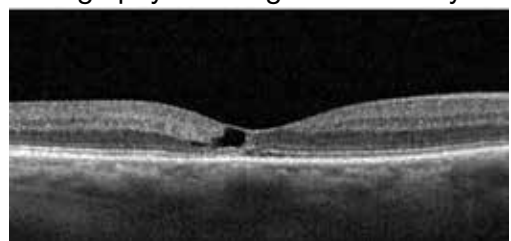
macular edema was made, and the patient was referred to the retina clinic for further evaluation.

At the 1-month follow-up in the retina clinic, VA, macula OCT, and fundus examination were stable. Fundus autofluorescence (FAF), optical coherence tomography angiography (OCT-A), and fluorescein angiography (FA) were performed. The FAF revealed a hyperreflective crescent in the temporal aspect of the fovea of both eyes, greater in the right eye than the left (Figure 3). The OCT-A showed abnormal dilation of the vessels in the deep capillary plexus of the temporal fovea of both eyes (Figure 4). This area of abnormality correlated to the area of

hyperreflectivity seen on FAF. The early-phase FA revealed telangiectatic vessels in the temporal fovea in both eyes; in the late phase, there was leakage of telangiectatic vessels, which remained localized to the temporal perifovea and spared the central fovea of both eyes (Figure 5). The patient was diagnosed with MacTel2.

DISCUSSION

This case highlights several important management considerations in MacTel2. These include symptoms, disease stage, and diagnostic imaging, which can allow more precise staging of the disease.

The etiology of MacTel2 is unknown.[6] It is believed to be primarily a neurodegenerative condition that damages Müller cells and photoreceptors, leading to vascular changes.[1-6,8-10] Müller cells may play a role in creating and maintaining the integrity of the blood-retinal barrier, particularly in the deep capillary plexus where the vascular abnormalities begin.[6,10] These early changes in the deep capillary plexus may evolve to include the superficial capillary plexus in intermediate stages with anastomoses forming between the 2 layers.[2,6-10] Late proliferative stages show significant alterations of the juxtafoveal capillary network, subretinal neovascularization and retinochoroidal anastomoses.[6,7,9,11] In one cohort study, 81% of patients with MacTel2 were White, and a genetic link is still under investigation.[2,4-9]

Presentation

The most common symptoms of MacTel2 include blurred vision, microscotoma, metamorphopsia, and difficulty reading, with missing or distorted letters a common concern.[1,2,4-8] Best-corrected VA at presentation is usually better than 20/30, and disease progression tends to be slow.[2,6] Microscotomata are best mapped with microperimetry.[1-3,5-7]

There are several classic fundus findings (Table). In the early stages, these findings are subtle or entirely absent funduscopically.[1,2,4-10] In intermediate stages, fundus findings become apparent and include a loss of retinal clarity (grayish perifoveal sheen), telangiectatic macular vessels, retinal pigment epithelium hypertrophy, blunted right-angled vessels, and superficial retinal crystalline deposits.[2,4-11] Right-angled vessels

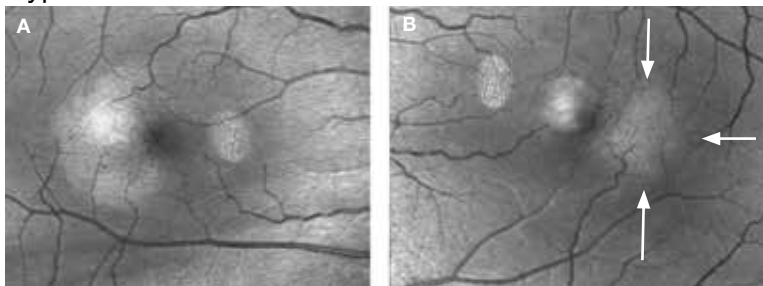**FIGURE 3** Fundus Autofluorescence Showing Hyperreflective Crescent

FIGURE 4 Optical Coherence Tomography Angiography Showing Abnormal Dilation
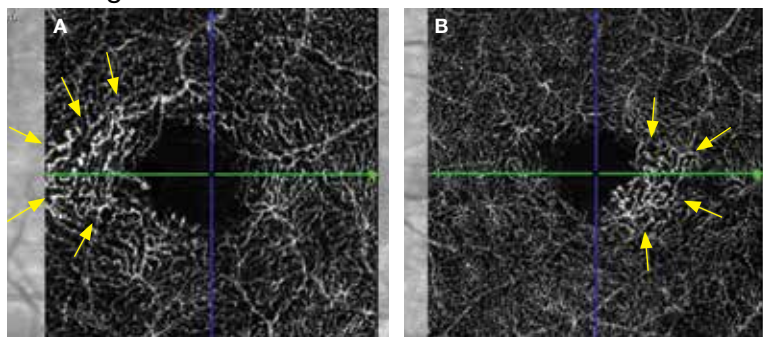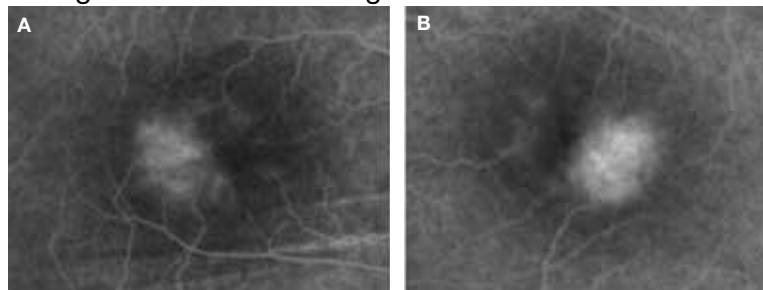

FIGURE 5 Fluorescein Angiography Showing Latephase Telangiectatic Vessel Leakage

A, right eye; B, left eye.

may have a greater association with choroidal neovascularization, with growth into the outer retina in particular being a marker of disease progression.[9] The crystalline deposits have been hypothesized to be the footplates of degenerated Müller cells.[6]

An important vision-threatening complication of MacTel2 is progression to proliferative disease.[1,2,5-10] Choroidal neovascularization is present in a minority of cases and is associated with rapid vision loss.[2,6] It is often accompanied by subretinal hemorrhage and lipid exudation.[6,7,9] If untreated, the result can be disciform scarring and fibrosis.[2,5,6] Additional complications of MacTel2 are foveal atrophy and full thickness

TABLE Fundus Findings in Macular Telangiectasia Type 2[11]

Fundus Findings	Prevalence, %
Loss of retinal clarity (grayish perifoveal sheen)	74
Telangiectatic macular vessels	51
Retinal pigment epithelium hypertrophy	33
Blunted right-angled vessels	29
Superficial retinal crystalline deposits	21-46
Choroidal neovascularization	2-14

macular holes.[1,2,4-8,] Macular holes secondary to MacTel2 respond poorly to pars plana vitrectomy with inner limiting membrane (ILM) peel.[2,6]

Diagnostic Testing

Diagnostic retinal imaging is invaluable in the diagnosis of MacTel2. The OCT can detect hyporeflectivity within the ellipsoid zone in early disease corresponding to ellipsoid zone loss, which increases as the disease progresses.[1-8,10] This loss most often begins in the temporal parafoveal region and correlates with the progression of both relative and absolute scotomas perceived by affected individuals.[2,3,5,8]

Intraretinal foveal hyporeflective spaces on the OCT represent cavity formation after Müller cell and photoreceptor loss and do not correlate with increased thickness.[1,2,4,6,7] This is important in differentiating from diabetic macular edema, which will often show thickening.[6] In most cases of MacTel2, foveal thickness is decreased.[4-6] The ILM remains intact overlying this space and is referred to as ILM drape.[6,7] This can cause blunting or absence of the foveal light reflex and mimic the appearance of a macular pseudohole.[4]

The OCT-A allows visualization of capillary changes through every layer of the retina, which could not otherwise be appreciated, allowing early detection as well as precise staging of the disease.[2,6-10] Anastomoses present in late-stage disease also can be imaged using OCT-A.[7,9] These anastomoses can be seen as hyperreflective vasculature present between the retinal layers where there is little to no vasculature visible in normal eyes.[7]

A lesser-known occurrence in MacTel2 is the depletion of macular luteal pigment, with many eyes possessing an abnormal distribution.[2,4,6-8,10] This depletion and abnormal distribution can be visualized with FAF. In particular, short wavelength fundus autofluorescence (SW-FAF) is the most effective at highlighting these changes.[10] The characteristic finding is a hyperreflective halo surrounding the fovea.[2,6] Fluorescence life imaging ophthalmoscopy (FLIO) is a recent development in FAF that measures FAF lifetime, which is the duration of time a structure autofluoresces.[8] A cross-sectional study published in 2018 showed prolonged FAF lifetime in the temporal fovea of patients with early and moderate stage MacTel2 when compared with normal patients.[8] More advanced stages showed a ring encircling the entire fovea.[8]

Classic FA findings in MacTel2 include early hyperfluorescence of temporal foveal telangiectatic capillaries and late-stage leakage with sparing of the central fovea.[1,2,4,6,7,11]

Management and Prognosis

Management of MacTel2 depends on the stage of the disease. In the absence of proven treatment, management in nonproliferative stages is conservative.[2,6] Intravitreal anti-VEGF does not offer any benefit in nonproliferative disease.[2,5,6] Indeed, as VEGF may have a neuroprotective effect on the retina, anti-VEGF may result in more harm than benefit in earlier disease stages.[5] In proliferative stages, intravitreal anti-VEGF can help limit scarring and prevent vision loss.[2,5]

Long-term prognosis of MacTel2 is variable with VA typically better than 20/100.[2] Vision loss in MacTel2 most often begins paracentrally; it can then progress centrally, leading to significant reduction in VA.[12] The progression of this functional vision loss and corresponding structural damage is typically slow.[3] VA worse than 20/100 is usually a result of proliferative disease; in such cases, there is potential for severe central vision loss and legal blindness.[1]

CONCLUSIONS

This case of MacTel2 underscores the subtle retinal findings in the earliest stages of the disease and the importance of a complete retinal examination and diagnostic imaging with macula OCT, OCT-A, and FAF to establish the correct diagnosis.

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Ethics and consent

All authors have adhered to ethical principles for medical research. Informed consent was obtained from the subject involved in the study who was fully aware that a case study might be published. No identifying personal information is present.

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