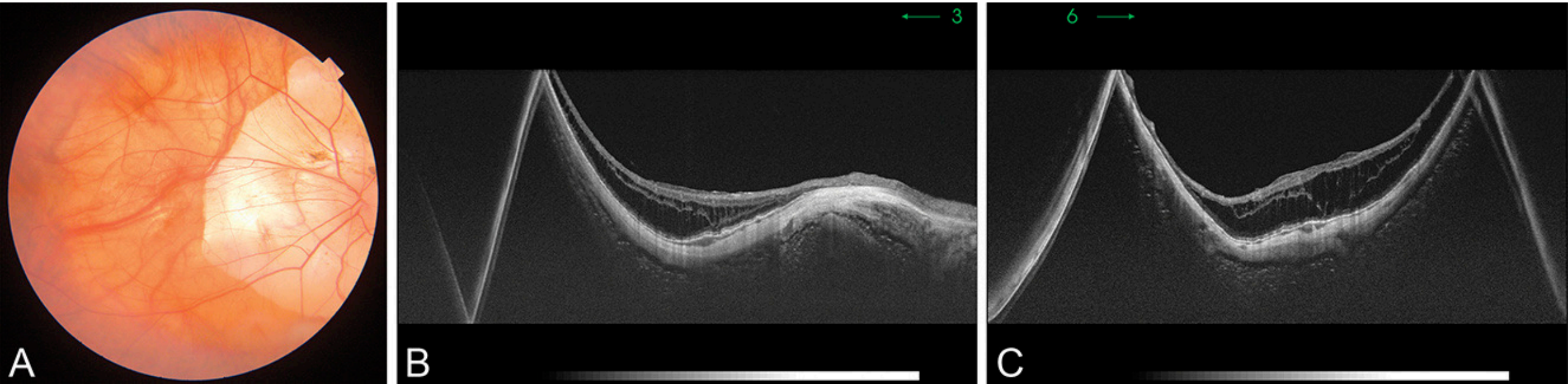
# ATN Classification

Table 1. Updated ATN Classification System

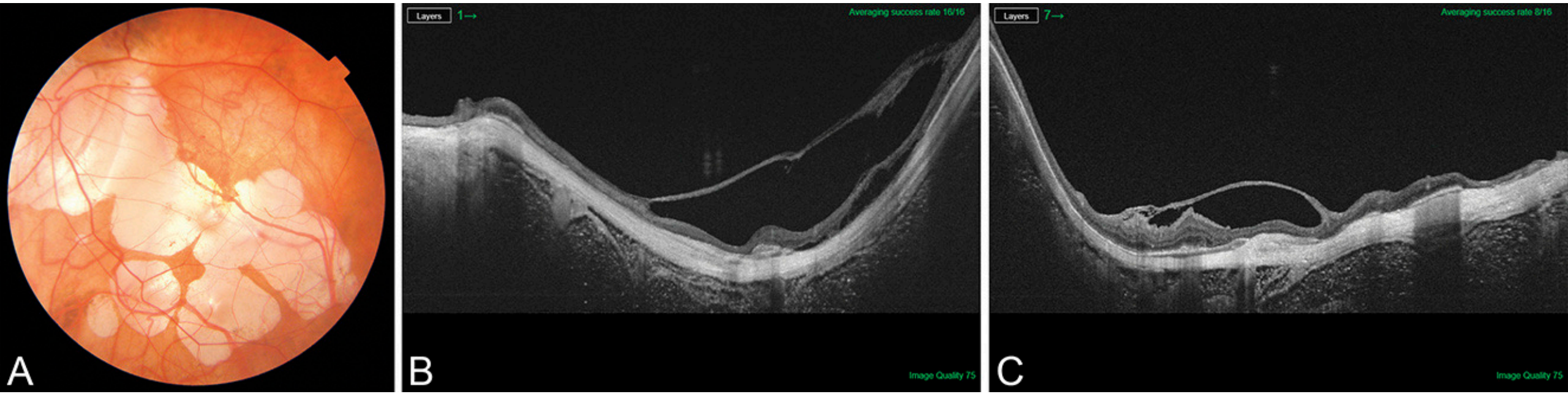
| Atrophic Component (A) | Tractional Component (T) | Neovascular Component (N) |
|---|---|---|
| A0: No myopic retinal lesions | T0: no macular schisis | N0: no myopic CNV |
| A1: Tessellated fundus only | T1: inner or outer foveoschisis OR *lamellar macular hole* | N1: lacquer cracks |
| A2: Diffuse chorioretinal atrophy | T2: inner + outer foveoschisis | ***N2a: active CNV*** |
| ***A3: Patchy chorioretinal atrophy*** | ***T3: foveal detachment*** | ***N2s: scar/Fuch spot*** |
| ***A4: Complete macular atrophy*** | ***T4: full-thickness macular hole*** | |
| | ***T5: macular hole + retinal detachment*** | |

New update based on the original ATN grading system from Ruiz-Medrano J. *Prog Retin Eye Res* 2019;69:80–115.
Bold-italic: stages that define severe pathologic myopia.




Highly myopic eye with patchy atrophy, outer foveoschisis, and no signs of CNV would be classified as A3T1N0.

*From:* Ruiz Medrano: Retina, Volume 40(11).November 2020.2113-2118




Highly myopic eye with geographic atrophy, outer and inner foveoschisis, and scar from old, inactive CNV would be classified as A4T2N2s.

# CORRELATION BETWEEN ATROPHY-TRACTION-NEOVASCULARIZATION GRADE FOR MYOPIC MACULOPATHY AND CLINICAL SEVERITY

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**Purpose:** To assess the reliability of the atrophy-traction-neovascularization (ATN) classification in patients with pathologic myopia (PM) and its correlation with best-corrected visual acuity (BCVA).

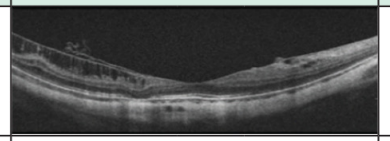
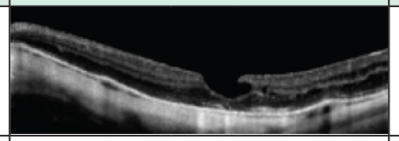
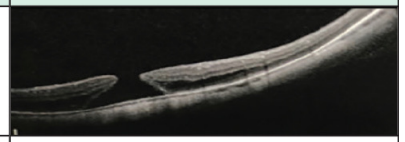
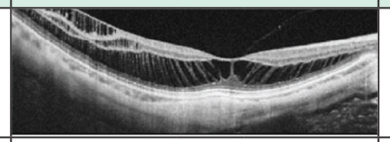
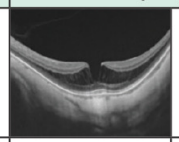
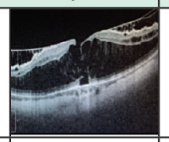
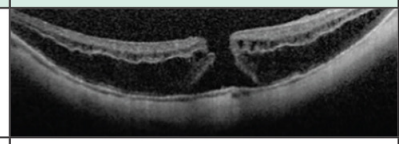
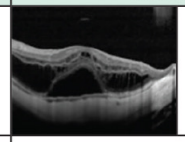
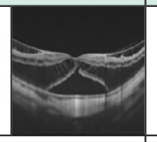
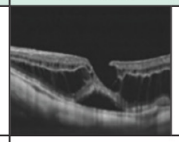
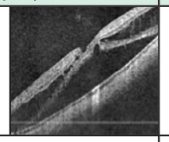
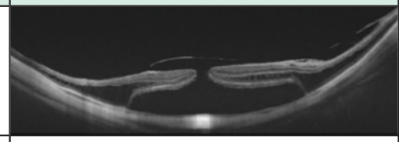
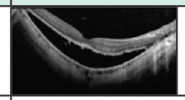
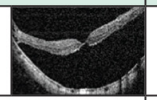
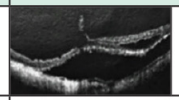
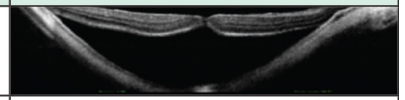
**Methods:** Cross-sectional study. Hundred highly myopic eyes with a spherical equivalent of $>-6.0$ diopters or axial length of $>26$ mm and a total ATN score of $\geq 3$ underwent a complete ophthalmological examination, including fundus photography and swept-source optical coherence tomography. Five observers graded each eye using the ATN system. Mean A, T, and N scores were calculated and correlated with age, BCVA (in logarithm of the minimum angle of resolution), and axial length. Patients were considered to present severe PM if either A or T components were $\geq 3$ and/or N was $\geq 2$.

**Results:** Hundred eyes (53 left) from 91 patients (78 women) were classified. Mean age, BCVA, and axial length values were, respectively, 65.1 ± 11.7 years (range, 36–97 years), −0.63 ± 0.62 (−3.00 to 0.00), and 29.26 ± 2.7 mm (26.01–37.66 mm). Mean ATN grades for each component were as follows: A = 2.51 ± 0.78 (0.6–4.0), T = 0.88 ± 1.14 (0.0–5.0), and N = 1.31 ± 1.40 (0.0–3.0). Weighted interobserver agreement was 98.1%, 98.7%, and 94.6%, for A, T and N, respectively. In eyes with severe PM, BCVA was significantly lower and axial length was significantly longer.

**Conclusion:** The excellent interobserver rate in this study demonstrates that the updated ATN grading system is an accurate and reliable tool to classify patients with PM. These findings show that BCVA is more compromised in eyes with severe PM, particularly those graded ≥A3 and/or T3.

**RETINA** 41:1867–1873, 2021

# MTM Classification

| PERPENDICULAR EVOLUTION | | TANGENTIAL EVOLUTION | | | | | |
|---|---|---|---|---|---|---|---|
| | | STAGE | NORMAL FOVEAL PROFILE | STAGE | TANGENTIAL EVOLUTION IN LMH | STAGE | TANGENTIAL EVOLUTION IN FTMH |
| | Inner-Outer Macular Schisis | 1A |  | 1B |  | 1C |  |
| | Average BCVA | | 0.5 | | 0.4 | | 0.1 |
| | Time to Next Step | | 18 months | | 15 months | | 12 months |
| | Management | | Observation | | PPV (if symptomatic) | | PPV |
| | Predominantly Outer Macular Schisis | 2A |  | 2B |  2b0  | 2C |  |
| | Average BCVA | | 0.3 | | 0.2 0.1 | | 0.1 |
| | Time to Next Step | | 12 months | | 6 months | | 1-3 months |
| | Management | | Observation | | MB + late PPV (if symptomatic) | | MB + PPV |
| | Macular Schisis Detachment | 3A |  3a0  | 3B |  3b0  | 3C |  |
| | Average BCVA | | 0.2 | | 0.1 | | 0.1 |
| | Time to Next Step | | 3 months | | 1-3 months | | less than 1 month |
| | Management | | MB | | MB + late PPV (if symptomatic) | | MB + PPV |
| | Macular Detachment | 4A |  4a0  | 4B |  4b0  | 4C |  |
| | Average BCVA | | 0.1 | | 0.1 | | 0.1 |
| | Management | | MB | | MB + late PPV (if symptomatic) | | MB + PPV |
| | **The "+" sign can be added to indicate epiretinal abnormalities and can be present in each stage** | | | | | | |

Abbreviations: LMH, lamellar macular holes; FTMH, full-thickness macular hole; PPV, pars plana vitrectomy; MB, macular buckle

## TANGENTIAL EVOLUTION

PERPENDICULAR EVOLUTION

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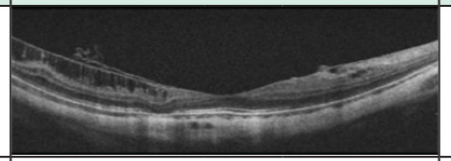
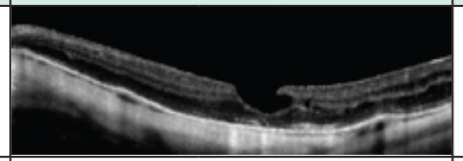
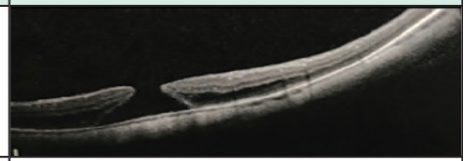
| Inner-Outer Macular Schisis | 1A |  | 1B |  | 1C |  |
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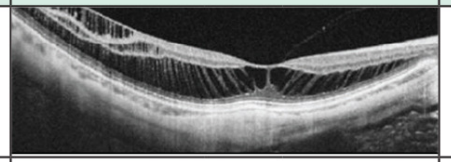
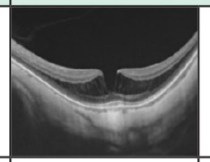
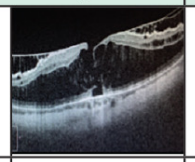
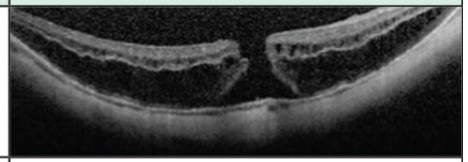
| Predominantly Outer Macular Schisis | 2A |  | 2B |  2b0  | 2C |  |
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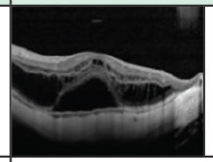
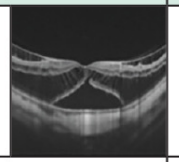
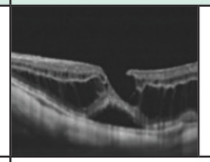
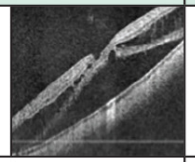
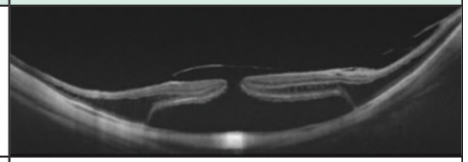
| Macular Schisis Detachment | 3A |  3a0  | 3B |  3b0  | 3C |  |
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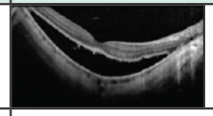
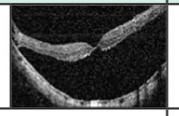
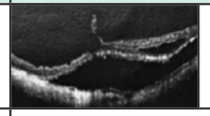
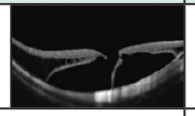
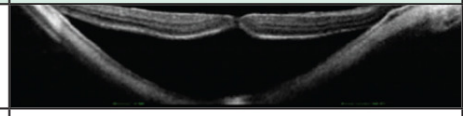
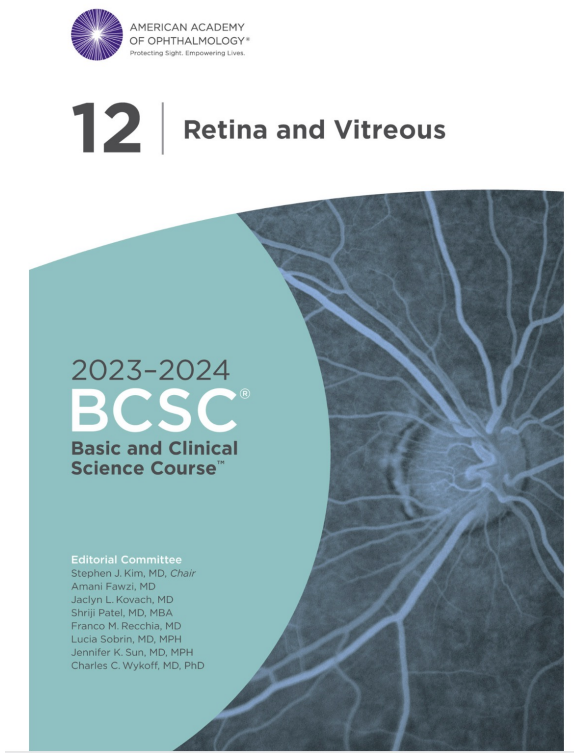
| Macular Detachment | 4A |  4a0  | 4B |  4b0  | 4C |  |
| Average BCVA | | 0.1 | | 0.1 | | 0.1 |
| Management | | MB | | MB + late PPV (if symptomatic) | | MB + PPV |

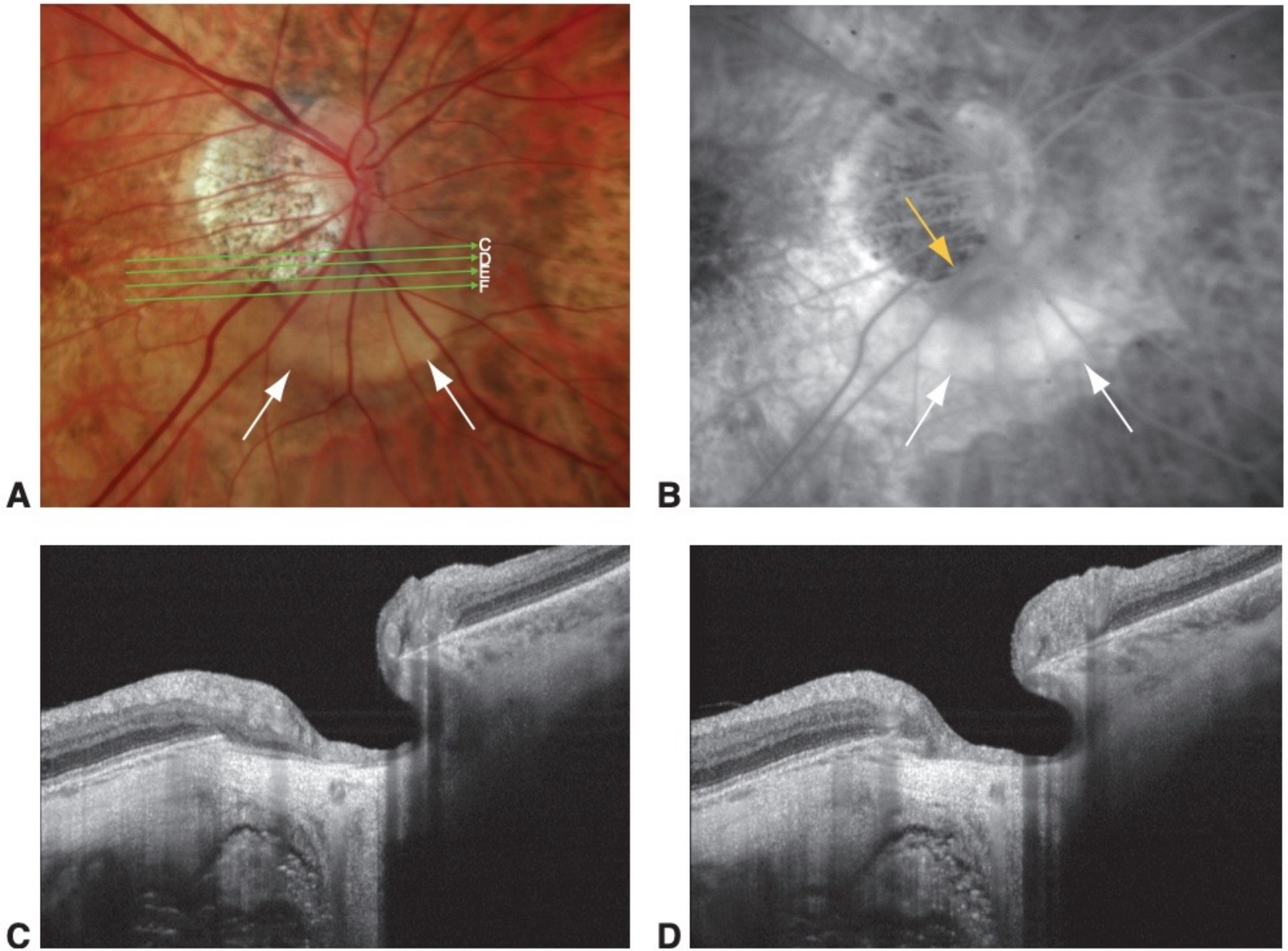
**The "+" sign can be added to indicate epiretinal abnormalities and can be present in each stage**

Abbreviations: LMH, lamellar macular holes; FTMH, full-thickness macular hole; PPV, pars plana vitrectomy; MB, macular buckle

Ruiz Medrano et al. published a classification not just of MTM but of myopic maculopathy (MM), addressing, as a whole, the Atrophic, Tractional and Neovascular aspects of MM. MTM is the Tractional side of the ATN Classification with T0 indicating no traction; T1 inner or outer FS; T2 inner + outer FS; T3 indicating FD; T4 a FTMH; T5 −MH + RD.[13] This classification is more complete then the previous ones and has the merit to offer a wider view of the highly myopic eye and all the associated complications. However, the description of MTM is not complete. None of the above classifications offers information on natural history.

Around the optic nerve, between 5% and 10% of highly myopic eyes have a yellow-orange pocket, which at one time was thought to be a localized retinal detachment, but more refined OCT imaging revealed it to be an acquired cavitation in the choroid (Fig 10-7). Therefore, these lesions are called *peripapillary intrachoroidal cavitations.* Enhanced depth imaging OCT demonstrated that these cavitations are associated with a posterior bowing of the sclera around the nerve.




A
B
C
D

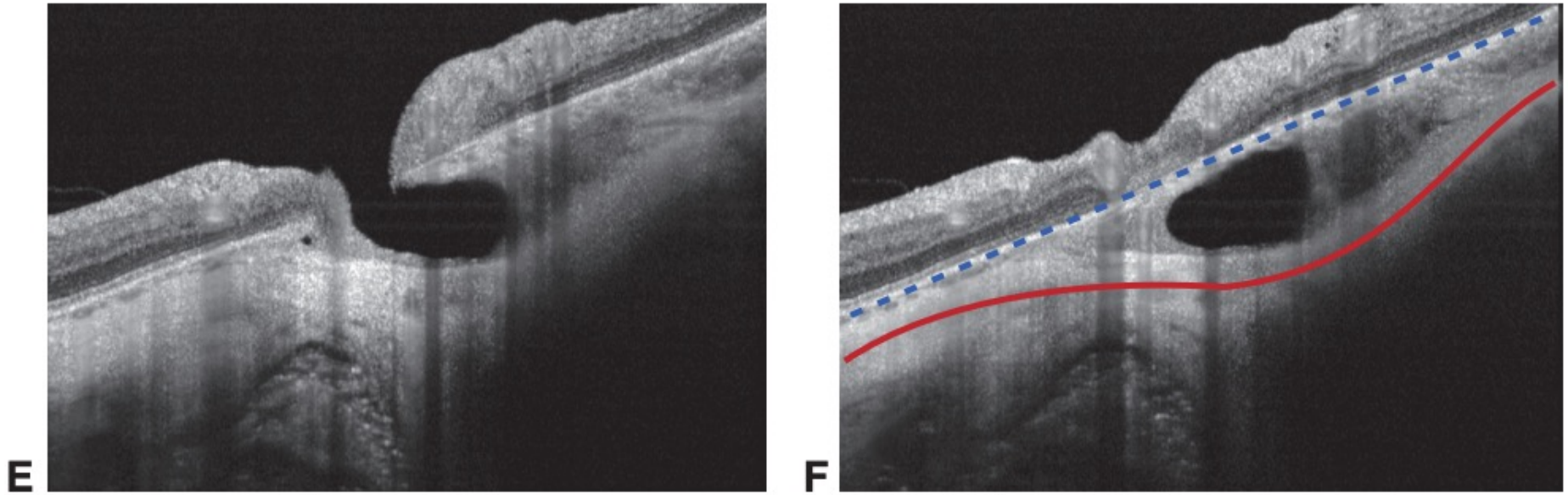



**Figure 10-7** Peripapillary intrachoroidal cavitation. **A,** Color fundus photograph shows the yellow-orange region of the intrachoroidal cavitation *(white arrows)*. The *green arrows* show the locations of subsequent OCT sections. **B,** Fluorescein angiography image shows a modest late collection of dye within the cavity *(white arrows)*. Note the upper edge of the cavity is sharply demarcated *(yellow arrow)*. The edge of the retinal defect is more clearly evident than in the color photograph. **C–F:** Successive serial sections taken using SS-OCT show the inner retinal defect and the extension of the cavitation into the choroid. A veil of tissue extends through the thickness of the choroid at the border of the cavitation. In **F,** the hyperreflective band that corresponds to the retinal pigment epithelium is nearly straight, as illustrated by the *blue dashed line*. The *red line* follows a posterior bowing at the center-point thickness in the sclera. *(Used with permission from Spaide RF, Akiba M, Ohno-Matsui K. Evaluation of peripapillary intrachoroidal cavitation with swept source and enhanced depth imaging optical coherence tomography.* Retina. *2012;32(6):1037–1044. doi:10.1097/IAE.0b013e318242b9c0)*

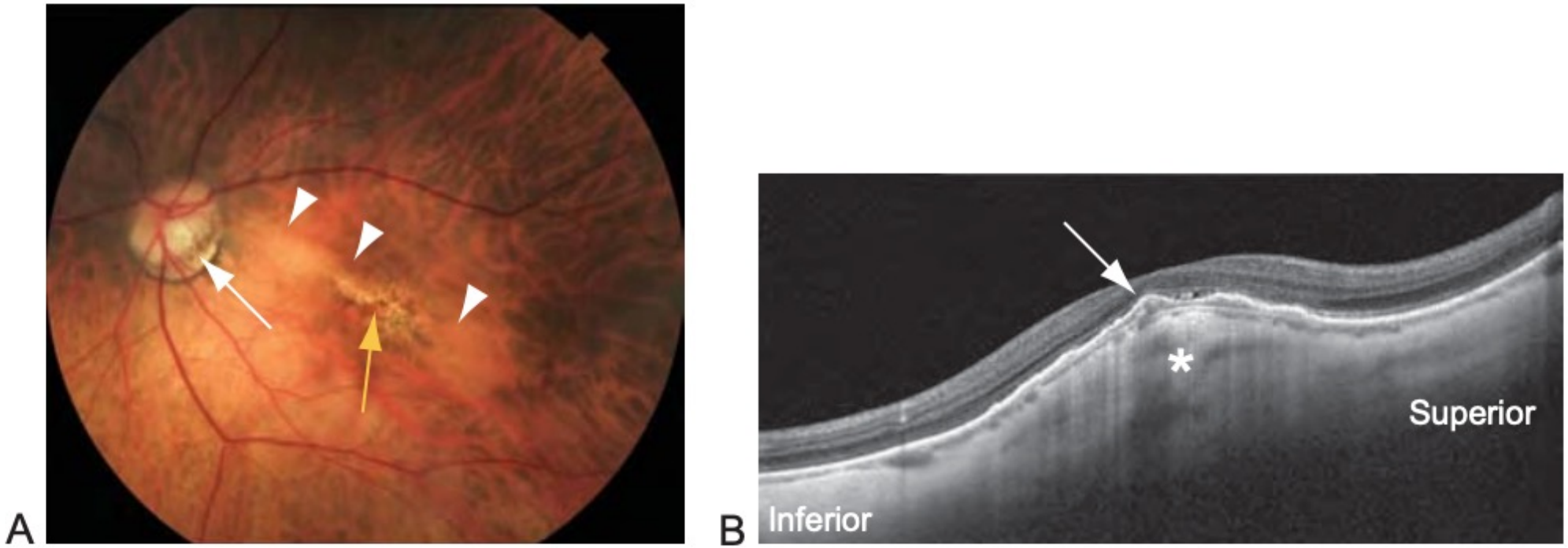



**Figure 10-8** Inferior staphyloma syndrome, also known as *tilted disc syndrome.* **A,** Fundus photograph shows that the superior fundus is darker than the staphylomatous inferior fundus. At the border between the 2 regions *(arrowheads)* there is a pigmentary change in the macula *(yellow arrow)*. Because this border runs through the superior border of the optic nerve head, the patient has a tilted disc *(white arrow)*. **B,** Dome-shaped macula. Vertical OCT image taken through the fovea shows the 2 curves. At the ridge between them, there is CNV *(arrow)* associated with a small amount of submacular fluid. The sclera is typically thicker at the border zone *(asterisk)* than anywhere in the neighboring areas. *(Courtesy of Richard F. Spaide, MD.)*

Ocular expansion can vary regionally, inducing formation of areas of the sclera that have differing radii of curvature. Bulging of the sclera and adherent uveal tissue in an area of thin sclera, or *staphyloma,* can result from regional expansion of the eye. These protrusions typically involve 3 general areas of the eye: (1) the area around the nerve; (2) the macular region, which leads to exaggerated thinning of the choroid and possibly myopic traction maculopathy; and (3) the inferior or inferotemporal portion of the eye (Fig 10-8). The superior portion of the eye has one radius of curvature, the inferior portion has another, and there is a visible border between these 2 curves. If the border occurs above the optic nerve, the optic nerve head will appear grossly tilted and rotated. If the border bisects the fovea, several alterations may be seen. In later life, there may be atrophy along the border that affects the RPE under the fovea, and either subretinal fluid without CNV or frank CNV may also develop in these eyes. Because a staphyloma involving the inferior or inferotemporal eye may be accompanied by a set of possible ocular manifestations, it has been referred to as *inferior staphyloma syndrome* or *tilted disc syndrome.*