



## TMDU Classification of Myopic Traction Maculopathy Based on OCT and Ultra Wide-Field OCT (UWF-OCT)

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### Abstract

Myopic traction maculopathy (MTM) is considered a pre-existing lesion of macular hole retinal detachment. The diagnosis of MTM is made by the existence of one of the macular lesions; epiretinal membrane, vitreomacular traction, retinal thickening, retinoschisis, macular hole (lamellar or full thickness), and retinal detachment. Tokyo Medical and Dental University (TMDU) classification of MTM is established based on the size and the location of the retinoschisis and the presence of six foveal pathologies. Progression from retinoschisis to retinal detachment is classified into four stages starting with a development of outer lamellar hole.

### Keyword

Retinoschisis · Epiretinal membrane · Vitreomacular traction · Macular hole · Retinal detachment

The terminology of myopic macular retinoschisis, myopic foveoschisis, or myopic retinoschisis has not been consistent. Retinoschisis is the most frequent form of tractional retinal changes before the development of a macular hole retinal detachment (MHRD) in eyes with pathologic myopia [1]. However, in some eyes, MHRD can develop without retinoschisis. Panozzo et al. [2] proposed to unify all of the pathologic features generated by traction in the myopic environment under the name of myopic traction maculopathy (MTM) in 2004. The diagnosis of MTM is made by the existence of one of the macular lesions; epiretinal membrane, vitreomacular traction, retinal thickening, retinoschisis, macular hole (lamellar or full thickness), and retinal detach-

ment (RD). Other causes of RDs, such as those caused by intrachoroidal cavitation [3], myopic macular neovascularization, or dome-shaped macula, should be excluded.

MTM is thought to be the preexisting lesion before the development of MHRD. Tractional mechanisms causing the MTM are diverse. Therefore, OCT images of MTM are also diverse. OCT examinations must be performed over the entire area of macula, as wide as possible with a use of wide-field OCT.

Tokyo Medical and Dental University (TMDU) classification of MTM is shown in Table 18.1. Firstly, the images over the entire area of the retinoschisis need to be thoroughly examined. Retromode imaging is also useful for detecting a characteristic fingerprint pattern at the corresponding area of the retinoschisis [4] (Fig. 18.1). When the entire area of the retinoschisis is examined, the eyes are classified into five groups based on the area and the extent of the retinoschisis: no retinoschisis (S0), extra-foveal retinoschisis (S1), foveal only retinoschisis (S2), foveal but not entire macular area retinoschisis (S3), and entire macular area retinoschisis (S4) (Fig. 18.2).

Next, other foveal pathologies should be identified in OCT images; such as an epiretinal membrane (M), a vitreomacular traction (V), an inner lamellar MH (L), a full thickness macular hole (H), a retinal detachment (D) and a retinal atrophy (A). A retinal detachment is classified into four stages according to its progression from retinoschisis [5] (Fig. 18.3). Retinal atrophy is included in TMDU classification of MTM because a retinal atrophy with outer retinal damage such as myopic macular neovascularization may worsen MTM [6], and may affect surgical outcome.

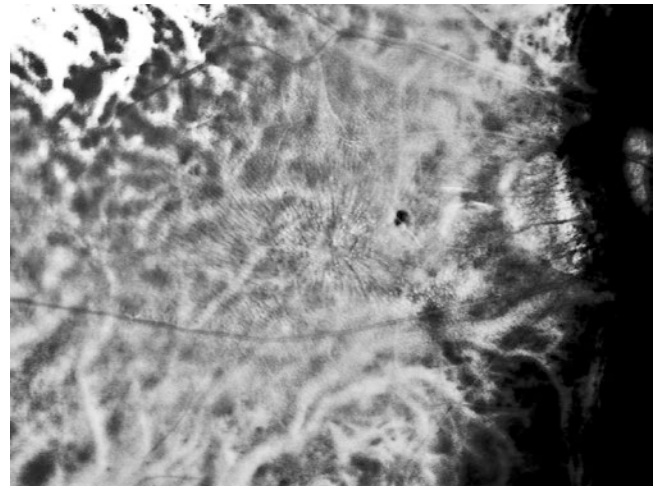
Natural course of the MTM is generally stable [7]. 3.9% showed a decrease or complete resolution of the retinoschisis. However, 11.6% had a progression of the MTM. The progression rate was high (42.9%) in the more advanced MTM (S4), whereas the progression rate was as low as 7.8% in the milder MTM, such as S1 to S3.

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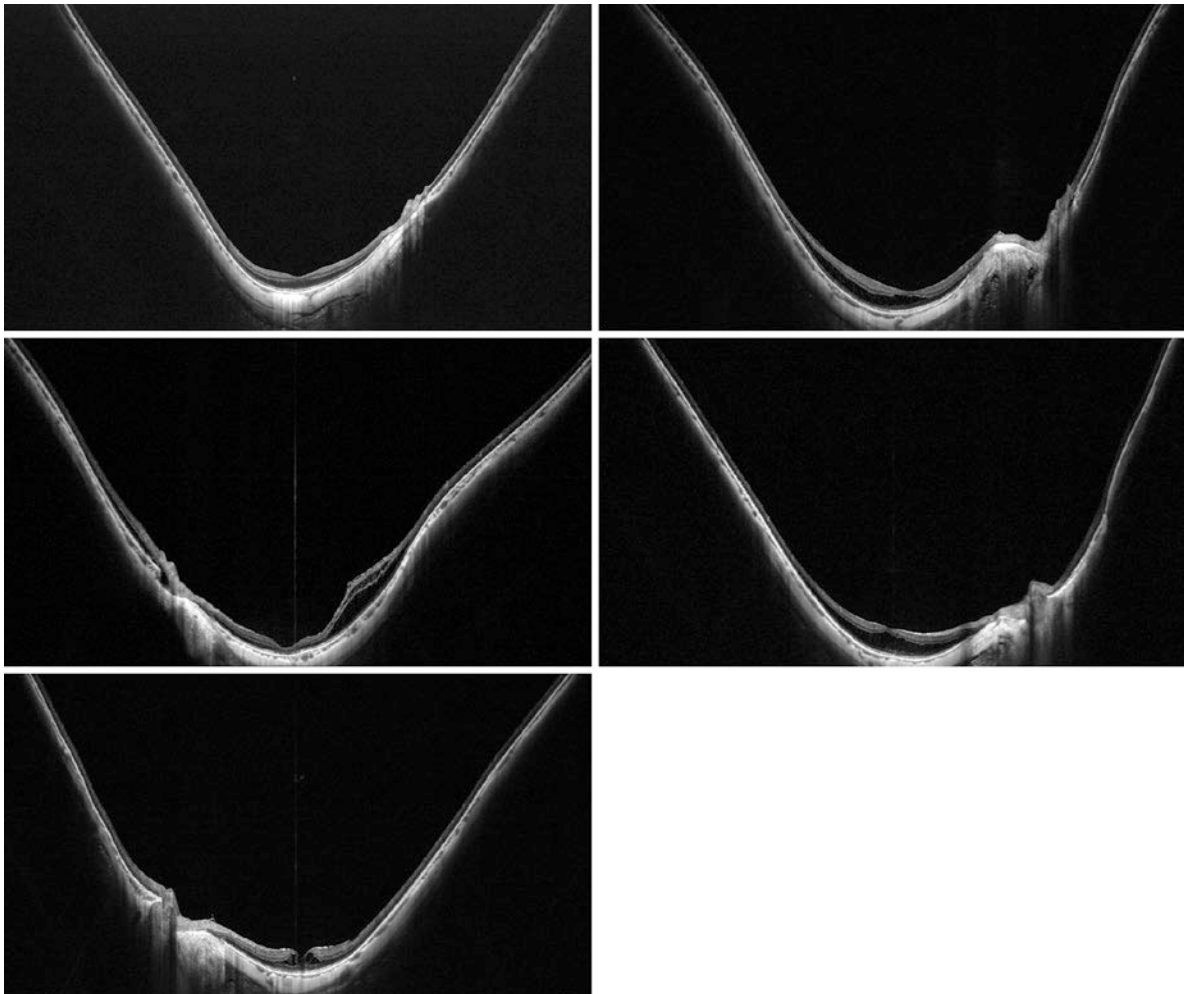
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**Table 18.1** Tokyo Medical and Dental University (TMDU) classification of myopic traction maculopathy

Area of the retinoschisis	S0: No retinoschisis S1: Extra-foveal retinoschisis S2: Foveal only retinoschisis S3: Foveal but not entire macular area retinoschisis S4: Entire macular area retinoschisis
Foveal pathologies	M: Epiretinal membrane V: Vitreomacular traction L: Inner lamellar macular hole H: Full thickness macular hole D: Retinal detachment (D1~4) A: Retinal atrophy
Retinal detachment (if accompanied)	D1: Irregularity of the thickness of the external retinal layer D2: Formation of outer lamellar hole D3: Vertically increased outer lamellar hole D4: Attachment of the edge of outer retina to the upper part of the retinoschisis layer

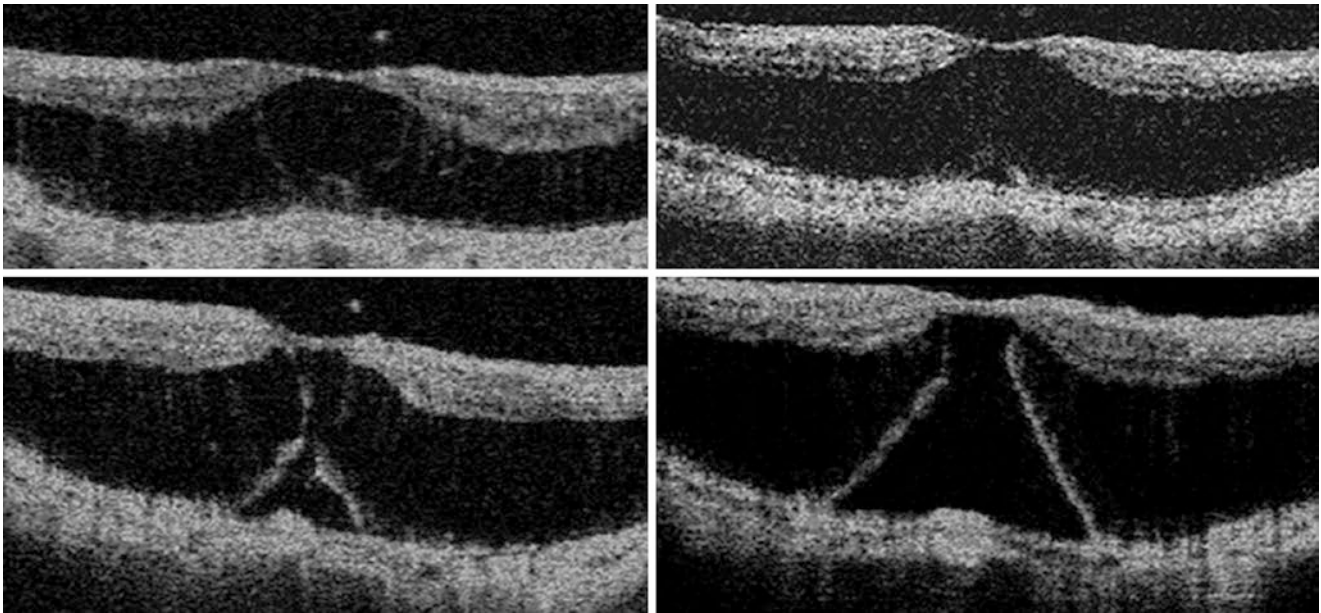


**Fig. 18.1** Representative retromode image of an eye with a retinoschisis. Retromode image shows a fingerprint pattern consisting of central radiating retinal striae and surrounding multiple dots and lines. Many lines appear in parallel or in a whorled pattern



**Fig. 18.2** Wide-field OCT images of five groups according to the size of the retinoschisis in Tokyo Medical and Dental University (TMDU) classification of myopic traction maculopathy. (Top Left) no retinoschisis (S0), (Second Row, Left) extra-foveal retinoschisis (S1), (Bottom Left)

foveal only retinoschisis (S2), (Top Right) foveal but not entire macular area retinoschisis (S3), (Second Row, Right) entire macular area retinoschisis (S4)



**Fig. 18.3** Different stages in the progression from the retinoschisis to the retinal detachment in Tokyo Medical and Dental University (TMDU) classification of MTM. In stage D1 (Top Left), OCT image shows an irregularity of the thickness of the outer retinal layer. In stage D2 (Top Right), an outer lamellar hole has developed in the thickened area of the outer retina. In stage D3 (Bottom Left), the column-like structures within the retinoschisis layer overlying the lamellar hole

appear to be separated horizontally, and consequently the hole is enlarged vertically. The outer margins of the outer retinal layer around the hole are further elevated, and the area of the retinal detachment is enlarged. In stage D4 (Bottom Right), the upper edge of external retina around the hole is attached to the upper part of the retinoschisis layer, and retinal detachment is further enlarged accompanied by a resolution of the retinoschisis

## References

1. Takano M, Kishi S. Foveal retinoschisis and retinal detachment in severely myopic eyes with posterior staphyloma. *Am J Ophthalmol.* 1999;128(4):472–6.
2. Panozzo G, Mercanti A. Optical coherence tomography findings in myopic traction maculopathy. *Arch Ophthalmol.* 2004;122(10):1455–60.
3. Shimada N, Ohno-Matsui K, Iwanaga Y, et al. Macular retinal detachment associated with peripapillary detachment in pathologic myopia. *Int Ophthalmol.* 2009;29:99–102.
4. Tanaka Y, Shimada N, Ohno-Matsui K, et al. Retromode retinal imaging of macular retinoschisis in highly myopic eyes. *Am J Ophthalmol.* 2010;149:635–40.
5. Shimada N, Ohno-Matsui K, Yoshida T, et al. Progression from macular retinoschisis to retinal detachment in highly myopic eyes is associated with outer lamellar hole formation. *Br J Ophthalmol.* 2008;92(6):762–4.
6. Shimada N, Ohno-Matsui K, Yoshida T, et al. Development of macular hole and macular retinoschisis in eyes with myopic choroidal neovascularization. *Am J Ophthalmol.* 2008;145(1):155–61.
7. Shimada N, Tanaka Y, Tokoro T, et al. Natural course of myopic traction maculopathy and factors associated with progression or resolution. *Am J Ophthalmol.* 2013;156:948–57.