

Natural history of macular holes in the era of optical coherence tomography

Abstract

Macular holes are an ophthalmological condition that can leave the eye totally blind if not treated. The condition all starts with a small splitting with the macular area that can break through with loss of neural retinal and subsequent collection of fluid making correction of the condition a time sensitive matter.

Keywords: macula, hole, PVD, cyst, distortion, retinal, detachment, fluid, subretinal, intraretinal

Volume 10 Issue 1 - 2020

Emad Selim

Department of Ophthalmology, North Cumbria University Hospitals, UK

Correspondence: Emad Selim, department of Ophthalmology, North Cumbria University Hospitals, UK, Tel +447429309328, Email emad.selim@nhs.net

Received: December 18, 2019 | **Published:** January 17, 2020

Introduction

The macula is a common location for symptomatic retinal problems. Commonly, posterior vitreous detachment (PVD) initiates the macular symptoms. Idiopathic macular hole is a symptomatic retinal pathology affecting nearly 7.8/100,000 population favouring more women with a ratio of 3.321:1 females: males.¹ The disease is bilateral in 12-13% in two years after presentation.²

Symptoms

Common features of symptomatic macular holes are decreased visual acuity, metamorphopsia and central scotomas.

Discussion

Grading, presentation and natural history

Watzke and Allen³ devised a test to examine for macular holes. Thinking now about this ingenious test, it had used the principles of Optical coherence tomography (OCT) even before OCT was ever known. Their test utilized the distortion caused displacement of photoreceptors along the perimeter of the whole and later lack of junction of those photoreceptors. By shining a line of light mostly vertically over the macular hole, a small waist or dehiscence can appear in the line of light. In the pre era, Gass⁴ devised a grading system for macular holes based on biomicroscopic findings. This system is still widely used in clinics and literature. It is also useful in predicting the visual outcome of surgical interference for macular holes. In the OCT era, new findings can be deduced from scanning the retina. With the availability of OCT to almost all major eye units at least; in western countries, OCT features of macular holes can be used in conjunction to the original Gass grading system. We are now aware of the term Occult PVD which means that posterior hyaloid is detached from the fovea but still attached to the optic disc.

Gass grading system

Stage 0

Posterior vitreous attachment to the fovea while being separated at the disc when the contralateral eye has full thickness macular hole.

Stage 1 (Impending macular hole)

Biomicroscopically, it appears as a foveal spot 1A⁵ or ring 1B.⁶ On OCT, it appears as an intraretinal cyst. Typically, at this stage there is no distortion. Although patient is usually asymptomatic or aware of a grey patch in their central vision. Such a macular hole has a 50% chance for self-resolution mostly with development of Posterior Vitreous Detachment (PVD).⁷ Progression to Full thickness macular hole (FTMH) occurs in 40%.⁸

Stage 2

Clinically a small crescent or round hole less than 400 appear. Distortion is a feature of this stage of macular hole. It progresses to stage 3 or 4 within 12 months in 74%.⁹ Occult PVD, as we know it now, occurs in 74%.¹⁰ Spontaneous closure occurs in 11.5%.¹¹ If left untreated, they have a 75 % chance of eye sight drop in 6/60 after 5 years duration.¹²

Stage 3

Large round whole more than 400um. Distortion and or Central scotoma. Occult PVD is present is 74%. Spontaneous closure occurs in only 4%.¹³

Stage 4

Any hole size or shape associated with PVD. Patient usually complains of central scotoma. OCT can show complete separation of posterior vitreous and occasionally an operculum floating over the hole. In FTMH, grades 2-4, variable amounts of intraretinal and subretinal fluid can appear around the hole. The edge of the hole can appear elevated either due to persistent vitreal traction or the intraretinal fluid.

New international classification

International Vitreomacular Traction Study Group¹⁴ Introduced a new classification suitable for the age when OCT is readily available to ophthalmologists. This classification is important because it determines management and prognosis of macular holes based on the cause, size and presence of vitreomacular traction. This OCT-based classification first divides macular hole into primary or secondary

depending on whether caused by vitreomacular traction (primary) or some other reason (secondary). Then a further division is made on basis of the minimum width of the hole; small, under 250 μm ; medium, 250–400 μm and large, larger than 400 μm in minimum width. The last layer of subclassification depends whether vitreomacular tractions still exists or not.

Conclusion

Macular hole is a condition that has been diagnosed and treated based on biomicroscopical findings for a long time before the introduction of OCT into Ophthalmology. OCT has revolutionised diagnosis and management of the condition. It also predicted the prognosis. Postoperatively OCT scanning allowed detection of closure of the hole and whether additional time was needed for posturing. In general ophthalmologists understanding of natural history of macular holes have improved dramatically with the use of OCT scanning.

Acknowledgments

None.

Funding

None.

Conflicts of interest

Author has no financial interest to declare.

References

- McCannel CA, Ensminger JL, Diehl NN, et al . Population-based incidence of macular holes. *Ophthalmology*. 2009;116:1366–1369.
- Schuman JS, Pulliafito CA. *Optical coherence tomography of ocular diseases*. NJ: Slack, Thorofare; 2004.
- Watzke RC, Allen L. Subjective slitbeam sign for macular disease. *Am J Ophthalmol*. 1969;68:449–453.
- Gass JD. Reappraisal of biomicroscopic classification of stages of development of a macular hole. *Am J Ophthalmol*. 1995;119(6):752–759.
- Haouchine B, Massin P, Gaudric A. Foveal pseudocyst as the first step in macular hole formation: a prospective study by optical coherence tomography. *Ophthalmology*. 2001;108(1):15–22.
- Gass JD. Idiopathic senile macular hole. Its early stages and pathogenesis. *Arch Ophthalmol*. 1988;106(5):629–639.
- Takahashi A, Nagaoka T, Yoshida A. Stage 1-A macular hole: a prospective spectral-domain optical coherence tomography study. *Retina*. 2011;31:127–147.
- Bustros S. Vitrectomy for prevention of macular holes. Results of a randomized multicenter clinical trial. Vitrectomy for Prevention of Macular Hole Study Group. *Ophthalmology*. 1994;101(6):1055–1059.
- Kim JW, Freeman WR, El-Haig W, et al. Baseline characteristics, natural history, and risk factors to progression in eyes with stage 2 macular holes. Results from a prospective randomized clinical trial. Vitrectomy for Macular Hole Study Group. *Ophthalmology*. 1995;102(12):1818–1828.
- Ito Y, Suzuki T, Kojima T, et al. Mapping posterior vitreous detachment by optical coherence tomography in eyes with idiopathic macular hole. *Am J Ophthalmol*. 2003;135(3):351–355.
- Ezra E, Gregor ZJ. Surgery for idiopathic full-thickness macular hole: two-year results of a randomized clinical trial comparing natural history, vitrectomy, and vitrectomy plus autologous serum: Moorfields Macular Hole Study Group Report no. 1. *Arch Ophthalmol*. 2004;122(2):224–236.
- Casuso LA, Scott IU, Flynn HW Jr, et al. Long-term follow-up of unoperated macular holes. *Ophthalmology*. 2001;108(6):1150–1155.
- Freeman WR, Azen SP, Kim JW, et al. Vitrectomy for the treatment of full-thickness stage 3 or 4 macular holes. Results of a multicentered randomized clinical trial. The Vitrectomy for Treatment of Macular Hole Study Group. *Arch Ophthalmol*. 1997;115(1):11–21.
- Duker JS, Kaiser PK, Binder S, et al. The International Vitreomacular Traction Study Group classification of vitreomacular adhesion, traction, and macular hole. *Ophthalmology*. 2013;120(12):2611–2619.