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Macular holes viewed objectively

Idiopathic full thickness macular holes (FTMH) are an important cause of poor vision in the elderly. Decreased visual function is mainly due to the absence of photoreceptors within the central retinal defect. Also, the adjacent cuff of subretinal fluid and secondary retinal elevation cause a relative scotoma surrounding the absolute central field defect.

The recent observation of Gass on the pathogenesis of FTMH¹ has sparked a number of investigations into new methods of assessment of FTMH. He described the vital importance of tangential vitreoretinal traction in the development and subsequent enlargement of FTMH and proposed a classification based on ophthalmoscopic signs.¹ In stage 1 (impending) macular hole, the vitreoretinal traction causes foveal detachment which may progress to a small full thickness retinal defect (stage 2 FTMH). Stage 3 FTMH is usually larger and is associated with a cuff of subretinal fluid and focal vitreous detachment over the macula. In stage 4 there is complete vitreous separation. The interpretation of such signs depends on the diagnostic skills of the observer and is limited by the optical resolution of our current biomicroscopic methods. The need for improved diagnosis of such minute pathological changes has led to the development of new objective systems to record the anatomical and functional alterations both before and after treatment.

In most cases the diagnosis of FTMH can be made by biomicroscopy using a preset handheld lens or a Goldmann fundus contact lens. Patients with FTMH may also report a gap in a thin slit-beam projected on the macula (Watzke-Allen sign²) or the disappearance of a 50 µm laser aiming beam shone in the centre of a macular hole.³ Such additional tests are useful in cases where the diagnosis of FTMH is in doubt. Indeed, in one series the diagnosis of macular pseudoholes by the initial ophthalmologist was correct in only 43%.⁴ An incorrect assessment may result in unnecessary surgery.

In an attempt to improve the diagnostic accuracy Tsujikawa and coworkers employed scanning laser ophthalmoscopic (SLO) microperimetry. In their study, published in this issue of the *BJO* (p 117), they examined a large series of patients with FTMH, macular pseudoholes, and impending (stage 1) macular holes. They correlated the presence of relative and absolute scotomata with the results of their ophthalmoscopic and preoperative findings. On preoperative biomicroscopy they were unable to classify nine of their 106 patients as FTMH or as a pseudohole. However, on SLO microperimetry four patients had a dense central scotoma; these patients were found to have FTMH at surgery. The remaining five eyes

had only a relative scotoma, which appeared to correlate well with the preoperative diagnosis of macular pseudoholes. The high sensitivity as well as specificity of SLO microperimetry as demonstrated by Tsujikawa *et al* in this article is impressive and, if confirmed by further studies, may become part of the growing diagnostic armamentarium for researchers and surgeons in this field.

Since the first report of closure of macular holes with vitrectomy and gas tamponade⁵ the reported surgical success has been steadily improving⁶⁻⁹ with or without the use of adjunctive substances such as transforming growth factor β,⁶ autologous serum,⁷ platelets,⁸ or thrombin.⁹ To date, the only explanation of the rather surprising visual improvement after the closure of FTMH has come from the histological examinations of postmortem eyes.^{10 11} These demonstrated the approximation of seemingly intact foveal photoreceptors to within 16 µm from the central glial 'plug'. In vivo, a surgically closed macular hole and the surrounding retinal elevation may no longer be detectable ophthalmoscopically. However, such subtle changes in retinal thickness and elevation are not always easy to appreciate clinically and again in this issue (p 107) Hudson *et al* describe an objective method of documenting the changes in the retinal height before and after macular hole surgery using scanning laser tomography. In their study the analysis of digitised images of the retinal topography of the central 10° and 20° fields provided objective confirmation of the postoperative changes in retinal height in three of the four eyes they studied. Preoperatively, these three eyes had relatively large holes (stages 3 and 4) where the surrounding subretinal fluid may be quite marked. However, no such differences were found for the remaining eye which had a smaller (stage 2) FTMH presumably with less subretinal fluid associated with it, thus making any postoperative changes in the retinal height more difficult to detect. Nevertheless, from these preliminary results it looks as though scanning laser tomography as described by Hudson *et al* may prove to be helpful to the clinician in accurately recording and possibly predicting the postoperative result.

There are already a number of imaging techniques which have proved to be useful both in research and clinical management of FTMH. Some are well established such as fluorescein angiography,¹² high resolution ultrasonography,¹³ and scanning laser ophthalmoscopy.¹⁴ By employing autofluorescence imaging the confocal SLO also allows differentiation between FTMH and pseudoholes without the inherent risks of an intravenous injection of fluorescein.¹⁵ New on the market is optical coherent tomography (OCT) which employs high resolution optical sections of the retina and allows for the measurement of

the retinal thickness and even the volume of the FTMH to be calculated.¹⁶

While the favourable results of macular hole surgery appear to justify the continuation of such operations most of the evidence available to date is based on clinical observations derived from uncontrolled studies.¹⁷ Such subjective observations are invaluable but there is a clear need for more objective methods of evaluation of our patients before and after surgery as demonstrated by these two reports in the *BJO*. There is hope that such evidence will not only enhance our understanding of the underlying pathological processes but will also provide objective evaluation of the results of our treatment.

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