

Alor setar experience: surgical outcomes of macular hole surgery with folding method

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Purpose: To review the surgical outcomes of macular hole surgery with internal limiting membrane (ILM) folding method in Hospital Sultanah Bahiyah (HSB), Alor Setar.

Method: A retrospective study reviewing the functional and anatomical outcomes of macular hole surgery with ILM folding method for all related cases in HSB during the period between January 2013 to December 2018.

Results: Thirty-seven patients with purely full-thickness macular hole who underwent ILM folding method surgery were included in the study, with 21 females and 16 males. Ages ranged between 51-74 years. We observed the outcomes of macular hole surgery using folding method based on visual improvement and macular hole closure at 6-weeks and 6-months post-surgery. All surgeries were performed by a single vitreo-retinal surgeon in HSB. Following macular hole surgery using folding method, 31 cases (83.8%) and thirty-three cases (89.2%) showed visual improvement by two or more lines at 6-weeks and 6-months post-surgery, respectively. Hole closure was achieved in all cases (100%) of macular hole surgery using the folding method at 6 weeks and 6 months post-surgery.

Conclusion: In conclusion, surgical outcomes of macular hole surgery using ILM folding method in Alor Setar showed 100% anatomical success and majority of cases showed improvement in visual acuity by 2-or-more line at 6-months post-surgery. Besides surgical techniques, macular hole surgical success is also attributed by size of macular hole.

Keywords: macular hole surgery, folding method, surgical outcome

Conflict of interest statement: We declare that we have no conflict of interest

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Introduction

Idiopathic macular hole is one of the causes of significant reduction in visual acuity particularly in women in the seventh decade of life.¹ Visual disturbance is believed to be due to dehiscence at the umbo, loss of retinal

tissue in the hole and detachment of the neurosensory retina surrounding the hole.² Gass has suggested that macular holes are the result of a dehiscence of the retina at the macula, and that this dehiscence is due to tractional forces on the macula by the prefoveal vitreous cortex, and by epiretinal membranes, especially in a tangential manner.³

Kelly and Wendell reported the first successful closure of a series of macular

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holes by pars plana vitrectomy and gas tamponade in 1991.⁴ In the past literature and studies, rate of successful macular hole closure is higher in ‘newer’ macular holes as compared to long-standing macular holes.⁵ Conventionally, most macular hole surgery involves ‘peeling’ method where vitrectomy, peeling of the internal limiting membrane (ILM) and gas tamponade. In 2010, a slightly newer technique was introduced to address larger and chronic macular holes; the inverted ILM flap or also known as ‘folding’ method in our study, where the surgeon leaves a piece of ILM attached to the edge of the hole, flattened and subsequently folded over the hole in an inverted manner to leave the hole covered after fluid-gas exchange.⁶ It is believed that the flap serves as a scaffold to induce and support glial cell proliferation, which founded the hole-closure process.⁶

Objective

To review the surgical outcomes of macular hole surgery with internal limiting membrane (ILM) folding method in Hospital Sultanah Bahiyah (HSB), Alor Setar, Kedah, Malaysia.

Method

A retrospective study reviewing the functional and anatomical outcomes of macular hole surgery with ILM folding method for all related cases in HSB during the period between January 2013 to December 2018. Data were collected retrospectively from patients’ case notes and inserted into a predetermined proforma on Microsoft Excel. Patient demographic data, diagnosis, underlying illness, pre- and post-operative vision and Optical Coherence Tomography (OCT) macular findings pre- and post-operatively were recorded. Those with previous or known retinal diseases limiting visual acuity such as retinal detachment, any types of retinopathy or posterior uveitis, and previous vitrectomy

ILM folding method surgery with C3F8 gas tamponade were included in the study, with 21 females and 16 males. Ages ranged between 51-74 years.

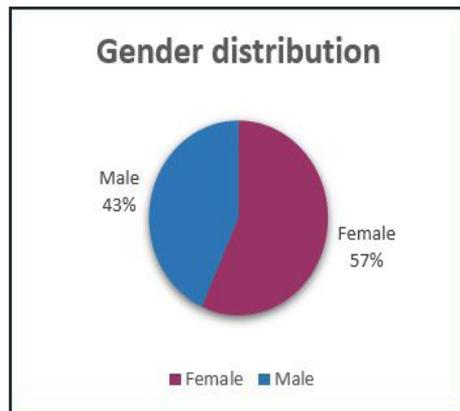


Figure 1: Pie chart depicting the gender distribution of patients who underwent macular surgery ILM folding method in HSB between the period of January 2013 to December 2018.

Based on Gass’ classification of macular hole, 18 (48.6%) were stage 3, 17 (45.9%) were of stage 2 macular hole and only 2 cases were of stage 4. We observed the outcomes of macular hole surgery using folding method based on visual improvement and macular hole closure at 6-weeks and 6-months post-surgery. Surgical outcomes were evaluated based on anatomical and functional parameters. Case were deemed an anatomic success if the macular hole closes as evidenced by the OCT imaging done post-operatively. Functional success is defined as an improvement in visual acuity by 2 lines or more on Snellen projection following macular hole surgery. All surgeries were performed by a single vitreo-retinal surgeon in HSB, which followed the same post-operative care and positioning as guideline. Following macular hole surgery using folding method, 31 cases (83.8%) and thirty-three cases (89.2%) showed visual improvement by

two or more lines at 6-weeks and 6-months post-surgery, respectively (Figure 2 and Figure 3). Remaining 4 cases which had no improvement in visual acuity (VA) were of stage 3 (2 cases) and stage 4 (2 cases), all of which had no drop in VA at 6-months post-surgery.

Post-operative visual acuity ranged from 6/9 to counting fingers on standardised Snellen projection. Best visual results were seen in those eyes with stage 2 holes, 45.9% (17 eyes) of these eyes achieved final best corrected visual acuity of 6/18 or better.

Out of the 100% anatomically-success eyes, 4 (10.8%) showed functional failure,

in which post-operative visual acuity remained static or improved by only a single line on Snellen chart, as compared to pre-operative vision. No patient demonstrated deterioration in visual acuity following macular hole surgery in this audit.

Lens opacities have progressed to cause significant cataracts post gas tamponade in 26 patients which requires cataract removal to date. On average, cataract were detected between 6-months to 15 months post vitrectomy surgery. No other immediate visual-threatening complications seen in all patients included in the study.



Hole closure was achieved in all cases (100%) of macular hole surgery using the folding method at 6 weeks (Figure 2 - above) and 6 months post-surgery (Figure 3 - below).



Table 1: the outcomes of macular hole surgery using folding method

Visual outcome at 6 months post-surgery	Folding method
No improvement	1 (2.7%)
1 line	3 (8.1%)
2 lines or more	33 (89.2%)

Discussion

The main goal of surgical therapy for macular hole is for visual improvement through closure of the hole and flattening of the cuff of subretinal fluid surrounding the hole.² Besides, the anatomical success of macular hole surgery, the visual restoration is highly dependent on the preservation of surrounding retinal tissues which contributes to emergence of new surgical techniques. The macular hole surgery performed in our centre is similar that of described by Kelly and Wendel⁴ involving pars plana vitrectomy, gas tamponade and post-operative posturing. Folding method involves trimming of the macular hole edges and subsequently flattening it rather than the normal membrane peeling before subsequently folded over the hole in an inverted manner to cover the hole after fluid-gas exchange (figure 4).

Others have proposed techniques such as aggressive peeling of very fine epiretinal membranes (ERM) and drainage of subretinal fluid through the macular hole. Minihan et al 1997² noted that fine ERM at macula, which usually contracted post-operatively, does not interfere with vision or increased risk of traction. They concluded that it is therefore possible to achieve high anatomic success rate despite avoiding aggressive peeling of fine ERMs or of the ILM which may cause nerve fibre layer haemorrhages.² Glaser et al 1992 projected a high anatomic success rate achievement following macular hole surgery without foveal manipulation.⁸

In addition, there are several factors needed to be considered by ophthalmic

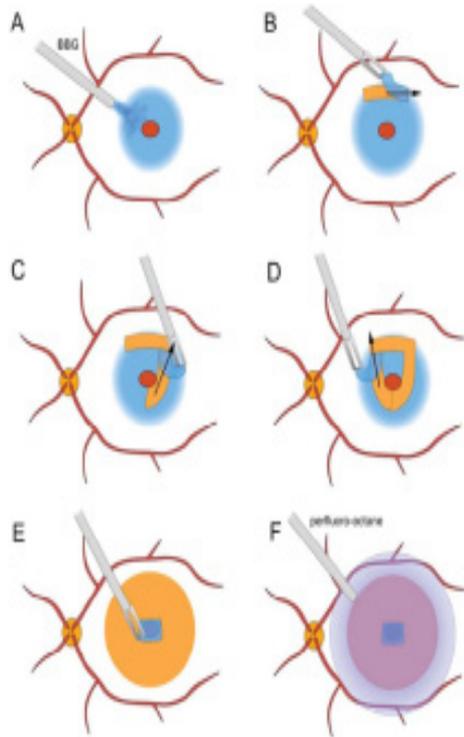


Figure 4: Diagrammatic representation of surgical technique to make an ILM-folding (adopted from Shin et al 2014⁷)

surgeons which determine the potential outcome of macular hole surgery and ethically compulsory to be included in the risk-benefit analysis discussion with patients pre-operatively. These include the chronicity of defect, size and stage of the hole, status of surrounding retinal tissues and pre-operative visual acuity. Ullrich et al⁹ demonstrated the role of pre-operative measurement of macular hole size with OCT in providing predictive value for visual and

anatomical success of macular hole surgery. The study also showed the superiority of hole base diameter (measured using OCT machine) as a prognostic tool as compared to slit lamp examination which is subjective to examiners involved and hence unable to reflect the real size of the retinal lesion. Similar results published by Freeman et al¹⁰ in 1997 also suggested that a macular hole with a small diameter was associated with better functional outcome as it might indicate better preserved macula, similar to results obtained in our study where all 4 cases with no improvement in VA were of Gass' stage 3 and 4 macular hole (size >400µm). Ullrich and co-workers added that no correlation found between the duration of symptoms and the diameters measured.⁹

In 1994, Ryan et al¹¹ evaluated the visual prognosis following macular hole surgery in 'recent' and 'old' holes. Subjects were considered to be having 'recent' holes if they were symptomatic for less than 6 months whereas patients with symptoms lasting more than 6 months were classified as 'old' holes. They concluded that recent macular holes demonstrated better visual outcomes than that of older holes and considered beneficial by most patients in the study.⁹ In our study, data is not available on the chronicity of the hole due to difficulty for patients to identify the exact time onset of symptoms and most of our patients presented rather late (Gass' stage 2 and above).

There is evidence suggesting that longer duration of intraocular gas tamponade may produce better outcome of macular hole surgery.¹² In our centre, we enforce to our patients regarding the importance of posturing post-operatively for higher success outcomes. We provided patients with ample information on posturing duration and techniques, verbally as well as information leaflet given following surgery. Posturing remains a troublesome and unpleasant requirement for patients

and we believe that it does contribute towards desirable surgical outcomes.

Limitations of the audit and its implications

The smallest macular holes done using folding method in our centre was 323µm, which falls into Gass' stage 2 macular hole. In the future, we would like to aid our cases-method selection by following international guideline in which macular hole is considered to be large if it is more than 400µm (Gass' stage 3 and 4). Besides, some macular hole stages were not properly documented, which limit our controlling power in auditing our cases. In the future, proper documentation of macular hole stages will be useful for future audits.

This audit helped to change our practice as it helped to construct new guideline for us in surgical technique selection. We have concluded that folding method will be the method of choice for all chronic macular holes (more than 1 year), stage 4 and large holes (size more than 400µm). We have also composed a new template clerking for all macular hole cases to aid us in decision-making and managing patient better. These efforts will hopefully be able to optimize our management and patient care services in the near future and subsequently offer successful outcomes in restoring vision.

Conclusion

In conclusion, surgical outcomes of macular hole surgery using ILM folding method in Alor Setar showed 100% anatomical closure and majority of cases demonstrated improvement in visual acuity by 2-or-more line at 6-months post surgery. Besides surgical techniques, macular hole surgical success is also attributed by size of macular hole, as evidenced in our study data where all Gass' stage 2 macular hole achieved anatomical hole closure and functional success.

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