

OUTCOMES OF MACULAR HOLE SURGERY AND SHORTENED FACE DOWN POSITIONING

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Purpose: Internal limiting membrane (ILM) peeling in macular hole surgery may allow a shortened period of face down positioning. This study reports the results of macular hole surgery combined with shortened (3-day) face down positioning.

Methods: The study was a retrospective review of data for 21 patients (21 eyes) treated for a macular hole by a single surgeon (G.K.S.). All patients underwent standard 3-port pars plana vitrectomy with triamcinolone-assisted ILM peeling and gas tamponade with 16% C₃F₈ or 25% SF₆. Patients were instructed to remain in a face down position for 3 days at least 8 hours a day and to avoid flat on back positioning.

Results: The main outcome of anatomical closure was achieved in 20 (95%) of 21 eyes. Snellen visual acuity improved >2 lines in 76% (16/21) of patients. No patient lost >1 line of Snellen visual acuity. Two patients had postoperative increased (>24 mmHg) intraocular pressure that was successfully treated with pressure-lowering drops. Initial surgery failed to achieve hole closure in one patient, but with a second surgery and similar face down positioning, the hole was closed.

Conclusions: This study found that macular hole surgery with ILM peeling and a shortened period of face down positioning achieves excellent anatomical closure and is not associated with significant adverse outcomes.

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Macular hole surgery as first described in 1991 by Kelly and Wendel¹ involved face down positioning and gas tamponade. Although the rate of success with macular hole surgery remains high, patients often complain about the difficulty and indirect costs of full-time face down positioning, including time from work. In addition to the common complaints of back or neck pain, complications of face down positioning, such as ulnar nerve palsy, have been described.^{2,3} To our knowledge, no study has directly evaluated the optimal period for face down positioning. Others have

reported various lengths of face down positioning, ranging from 1 day to 4 weeks.^{4–7}

More recently, internal limiting membrane (ILM) peeling has gained acceptance as a variation to the initial technique that may allow for an increased rate of hole closure.⁸ Some investigators have suggested that ILM peeling may reduce the tangential contractile forces,^{9,10} which may decrease the need for prolonged prone positioning.^{11,12} To study this strategy, we retrospectively evaluated the outcomes of macular hole surgery involving ILM peeling and a shorter duration of face down positioning.

Methods

This retrospective case series included 21 consecutive patients treated for a macular hole by a single surgeon (G.K.S.). Patients underwent standard preop-

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Table 1. Visual Outcomes

Improved >2 lines	16 (76)
Stable	5 (24)
Decreased >2 lines	0

Data are number (%) of patients with indicated visual outcome.

erative ophthalmologic examination that included Snellen visual acuity assessment (improvement with pinhole was noted), slit-lamp examination, and dilated fundus examination. Optical coherence tomography was performed when available. The surgical technique consisted of standard 3-port pars plana vitrectomy using a 20-gauge system. Core vitrectomy was performed followed by the placement of nondilute triamcinolone acetate into the vitreous cavity. The posterior hyaloid was separated using the vitrector with aspiration. To remove the ILM, the nondilute triamcinolone acetate suspension was allowed to settle over the posterior pole followed by removal of freely flowing particles using active aspiration. ILM maculorhexis was initiated and completed with 25-gauge forceps. After ILM delamination, the remaining triamcinolone was removed with active aspiration. Gas tamponade was achieved with either 16% C₃F₈ or 25% SF₆. Patients were instructed to remain in a face down position for 3 days, at least 8 hours a day. The only position that they were asked to avoid was flat on the back. Follow-up was a minimum of 4 weeks. The primary outcome measure was anatomical closure. Additional outcomes, including Snellen visual acuity and complications, were evaluated. Stable visual acuity was defined as vision within 1 line of baseline Snellen vision.

Results

The main outcome of anatomical closure was achieved in 20 (95%) of 21 eyes. Snellen visual acuity improved >2 lines in 16 patients (76%). Stable vision within 1 line of baseline was recorded for 5 patients (24%). Eight patients (38%) had 20/40 or better vision at the last examination. No patient lost >1 line of Snellen visual acuity. Of the five patients with stable vision, three were noted to have cataract progression at follow-up (Table 1). One patient with stable vision was lost to follow-up after only 4 weeks. The preoperative visual acuity range was 20/50 to 20/1000 (mean, 20/215). The postoperative visual acuity range was 20/20 to 20/500 (mean, 20/70).

Demographic data revealed that 16 (76%) of 21 patients were female. The mean age of the patients was 67 years. The mean follow-up was 37 weeks

Table 2. Baseline Characteristics

Mean age (range) in y	67 (49–81)
No. (%) of female patients	16 (76)
No. of patients with stage III macular hole	15 (71)

(range, 4–96 weeks). The duration of macular hole ranged from 1 week to 52 weeks. Gas tamponade with 16% C₃F₈ was used for 15 (71%) of 21 patients (Table 2). Fifteen patients (71%) were diagnosed with stage III macular holes. Fourteen patients (67%) were pseudophakic at the last observation.

Two patients had increased postoperative (>24 mmHg) intraocular pressure that was successfully treated with pressure-lowering drops and resolved before the 1-month postoperative evaluation. The initial surgery failed to achieve hole closure in one patient. It was believed that the patient received air and not the appropriate gas mixture, because the gas bubble dissipated within 1 week. A second surgery with similar positioning was performed using 16% C₃F₈ with successful closure of the hole. Indocyanine green dye was not used in the reoperation. One patient had an intraoperative retinal tear that was successfully treated. There were no cases of endophthalmitis.

Discussion

Macular hole surgery is generally associated with good anatomical success. Various periods of face down positioning have been suggested to allow for anatomical closure. The addition of ILM peeling has been reported to increase the rate of anatomical hole closure.¹⁰ Histologic analysis of ILM specimens removed during macular hole surgery indicated that with higher stages of macular holes there was an increased amount of myofibroblasts.¹³ ILM peeling may reduce the tangential tractional forces by assuring that any remaining cortical vitreous or surface myofibroblasts are removed. As the edges of the hole become more mobile, the hole closes in a shorter period, allowing for a reduced period of face down positioning.¹¹ In addition to reducing tangential traction, other investigators have suggested that ILM removal may increase cytokine release and thus enhance glial proliferation that leads to hole closure.¹⁰

Previous reports have evaluated the necessity of extended periods of face down positioning. Krohn⁵ found similar hole closure rates for 3-day and 1-week face down positioning with vitrectomy, gas tamponade, and no ILM peeling. The study involved 53 patients who were admitted to the hospital during the face down period. Park et al¹² reported that 91% of 58

macular holes closed when surgery was performed with vitrectomy, ILM peeling, intravitreal air, and face down positioning for 4 days. Tornambe et al⁴ described macular hole surgery without any face down positioning. In a series of 33 macular holes, 79% closed when surgery was performed with 15% C₃F₈, no ILM peeling, and no face down requirements. In a single case observation, Sato et al¹⁴ reported with optical coherence tomographic images that a full-thickness macular hole closed completely within 3 days after ILM peeling and gas tamponade. These studies support a shortened period of face down positioning.

A difficulty with macular hole surgery is often motivating the patient to accept face down positioning. Extended periods of face down positioning often produce neck or back pain. There have been reports of complications including ulnar nerve neuropathy^{2,3} and pressure sores.¹⁵ In addition to these medical complications, there are the financial costs of lost time from work, caregiver requirements, and expensive medical equipment. These associated costs of macular hole surgery may be reduced if a shorter period of face down positioning were required.

In this limited retrospective case series, we found that macular hole surgery with ILM peeling, gas tamponade, and 3-day prone positioning can achieve excellent anatomical closure. Initial surgery failed to close the macular hole in one patient. We believe that this patient received air rather than the intended gas mixture. The patient had particular difficulty with face down positioning; therefore, 16% C₃F₈ was used for gas tamponade. Indeed, most patients received 16% C₃F₈. Some may argue that using a longer-acting gas is not necessary. Currently, we reserve C₃F₈ for those patients with significant difficulties with face down positioning or patients with chronic macular holes. The use of triamcinolone acetonide for ILM peeling did not cause delayed hole closure, significant long-term pressure elevation, or endophthalmitis. A shortened prone positioning period offers patients decreased risk of medical complication, increases patient convenience, and lowers the indirect costs of macular hole surgery.

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