Combining phacoemulsification with vitrectomy for treatment of macular holes

J M Lahey, R R Francis, D S Fong, J J Kearney, S Tanaka

Aim: To describe the results of combined phacoemulsification, insertion of posterior chamber intraocular lens (PCIOL), and pars plana vitrectomy for patients with macular hole.

Methods: A case series of 89 consecutive patients with macular hole who underwent combined phacoemulsification, insertion of PCIOL, posterior capsulotomy, and pars plana vitrectomy.

Results: 80 of 89 patients (89%) had their holes closed with the combined surgery. Four of the nine patients who failed had their holes closed with one further procedure. Of the 89 patients operated on, 61 (65%) had vision of 20/40 or better. Three patients (3%) had Snellen acuity of less than 20/400 postoperatively. Three patients (3%) developed retinal detachments, one with proliferative vitreoretinopathy (PVR). Eight patients (9%) developed CMO. Three patients developed late reopening of their macular holes after remaining closed for 9 months or more.

Conclusion: Combined phacoemulsification, insertion of PCIOL, and pars plana vitrectomy surgery can be used to treat macular holes. Combining cataract surgery with vitrectomy surgery may prevent a later second operation for post-vitrectomy cataract formation.

Macular hole surgery has been shown to be effective in closing macular holes. However, despite closing the macular hole, phakic patients frequently develop progressive nuclear sclerosis after the surgery. After vitrectomy, 75% will develop visually significant cataracts within 1 year and 95% within 2 years and require subsequent cataract surgery. Before cataract removal, vision often decreases as a result of progressive nuclear sclerotic and posterior cortical changes. To address this problem, we propose the use of combined cataract surgery and intraocular lens implantation with the initial vitrectomy. This paper describes our experience in 89 eyes with macular hole.

PATIENTS AND METHODS
Between August 1994 and June 1999, 89 eyes with stage III or stage IV macular holes underwent pars plana vitrectomy repair combined with phacoemulsification and insertion of posterior chamber intraocular lens (PCIOL).

Our operative technique comprised the following. All operations were done under monitored anaesthesia care with retrobulbar blocks. The lens was removed by phacoemulsification and a posterior chamber intraocular lens inserted. Forty six patients received all PMMA lenses through a scleral tunnel incision, and 43 patients received acrylic lenses through a clear corneal incision. The scleral wounds were all closed with one cross stitch nylon suture. Corneal wounds were left sutureless unless a leak was discovered. In seven patients, the IOL was placed into the ciliary sulcus because of concerns about an intact posterior capsule.

Vitrectomy, air-fluid exchange, and gas injection were then performed to close the hole. During the vitrectomy, removal of all posterior cortical vitreous was carried out. In addition, the area around the macular hole was explored for membranes in every patient. Because removal of the internal limiting membrane (ILM) was controversial during the study period, the ILM was only peeled if it was easily engaged or appeared to be causing retinal distortion or thickening. A bent myringotomy knife was used to engage the membrane which was then peeled in a sheet with vitreous forceps. In 30% of patients, either a fine epiretinal membrane or ILM around the hole was removed. Eight patients with stage IV holes had removal of the ILM and epiretinal membrane, and 19 patients with stage III holes had peeling of the ILM. Scleral depression was performed to remove anterior vitreous and inspect the peripheral retina with the microscope for possible retinal breaks. The peripheral retina was then again inspected with the indirect ophthalmoscope and any suspicious areas or retinal breaks were treated with laser. The vitreous cutter was then used to remove the central posterior capsule. The edge of the capsule was removed to underline the edge of the anterior capsulorrhexis. An air fluid exchange followed by exchange with a mixture of 14% C3F8, then was performed.

Postoperatively, the patients were asked to alternate prednisolone acetate with neomycin/polymyxin B/dexamethasone eye drops every 2 hours during waking hours for the first 2 weeks. These drops were eventually tapered. No postoperative cycloplegic medication was used. The patients were instructed to remain face down as much as possible for the first 7 days, and to avoid sleeping in the supine position for 4 weeks. They were instructed to lie on their sides and turn their head towards the floor during sleep. If the surgery was successful and the macular hole closed, the patient was then refracted and fitted with glasses 10 weeks after the combined surgery.

RESULTS
Eighty nine consecutive eyes with stage III or stage IV macular holes underwent pars plana vitrectomy repair combined with phacoemulsification, insertion of PCIOL, and posterior capsulectomy. Table 1 describes the clinical characteristics of the study population.

Six months of follow up were available for every patient. The follow up interval ranged from 6 months to 6 years. After the initial surgery, 89% (80/89 eyes) had closure of the macular hole with one surgical procedure. Of the nine patients whose holes did not close with the first surgery, three had ILM peeling during the initial surgery. Subsequently, four eyes closed with one further operation; three had repeat vitrectomy with membrane peeling and fluid-gas exchange, and one had fluid-gas exchange in the office. Three patients (3%) developed reopening of their macular holes after being closed for over 9 months. These patients had their holes closed again after repeat vitrectomy and membrane peeling with fluid-gas exchange.
Table 1 Description of study population

<table>
<thead>
<tr>
<th>Distribution of visual acuity</th>
<th>Preoperative</th>
<th>Final visual acuity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (No)</td>
<td>% (No)</td>
</tr>
<tr>
<td>&gt;20/40</td>
<td>3 (3)</td>
<td>65 (58)</td>
</tr>
<tr>
<td>&lt;20/40 to &gt;20/200</td>
<td>79 (70)</td>
<td>32 (29)</td>
</tr>
<tr>
<td>&lt;20/200</td>
<td>18 (16)</td>
<td>3 (2)</td>
</tr>
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</table>

Table 2 describes the visual acuity outcomes. At the final visit, 65% (58 of 89 eyes) had postoperative visual acuity of 20/40 or better. Table 3 lists the postoperative complications. Three of 89 (3.3%) patients had retinal detachments. One of these occurred as a result of a mild posterior staphyloma in a highly myopic patient who had a significant amount of subretinal fluid surrounding the hole preoperatively. One patient developed proliferative vitreoretinopathy (PVR) and required silicone oil, but in all cases the retina was reattached.

One previous report in a series of seven cases of combined surgery for macular hole found a 43% incidence of clinical and angiographic cystoid macular oedema after combined surgery. We were particularly careful to find patients who developed cystoid macular oedema after the combined surgery. Only eight patients (9%) in our study had clinically significant cystoid macular oedema after surgery. All cases had improvement of vision and resolution of oedema with topical and posterior sub-Tenon's steroids and time.

Increased inflammation did occur in our series. Eight patients (9%) in our series had small, segmental synechiae of the iris to the anterior capsule. Although there is an increase in inflammation because of combined surgery, topical steroids appear to be effective in bringing it under good control soon after the surgery.
Combining phacoemulsification, insertion of PCIOL, posterior capsullectomy and pars plana vitrectomy repair can be used to treat macular holes. Combined surgery appears to be safe and may prevent common postoperative visual loss from progressive cataract formation.

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