

## SCIENTIFIC CORRESPONDENCE

## Combining phacoemulsification with vitrectomy for treatment of macular holes

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**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 capsulectomy, 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.<sup>1</sup> After vitrectomy, 75% will develop visually significant cataracts within 1 year and 95% within 2 years and require subsequent cataract surgery.<sup>2</sup> Before cataract removal, vision often decreases as a result of progressive nuclear sclerotic and posterior cortical changes.<sup>2,3</sup> 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 laser 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 underlie the edge of the anterior capsulorrhexis. An air fluid exchange followed by exchange with a mixture of 14% C<sub>3</sub>F<sub>8</sub> 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

Mean age (years)	68.7 (0.86)
% female	72
Mean duration of symptoms from macular hole (months)	6.3 (0.34)
<b>Macular hole stage</b>	<b>% (No)</b>
III	91 (81)
IV	9 (8)
<b>Preoperative lens nuclear sclerosis*</b>	<b>% (No)</b>
1+	
2+	75 (67)
3+	25 (22)

\*Nuclear sclerosis was graded at the slit lamp and defined as follows: Grade 0 was a clear lens, grade 1 early nuclear sclerosis with mild yellow colour of the posterior lens in the slit beam, grade 2 yellow colour change throughout the lens, grade 3 yellow brown coloration throughout the lens, and grade 4 a brown coloured lens.

**Table 2** Distribution of visual acuity

	Preoperative		Final visual acuity	
	% (No)	% (No)	% (No)	% (No)
≥20/40	3 (3)		65 (58)	
<20/40 to ≥20/200	79 (70)		32 (29)	
<20/200	18 (16)		3 (2)	

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. Retinal tears were found and treated in 13 (14.6%) patients, of which 10 had >2 dioptres of myopia.

Cystoid macular oedema developed in 9% (eight eyes). In one of these cases it was probably due to latanoprost use which the patient had been on long before surgery. After stopping the latanoprost, the vision improved from 20/80 to 20/25. The other seven patients were treated with posterior sub-Tenon's injections of triamcinolone and topical prednisolone acetate. If the intraocular pressure was high, non-steroidal anti-inflammatory drops were used instead. Vision improved with treatment in all but one case.

**Table 3** Postoperative findings at 6 months

	Frequency	
	% (No)	% (No)
<b>Vision threatening:</b>		
Cystoid macular oedema	9.0 (8)	
Retinal detachment	3.3 (3)	
Persistent hole	10.1 (9)	
Reopening of hole from epiretinal membrane	1.1 (1)	
Late reopening of hole	3.3 (3)	
<b>Others:</b>		
PCIOL placed in sulcus instead of "in the bag"	10.1 (9)	
Iris synechiae to capsular opening	9.0 (8)	
Iritis	1.1 (1)	

There were no instances of significantly subluxated or dislocated intraocular lenses. In nine patients, the PCIOL was placed in the ciliary sulcus. It is our practice to place a sulcus lens whenever there is a question about posterior capsule integrity. No problems with IOL cornea touch occurred in any of the patients during or after surgery. There were no postoperative problems related to corneal oedema. No patients were brought back to the operating room for wound leaks.

Eight patients had mild segmental synechiae of the iris to the anterior capsulorhexis. One patient who had sickle cell disease had a significant iritis and developed iris bombe, which resolved after YAG peripheral iridectomies and topical steroids.

One patient developed an epiretinal membrane without reopening of the macular hole. This patient underwent repeat vitrectomy with epiretinal membrane peeling.

## DISCUSSION

Vitrectomy surgery alone is only the first step in visual rehabilitation of the phakic patient with a macular hole. Following vitrectomy surgery, cataract may develop in older patients and may lead to reduction in visual gain from macular hole closure.<sup>2-5</sup> Patients often require multiple changes to their spectacle correction and, later, require cataract surgery. Of 56 patients in Thompson's series, 96% (54 eyes) developed progressive nuclear sclerosis during follow up.<sup>1</sup> In Leonard's series, nuclear sclerotic cataracts progressed in 75% of eyes by one year and 95% of eyes followed for 2 years.<sup>3</sup> Of the 81 phakic eyes, 80% required CE/IOL 5-36 months after macular hole surgery. The current study suggests that vitrectomy surgery should be combined with cataract surgery to minimise patient morbidity and to speed up visual recovery.

In addition to faster visual recovery, potential benefits include the ability to remove the anterior vitreous; removal of the anterior vitreous can be performed without risking lens injury during vitrectomy. The scleral depression also allows visualisation and detection of small tears in the anterior retina. This more complete vitrectomy allows for a better gas fill. The increased gas fill may provide longer tamponade, which will increase the closure rate.<sup>4</sup>

Although concerns about combining macular hole surgery with cataract surgery have been raised,<sup>6</sup> numerous studies have reported the safety and efficacy of combining phacoemulsification with vitrectomy surgery.<sup>7-9</sup> The current study confirms earlier reports that combining vitreous surgery with cataract surgery for macular hole is safe.<sup>5 10-13</sup> Because early opacification of the posterior capsule after combined surgery for macular hole is common (personal experience), we have added a posterior capsulectomy to the combined approach to prevent posterior capsule opacification, a common cause of late visual loss after cataract surgery. There was no increase in the number of retinal detachments compared to other studies in which vitrectomy alone was performed to repair macular holes. Only three patients (3%) in our series developed retinal detachments. There were no significant IOL complications.

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.<sup>11</sup> 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 capsulectomy 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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