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Phacoemulsification in vitrectomized eyes under topical anesthesia

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PURPOSE. *To study phacoemulsification in vitrectomized eyes under topical anesthesia, assessing anesthetic and intraoperative characteristics and complications.*
METHODS. *A prospective study was performed on 52 eyes of 51 patients who underwent phacoemulsification of cataract with intraocular lens implantation under topical anesthesia, having previously undergone pars plana vitrectomy. Surgical and anesthetic observations and complications were recorded, as were visual outcomes.*
RESULTS. *Ninety-two percent of patients had improved visual acuity postoperatively with only one patient having visual loss as a result of surgery. The most common intraoperative observations were of a deep anterior chamber, posterior capsular plaques, posterior synechiae, and nuclear sclerotic cataracts. Topical anesthesia proved satisfactory in 96%, with only two patients requiring intracameral lignocaine 1%; no patients required conversion to injection anesthesia. There were no major operative or postoperative complications.*
CONCLUSIONS. *Phacoemulsification in vitrectomized eyes can be challenging, but is visually rewarding. Topical anesthesia proved satisfactory for the vast majority of cases, with none of our patients requiring conversion to injection anesthesia. (Eur J Ophthalmol 2007; 17: 336-40)*

KEY WORDS. *Phacoemulsification, Topical anesthesia, Vitrectomy*

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INTRODUCTION

It is becoming increasingly common for surgeons to be faced with the prospect of performing cataract surgery in vitrectomized eyes as a result of the increase in use of pars plana vitrectomy (PPV) in the management of posterior segment disorders (1). In this study, we examined phacoemulsification in vitrectomized eyes under topical anesthesia, assessing the feasibility of this anesthetic approach, intraoperative challenges, and visual outcomes.

METHODS

We conducted a prospective study of 52 consecutive cataract operations performed on vitrectomized eyes under topical anesthesia. All surgery was performed by two surgeons (R.V.P. and I.Z.) over a period of 3 years from 2001 to 2004. Data were collected on preoperative patient characteristics, intraoperative observations and complications, postoperative complications including the need for Nd:YAG laser posterior capsulotomy, as well as visual outcome. A vast majority of our routine cataract surgery patients are operated under topical anesthesia and our criteria for choosing the patients in this study do not differ from those chosen for routine cataract surgery under topical anesthesia (except see below).

Exclusion criteria

Any patients with in situ silicone oil and requiring cataract surgery were excluded from this study.

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Anesthetic technique

The anesthetic technique consisted of the instillation of four drops of proparacaine 0.5% (Proxymetacaine®): two drops within the hour preceding surgery, one 5 minutes presurgery, and finally one drop in theater after draping. Further drops were added if the patient reported pain or if excessive ocular movements suggested it. Intracameral lignocaine 1% was introduced into the anterior chamber if drops proved insufficient and sub-Tenon anesthesia was also available.
No patient in this study received any preoperative systemic sedatives/analgesics.

Surgical technique

In all eyes, a three-step, 2.75-mm clear corneal temporal incision and a 20-gauge side entry stab incision were made. A continuous curvilinear capsulorrhexis was created under viscoelastic (Biolon® or HPMC). Hydrodissection with balanced salt solution was followed by anterior chamber entry with the phaco tip using a lowered bottle height of 50 cm. The pupil margin was lifted with the second instrument so as to equalize fluid pressure between anterior chamber and vitreous cavity and prevent excessive deepening of the anterior chamber and iris excursions.
Phacoemulsification of the lens was performed using the divide-and-conquer or stop-and-chop techniques and the AMO Sovereign® phacoemulsifier. Automated irrigation and aspiration of soft lens matter followed and an Acrylic foldable lens (MA60BM or SA60AT, Alcon) was implanted. Removal of the viscoelastic, hydration of corneal wound, and a subconjunctival injection of cefuroxime 125 mg completed the procedure.
Additional surgical maneuvers that were sometimes required included synechialysis, enlargement of the pupil by iris hooks, Trypan blue staining of anterior capsule, sulcus implantation of the intraocular lens, removal of posterior capsule plaques with forceps, and suturing of the corneal wound.
Postoperatively, chloramphenicol 0.5% and dexamethasone 0.1% were prescribed qid for 4 to 5 weeks. Two doses of Diamox SR 250 mg orally were given over the 12 hours immediately postoperatively.
All patients were followed up for a period of 12 to 18 months.

TABLE I - INDICATIONS FOR INITIAL PARS PLANA VITRECTOMY

Indication	No. (n=52)
Macular hole	25
Retinal detachment	13
Idiopathic epiretinal membrane	8
Vitreous hemorrhage	5
Vitreomacular traction	1

TABLE II - INTRAOPERATIVE COMPLICATIONS/OBSERVATIONS

Complications/observations	No. (n=52)
Deep anterior chamber	30
Posterior capsular plaque	7
Posterior synechiae	4
Incomplete capsulorrhexis	2
Fleeting angle hemorrhage	1
Shallowing of the anterior chamber	1
Zonular dehiscence	1
Posterior capsular rupture	1
Intraoperative discomfort	2

RESULTS

The age of the patients ranged from 48 to 80 years with a mean of 67 years. The mean time from pars plana vitrectomy to cataract surgery was 16 months (range 5–61 months). Indications for vitrectomy are listed in Table I. In all, 38 patients (76%) had received intraocular tamponade with expansile gas or silicone oil. None of the patients had silicone oil in the eye at the time of cataract surgery.
There was no statistical difference in the interval between vitrectomy and cataract surgery for the different indications, although there was a trend towards the patients who underwent vitrectomy for an epiretinal membrane taking the longest with a mean interval of 25.4 months (range 10–61).

Surgical observations and complications

Surgical observations and complications are summarized in Table II. The most common observation was of an abnormal deep anterior chamber at first entry into the eye by the phaco tip, which was noted in 30 patients

(58%). All became stable once the pressure had equilibrated between the anterior and posterior cavities. Posterior synechiae were present in four patients. These were easily managed by sweeping the viscoelastic cannula underneath the iris while simultaneously injecting viscoelastic. Posterior capsular plaques were present in seven cases, but in only two cases did these require a primary posterior capsulotomy. A transient anterior chamber angle hemorrhage was noticed in one case at the start of the procedure, but stopped as soon as the anterior chamber was filled with viscoelastic.

In one patient the capsulorrhexis edge ran to the periphery, resulting in an irregular anterior capsular opening, but no posterior capsular rupture. This case comprised a white cataract which had also required Trypan blue dye for adequate capsular visualization.

A small zonular dehiscence of two clock hours was seen in one case and required the insertion of a capsular tension ring to stabilize the bag followed by uneventful in-the-bag lens insertion. One patient had a posterior capsular rupture during phacoemulsification. In this case, damage to the posterior capsule had been recorded at the time of initial vitrectomy and was noticeable prior to cataract surgery. Sulcus lens implantation was carried out successfully after uneventful nucleus removal.

Anesthetic observations and complications

In 50 of the 52 cases (96%), no problems were encountered with topical anesthesia. The other two patients felt discomfort at the start of procedure, but this was successfully overcome by introducing intracameral 1% lignocaine into the anterior chamber and waiting 2 minutes before continuing. None of the patients required conversion to injection anesthesia.

Postoperative complications and visual outcome

The postoperative course was uneventful in most cases, but three patients had transiently raised intraocular pressure, which was successfully managed medically. Two patients required Nd:YAG laser posterior capsulotomy during the 12- to 18-month follow-up period. One diabetic patient had a recurrent vitreous hemorrhage 3 months following cataract surgery which required a vitreous cavity washout to restore vision.

Table III summarizes the change between pre- and postoperative visual acuities.

Snellen acuity improved in 92% of the patients and remained unchanged in 6%, with only one patient deteriorating to below his preoperative level by the end of the follow-up period owing to the development of a choroidal neovascular membrane.

None of the patients in our series were worse in the first 3 months following surgery. The initial diagnoses of the three patients who gained no improvement were epiretinal membrane, macula-off retinal detachment, and diabetic vitreous hemorrhage. Failure to achieve 6/6 vision was in all cases related to coexistent posterior segment disease.

DISCUSSION

Kershner first described topical anesthesia for phacoemulsification cataract surgery in 1993 (2) and it has since become routine for uncomplicated procedures. Phacoemulsification is also the preferred surgical technique for cataract extraction in postvitrectomy eyes (3), although it can be more challenging than routine phacoemulsification surgery (4). Pha-

TABLE III - VISUAL OUTCOMES OF CATARACT SURGERY AT 3 MONTHS POSTOPERATIVELY

Procedure	No. (n=52)	Change in acuity/Snellen lines				
		>+3	+2 or +3	+1	0	–1
Macular hole	25	7	11	7		
Retinal detachment	13	5	7		1	
Epiretinal membrane	8	2	3	1	1	1
Vitreous hemorrhage	5	3		1	1	
Vitreomacular traction	1		1			

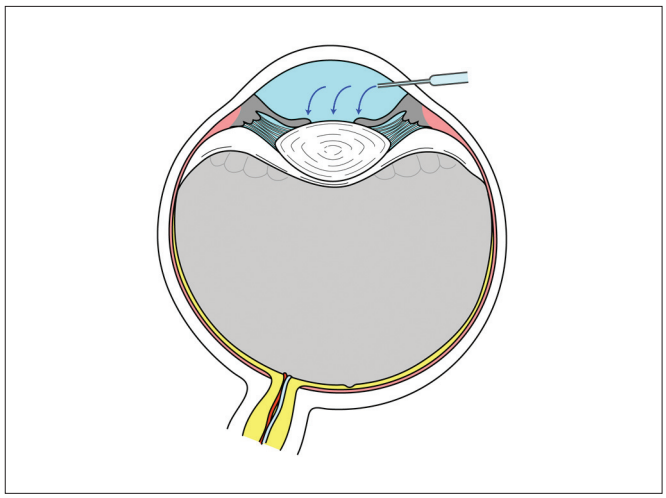

Fig. 1 - *As the irrigating phaco probe enters the eye, the iris-lens diaphragm is displaced posteriorly, creating a relative pupil block.*

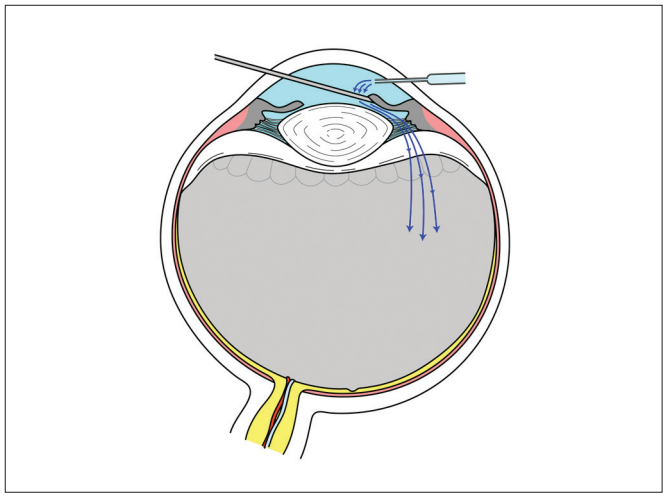

Fig. 2 - *Lifting the pupil margin allows free flow of fluid from anterior chamber to vitreous cavity.*

coemulsification surgery in vitrectomized eyes under general or peribulbar anesthesia has been previously reported (5, 6), but topical anesthesia is used less frequently owing to the perceived greater challenges involved in operating on these patients.

The advantages of topical anesthesia are well-known and center on safety, simplicity of use, and effectiveness. There is no risk of globe perforation, damage to orbital contents, subdural injection, chemosis, preoperative intraocular pressure rises, or postoperative diplopia; there is also a reduced risk of cardiac arrhythmias (7). We used proparacaine 0.5% as topical anesthetic for phacoemulsification in our series of patients as

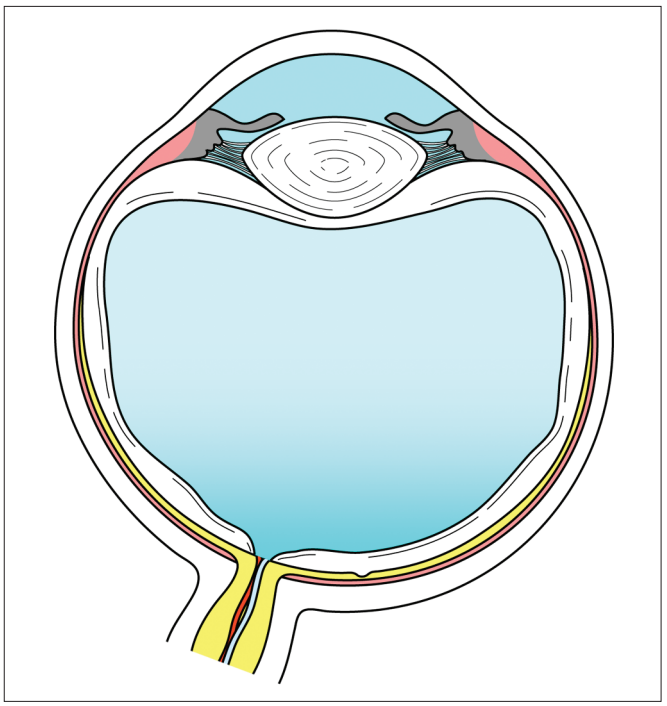

Fig. 3 - *Pressure equilibrium stabilizes iris-lens diaphragm.*

it is known to cause less corneal epithelial edema than tetracaine 0.5% (Amethocaine®) (8); using HPMC 1% as a corneal lubricant helps to reduce this further.

The patient's ability to move the eye during surgery under topical anesthesia can be used to advantage, e.g., to improve the red reflex and facilitate other maneuvers such as lens implantation. Less frequently required procedures such as pupil stretching, synechialysis, use of iris hooks, and corneal suturing are all possible under topical anesthesia.

Use of intracameral 1% unpreserved lignocaine in the anterior chamber can relieve discomfort arising from the iris and ciliary body as a result of fluctuating anterior chamber depth (9). We only had to use this on two occasions, as anterior chamber stabilization maneuvers alone (described later) were almost always adequate.

McDermott et al (10) used a scleral incision to avoid creating a corneal wound as they found problems with wound healing and dellen formation. It can be difficult to fashion a scleral wound when significant scarring is present, particularly after multiple vitreoretinal procedures, and we did not encounter any problems in our patients with clear corneal incisions. McDermott et al (10) suggested displacement of capsu-

lorrhexis superiorly to allow better engagement of nuclear material with the phaco tip when the anterior chamber is deep, but we found a central CCC to be adequate, owing to our use of temporal corneal incisions and bent Kelman phaco tips to engage nuclear fragments.

The most important feature of these eyes is lack of vitreous support. A phakic, vitrectomized eye has a posterior segment filled with fluid which lacks the properties of a gel owing to the absence of collagen and hyaluronic acid (10). Inherently there is less support for the iris-lens diaphragm and zonules may be subclinically weak in vitrectomized eyes (11), particularly if an expansile gas has been used.

At first entry into anterior chamber, the chamber deepens due to lack of vitreous support and there is posterior bowing of iris lens diaphragm creating a relative pupil block (Fig. 1). This can not only cause discomfort to the patient, but also result in a blockage of fluid access to vitreous cavity, causing a significant pressure difference between the two compartments. We use a blunt second instrument to lift the pupil margin for a few seconds, allowing fluid from the anterior chamber to pass underneath into the vitreous cavity, resulting in pressure equilibration (Figs. 2 and 3). This stabilizes the anterior chamber, avoiding abrupt excursions of the iris-lens diaphragm and making sculpting and nuclear fragmentation much easier.

Final visual outcome was dictated by the nature of retinal pathology present preoperatively at the time of initial vitrectomy procedure. Visual acuity improved in 47 out of 52 patients and 60% of patients achieved a visual acuity of 6/12 or better. These results are comparable to those reported by Grusha et al (12), McDermott et al (10), and previously by Saunders et al (13).

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