

Phacoemulsification with topical anesthesia: Resident experience

Mustafa Ünal, MD, İclal Yücel, MD, Ahmet Sarıcı, MD, Özgür Artunay, MD, Kazım Devranoğlu, MD,
Yusuf Akar, MD, Meryem Altın, MD

PURPOSE: To compare the intraoperative and postoperative complications and outcomes of phacoemulsification performed by residents using topical and retrobulbar anesthesia.

SETTING: Two university ophthalmology departments.

METHODS: One hundred fifty phacoemulsification procedures were performed by 3 residents who used retrobulbar anesthesia (retrobulbar group), and 146 phacoemulsification procedures were performed by another 3 residents who used topical anesthesia and who had no experience with retrobulbar or peribulbar anesthesia (topical group). Case notes were prospectively compared. The data analyzed included the ocular history, intraoperative and postoperative complications, and final best spectacle-corrected visual acuity (BSCVA).

RESULTS: There were no differences between the 2 groups in complication rates. Anterior capsule tears occurred in 8 eyes (5.3%) in the retrobulbar group and 7 eyes (4.7%) in topical group. Capsulorhexis was continuous but not curvilinear in 14 eyes (9.3%) and 12 eyes (8.2%), respectively. Capsulorhexis tear or posterior capsule rupture that necessitated conversion to extracapsular cataract extraction occurred in 3 eyes (2.0%) in the retrobulbar group and in 1 eye (0.6%) in the topical group. Posterior capsule rupture with vitreous loss occurred in 3 eyes (6.6%) and 9 eyes (6.1%), respectively. Loss of lens fragments in the vitreous cavity occurred in 3 eyes (2.0%) and 4 eyes (2.7%), respectively. The 63 postoperative complications (41 eyes [27.3%], retrobulbar group; 22 eyes [15.0%], topical group) included cystoid macular edema, intraocular lens decentration, endophthalmitis, bullous keratopathy, transient intraocular pressure elevation, temporary corneal edema, and vitreous hemorrhage. Some cases had more than 1 complication. The BSCVA, including in eyes with preexisting ocular pathology, was 20/40 or better in 86.7% in the retrobulbar group and 84.9% in the topical group.

CONCLUSION: When supervised and in selected patients, residents who have no retrobulbar or peribulbar anesthesia experience can safely perform phacoemulsification using topical anesthesia.

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Anesthesia requirements in cataract surgery have changed. First proposed by Fichman¹ as an attractive alternative to traditional local anesthesia injections, topical anesthesia is growing in use.² The advantages of topical anesthesia include rapid onset of anesthesia, early return of visual acuity,

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From the Akdeniz University (Ünal, Yücel, Akar, Altın), Ophthalmology Department, Antalya, Turkey Istanbul University of Sarıcı, Artunay, (Devranoğlu), Ophthalmology Department, Istanbul, Turkey.

Corresponding author: Mustafa Ünal, MD, Demircikara mah. 1426. sk., Zeybek Apt. B Blok. 14/12, Muratpaşa, Anatolia, Turkey. E-mail: drmustafaun@hotmail.com.

and avoidance of the risks related to retrobulbar injection such as postoperative diplopia, ptosis, periocular ecchymosis, subconjunctival hemorrhage and chemosis, optic nerve injury, globe perforation, retrobulbar hemorrhage, intravascular injection of anesthetic, retinal detachment, and postoperative akinesia.³⁻⁵ Several studies^{1,6-13} report the safety and comfort of topical anesthesia in surgery with clear corneal incisions, and it has not been associated with an increased incidence of perioperative complications.

Phacoemulsification training techniques remain current and modern,¹⁴ and resident training programs may not be the same in different training centers; topical anesthesia is the current choice of anesthesia technique for even the first cases of residents at Mediterranean University.

Outcomes of phacoemulsification cases performed by residents using topical anesthesia after briefly using retrobulbar anesthesia have been reported.¹⁵ To our knowledge, this is the first study to report the results of phacoemulsification with topical anesthesia performed by residents who had no experience with retrobulbar or peribulbar anesthesia.

PATIENTS AND METHODS

The surgical records of 150 patients who had phacoemulsification surgery performed by 3 residents using retrobulbar anesthesia (retrobulbar group) at the Istanbul University Cerrahpasa Medical Faculty Ophthalmology Department were compared with those of 146 patients (topical group) who received topical anesthesia by another 3 residents who had no prior retrobulbar or peribulbar anesthesia experience at the Akdeniz University Medical Faculty Ophthalmology Department from April 2001 to May 2005. The data were collected prospectively.

Patients were 43 to 91 years of age with immature cortical cataract, posterior subcapsular cataract, or nuclear sclerosis grade I, grade II, or mixed.¹⁶ Eyes with nuclear sclerosis grade III or greater, pseudoexfoliation, previous ocular surgery, periorbital muscle spasm, nystagmus, and coexisting ocular pathology were excluded. Patients with hearing impairment, claustrophobia, speech disorder, orthopnea, extreme anxiety, mental retardation, and irreversible blindness in the contralateral eye were also excluded. When an uneventful surgery was performed in the first eye, the same resident operated on the second eye.

The retrobulbar group received approximately 4 to 6 cc of bupivacaine 0.5% and prilocaine 2% (1:1) in the retrobulbar space via a 27-gauge, 1.25-inch Atkinson needle. The topical group received proparacaine hydrochloride 0.5% drops in the conjunctival sac 4 times in the 10 minutes preceding surgery. Intracameral anesthesia was not used. No sedation was given, and an anesthesiologist monitored standard vital signs.

A 3.2 mm clear corneal incision, continuous curvilinear capsulorhexis, bimanual endocapsular phacoemulsification,¹⁷ and bimanual aspiration of cortical lens material followed by corneal tunnel widening to implant a hydrophobic acrylic intraocular lens (IOL) were used in all cases. Residents performed their first procedures under the supervision of experienced surgeons (I.Y., K.D.). When capsule rupture or another important complication occurred in early cases, the instructor completed the surgery.

Patient data included sex, age, detailed preoperative ocular examination, preoperative and postoperative best spectacle-corrected visual acuities (BSCVAs), eye operated on, resident surgeon, attending surgeon, type of anesthesia, intraoperative complications, and postoperative information. Main outcome measures were intraoperative and postoperative complications and final BSCVA.

Data were analyzed with SPSS 10.0 software. Chi-square tests were performed to compare the complications rates between the 2 groups. The Student *t* test was used to compare the baseline demographics. Statistical significance was set at *P* = .05.

RESULTS

Residents performed cataract surgery in 296 eyes of 286 patients. Three residents used retrobulbar anesthesia in 150 eyes of 143 patients. These were the first 50 phacoemulsification procedures performed by each resident. Two residents performed 15 planned extracapsular cataract extractions (ECCEs) before moving to phacoemulsification. One resident began cataract extraction using phacoemulsification.

Another 3 residents performed phacoemulsification as their first cataract procedures in 146 eyes of 143 consecutive patients using topical anesthesia. One resident performed 46 cases; the other 2 performed 50 cases each. None performed ECCE before beginning phacoemulsification. Once cataract extraction was begun with phacoemulsification, only phacoemulsification was used.

Table 1 shows the baseline demographics. The mean age in the retrobulbar group patients was 65.06 years \pm 9.08 (SD) (range 43 to 84 years), and the mean age in the topical group was 64.78 \pm 11.38 years (range 47 to 91 years). There were 81 women (54%) in the retrobulbar group and 74 women (50%) in the topical group.

Table 2 shows the intraoperative complications. Four cases (1.3%) were converted to ECCE when the posterior capsule ruptured during phacoemulsification or the anterior capsulorhexis could not be completed. Five anterior capsule tears occurred during anterior chamber entry. All

Table 1. Baseline demographics.

Characteristic	Retrobulbar Group (n = 150)	Topical Group (n = 146)	Total (n = 296)	<i>P</i> Value
Number of cases	150	146	296	—
Number patients	143	143	283	—
Eye				.054
Right	79	93	172	
Left	71	53	124	
Sex				.406
Male	62	69	131	
Female	81	74	155	
Age (y)				—
Mean \pm SD	65.06 \pm 9.08	64.78 \pm 11.38	64.92 \pm 10.23	
Range	43–84	47–91	43–91	

Table 2. Intraoperative complications.

Complication	Retrobulbar Group (n = 150)	Topical Group (n = 146)	Total (n = 296)	P Value
Conversion to ECCE	3	1	4	.623
Anterior capsule tears	8	7	15	.833
Noncurvilinear anterior capsulorhexis	14	12	26	.735
Posterior capsule rupture	15	16	31	.778
Without vitreous loss	5	7	12	.524
With vitreous loss	10	9	19	.860
Loss of nucleus fragments	3	4	7	.720
Suturing of corneal tunnel	8	9	17	.759
IOL implantation in sulcus	10	9	19	.860
Wound burning	4	3	7	1.000

ECCE = extracapsular cataract extraction; IOL = intraocular lens

eyes received a posterior chamber IOL. There were no significant differences in intraoperative complications between the groups.

Table 3 shows the postoperative complications. There were 63 identified postoperative complications, 19 cases (12.6%) in the retrobulbar group and 22 (15.0%) in the topical group. The most common postoperative complication in both groups was temporary corneal edema (10 retrobulbar, 14 topical). Some patients had more than 1 complication. There were no significant between-group differences in the occurrence of any postoperative complication.

Preoperative BSCVA ranged from 20/40 to hand movements. Postoperative BSCVA, including in eyes with pre-existing pathology, was 20/40 or better in 86.6% of retrobulbar cases and 84.9% of topical cases (Table 4).

DISCUSSION

The efficacy of topical anesthesia for modern cataract surgery has been widely reported.⁶⁻¹³ The main advantages include immediate visual recovery and the lack of serious needle complications,⁶ making it the preferred technique of many cataract surgeons. Preserved ocular motility

improves operating conditions by optimizing the red reflex and wound access. Compared with local techniques such as peribulbar anesthesia, the topical approach produces less vitreous pressure and does not affect optic-nerve blood flow. Postoperative recovery is quicker with less pain, and patients may prefer the technique.¹⁸

Recently, the safety and efficacy of residents' transition from local to topical anesthesia have been evaluated.¹⁵ To our knowledge, this is the first study to evaluate the intraoperative and postoperative complications and visual outcomes of phacoemulsification cases performed under topical anesthesia by residents who had no experience with peribulbar or retrobulbar anesthesia.

Although more right eyes than left eyes had topical anesthesia, there was no statistically significant difference in demographic features between the retrobulbar and topical anesthesia groups. Ninety-three surgeries (63.6%) in the topical group and 79 (52.6%) in the retrobulbar group were performed in right eyes.

All residents using topical anesthesia and 1 resident using retrobulbar anesthesia began with phacoemulsification without first learning ECCE. It has been reported that 24% of surgeons learn cataract extraction with

Table 3. Postoperative complications.

Complication	Retrobulbar Group (n = 150)	Topical Group (n = 146)	Total (n = 296)	P Value
Transient IOP rise	5	9	14	.251
Corneal edema	10	14	24	.357
Shallow anterior chamber	2	3	5	.681
IOL decentration	3	2	5	1.000
Vitreous hemorrhage	1	1	2	1.000
Cystoid macular edema	4	5	9	.747
Bullous keratopathy	0	1	1	.989
Endophthalmitis	0	2	2	.466
Retinal detachment	0	1	1	.989

IOL = intraocular lens; IOP = intraocular pressure

Table 4. Causes of visual acuity worse than 20/40.

Cause	Retrolubar Group (n = 150)	Topical Group (n = 146)	Total (n = 296)	P Value
Surgical complication	7	9	16	.569
Diabetic retinopathy	5	5	10	1.000
Senile macular degeneration	5	3	8	.723
Amblyopia	0	2	2	.466
Other retinal diseases	3	3	6	1.000

phacoemulsification¹⁴ and ophthalmology residents can learn to perform phacoemulsification cataract surgery safely and effectively without prior planned ECCE experience.¹⁹

Intraoperative complications were not significantly higher in the retrolubar group than in the topical group ($P > .05$). The incidence of posterior capsule rupture with vitreous loss was 6.4% in both groups and 6.1% in the topical group. This compares favorably with the incidence of vitreous loss in resident surgeries performed with topical anesthesia.¹⁵ Our 6.1% vitreous loss rate in the topical anesthesia group is comparable to those reported^{19–29} between 2.8% and 14.7%.

Rates of vitreous loss among senior surgeons converting from ECCE to phacoemulsification range between 1.4% and 14%^{10,30–34} and are similar to those in this study. This indicates that a resident beginning with topical anesthesia has a phacoemulsification learning curve comparable to that of an experienced ECCE surgeon.

There was 1 retinal detachment after vitreous loss during the follow-up period. Approximately 70% of patients with vitreous loss had a final BSCVA of 20/40 or better after preexisting retinal pathologies were excluded. Other studies report comparable results.^{22,25,28–30}

The visual results obtained in the topical anesthesia group were good, with a mean BSCVA better than 20/40 in 93.9% cases. The results in this and other studies^{15,19,23,25,28,29} confirm that most patients recover excellent vision, particularly when those with preexisting ocular comorbidities are excluded.

Topical anesthesia provided similar and reasonable analgesic effects when performed by resident surgeons or experienced surgeons³⁵; however, this study is limited because patients were not asked to rate their discomfort and pain level during anesthesia administration and surgery.

With appropriate training, patient selection, and faculty supervision, residents have acceptably low complication rates and good visual results using topical anesthesia in phacoemulsification.

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