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Phacotrabeculectomy and Implantation of Intraocular Lenses with Releasable Sutures and Antimetabolite Agents: Efficacy and Safety

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Abstract

Background: The aim of this study was to evaluate the efficacy and safety of phacoemulsification and the implantation of intraocular lenses (IOL) combined with trabeculectomy supplemented by releasable sutures and antimetabolite agents.

Methods: Phacotrabeculectomy was performed in 36 eyes of 30 patients who hadmedically uncontrolled Intraocular pressure (IOP) or were nonreliable for medical therapy and had significant cataract, or had low Visual Activity (VA) due to cataract and simultaneous uncontrolled or medically controlled IOP with at least 2 medications. Mitomycin C (0.02%) for 1-3 minutes was applied in all cases. Scleral flap was sutured with permanent (loose) and releasable (tight) 10-0 nylon sutures. The releasable sutures were removed in the first to third postoperativeweeksif IOP was more than 12mmHg. If bleb was vascularized or flat, and IOP was high or borderline (>16mmHg), 5FU was injected subconjunctivally 1-3 weeks after the surgery. If postoperative IOP was more than target pressure, antiglaucoma medications were used.

Results: Eight eyes (22.2%) required releasable suture removal. Mean preoperative IOP was 28.4±9.4 (12-52) mmHg. Totally, 33 eyes (91.7%) had primary open angle glaucoma, two eyes (5.5%) had posttraumatic glaucoma and one eye (2.8%) had exfoliative glaucoma (XFG). Mean postoperative final IOP was 12.1±3.9 (5-22) mmHg (P<0.0001). Preoperative VA was 0.5mCF (log Mar=2) to 20/200 (log Mar=1). Mean VA was 3mC.F (Log Mar=1.3±0.4). Postoperative VA was 20/200 (log Mar=1) to 20/20 (log Mar=0) and mean postoperative VA was 20/60 (log Mar=0.57±0.46) (P<0.0001). Mean number of required medications to control IOP was 2.58±0.09 (2-4) preoperatively and 0.58±0.15 (0-3) postoperatively (p<0.0001). Early postoperative complications were flat anterior chamber in 3 eyes (8.3%), postoperative uveitis in 3 eyes (8.3%) leakage in 3 eyes (8.3%) and choroidal effusion in 1 eye (2.8%).

Conclusion: It seems, this method is an effective and safe procedure for patients with coexisting cataract and glaucoma.

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Introduction

Trabeculectomy is a surgical procedure to create an opening in eye wall that is covered by thin scleral flap and conjunctiva. It is accepted as a long-term solution for glaucoma control (1-5). In selected cases, it is done in combination with cataract surgery and implantation of an

intraocular lens (IOL) (6).To increase the success rate of intraocular pressure (IOP) control and to prevent glaucoma progression, antimetabolite drugs such as Mitomycin-C (MMC) and 5-fluorouracil (5FU) are prescribed (3, 7). The use of releasable suture is a method to reduce postoperative complications such as wound leakage, flat anterior chamber, and choroidal effusion(8, 9). Trabeculectomy and combined phacotrabeculectomy, a procedure that is a combination of trabeculectomy and cataract surgery (phacoemalsification), can be performed with either limbal-based or fornix-basedconjunctival flaps. In literature, there is no significant difference between the results of these two methods(10-12).Phacoemulsification and IOL implantation combined with trabeculectomy can be performed under the scleral flap (one site) or in two separate sites. Clinically, the results of these two methods are the same(13).

In the selected cases of coexistingcataract and glaucoma, combined glaucoma surgery and cataract extraction with implantation of an intraocular lens is the procedure of choice (14). According to certain studies, the rate of complications in phacotrabeculectomy is higher than that in trabeculectomy alone (15). In some studies, fewer complications are reported for combined procedures than for trabeculectomy (16, 17). Using Mitomycin C with phacotrabeculectomyresults in lower IOP, but is accompanied with more complications(18, 19). Releasable sutures reduce the incidence of postoperative complications when used in conjunction with trabeculectomy or combined procedures(8, 9).

We did not find any previous study about phacoemulsification and IOL implantation combined with trabeculectomy, releasable sutures and the application of antifibrotic medications. Here, we evaluated the results and complications of phacotrabeculectomy and IOL implantation with a releasable suture and antimetabolite application in selected cases of coexisting glaucoma and cataract and also evaluated the results and complications of phacotrabeculectomy and IOL implantation with releasable suture and antimetabolite application in selected cases of coexisting glaucoma and cataract.

Materials and Methods

Study Design

In this longitudinal study, 36 eyes of 30 patients were operated using phacotrabeculectomy because of simultaneous glaucoma and cataract from April 2010 to March 2013 in Shafa Medical Center, Kerman, Iran. Patient follow-up lasted a minimum of 12 months, and both positive results and complications were evaluated. Phacotrabeculectomy was performedfor a.) uncontrolled IOP with medication or nonreliable patients for medical therapy and significant cataract, or b.) low VA due to cataract and simultaneous uncontrolled or medically controlled IOP with at least 2 medications.

Preoperative assessment

Before the surgery, a complete ocular examination, including Snellen VA, IOP (Goldman tonometry), anterior segment (slit lamp exam), and posterior segment (retina and optic nerve head) examination with indirect ophthalmoscope, was done. Cup/disc ratio determination and an evaluation of the optic nerve head were performed using a slit lamp and condensing +90 lens. Antiglaucoma medications were Timolol, Latanaprost, Dorzolamide and Brimonidine.

Surgery and follow-up

One experienced ophthalmologist performed all surgeries under general anesthesia. Trabeculectomy was done with triangular 3.5-4mm scleral flap under fornix-based superiorperitomy. Mitomycin C 0.02% was applied for 1-3 minutes, under scleral flap, in all cases. Scleral flap was sutured with permanent (loose) and releasable (tight) 10-0 nylon (Ethicon LLC USA) sutures. Cataract surgery was done with separate, superior clear corneal incision and foldable IOL was implanted. After the surgery, patients were examined on postoperative days 1, 2, 3, 5, 7, 14, 21 and 30. Then

examination was done every 2-4 weeks forthree months and after that every three months. Postoperative medications were Chloramphenicol eye drop every 6hr for 7-10 days, and Betamethasone eye drop every 4-6hrfor 5-6 weeks.

The releasable suture was removed at the slit lamp to increase aqueous filtering in the first to third weekafter the operation if IOP was more than 12 mmHg; otherwise, it was left in place.

If bleb was vascularized or flat, and IOP was high or borderline (>16mmHg), 5FU was injected subconjunctivally 1-3 weeks after the surgery. First, injection included 20mg/0.2 CC and then 10mg/0.1CC for 4-6 injections. Early postoperative complications were evaluated, including wound leakage, flat anterior chamber (flat AC), choroidal effusion, and postoperative uveitis (POU). Patients with ocular problems other than cataract and glaucoma, those with previous intraocular surgeries and patients with inappropriate follow-upwere excluded. If postoperative IOP was more than 21 mmHg (in some patients a lower target pressure was used), anti-glaucoma medications were used (including beta-blockers, carbonic anhydrase inhibitors, and alpha2 agonists). After final examination, data were collected.

Statistical Analysis

Data were analyzed using descriptive statistics, and results were reported as mean ± standard deviation (SD) and range of quantitative data and percent for categorical data. To compare IOP, VA and number of medications before and after the operation, paired student's t-test was used. Statistical analysis was performed using SPSS version 21.

Results

Mean ± SD (range) age of patients was 66.6±11.9 years (22-82). Of the 36 eyes, 21 ones (58.3%) belonged to male patients and 27 ones (75%) were right eyes. In whole, 33 eyes (91.7%) had primary open angle glaucoma, two eyes (5.5%) had posttraumatic glaucoma and one eye (2.8%) had exfoliative glaucoma (XFG). C/D ratio was 0.67±0.26 (0.1-1.00). Eight eyes (22.2%) needed removal of releasable sutures 3-20 days after the surgery. Follow-up time was 12-59 (16.6±12.3) months. Table 1 shows the demographic and clinical characteristics of patients.

Table 1. Demographic and clinical characteristics of patients with phacotrabeculectomy and implantation of intraocular lenses

Variable	Description
Number of eyes	36
Number of patients	30
Age(years)	
Mean± SD	66.60±11.90
Range	22-82
Number of male/female	21/15
C/D ratio	0.10-1.00
No. of eyes right/left	27/9
MMC use	
Mean± SD	75±28
Range	60-180
Follow-up time	
Mean± SD	16.60±12.30
Range	12-59
Releasable suture removal	8/28

Preoperative IOP was 28.4±9.4 (12-52) mmHg with medication. Contralateral IOP was 16.3±5.5 (8-32) mmHg. Postoperative final IOP was 12.05±3.96 (5-22) mmHg (with medication), which was significantly lower than preoperative values (P<0.0001).

Preoperative VA was 0.5mCF (log Mar=2) to 20/200(log Mar=1). Mean preoperative VA was 3mC.F (log Mar=1.3±0.4).Postoperative VA was 20/200 (log Mar=1) to 20/20 (log Mar=0) and mean postoperative VA was 20/60 (log Mar=0.57±0.46) (P<0.0001). In all cases VA increased. Table 2 shows preoperative and postoperative values.

Preoperatively, patients needed 2.6 ± 0.09 (ranged 2-4) medications to control IOP. After the operation, the patients required 0-3 (0.58±0.15) drugs to control their IOP (P<0.0001). The results have been presented in Table 3.

Postoperative complications included: flat AC in 3 eyes (8.3%), POU in 3 eyes (8.3%), leakage in 3 eyes (8.3%) and choroidal effusion in 1 eye (2.8%).No late complication was observed.

After the surgery, IOP lower than 21mmHg was seen in 35 eyes (97.22%), under 16mmHg in 31 eyes (86.1%) and under 12mmHg in 21 eyes (58.3%).

Procedures (early) that were done following phacotrabeculectomy were: subconjunctival 5FU injection in 3 eyes (8.3%), AC formation in 2 eyes (5.4%), re-suturing of the wound in 2 eyes (5.4%) and choroidal tap in 1 eye (2.8%).

Table 2. Preoperative and postoperative valuesin patients with phacotrabeculectomy and implantation of intraocular lenses

	Pre-operation	Post-operation	p_value
IOP(mmHg)			<0.0001
Mean±SD	28.40±9.40	12.05±4.01	
Range	12-52	5-22	
Visual Acuity			<0.0001
Mean±SD	3m CF	20/60	
Range	0.5mCF-20/200	20/200-20/20	
No. of medications			<0.0001
Mean±SD	2.60±0.10	0.60±0.15	
Range	2-4	0-3	

Table 3. The frequencyof eyes that need medicine to control IOP preoperatively and postoperatively

Number of medications	Preoperative	postoperative
0	0 (0.00%)	24 (66.67%)
1	0 (0.00%)	5 (13.89%)
2	16 (44.44%)	5 (13.89%)
3	19 (52.78%)	2 (5.56%)
4	1 (2.78%)	0 (0.00%)
Total	36 (100%)	36 (100%)

Discussion

In this study, we evaluated the effectiveness of phacoemulsification and the implantation of intraocular lenses (IOL) combined with trabeculectomy supplemented by releasable sutures and antimetabolite agentsby comparing preoperative and postoperative IOP, VA and the number of medications that were used to control IOP.We also evaluated the occurrence of postoperative complications.

In our study, mean preoperative IOP was 28.4mmHg and reducedto 12.05mmHg in the last follow-up examination. Stark et al. reported 251 eyes after phacotrabeculectomy with releasable suture without antimetabolite with a mean 16-monthfollow-up. In their study,mean preoperative and postoperative IOP wererespectively 18.7mmHg and 15.1mmHg (9). In a study by Caporossi et al. (1999) on 42 eyes with phacoemulsification combined with trabeculectomy and a mean 28.24-month follow-up, mean IOP reduced from 24.6 to 15.36 mmHg (20). We had higher preoperative and lower postoperative IOPs compared to other studies (more IOP reduction), which can be theadvantage of antimetabolite use.

Mean VA improved from 3mCFto 20/60. No patient had loss of vision. In the Stark et al.study,mean VA improved from 20/80 to 20/32, showing96% improvement of VA and 4% having 1-3 line loss of VA (9). In our study, all eyes showed improvement in their VA. Caporossi et al. reported improvement of mean VA from 20/200 (HM-20/30) to 20/30 (20/60-20/20) (20). This improvement in vision can be related to simultaneous cataract surgery and implantation of intraocular lens in patients.

An interesting finding of this study was reduction of the number of medications required after the surgery. In 97.2% of eyes, IOP was lower than 21mmHg with medication at the end of follow-up. IOP <16mmHg and <12mmHg were seen in 86.1% and 58.3%, respectively. Jampel et al. reported 72%, 60% and 44% success rates for achievement of target IOP, ≤18mmHg, ≤15mmHg and ≤12mmHg, in 797 eyes four years after trabeculectomy without any concurrent surgery (3). Khandelwal et al. reported 91%, 70%, and 51% for IOP ≤18, ≤15, and ≤12mmHg, respectively, after trabeculectomy with MMC combined with phacoemulsification in 105 cases with a minimum follow-up of 12 months (21).Mamalis et al. evaluated 212 eyes with a mean follow-up of 26 months, and mean preoperative and postoperative IOP was 23.1mmHg and 15.9mmHg respectively; 10% of their cases had postoperative IOP more than 21 mmHg (22). In the report of Stark et al., 51% of eyes required 2 or more medications (mean 1.9 drugs per eye) preoperatively. Totally, 78% of eyes were medication free postoperatively, and 2% required more drugs than preoperative time (9). In the Mamalis et al. study,mean amount of antiglaucoma medication was reduced from 1.89 to 0.41 postoperatively (22). In our study, the operation caused reduction of drugs from a mean 2.6 to 0.6 per eye and 66.7% of eyes were medication free postoperatively. These results supporteffectiveness of trabeculectomy with antimetabolite agents in reduction of IOP and also reduction in the number ofrequired medications for controlling IOP.

Stark et al. reported 10.7% leakage, 7.5% choroidal effusion, and 4% hyphema (9).Caporossi et al. reported 4.76% choroidal effusion (20).We encountered 2.8% effusion in suprachoroidal space and 8.3% leakage, which is lower than other studies and can be attributed to the advantages of releasable sutures. Henderson et al. (2004) reported 59% leakage after 286 trabeculectomies without releasable sutures at some stages postoperatively (65% of fornix-based flaps compared with 24% of limbus-based flaps) (23).

After removal of releasable sutures, we had no particular complications. Sathyan et al. (2007) reported a case of suprachoroidal hemorrhage following removal of the releasable suture (24). We removed releasable sutures within three weeks postoperatively when the wound healing was not complete; this allowed more effect to decrease IOP. Tezel et al. removedreleasable suture laterthan three weeks after trabeculectomy and combined phacotrabeculectomy procedures in the presence of antifibrotic supplements and concluded that intraoperative antifibrotic supplements in trabeculectomy and combined trabeculectomy/cataract extraction alter wound healing and extend the period in which releasable suture removal is clinically effective. They reported a significant immediate IOP reduction (6.3± 2.8mmHg) in these eyes; no complicationwasseen after removal of the releasable sutures. They removed releasable sutures if IOP was more than 10mmHg (25). We performed releasable suture removal if IOP was more than 12mmHg to prevent complications such as hypotony, flat or shallow AC, and choroidal effusion. We performed the combined procedure in some cases with a small C/D ratio, because we had cases that had high IOP of more than 40mmHg in spite of using full medication (4 antiglaucoma medications), and they had significant lens opacity that reduced vision.

The limited number of patients, as the simultaneous occurrence of glucoma and cataract is not prevalent, was one of the limitations of this study. Also, majority of these patients couldbe controlled by medications or cataract surgery alone. Moreover, some patients had poorcooperation and tocontrol this problem we tried to call them before their periodical examinations and performed free of charge exams to increase their follow-up cooperation. Lack of a group for comparisonwasalso another limitation of this evaluation.

In conclusion, phacotrabeculectomy and implantation of an intraocular lens with releasable suture and antimetabolite agents can be an effective and safe method with an acceptable rate of complications for those cases of coexistingglaucoma and cataract. Antimetabolites increase the rate of success and releasable sutures are effective inpreventing complications.

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