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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF BLEB SCORES AND CENTRAL ANTERIOR CHAMBER DEPTH IN TRABECULECTOMY WITH CONVENTIONAL SUTURES VERSUS RELEASABLE SUTURES

*Sud, R. and Sharma, V.

Kalpana Chawla Medical College, India

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ABSTRACT

Purpose: Despite many advancements in the management of glaucoma, trabeculectomy remains the mainstay of surgical management. Since ocular hypotony and shallow anterior chamber in the early postoperative period and their resulting complications are found to be the main cause for reduction in visual acuity following trabeculectomy, our study was designed to compare the IOP reduction and anterior chamber depth along with bleb scores in patients undergoing trabeculectomy with conventional interrupted sutures vs releasable sutures.

Methods: The prospective randomized study was conducted in 40 eyes of 37 patients with the diagnosis of primary open angle glaucoma or primary angle closure glaucoma. The age of the patients in the study ranged from 40-69 years with a mean of 52.77±7.05 years. There were 14 males and 23 females in the study. A total of 40 eyes of 37 patients were randomly divided into 2 groups:

Group A: 20 eyes undergoing trabeculectomy with conventional 10-0 nylon sutures and

Group B: 20 eyes undergoing trabeculectomy with releasable 10-0 nylon sutures. All patients were kept on a regular follow up for a minimum period of 3 months and postoperative assessment was done on day 1, day 7, day 30 and day 90.

Results: The mean IOP in the two groups was comparable at all postoperative visits ($p > 0.05$). The mean percentage fall from preoperative IOP was comparable on follow up visits between the two groups. Bleb score was the lowest on first postoperative day in both the groups, progressively increasing over the period of follow up. There was no significant difference in the bleb score amongst the two groups in the initial postoperative period. Subsequently, by day 30, when the sutures had been released, Group B eyes had significantly better bleb scores than Group A ($p = 0.00$). The mean central anterior chamber depth was lowest on the first postoperative day in both the groups, with significantly low CACD in group A ($p = 0.042$). Subsequently, the mean CACD increased progressively in both the groups.

Conclusion: Releasable suture technique is a simple and effective technique and should be considered as a safe and effective way to improve trabeculectomy outcomes.

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INTRODUCTION

Surgical attempts to treat glaucoma date back to Mckenzie (1930) who first performed scleral puncture for chronic stages of glaucoma. Trabeculectomy, since its introduction by Cairns (1968) has become the gold standard surgical procedure for glaucoma. Unlike with the earlier full thickness fistulas, there is a lower incidence of postoperative hypotony, anterior chamber shallowing and related complications. However, the resulting guarded aqueous outflow prevents the profound and longlasting reduction in intraocular pressure typically obtained by full thickness procedures (Cairns, 1968). Trabeculectomy using releasable sutures is an effective method in titrating

postoperative filtration (Lewis and Phelps, 1984). It allows the surgeon to close the scleral flap relatively tight intraoperatively, thereby decreasing the incidence of early postoperative complications. When the wound and anterior chamber are believed to be stabilised, the sutures can be removed, serially, to increase filtration in small increments and thus simulate a full thickness filtration procedure (Jay and Murray, 1988). Complications following trabeculectomy can vary and can include conjunctival buttonholing (Petursson and Fraunfelder, 1979), cataract (Ermo *et al.*, 1974), hyphema (Zaidi, 1980), choroidal separation and flat anterior chamber (Mc Pherson *et al.*, 1997), bleb infection and endophthalmitis, Tenon's cyst and ocular hypotony. Costa *et al.* (1993) found hypotony and its resulting complications the main cause of loss of visual acuity after trabeculectomy. To decrease the complications of early postoperative over-filtration after

*Corresponding author: Sud, R.

Kalpana Chawla Medical College, India.

trabeculectomy, a tightly sutured scleral flap is widely recommended. Titration of the filtration is in the postoperative period is attempted by digital massage or laser sutureolysis. Lasersutureolysis, though effective, requires access to argon laser and a Hoskins or equivalent lens, which causes compression of the filtration area during the procedure. These and other disadvantages have led to the advent of releasable suture techniques. The use of releasable sutures in filtration surgery originated with Schaffer *et al.* (1971) (Thomas *et al.*, 1997), but the success of their technique in preventing hypotony and flat anterior chamber was limited by the gross nature of the filtering wound in guarded thermal sclerostomy. Cohen and Osher (1988) reinitiated the use of releasable sutures in trabeculectomy in 1988. In an Indian study by Thomas *et al.* (1997), a retrospective review of 154 trabeculectomies with releasable sutures was performed to assess the effect of suture release on IOP at various postoperative periods. The immediate reduction in IOP was significant ($p < 0.01$) when the suture was released during the first three postoperative weeks. Complications included a typical windshield wiper keratopathy (18 eyes), epithelial abrasion (6 eyes) and a subconjunctival bleed (1 eye). Raina *et al.* (1998) conducted a prospective randomized study to compare the short term and long term efficacy of using releasable sutures. They concluded that the use of releasable sutures is an effective way at no extra cost or instrumentation to maximize long term bleb score and lower IOP, and to minimize short term complications of trabeculectomy. Since ocular hypotony and shallow anterior chamber in the early postoperative period and their resulting complications are found to be the main cause for reduction in visual acuity following trabeculectomy, our study was designed to compare the IOP reduction, bleb scores and anterior chamber depth in patients undergoing trabeculectomy with conventional interrupted sutures vs releasable sutures.

MATERIALS AND METHODS

Inclusion Criteria

Patients with the diagnosis of primary open angle glaucoma and primary closed angle glaucoma, uncontrolled, with maximal medical and/or laser therapy and needing filtration surgery were included in this study.

Exclusion criteria

Patients having corneal opacities, congenital/juvenile glaucoma, secondary glaucoma, with previous ocular surgery and patients needing combined surgery were excluded from the study.

A total of 40 eyes of 37 patients were randomly divided into 2 groups as follows:

Group A: 20 eyes undergoing trabeculectomy with conventional 10-0 nylon sutures

Group B: 20 eyes undergoing trabeculectomy with releasable 10-0 nylon sutures

Preoperative assessment of patients included detailed ocular examination including detailed slit lamp examination, refraction and best corrected visual acuity, intraocular pressure, gonioscopy, anterior chamber depth and corneal thickness measurement, axial length, manual keratometry and

corneal topography. All surgeries were conducted under peribulbar anaesthesia. A limbal based conjunctival flap was created 8-10 mm from the limbus. A triangular partial thickness flap measuring 4mmx4 mm was dissected upto the limbal zone. Innersclerotomy measuring 2x2mm was made just anterior to the scleral spur followed by peripheral iridectomy. The scleral flap was closed with 3 interrupted 10-0 nylon sutures in group A. The tightness of the sutures was adjusted to maintain the anterior chamber depth and to restrict aqueous run off around the flap edges to little or no flow. Conjunctival flap was sutured using 8-0 nylon mattress sutures. The releasable suture technique was identical except for the closure of the scleral flap. The apex of the partial thickness scleral flap was closed with 1 interrupted 10-0 nylon suture. The releasable suture was placed 1 on each side. To place the releasable sutures the needle was passed first into the sclera and then through the scleral flap. The needle was passed through the base of the scleral flap beneath the conjunctival insertion and then through the peripheral cornea 1-2 mm from the limbus. A small superficial bite through adjacent cornea was then taken. The corneal end of the suture was then cut flush to avoid leaving a protruding suture end. The sutures were tied with a quadruple throw hemi bow slip knot. Detailed postoperative assessment was carried out for all patients including detailed slit lamp examination, refraction and best corrected visual acuity, intraocular pressure, gonioscopy, anterior chamber depth and corneal thickness measurement, axial length, manual keratometry and corneal topography.

Bleb Score

The bleb score was assessed objectively by using the method of Migdall and Hitchings (39)

Grade 1 Flat bleb

Grade 2 Elevated engorged conjunctiva

Grade 3 Pale elevated area within engorged conjunctiva

Grade 4 Residual conjunctival engorgement along suture line.

Grade 5 Pale and diffusely elevated conjunctiva

Grade 6 Pale cystic conjunctival inflammation

RESULTS

Age and Sex distribution: The age of the patients in the study ranged from 40-69 years with a mean of 52.77 \pm 7.05 years. No statistically significant difference was noted between the two groups in terms of age distribution ($p=0.876$). There were 14 males and 23 females in the study. No statistically significant difference was noted in the sex distribution.

Intraocular pressure

Table 1. Preoperative Intraocular pressure

IOP(mm Hg)	Group A	Group B	Total
20-30	2	9	11
30-40	12	7	19
40-50	6	1	7
50-60	0	3	3
n	20	20	40
Mean	36.7 \pm 8.44	33.2 \pm 10.7	

The preoperative IOP recorded by Goldmanns applanation tonometer are summarized in Table 1. No statistically significant difference in the mean iop was noted between the two groups ($p=0.259$).

The variation in the postoperative iopwith time is summarized in the Table 2.

Table 2. Variation in the intraocular pressure with time

IOP(mm Hg)	Group A	Group B	p
Day 1	9.1+/-2.4	9.3+/-4.0	0.850
Day 7	9.9+/-2.1	10.7+/-3.4	0.383
Day 30	11.5+/-3.7	12.4+/-2.9	0.406
Day 90	13.2+/-2.9	13.8+/-2.9	0.519

At no point was the difference in the mean IOP between the two groups significant. The variation in the percentage fall in postoperative intraocular pressure from the preoperative values is summarized in Table 3.

Table 3. Percentage fall in the intraocular pressure:preoperative vs postoperative values

%fall in IOP	Group A	Group B	p
Day 1	74.26+/-8.14	70.08+/-14.15	0.262
Day 7	71.41+/-11.25	65.5+/-13.08	0.134
Day 30	68.04+/-9.68	59.85+/-12.87	0.029
Day 90	62.67+/-11.58	55.31+/-14.31	0.082

Bleb Scores

The resultant bleb was examined and graded according to the scoring suggested by Migdal and Hitchings (as elaborated in Materials and Methods). The details of the mean bleb scores at various times in the follow up in the two groups are recorded in Table 4.

Table 4. Postoperative bleb scores

Bleb score	Group A	Group B	p
Day 1	2.70+/-0.80	2.65+/-0.87	0.852
Day 7	3.15+/-0.58	3.15+/-1.04	1.000
Day 30	3.65+/-0.58	4.65+/-0.93	0.000
Day 90	4.10+/-0.71	5.05+/-0.99	0.001

The bleb score on day 1 was lower in group B(2.65+/-0.87) as compared to group A(2.70+/- 0.80). However, there was no statistically significant difference between the two groups on day 1 (p=0.852). A statistically significant difference(p=0.000 and p=0.001) in the bleb score was noted on day 30 and day 90 respectively between the two groups with group B having significantly better bleb scores.

Anterior Chamber Depth (CACD)

The CACD in Group A ranged from 1.0 mm to 2.7 mm with an average of 1.68+/-0.51 mm while in group B it varied from 0.9 mm to 2.6mmwith a mean reading of 1.75+/- 0.57mm. No statistically significant difference was noted in terms of central anterior chamber depth between the two groups (p=0.686). The details of central anterior chamber depth in the postoperative period in the two groups are summarized in the Table 5.

Table 5. Postoperative central anterior chamber depth

Central ACD(mm Hg)	Group A	Group B	p
Day 1	1.18+/-0.27	1.39+/-0.36	0.042
Day 7	1.52+/-0.28	1.51+/-0.35	0.923
Day 30	1.65+/-0.17	1.87+/-0.44	0.047
Day 90	1.77+/-0.24	1.91+/-0.37	0.176

There was a statistically significant difference in the anterior chamber depth between the two groups. Group B patients fared significantly better in in their anterior chamber depths with a mean CACD of 1.39 +/- 0.36 mm on day 1 versus 1.18+/- 0.27mm seen in Group A. On day 30 group B patients had a mean CACD of 1.87+/- 0.44mm which again was significantly better than 1.77+/- 0.24 mm CACD seen in Group A patients.

DISCUSSION

Glaucoma is a potentially blinding disease with enormous personal, medical and social consequence (Strategies for prevention of blindness in national programmes-a primary health care approach, 1984). Many advancements, both pharmacological and surgical, have been made in the management of glaucoma. However, trabeculectomy remains the mainstay of surgical management. Various complications following trabeculectomy have been described, among which hypotony and a shallow anterior chamber were found to be commonly encountered complication in the postoperative period. Costa *et al.* (1993) found hypotony and its resulting complications as the main cause of visual acuity following trabeculectomy. To decrease this, a tightly sutured scleral flap is widely recommended. Titration of the filtration may then be attempted with digital massage or laser suturolysis. Lasersuturolysis, though effective, requires access to an argon laser and a Hoskins or equivalent lens, which causes compression of the filtration area. These and other disadvantages have led to the use of releasable suture technique. The technique of releasable sutures is an effective method of titrating postoperative filtration. It allows the surgeon to close the flap relatively tight intraoperatively. When wound and anterior chamber are stabilized, the sutures can be removed, to increase filtration in small increments. This has helped to decrease the hypotony postoperatively, thereby leading to better anterior chamber depth. Since ocular hypotony and shallow anterior chamber in the early postoperative period and their resulting complications are found to be the main cause for reduction in visual acuity following trabeculectomy, our study was designed to compare the IOP reduction and anterior chamber depth in patients undergoing trabeculectomy with conventional interrupted sutures vs releasable sutures. The prospective randomized study was conducted in 40 eyes of 37 patients with the diagnosis of primary open angle glaucoma or primary angle closure glaucoma. The age of the patients in the study ranged from 40-69 years with a mean of 52.77+/-7.05 years. There were 14 males and 23 females in the study. A total of 40 eyes of 37 patients were randomly divided into 2 groups:

Group A: 20 eyes undergoing trabeculectomy with conventional 10-0 nylon sutures and **Group B:** 20 eyes undergoing trabeculectomy with releasable 10-0 nylon sutures. All patients were kept on a regular follow up for a minimum period of 3 months and postoperative assessment was done on day 1, day 7, day 30 and day 90. The mean IOP in the two groups was comparable at all postoperative visits (p>0.05) at all the visits. The mean percentage fall from preoperative IOP was comparable on follow up visits between the two groups. Bleb score was the lowest on first postoperative day in both the groups, progressively increasing over the period of follow up. There was no significant difference in the bleb score amongst the two groups in the initial postoperative period. Subsequently, by day 30, when the sutures had been released, Group B eyes had significantly

better bleb scores than Group a ($p=0.00$). The mean central anterior chamber depth was lowest on the first postoperative day in both the groups, with significantly low CACD in group A ($p=0.042$). Subsequently, the mean CACD increased progressively in both the groups.

Conclusion

Releasable suture technique has emerged as a simple and effective way to decrease the incidence of postoperative hypotony and its ensuing complications. Releasable suture technique is relatively easier to learn and does not require additional equipment/instrumentation. Our study found that the mean percentage fall in IOP and anterior chamber depth is comparable between the two groups. The bleb score was found to be better in releasable suture group at 3 months. Hence releasable suture technique should be considered as a safe and effective way to improve trabeculectomy outcomes.

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