

# Phacotrabeculectomy: results of 2.8mm scleral tunnel incision

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## Abstract

• **AIM:** To report the results of phacotrabeculectomy with 2.8mm scleral tunnel incision.

• **METHODS:** Phacotrabeculectomy was performed through an identical 2.8mm scleral tunnel incision in 52 eyes of 49 patients with cataract and glaucoma. The incision was closed with out suture. Foldable intraocular lens was implanted in all eyes.

• **RESULTS:** The control of intraocular pressure on 36 eyes was desirable. The average postoperative intraocular pressure was  $(8.24 \pm 3.61)$  mmHg,  $(13.22 \pm 4.12)$  mmHg,  $(12.11 \pm 4.23)$  mmHg and  $(12.59 \pm 4.26)$  mmHg at one week, one month, three months and six months. As compared with 56 eyes in which phacotrabeculectomy was performed with 5.5mm scleral tunnel sutureless incision, there was no statistical difference, between the two, regarding the mean postoperative intraocular pressure at six months ( $t = 1.7536, P = 0.08239$ ). The retinal nerve fiber layer thickness was not statistically different between the preoperative and postoperative times in one year in 26 eyes. The uncorrected postoperative visual activity was 0.8 or better in 62% of 52 eyes.

• **CONCLUSION:** The advantages of this operative method are minimal size scleral flap, smaller and sutureless incision, immediate chamber restoration, decrease in postoperative astigmatism, enhanced postoperative visual activity, reduced postoperative inflammatory response and complications.

• **KEYWORDS:** scleral tunnel small incision; phaco; trabeculectomy

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## INTRODUCTION

With the introduction of the concept of minimally invasive surgery, small/micro-incision cataract surgery has become gradually routine in clinical practice, and soon

demonstrated its minimal tissue damage, less postoperative astigmatism, and faster visual recovery. Therefore, the small-incision cataract surgery has become the inevitable trend of future development. In the patients with cataract and glaucoma, we used tiny 2.8mm scleral tunnel flap to complete phacoemulsification, foldable intraocular lens implantation and trabeculectomy. The results in terms of control of intraocular pressure (IOP), visual acuity, corneal astigmatism and retinal nerve fiber layer thickness following this procedure are reported in this paper.

## MATERIALS AND METHODS

**Materials** Fifty-two eyes of 49 patients with cataract and glaucoma were operated in this study; of which 50 eyes had senile cataract and 2 had complicated cataract; mature cataract 21 eyes and immature 31 eyes. Twenty-one cases were males and 28 were females; 29 eyes were right eye and 23 left eye. The mean age of patients was  $72.69 \pm 9.22$  years (range 35-85 years). Out of 52 eyes, acute angle-closure glaucoma was present in 11 eyes, of which acute exacerbation of chronic phase in 4 eyes, chronic angle-closure glaucoma in 26 eyes, secondary glaucoma in 11 eyes, recurrence after glaucoma surgery in 4 eyes. Preoperative IOP range (TOPCON CT-80): 28-66mmHg (1mmHg = 0.133kPa), average  $(47.63 \pm 7.42)$  mmHg. Preoperative visual acuity ranged from light perception to 0.4.

**Methods** Using topical anesthesia (5g/L Alcaine preoperatively at an interval of 5 minutes for 3 times), limbal based conjunctival flap was made. A scleral tunnel incision of 2.8mm width was made with a crescent knife, 1.5mm above the limbus. The anterior chamber was opened with needle knife and viscoelastic was injected. A 5.5mm anterior capsule continuous curvilinear capsulorhexis. Hydrodissection and hydro-deleniation were done with perfusion fluid. Stop and chop the nucleus then phacoemulsification. One of the foldable intraocular lens (Acrysof SA60AT/SN60AT/SN60WF, Alcon, USA) was implanted in the capsular bag using Monarch II (IOL delivery system, Alcon, USA). Then, 1 × 1mm incision in the scleral tunnel was made and trabecular tissue was cut using micro trabecular cutting and biting device (Jiangsu New Medical Device Co Vision), followed by iridectomy. Anterior chamber reformed with perfusion fluid; incision checked for leakage, and conjunctival flap repositioned. Postoperatively, tobramycin and dexamethasone eye drops (TobraDex) and pranoprofen ophthalmic solution, four times a day for eight weeks. The patients were followed up one

week, a month, three months and six months. Postoperative IOP, visual acuity, corneal astigmatism, and retinal nerve fiber layer thickness were followed up.

## RESULTS

**Postoperative Intraocular Pressure** The mean intraocular pressure (IOP) readings were, after one week of surgery:  $8.24 \pm 3.61$  mmHg (range 8.2-14.6 mmHg), after a month:  $13.22 \pm 4.12$  mmHg (range 9.6-17.3 mmHg), after three months:  $12.11 \pm 4.23$  mmHg (range 10.3-17.1 mmHg), after six months:  $12.59 \pm 4.26$  mmHg (range 9.2-17.1 mmHg).

**Preoperative IOP** Range: 28-66 mmHg (1 mmHg = 0.133 kPa), average ( $47.63 \pm 7.42$ ) mmHg. Compared with before surgery the IOP was significantly lower, *F* test ( $F = 31.4376, P = 0.0000$ ).

In a previous study of 56 eyes in which phacotrabeculectomy was done using 5.5 mm scleral tunnel incision and PMMA IOL (Alcon United States produced MZ30BD) implantation, the postoperative 6 months mean IOP was  $13.27 \pm 3.84$  mmHg. In the present study with 2.8 mm scleral tunnel incision, the mean IOP 6 months after surgery was  $12.59 \pm 4.26$  mmHg. There was no significant difference in the IOP lowering effect between the two incisions groups ( $t = 1.7536, P = 0.08239$ ).

**Postoperative Visual Acuity** Fifty-two eyes had improved visual acuity on the first postoperative day-uncorrected visual acuity was 0.12 in 2 eyes, 0.6 in 18 eyes, 0.8 in 21 eyes, 1.0 in 9 eyes, 1.2 in 2 eyes. Uncorrected visual acuity of 0.8 or more was noted in 62% of eyes. Visual acuity was 0.12 in 2 eyes due to optic atrophy. The uncorrected visual acuity after 6 months was 0.12 in 2 eyes, 0.6 in 17 eyes, 0.8 in 22 eyes, 1.0 in 9 eyes, 1.2 in 2 eyes. Uncorrected visual acuity of 0.8 or more was noted in 63% of eyes. There was no significant change in visual acuity.

**Corneal Astigmatism** The mean preoperative astigmatism was ( $1.14 \pm 0.58$ ) D. The readings of mean postoperative astigmatism were, after 1 month: ( $1.26 \pm 0.41$ ) D; after six months: ( $0.89 \pm 0.47$ ) D. The *F* test was not significant between the three ( $F = 2.93243, P = 0.10456$ ).

**Retinal Nerve Fiber Layer (RNFL) Thickness** Zeiss-Humphrey OCT 3000 instrument was used to measure RNFL in 26 eyes before surgery and after one year following surgery (Hefei Celebrity Eye Hospital to provide assistance). RNFL thickness data of each quadrant is shown in Table 1. There was no significant difference between the two values.

**Reactions and Complications after Surgery** In all the 52 eyes, the surgery was successful without posterior capsule rupture, vitreous loss and other intraoperative complications. We found that apart from two eyes which were more than grade IV hard cataract, cornea was clear in the rest 50 eyes. the subconjunctival filtering bleb was flat postoperatively in all the eyes, and there were no obvious postoperative reactions. Postoperative complications such as shallow anterior chamber, hyphema, were also not seen in any case.

## DISCUSSION

In 2003, Zhao and Yu<sup>[11]</sup> reported a scleral tunnel flap phaco-

**Table 1 The average preoperative and postoperative RNFL thickness in 26 eyes compared quadrants**

	Above	Below	Nasal	Temporal
Preoperative	125.9 ± 9.1	126.0 ± 9.0	69.1 ± 7.3	77.4 ± 9.4
Six months after surgery	124.1 ± 8.1	125.3 ± 8.3	69.4 ± 7.2	76.6 ± 7.3
<i>t</i>	0.4247	0.3398	0.2122	0.1725
<i>P</i>	0.6887	0.7478	0.8403	0.8697

emulsification and trabeculectomy. As the trabeculectomy is completed in the scleral tunnel, there is no need of suturing the scleral flap or making another incision for trabeculectomy has all the advantages of phacoemulsification, but because of rigid one-piece IOL, scleral tunnel incision is to be made greater than 5 mm. This had some impact on postoperative astigmatism, par example irregular astigmatism, *et al.* With the small incision phacoemulsification technology and foldable intraocular lens for general clinical use, micro-incision cataract surgery has become the inevitable trend of future development. Therefore, phacotrabeculectomy incision was miniaturized. In general, the incision of less than 3 mm can be called small incision and less than 2 mm can be called micro-incision. This means an incision of scleral tunnel flap can not be greater than 3 mm. However, due to the special nature of glaucoma itself, we have to make a miniaturized surgical incision, to reduce surgically induced astigmatism, while taking into account the lowering of intraocular pressure and optic nerve protective effect in the phacotrabeculectomy surgery.

By making 2.8 mm incision in our surgical procedure, we have retained the advantages of 5.5 mm scleral tunnel flap i. e. the incision without suture and better closure of the incision by reducing to nearly half its size, thus preventing the excessive drainage and lower incidence of shallow anterior chamber.

The control of postoperative IOP after surgery was very good up to 6 months period. This shows that although the surgical incision is decreased, the effect of lowering intraocular pressure is positive. It can be considered that the effect of lowering intraocular pressure is stable because the post operative IOP after 6 months was good in all the eyes. However, there was no statistically significant difference between 2.8 mm scleral tunnel and 5.5 mm scleral tunnel phacotrabeculectomy procedures. When we evaluate the effect of glaucoma surgery, the intraocular pressure is only one aspect, and more important indicator is control of the optic nerve damage. Characteristics of glaucoma optic nerve damage are secondary to optic nerve fiber loss and then appear to atrophy of optic disc<sup>[2]</sup>. The optic nerve fiber loss can be accurately judged by measuring the RNFL thickness.

The observation of "no significant change" between pre operative and 1 year postoperative thickness of RNFL suggests that the optic nerve is protected well and no further damage occurred.

Because of the small incision, postoperative astigmatism is well controlled. There was no significant change in corneal astigmatism by six months observation.

**Conclusion** 2. 8mm small scleral tunnel flap phaco-trabeculectomy has good clinical results, in improving visual acuity, reducing postoperative astigmatism, reducing intraocular pressure and optic nerve protection. As the surgical method is easy to grasp, no special learning curve is needed for phacosurgeons.

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### 微小巩膜隧道瓣的白内障超声乳化联合小梁切除术

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#### 摘要

**目的:**探讨微小巩膜隧道瓣白内障超声乳化联合小梁切除术的可行性。

**方法:**对青光眼合并白内障 49 例 52 眼行 2.8mm 巩膜隧道瓣切口的白内障超声乳化联合巩膜隧道内的小梁切除术。

**结果:**术后 52 眼眼压控制满意, 术后 1wk; 1, 3, 6mo 眼压平均值分别为:  $(8.24 \pm 3.61)$  mmHg,  $(13.22 \pm 4.12)$  mmHg,  $(12.11 \pm 4.23)$  mmHg,  $(12.59 \pm 4.26)$  mmHg。取本组术后半年平均眼压与行 5.5mm 巩膜隧道瓣白内障超声乳化、植入一片式硬性 PMMA 人工晶状体并联合小梁切除术的 56 眼术后半年平均眼压  $(13.27 \pm 3.84)$  mmHg 进行对比分析无统计学意义 ( $t = 1.7536, P = 0.08239$ )。26 眼手术前后随访 1a, 视网膜神经纤维层厚度变化无统计学意义 ( $P > 0.05$ )。术后裸眼视力达到或超过 0.8 者占 62%。

**结论:**该术式切口小, 无需做巩膜瓣, 切口无需缝合, 并避免滤过过畅, 减少术后散光发生, 迅速恢复术后视力, 术后反应轻, 减少术后并发症。

**关键词:** 巩膜隧道瓣/微小; 超声乳化; 小梁切除