

# Pars-plana vitreous aspiration during combined trabeculectomy, phacoemulsification, and intraocular lens implantation in eyes with very shallow anterior chamber

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## Aim

The aim of this study was to evaluate the outcome of pars-plana vitreous aspiration during combined trabeculectomy, phacoemulsification, and intraocular lens (IOL) implantation in eyes with shallow anterior chamber (AC) to prevent its associated complications.

## Patients and methods

Fifty-four eyes of 46 patients were included in this study. All eyes were indicated for combined trabeculectomy, phacoemulsification and IOL implantation. All eyes had very shallow AC and injection of a viscoelastic substance through AC paracentesis failed to deepen the AC. Vitreous aspiration was performed with a 27 G needle on a 3 ml syringe over the pars plana 3.5 mm posterior to the limbus in the superotemporal quadrant. The cases were followed up for 12 months. The main outcome measures were the volume of aspirated vitreous, and intraoperative and postoperative complications.

## Results

Intraoperative deepening of the AC occurred in all cases after vitreous aspiration. Aspirated vitreous volume varied from 0.3 to 0.7 ml (average 0.47 ml). There was no evidence of positive vitreous pressure during surgery in any case. No intraoperative complications occurred in all cases. Postoperative complications were detected in the form of shallow AC with hypotony in 5.5% of the cases (3 out of 54 cases) and shallow AC with high intraocular pressure was reported in 3.7% of the cases (2 out of 54 cases). All cases were managed without the need for a second surgery. Complications related to vitreous aspiration like vitreous hemorrhage, retinal tear, or detachment were not observed in any case.

## Conclusion

Pars-plana vitreous aspiration is a safe procedure to prevent intraoperative shallow AC and its associated complications during combined trabeculectomy, phacoemulsification, and IOL implantation.

## Keywords:

combined trabeculectomy and phacoemulsification, intraocular lens implantation, shallow anterior chamber, vitreous aspiration

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## Introduction

Crowded anterior chamber (AC) is usually seen in eyes with small axial length. Small eye is a descriptive term for a group of disorders characterized by short axial length [1]. Shallow AC with normal axial length occurs in some ocular conditions like anterior microphthalmos [2], intumescent cataract [3], and angle closure glaucoma [4–6]. In addition, systemic elevated blood pressure, chronic obstructive pulmonary disease, arteriosclerosis, obesity, and senility can cause AC shallowness and positive vitreous pressure during ophthalmic surgery [7].

Narrow AC can cause difficulties in almost each step in combined trabeculectomy, phacoemulsification, and intraocular lens (IOL) implantation surgery. From

creation of the wound and capsulorhexis till the IOL implantation [7], dealing with a narrow space inside the eye increases the incidence of complications such as capsulorhexis extension, Descemet's membrane detachment, corneal edema due to endothelial loss because of the contact of the phaco tip and the back of the cornea and dialysis of the zonules [4,8]. The elevated vitreous pressure in narrow eyes can result in prolapsed iris and rupture of the posterior capsule with vitreous loss and may end with suprachoroidal hemorrhage [9]. Postoperative complications like

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increased intraocular pressure (IOP), choroidal effusion, macular edema, and malignant glaucoma occur frequently in such eyes [10]. It was observed that the AC depth decreases by about 0.024 mm per year of age [11].

The aim of this study was to evaluate the outcome of pars-plana vitreous aspiration during combined trabeculectomy, phacoemulsification and IOL implantation in eyes with shallow AC to prevent its associated complications.

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## Patients and methods

The current study was conducted after getting an approval from the Local Ethics Committee in Benha University Hospitals. All procedures in the study were done according to the Declaration of Helsinki and its updates. All patients signed a written informed consent to participate in the study and for publication of data before enrolment in the study. This study was conducted on patients for whom combined trabeculectomy, phacoemulsification, and IOL implantation was done at the Ophthalmology Department of Benha University Hospitals during the period from November 2016 till September 2019. Cases in which vitreous aspiration was not needed were excluded from the study.

This prospective study was done on 54 eyes of 48 patients. The sample size was determined to reach a statistical power of 90% and a marginal error of about 5%. The study duration was about 3 years including a follow-up period of 1 year. The study included patients with shallow AC (AC depth of <2.8 mm measured by A-scan ultrasound), who underwent uneventful combined trabeculectomy, phacoemulsification and IOL implantation and were above 50 years old. Cases with a history of ocular trauma or previous ocular surgery were excluded from the study.

The preoperative evaluation included full ophthalmological examination including slit lamp examination, fundus examination by indirect ophthalmoscopy, and IOP measurement using Goldman applanation tonometer (Haag-Streit, Mason, Ohio, USA). A-scan (Sonomed, PASCAN 300 A, New York, USA) biometry was used to measure the AC depth and axial length of the eye and to calculate the IOL power.

All eyes had shallow AC less than 2.8 mm and injection of a viscoelastic substance through the AC paracentesis failed to deepen the AC. Vitreous aspiration was

performed with a 27 G needle on a 3 ml syringe over the pars plana 3.5 mm posterior to the limbus in the superotemporal quadrant. The needle was inserted through the pars plana in the direction of the optic disk. The whole length of the needle was inserted into the vitreous cavity. Then, the plunger of the syringe was dragged smoothly to generate a negative pressure. If the needle stroked a fluid pocket, the fluid was derived into the syringe instantaneously. If not, the needle tip was moved anteriorly or to the sides and aspiration was repeated. If no fluid was aspirated, the needle was retracted by 5 mm and then the aspiration was tried again. Vitreous tapping was done once to every patient.

Additional viscoelastic material was added through the paracentesis to deepen the shallow AC. Other steps of the surgery were done as usual. Scleral flap was done in the superonasal quadrant and Mitomycin-C (Koywa Kirin Ltd, Galashiels, UK) 0.3 mg/ml was applied for 3 min. All surgeries were done by the same surgeon (M. N.E).

Follow-up visits at 1 month, 6 months, and 12 months were scheduled. In these visits, slit lamp examination, indirect ophthalmoscopy, and Goldmann applanation tonometry were done. Cases with IOP less than 8 mmHg were considered hypotonus, while cases with IOP greater than 21 mmHg were referred to as elevated IOP. The main outcome measures were the volume of aspirated vitreous, and intraoperative and postoperative complications.

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## Results

This was a prospective study that was done on 54 eyes of 48 patients, but the data were available only for 52 eyes of 46 patients as two patients were missed during the follow-up period at 1 month and 6 months, respectively. This study included 21 women and 25 men with age more than 50 years. Thirty-seven (80.4%) patients were above 60 years. Most of the patients had a unilateral treated eye (40 patients=86.9%). The mean aspirated vitreous volume was  $0.47 \pm 0.1$  ml (Table 1). Intraoperative deepening of the AC occurred in all cases after vitreous aspiration. No case had evidence of positive vitreous pressure during surgery. No intraoperative complications occurred in any case.

By reviewing the outcome after 1 year of follow-up, there were three (5.7%) patients with shallow AC with hypotony (IOP <8 mmHg) and two (3.8%) patients with shallow AC with high IOP (IOP >21 mmHg)

**Table 1 Patients' demographic data**

Data	n (%)
Age strata (years)	
50–60	9 (19.6)
>60	37 (80.4)
Sex	
Female	21 (45.7)
Male	25 (54.3)
Treated eye	
Right	22 (47.8)
Left	18 (39.1)
Bilateral	6 (13.1)
Axial length (mm)	21.17±1.04
Anterior chamber depth (mm)	2.53±0.32
Aspirated vitreous volume (ml)	0.47±0.1
Range	0.3–0.7

**Table 2 One-year follow-up outcome**

Data	n (%)
Shallow AC with hypotony	3 (5.7)
Shallow AC with high IOP	2 (3.8)

AC, anterior chamber; IOP, intraocular pressure.

(Table 2). Cases with hypotony did not need any treatment or intervention as there was no maculopathy. Cases with elevated IOP were managed by an eye drop combination of brinzolamide 2% and timolol 0.5%.

## Discussion

Operating on an eye with a narrow AC is a very stressful situation for all ophthalmic surgeons. Good preoperative assessment and accurate planning of the surgical strategies are essential in such high-risk eyes to minimize the complications and to achieve better visual outcomes [7]. The surgeon must be ready to face operative complications in almost each step. So, surgeons always tried to overcome this problem by various methods like injecting a viscoelastic substance through AC paracentesis, use of AC maintainer, intravenous mannitol to reduce the vitreous pressure, vitreous tapping, or by limited vitrectomy [12]. Sometimes, viscoelastic injection alone is not sufficient to deepen the extremely shallow AC and pars-plana vitreous tapping is another safe and useful method to expand the anterior segment [13].

In this study, vitreous tapping was done to all patients during the course of combined trabeculectomy, phacoemulsification, and IOL implantation. Pars-plana vitreous aspiration with a 27 G needle permitted us to subtract fluid alone without suctioning the formed vitreous because the viscosity

of the formed vitreous impedes aspiration within a 27 G needle [14]. The short needle (11 mm) lessens the risk of hitting the retina. In this study there were no intraoperative complications such as retinal incarceration in the tapping site and vitreous hemorrhage. This may be due to the age group of our patients as they were above 50 years and at that age vitreous liquefaction has already occurred. This also can explain why tapping once was successful and efficient in all cases. Some surgeons do vitreous tapping twice before declaring the failure of the technique [8]. In addition, these complications appear more in patients with nanophthalmia and microphthalmia [2], who were not included in this study.

We did a manual aspiration using a 27 G needle attached to a 3 ml syringe. Other investigators used automated vitrectomy with a low-speed and high cutting rate [5]. Vitreous tapping was done in the superotemporal quadrant aiming to better exposure for the surgeon.

Chang in a previous study stated that doing vitreous tapping with a 20 G vitrectomy system in eyes with extremely crowded anterior segment and shallow AC made the phacoemulsification and foldable IOL implantation easier with less complications [8].

Nossair *et al.* [15], in a previous study, on 26 eyes with shallow AC who underwent phacoemulsification, performed vitreous aspiration with a 27 G needle on a 5 ml syringe over the pars plana 3.5 mm from the limbus. They reported that vitreous aspiration of about 0.2 ml induced successful deepening of the AC on the first attempt in all 26 eyes. They concluded that it is a safe rapid technique with no postoperative complications.

Chang *et al.* [7] also suggested that using a limited transconjunctival pars plana vitrectomy (0.2–0.3 ml) with a 25 G high-speed cutter during the phacoemulsification procedure in eyes with very shallow AC due to increased posterior vitreous pressure, facilitated all operation steps by inducing deepening of the AC, with less complications. Miura *et al.* [5], in their study, on 17 eyes with angle closure glaucoma proved that performing phacoemulsification and IOL implantation associated with limited 25 G sutureless vitrectomy resulted in well-formed AC with significant reduction of the IOP in the first postoperative day. They also concluded that using a single-port 25 G limited vitrectomy made the procedure more easy and safe.

He *et al.* [16] performed pars plana vitrectomy combined with phacoemulsification, IOL implantation, and posterior capsulectomy on 30 eyes with malignant glaucoma. They reported a significant reduction of the postoperative IOP and a significant increase of the mean AC depth. No severe complications were noted. They concluded that this was an effective procedure that resolved the ciliary block and managed the misdirection of aqueous humor in such cases.

In this study, the 1-year follow-up of patients showed three cases of shallow AC with hypotony due to leakage from the site of sclerotomy as a result of defective healing or cautery at that site and two cases of shallow AC with elevated IOP due to narrow eyes and narrow angles increasing the positive pressure and interfering with aqueous drainage. All cases were managed without the need for a second surgery. Complications related to vitreous aspiration like vitreous hemorrhage, retinal tear, or detachment were not observed in any case.

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### Conclusion

In conclusion, pars plana vitreous aspiration was a safe procedure to prevent intraoperative shallow AC and its associated complications during combined trabeculectomy, phacoemulsification, and IOL implantation.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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