Abstract. The aim of the present study was to examine the effects of phacoemulsification and intraocular lens implantation combined with ciliarotomy in the treatment of angle-closure glaucoma with cataract in the elderly. A total of 68 patients were consecutively selected and divided into the control group with 33 cases (48 eyes) and the observation group with 35 cases (53 eyes). Cataract surgery combined with trabeculectomy was performed on the patients in the control group and phacoemulsification cataract extraction combined with ciliarotomy was performed on the subjects in the observation group, to compare postoperative effects and complications. Following surgery, the visual acuity of patients in the two groups significantly improved, intraocular pressure decreased, and improvement of the observation group was more evident (P<0.05). Following surgery, the depth of central anterior chamber and width of chamber angle of patients in two groups was increased, and improvement of the observation group was significantly more evident (P<0.05). Additionally, the incidence of complications, including corneal swelling, shallow of anterior chamber, fibrinous exudate in iris, and filtering bleb leaking and following cataract removal, of patients in the observation group was significantly reduced compared to the control group (P<0.05). In summary, the results of the present study show that phacoemulsification and intraocular lens implantation combined with ciliarotomy in the treatment of angle-closure glaucoma with cataract in the elderly is a safe and effective method and should be applied in the clinic.

Introduction

Primary angle-closure glaucoma is a pathological condition of increased intraocular pressure caused by blockage of aqueous humor flow or angle closure, and constitutes approximately 70% of glaucoma (1). There is high morbidity in elderly individuals suffering from angle-closure glaucoma (2). Most of their eye structures have degenerative changes, thus the incidence of angle-closure glaucoma with cataract is high at 30%, and has become a common cause of eye diseases resulting in blindness (3).

Simple treatment of glaucoma or cataract surgery does not relieve clinical symptoms effectively, and even increases the risk of recurrence (4). An effective response rate of conventional cataract extracapsular extraction combined with glaucoma operation can be ≤50‑70% (5). Phacoemulsification cataract surgery is a possible technique that can be applied in the treatment of cataract combined with glaucoma.

Randomized controlled experiments were carried out in the present study to determine the safety and effectiveness of this type of surgery in the clinic and suggest possible applications thereof.

Materials and methods

General materials. In total, 68 patients with primary angle-closure glaucoma with cataract presenting at the First Affiliated Hospital of Zhengzhou University were selected between February, 2012 and February, 2014 for the present study. The patients were examined using a non-contact tonometer (Keeler Ltd., London, UK), slit lamp microscope, gonioscopy and ophthalmologic A/B ultrasound machine (all from Shanghai Yimeng Software Technology Co., Ltd., Shanghai, China).

The inclusion criteria for the study were: ≥18 and <80 years of age, compliance with the diagnostic code of angle-closure glaucoma suggested by Johnson and Foster (6) and the Emery-Little classification diagnostic code, the range of angle closure from 120 to 270°, patients being administered ≥2 types of drugs to control glaucoma, and progression or intolerance of drugs following the initial treatment. Exclusion criteria for the
In between the tobradex ointment, eyedrops were given. The continuously after tobradex ointment was applied in the eyes.

seal the ocular region. Following surgery, periocular injec

surgery, water was used to close the corneal incision and then

intraocular lens and depth of anterior chamber. Following

anterior chamber was restored to adjust the position of the

After dissection, the viscoelastic agent was removed and the

root of the iris gently, promoting the anterior angle dissection.

anterior chamber, and a polishing tool was used to press the

viscoelastic agent was injected into the root of the iris in the

Discussion

Pupil blockage is the main nosogenesis of angle-closure glau
coma. The degeneration of lens structure is the main factor

for pupil blockage. Changes in the anatomic structure of local

eyeball including thickening of lens, diminution of cornea,

shortening of ocular axis and other changes may lead to the

occurrence of angle-closure glaucoma (7). Clinical treatment

glaucoma combined with cataract mainly depends on

extracting the lens and relieving pupil blockage. Traditional
treatment mainly depends on filtrable operation and peripheral
Iridectomy. Filtrable operation cannot resolve shallow of anterior chamber and narrow angle of angle-closure glaucoma fundamentally (8). Due to stimulation of surgical instruments and changes of local metabolism environment following surgery, the lens may experience turbid phenomenon again (9), which increases the rate of a secondary operation, the mental stress and economic pressure of patients.

The development of the phacoemulsification technique and promotion of medical instruments have led to use of phacoemulsification cataract combined with ciliarotomy in the treatment of angle-closure glaucoma combined with cataract, a method that has great application prospect in clinic. The results of the study show that, following surgery, visual acuity in the observation group improved significantly. Intraocular pressure was decreased significantly, the depth of central anterior chamber and width of chamber angle were increased significantly, while operative complications decreased significantly. However, substantial reduction of intraocular pressure prior to surgery to relieve postoperative response and reduce complications (10) is imperative. In addition, ciliarotomy was carried out after completion of cataract extraction because space of the posterior chamber of the eyes is enlarged and the iris became flat after extraction of the lens, since during the process of separating chamber angle, the iris is easy to remove. Ciliarotomy is assessed prior to and after emulsification, and it was found that the differences of vision, intraocular pressure, depth of anterior chamber and opening degree of chamber angle were not evident (11). Mitosis was completed prior to separating the chamber angle in order to increase the tension of iris, which is useful to separate chamber angle and prevents synechia at the same time (12). Before cataract extraction, pupil adhesion was relieved fully, a viscoelastic agent was used or the pupil was gradually dilated, which can reduce damage of the iris sphincter. Curvilinear capsularhexis was applied, a capsule membrane scissors were used to cut off part of the adhered organizational membrane and separate the capsule and cortex was adhered completely in the process of hydration separation (13). An auxiliary hook was used to open the lower iris when phacoemulsification lens cleaved the nucleus, in situ phacoemulsification was assessed directly, and the nucleus was divided into two sections using the stop-and-chop method to divide the remaining nucleus into 2-3 fragmentation nucleus, which was successively removed while avoiding placing the probe of ultrasonic emulsification into the iris to operate blindly (14). The auxiliary hook was used to avoid the iris while perfusing the cortex, polishing

| Table I. Comparison of vision and intraocular pressure. |
|--------------------------------------------------------|
| Group | Before operation | After operation | t | P-value | Before operation | After operation | t | P-value |
|-------|------------------|-----------------|---|---------|------------------|-----------------|---|---------|
| Observation | 0.12±0.03 | 0.67±0.14 | 6.032 | 0.025 | 43.25±5.43 | 17.56±3.15 | 5.327 | 0.035 |
| Control | 0.14±0.02 | 0.43±0.08 | 4.632 | 0.037 | 41.62±4.21 | 26.78±4.29 | 4.798 | 0.039 |
| t | 0.824 | 5.854 | | | 0.914 | 4.969 | | |
| P-value | 0.632 | 0.032 | | | 0.826 | 0.037 | | |

| Table II. Comparison of the depth of central anterior chamber and width of chamber angle. |
|------------------------------------------------------------------------------------------|
| Group | Depth of central anterior chamber, mm | Width of chamber angle, mm |
|-------|-------------------------------------|---------------------------|
| Before operation | After operation | t | P-value | Before operation | After operation | t | P-value |
| Observation | 1.21±0.06 | 3.74±0.32 | 4.698 | 0.037 | 1.24±0.23 | 3.97±0.46 | 4.967 | 0.036 |
| Control | 1.23±0.04 | 2.92±0.46 | 3.936 | 0.043 | 1.27±0.31 | 3.51±0.33 | 4.201 | 0.042 |
| t | 0.914 | 4.314 | | | 0.745 | 4.426 | | |
| P-value | 0.865 | 0.041 | | | 0.439 | 0.039 | | |

| Table III. Comparisons of operative complications [cases (%)]. |
|---------------------------------------------------------------|
| Group | No. of eyes | Corneal swelling | Shallow of anterior chamber | Exudation of fibrinoid in iris | Filtering bleb leaking | After-cataract | Total incidence |
|-------|-------------|-----------------|---------------------------|-----------------|-----------------|-------------|----------------|
| Observation | 53 | 1 | 1 | 1 | 1 | 1 | 5 (9.43) |
| Control | 48 | 3 | 3 | 2 | 2 | 2 | 12 (25.0) |
| χ² | | | | | | | 4.360 |
| P-value | | | | | | | 0.037 |
the posterior capsule and implanting the foldable intraocular lens into a capsular bag. After separating the chamber angle with a viscoelastic agent, it was completely removed from the anterior chamber, and pigments and organizations. The remaining viscoelastic agent in the intraocular lens was also removed, as well as caducous iris pigments, white organizational membranes and other residues in the surface and capsular bag (15).

In summary, use of phacoemulsification and intraocular lens implantation combined with ciliarotomy to treat angle-closure glaucoma with cataract in the elderly is a safe and effective technique, and should be applied in the clinic.

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