Effect of phacoemulsification, intraocular lens implantation, and trabeculectomy on angle-closure glaucoma merged with cataract

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Objective: To explore the clinical effect of phacoemulsification, intraocular lens implantation, and trabeculectomy in the treatment of angle-closure glaucoma merged with cataract.

Methods: A total of 80 patients with angle-closure glaucoma merged with cataract who were admitted in our hospital from May, 2015 to May, 2016 were included in the study and randomized into the observation group and the control group. The patients in the control group were given phacoemulsification and intraocular lens implantation. On this basis, the patients in the observation group were given trabeculectomy. The vision, intraocular pressure, central anterior chamber depth, and visual field before operation, 1 week, 1 month, and 3 months after operation in the two groups were detected.

Results: In the control group, 1 month after operation, while in the observation group, 1 week after operation, the vision was significantly improved, the intraocular pressure was significantly reduced, the central anterior chamber depth was significantly increased, and the average visual field defect value and average standard deviation value were significantly improved when compared with before operation ($P<0.05$); moreover, the improved degree in the observation group was significantly superior to that in the control group ($P<0.05$). Conclusions: Phacoemulsification, intraocular lens implantation, and trabeculectomy in the treatment of angle-closure glaucoma merged with cataract can effectively increase the central anterior chamber depth, reduce the intraocular pressure, and improve the vision; therefore, it deserves to be widely recommended in the clinic.

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1. Introduction

Glaucoma and cataract are the common and frequently-occurring diseases in the aged. Due to the population aging, glaucoma merged with cataract are more common, both of which can be mutually affected, resulting in the serious reduction of vision[1]. The pure trabeculectomy is mostly involved in the treatment of glaucoma merged with cataract previously, and has disadvantages of large incision, heavy tissue damage, acceleration of phacoscotasmus speed, and requirement of second operation[2]. With the development of phacoemulsification technology, the operation success rate for patients with glaucoma and cataract is increased, in that it can effectively remove the pupil block, open the chamber angle, deepen the anterior chamber, control the intraocular pressure, and improve the vision; therefore, it is widely applied in the clinic[3,4]. The study is aimed to explore the clinical effect of phacoemulsification, intraocular lens implantation, and trabeculectomy in the treatment of angle-closure glaucoma merged with cataract.

2. Materials and methods

2.1. General materials

A total of 80 patients with angle-closure glaucoma merged with cataract who were admitted in our hospital from May, 2015 to May, 2016 were included in the study, among which 37 were male, and 43 were female; aged from 59 to 79 years old, with an average age
of (67.2±8.5) years old; the preoperative vision sensitization value was 0.18-0.35, with an average value of (0.2±0.08), course from 1 to 7 years, with an average course of (4.2±2.1) years; 37 at grade II, 28 at grade III, and 15 at grade IV according to Emery grading of lenticular nucleus hardness. The patients were randomized into the observation group and the control group with 40 cases in each group. The difference between the two groups was not statistically significant (P>0.05).

2.2. Methods

The patients in the control group were given phacoemulsification and intraocular lens implantation. The bulbar conjunctiva was cut open along with the cornea margin above the eye. A conjunctival flap was made in the basilar part of fornix. A curved incision parallel to the corneal limbus with a length of about 5-6 mm was made 1 mm above the corneal limbus, with depth reaching 1/2 sclera, and interlayer tunnel incision to the cornea. The anterior chamber was penetrated 10 o’clock of the corneoscleral limbus. The viscoat was injected. The sac with a length of about 6 mm was tear ed in an annular form. The discission needle was used to separate the lens nucleus. Appropriate viscoat was injected in front of and behind the nucleus. The incision was enlarged. The circle key was used to deliver the lenticular nucleus. The posterior chamber artificial lenses were implanted. The perfusate was used to replace the anterior chamber viscoat.

On this basis, the patients in the observation group were given trabeculectomy. Mannitol (250 mL) was intravenously injected 1.5 h before operation. Routine pupil dispersing was performed 0.5 h before operation. The bulbar conjunctiva was cut open in a curved form 2 mm above the corneal limbus. Sclera (1/2) and sclera flap (4 mm×5 mm) were made in the basement of corneal limbus. The stab knife was inserted into the anterior chamber 1 mm inside the hyaline membrane of cornea, with an incision length of 3.2 mm. After water separation, the lens was emulsified, and the cortex was absorbed. The posterior chamber artificial lenses were implanted. Carbamycholine was injected into the anterior chamber for pupil contraction. Viscoat was absorbed. Trabecula (2.5 mm×1.5 mm) was removed. Two releasable adjusted stitches were sutured on the bilateral corneal limbus of sclera flap. The anterior chamber angle was recovered. The residual viscoat was absorbed. After being confirmed no abnormality, the incision was sutured.

A subconjunctival injection of dexamethasone (2.5 mg) was given after operation continuously for 3 d. Tobramycin dexamethasone eye drops and pranoprofen eye drops were locally applied. The compound tropicamide eye drops were used for pupil dilation, once a day.

2.3. Observation indicators

The vision, intraocular pressure (measured by non-contact tonometer), central anterior chamber depth (A ultrasound), and visual field (Goldmann perimeter) before operation, 1 week, 1 month, and 3 months after operation in the two groups were detected.

2.4. Statistical analysis

SPSS 18.0 software was used for the statistical analysis. The measurement data were expressed as mean±SD, and t test was used. Chi-square test was used for the enumeration data. P<0.05 was regarded as statistically significant difference.

3. Results

3.1. Comparison of vision change before and after operation

In the control group, 1 month after operation, while in the observation group, 1 week after operation, the vision was significantly improved when compared with before operation (P<0.05), and the improved degree in the observation group was significantly superior to that in the control group (P<0.05) (Table 1).

| Table 1 |
|-----------------|--------------|-------------|-------------|-------------|
| Groups          | n            | Before      | 1 week      | 1 month     | 3 months    |
| Observation     | 40           | 0.24±0.07   | 0.69±0.12   | 0.81±0.17   | 0.87±0.18   |
| Control         | 40           | 0.24±0.06   | 0.29±0.09   | 0.54±0.15   | 0.79±0.19   |

P<0.05, when compared with before operation; *P<0.05, when compared with the control group.

3.2. Comparison of intraocular pressure change before and after operation

In the control group, 1 month after operation, while in the observation group, 1 week after operation, the intraocular pressure was significantly reduced when compared with before operation (P<0.05), and the improved degree in the observation group was significantly superior to that in the control group (P<0.05) (Table 2).

| Table 2 |
|-----------------|--------------|-------------|-------------|-------------|
| Groups          | n            | Before      | 1 week      | 1 month     |
| Observation     | 40           | 25.13±6.72  | 21.34±4.17  | 18.87±4.64  |
| Control         | 40           | 25.13±6.58  | 24.11±4.15  | 22.18±4.57  |

P<0.05, when compared with before operation; *P<0.05, when compared with the control group.

3.3. Comparison of central anterior chamber depth before and after operation

In the control group, 1 month after operation, while in the
observation group, 1 week after operation, the central anterior chamber depth was significantly increased when compared with before operation ($P<0.05$), and the improved degree in the observation group was significantly superior to that in the control group ($P<0.05$) (Table 3).

Table 3 Comparison of central anterior chamber depth before and after operation (mm).

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Before operation</th>
<th>After operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 week</td>
</tr>
<tr>
<td>Observation group</td>
<td>40</td>
<td>2.12±0.52</td>
<td>2.75±0.81*</td>
</tr>
<tr>
<td>Control group</td>
<td>40</td>
<td>2.11±0.54</td>
<td>2.25±0.57</td>
</tr>
</tbody>
</table>

* $P<0.05$, when compared with before operation; \(^{\wedge}P<0.05$, when compared with the control group.

3.4. Comparison of visual field before and after operation

In the control group, 1 month after operation, while in the observation group, 1 week after operation, the average visual field defect value and average standard deviation value were significantly improved when compared with before operation ($P<0.05$), and the improved degree in the observation group was significantly superior to that in the control group ($P<0.05$) (Table 4).

Table 4 Comparison of visual field before and after operation (dB).

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Items</th>
<th>Before operation</th>
<th>After operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 week</td>
</tr>
<tr>
<td>Observation group</td>
<td>40</td>
<td>Average visual field defect value</td>
<td>-13.5±7.9</td>
<td>-15.8±8.6*</td>
</tr>
<tr>
<td>Control group</td>
<td>40</td>
<td>Average standard deviation value</td>
<td>5.7±3.4</td>
<td>6.6±3.7*</td>
</tr>
</tbody>
</table>

* $P<0.05$, when compared with before operation; \(^{\wedge}P<0.05$, when compared with the control group.

4. Discussion

With the age increasing, the metabolic and immunity disorders can increase the thickness of lens and make it turbid, and the suspensory ligament relaxation can shift the lens forward, resulting in iris bulging, which can increase the contact area with the iris, leading to the closure of anterior chamber angle, the discharge block of posterior chamber aqueous humour to the anterior chamber, and the formation of pupil retardation, which can cause the angle-closure glaucoma; therefore, it is argued that glaucoma is caused by the abnormally local anatomical structure of eyeball[5,6]. From the aspect of pathogenesis, removing the effect on lens and pupil retardation, deepening the anterior chamber, opening the anterior chamber angle, recovering the filtration function of trabecula, reducing the intraocular pressure, and preventing the attack of glaucoma are involved in the clinical treatments[7].

It is reported that[8] trabeculectomy for angle-closure glaucoma merged with cataract can not significantly improve the vision, easily cause corneal edema, eye nucleus swelling, and pupil up shifting, is not beneficial for the recovery, and will accelerate the progression of cataract. It is also reported that[9] the pure phacoemulsification and intraocular lens implantation in the treatment of primary cataract merged with glaucoma can achieve a preferable clinical effect, and is mostly applied in the acute angle-closure glaucoma; however, a comprehensive study on whether the intraocular pressure will be reduced or not is required in the study. With the development of phacoemulsification, intraocular lens implantation, and trabeculectomy, currently, it has been the common surgical method in the treatment of glaucoma merged with cataract[10]. This surgical method has the following advantages[11,12]: (1) the sclera tunnel incision and tight incision flap can reduce the surgical trauma and corneal astigmatism; (2) the small surgical incision, less tissue injury, and slight inflammatory reaction can reduce the occurrence of bulbar conjunctiva scarring in the filtration region; (3) it can effectively remove the pupil retardation, shift the iris backward, deepen the anterior chamber, promote the reopen of non-adhesive closed anterior chamber angle, alleviate the congestion of anterior chamber angle to a certain degree, make the trabecula with a compensatory function play a new role, and is beneficial for increasing the drainage of aqueous humour; (4) the maintenance of normal filtration channel by the sclera flap is beneficial for the formation of anterior chamber, and can reduce the occurrence rate of postoperative shallow anterior chamber; (5) the preferable sclera tunnel incision closure and rapid vision recovery can reduce the possibility of second operation. Some researches demonstrate that the combined operation can effectively reduce the intraocular pressure, rapidly improve the vision, and reduce the occurrence of postoperative complications; therefore, it is argued that phacoemulsification, intraocular lens implantation, and trabeculectomy in the treatment of angle-closure glaucoma merged with cataract is feasible and effective[13].

It is reported that phacoemulsification, intraocular lens implantation applied in the releasable acute angle-closure glaucoma and early chronic angle-closure glaucoma can remove the pupil retardation, inhibit the chamber angle closure, and effectively reduce the intraocular pressure[14,15]. With the population aging, the lens is thickened, the zonule is loosened, and the iris lens is shifted forward, which can cause the closure of chamber angle, resulting in the occurrence of glaucoma. Phacoemulsification, intraocular lens implantation, and trabeculectomy with a thin lens being placed, can make the iris backward, and significantly increase the chamber angle...
width, which can block the occurrence and development of glaucoma from the pathogenesis\cite{16}. The results in the study showed that In the control group, 1 month after operation, while in the observation group, 1 week after operation, the vision was significantly improved, the intraocular pressure was significantly reduced, the central anterior chamber depth was significantly increased, and the average visual field defect value and average standard deviation value were significantly improved when compared with before operation ($P<0.05$); moreover, the improved degree in the observation group was significantly superior to that in the control group ($P<0.05$), which is consistent with related reports\cite{17}.

In conclusion, phacoemulsification, intraocular lens implantation, and trabeculectomy in the treatment of angle-closure glaucoma merged with cataract can effectively increase the central anterior chamber depth, reduce the intraocular pressure, and improve the vision; therefore, it deserves to be widely recommended in the clinic.

References


