

Treatment of Severe Chronic Angle Closure Glaucoma with "Double Punctures-Goniosynechialysis", a Case Report

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Abstract: Objective: By introducing a method of treating severe chronic closed glaucoma, "double puncture goniosynechialysis", observes the changes of anterior chamber with intraoperative OCT. Methods: For patients with severe chronic angle-closure glaucoma with cataract complications, anterior chamber puncture and vitreous puncture are used to extract fluid, and finally the anterior chamber is pressurized to deepen the anterior chamber. Then surgical phacoemulsification combined with goniotomy was performed three weeks later. The patient's postoperative eyes were observed twice for changes in intraocular pressure and chamber angle. RESULTS: After the patient underwent double puncture-angiotomy, the intraocular pressure was reduced from 45mmHg to 16-30mmHg, and the angle of opening was changed from 0 to 90 degrees. After phacoemulsification combined with goniotomy, the intraocular pressure was reduced to normal, and the chamber angle was opened at 210 degrees. CONCLUSION: After opening part of the chamber angle through double puncture goniotomy to lower the intraocular pressure of the patient, phacoemulsification combined with goniotomy to further open the chamber angle and reduce the intraocular pressure is the most effective treatment for patients with severe chronic angle-closure glaucoma. best treatment plan. The point of the scheme is that it uses internal drainage surgery instead of filtering surgery, which can achieve long-term control and reduce the patient's intraocular pressure.

Keywords: Severe Acute Angle-Closure Glaucoma, Anterior Chamber Paracentesis, Vitreous Paracentesis, Surgical Treatment, Double Puncture-Goniotomy

1. Introduction

Glaucoma is the first irreversible blinding eye disease in the world, and elevated intraocular pressure is the main pathogenic factor. There are a large number of patients with angle-closure glaucoma in China, accounting for 47.5% of the total number of angle-closure glaucoma in the world, and the symptoms of the patients are very severe. [1-3]. One type of angle-closure glaucoma is characterized by sharp decline in visual acuity, severe visual field damage, continuous increase in intraocular pressure greater than 40 mmHg, continuous corneal edema, extremely shallow anterior chamber, large pupil, and no effect of drug treatment. This type of glaucoma is called Severe Angle-Closure Glaucoma. In general, for the closed-angle glaucoma which cannot be

controlled with medicines, the conventional anterior chamber puncture method is applied to reduce the intraocular pressure, but this method can only temporarily reduce the intraocular pressure, but it is not possible to reduce the intraocular pressure for a long time. We have reported 33 cases of acute angle closed glaucoma patients with the application of anterior chamber puncture combined with vitreous cavity puncture (double punctures), and the anterior chamber angle separation and controlling the intraocular pressure are done at the same time [4]. This article reports a patient with severe chronic angle close glaucoma was treated with "double punctures-goniosynechialysis", an OCT scanner was used in the operation to observe the changes in the depth of anterior chamber, in order to increase the understanding of the surgery.

2. Case Presentation

A female patient of 62 years old was a retired employee. Her major complaint was "the right eye vision has reduced for 1 year, with intermittent distending pains", the specialist examination found: the pressure of the right eye was 45mmHg, and that of the left eye was 16mmHg. Naked eye vision: right eye 0.3, left eye 0.5. The right eye was mild mix hyperaemia, and the cornea was mild edema, the endothelial folded, the anterior chamber was shallow, the axis depth of anterior chamber was 2CT, the and peripheral iris was bulged. Besides, the pupil was vertically elliptical, with diameters of about 4 mm X 5mm, and the optical reaction was slow, the lens was turbid (C2N3P2). Left eye cornea was transparent, with deep anterior chamber and correct artificial crystal position. The eyegrounds: the optic discs were circles, the boundaries were clear. The ratio of optic cup to disc (C / D): the right eye was 0.7, and left eye 0.5. The posterior pole retina was not observed.

Gonioscope detection: in static state, the complete circle of the right eye was N4 (Scheie grading), and in dynamic state, the complete circle of chamber angle was fully closed. In the static state, the chamber angle of the left eye was open from 1:00-6:00-11:00, and the chamber angle was N1 for the remaining quadrant. The right eye UBM check suggested that anterior chamber depth was 1.41mm, with the peripheral iris bombe and the fully closed chamber angle. The connection line from the pupil margins was obviously more forward than the iris root connection line (Figure 1).

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Right eye had tubular vision field, MD = -14.56dB, while left eye showed mild tubular vision field, MD = -9.89dB. The axis length of right eye was 22.5mm, and that of the left eye was 22.3 mm long. Admission diagnosis: the right eye suffers from a primary chronic closed angle glaucoma (severe), and cataract, left eye underwent an anti-glaucoma surgery (with an artificial crystal eye). A largest dose of reducing intraocular pressure drugs (pilocarpine, one pupil retraction drug, once every 15-30 minutes; 3 kinds of eye pressure reduction drugs, twice per day respectively; Intravenous injection of Mannitol, once a day, 200ml, each time; oral acetize Amide tablets, 0.5 grams twice daily) for one week treatment, right intraocular pressure was still higher than normal (intraocular pressure fluctuation ranged between 38.5-46.4 mmHg). Subsequently, under local anesthesia "double punctures- goniosynechialysis" was practiced in the right eye: at 10:00 corneal limbus, the anterior chamber puncture slowly released a small amount of aqueous humor. Then at 4 mm after 10:30 corneal limbus, the blood vessel-free conjunctiva area, 27 G needle entered to the center of camera vitrea bulbi, perpendicular to the scleral surface and slowly pulled out 0.3 ml of the liquefied vitreous, and the puncture point was pressed with a cotton swab. In the intraoperative, real-time OCT observation of the anterior chamber changes: Before the puncture, the around iris and cornea were attached, the anterior chamber was shallow, and the angle was closed, with the anterior chamber depth of 1.43mm (Figure 2). When the liquefied vitreous was extracted,

the anterior chamber was significantly deepened to a depth 2.63mm, the distance of the cornea and the iris became larger (Figure 3). The anterior chamber was then rinsed with 5ml of BSS solution to deepen the anterior chamber. The intraoperative real-time OCT indicated that the anterior chamber was further deepened, the attached angle of the cornea and the iris is further expanded, and the depth of anterior chamber reached 5.28 mm (Figure 4). Finally, the anterior chamber was injected into a small BSS liquid and the carbachol injection was added to shrink the pupil, and to make the intraocular pressure a little higher. The purpose of higher intraocular pressure was to try to make the deepened anterior chamber last more time.

On the first day of the double puncture, the right eye vision was 0.3, the intraocular pressure was 25mmHg (without using glaucoma medicine), the right eye corneal edema was alleviated a little, the anterior chamber was deeper than pre-surgery, and the intraoperative pressure maintained at 16-30 mmHg after using glaucoma medicine. 2 weeks after surgery, the UBM found that at the point positions of 7:00-9:00-10:00, (90 degrees) the chamber angles showed a seam-like opening, the remaining anterior chamber angles were closed, and the anterior chamber depth was 1.84mm (Figure 5). That is, after the surgery of "double puncture-goniosynechialysis" in the right eye, The intraocular pressure of the patient was reduced, and the 90 degree angle of the temporal side was opened.

3 weeks after "double punctures- goniosynechialysis", under local anesthesia, the right eye cataract phacoemulsification, and intraocular lens implantation + goniosynechialysis were practiced. After implanting artificial lens, the infusion-suction needle was used to pull the iris edge to the pupil center, and a hook was used to help separate the chamber angle. In the operation, the gonioscope observation found that at the point positions of 3:00-7:00-10:00 (210 degrees), the anterior chamber angles were opened, the angles in the remaining quadrants were close. After surgery, naked eye vision was 0.5, and intraocular pressure fluctuations were between 16.1-19.4mmHg (Goldmann tomometer measurement). 4 weeks after the surgery, UBM prompted the chamber angles at 360 degrees were all open. At the point position of 6: 00 and 12:00, the iris periphery was thick, the ciliary body was anteposition, and the anterior chamber was 3.04mm in depth (Figure 6). 1 month, 3 months, 6 months and 1 year after the surgery, the follow-ups indicated that corneal was clear, pupil was 4mm, and artificial lens was positioned correctly; intraocular pressures (Goldmann tomometer measurement) were 19.3, 17.3, 18.4, 15.2 mmHg.

In summary, the "double punctures- goniosynechialysis" partially lowered the intraocular pressure, and a part of anterior chamber angle (90 degrees) was opened. Then using the phacoemulsification combined with goniosynechialysis surgery, the anterior chamber angle (200 degrees) was opened. The remaining 70-degree angle was opened 4 weeks after the phacoemulsification surgery, so, the total anterior angle was open (360 degrees). And one year follow-up showed the intraocular pressure was normal.

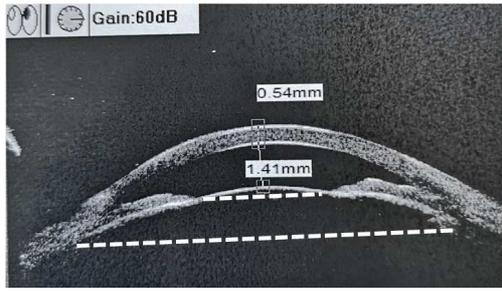


Figure 1. Preoperative right eye UBM diagram: the anterior chamber is very shallow, the peripheral iris bulges, the chamber angle is closed (the anterior chamber depth measures 1.41mm), the connecting line between pupil edges (shown by short dotted line), was obviously more forward than the iris root connection line (shown by long dotted line).

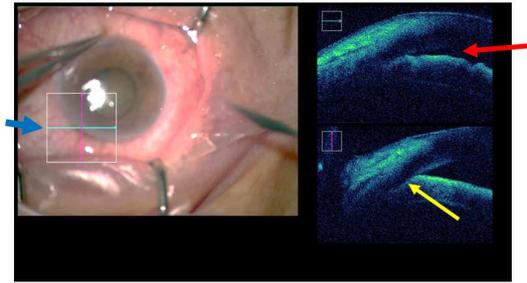


Figure 2. The intraoperative real-time OCT scanning indicates that before acupuncture the anterior chamber is shallow, and the angle is closed (the anterior chamber depth is 1.41mm). Blue arrow points the scan position, red arrow points the horizontal anterior chamber depth, and yellow arrow shows the vertical anterior chamber depth.

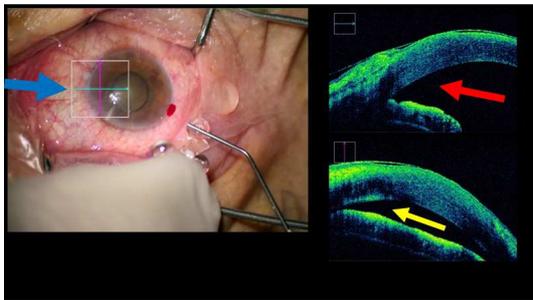


Figure 3. The intraoperative real-time OCT scanning prompts, after the performing vitreous puncture, the scanning finds that anterior chamber is significantly deepened (the measured depth of anterior chamber was 2.63 mm). Blue arrow points the scanning position, red arrow shows that the horizontal anterior chamber deepens, and yellow arrow points its vertical anterior chamber depth.

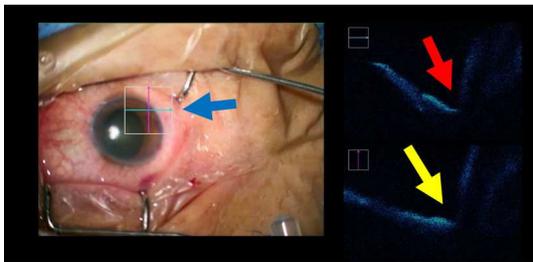


Figure 4. The intraoperative real-time OCT shows that washing with BSS liquid deepens the anterior chamber more significantly (the anterior chamber depth is 5.28 mm). Blue arrow points the scanning position, red arrow shows that a horizontal anterior chamber deepens, yellow arrow shows that a vertical anterior chamber deepens.

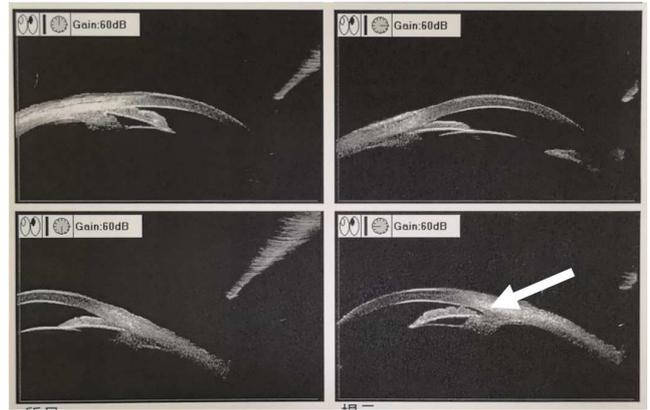


Figure 5. UBM diagram 2 weeks after the right eye's double puncture, temporal anterior chamber (9: 00-position) is open (pointed by the arrow), and the other quadrants' angles are closed (the depth of the anterior chamber is 1.84mm).

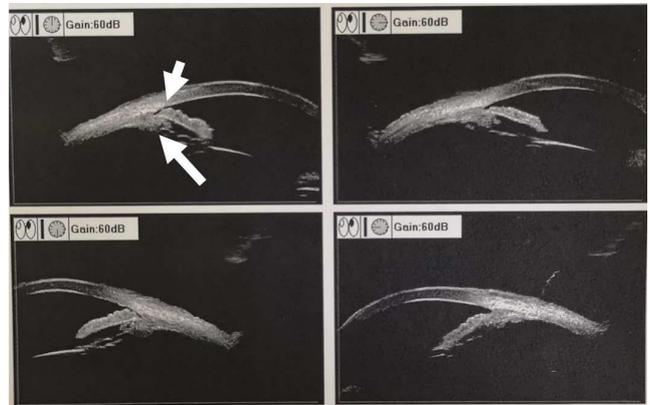


Figure 6. UBM diagram after phacoemulsification-goniosynechialysis surgery shows, that at four quadrants, the anterior chamber angles are all open (the anterior chamber depth: 3.04 mm), and it can be seen that the iris root is thickening (short arrow) and ciliary body is anteposition (long arrow).

3. Discussion

Glaucoma is the world's first irreversible blind eye disease, and the intraocular pressure increase is the most important pathogenic factor. China's closed-angled glaucoma patients are not only in a great number, but also the condition is severe [5, 6]. Clinically, there are a very small number of closed-angle glaucoma, and the maximum amount of the intraocular pressure is still unable to be effectively controlled even if the largest dose of glaucoma medicine is used. Typical signs: the intraocular pressure is extremely high, and the cornea is obvious edema. The anterior chamber is very shallow, and the pupil is expanded (fixed). This is called severe angle-closure glaucoma. The usual treatment is that the anterior chamber puncture is done first to lower the intraocular pressure for a short-time, and then the trabeculectomy [7] is used to achieve the purpose of long-term reduction of intraocular pressure. However, there are many complications such as postoperative shallow anterior chamber, malignant glaucoma, etc., causing permanent ocular surface changes [8], and thus exploring new, minimally invasive, non-filtered-dependent surgery methods is the goal pursued by ophthalmologists in the new century [9].

The patient's right eye belonged to severe chronic angle closure glaucoma. Because there was a pupil block, the anterior rotation of ciliary body, and the hypertrophic iris root, it belonged to a glaucoma co-existing with multiple mechanisms [10]. Ritch [11] proposed four influencing factors affecting closed angle glaucoma, besides factors like pupil blocking, high fold iris, and lens, and also the factor of the water flow of vitreous chamber. Chandler [12] used puncture vitreous body to extract liquid to treat malignant glaucoma. We have reported the role of vitreous puncture [13] and double punctures [4] on severe acute closed angle glaucoma. The "double punctures-angle separation" can open the chamber angle of severe acute closed angle glaucoma on the average one third of the quadrants, subsequent phacoemulsification, and goniosynechialysis surgery further open chamber angle, and the effective rate of the angle opening is greater than 90%.

The disease of the patient is severe chronic angle closure glaucoma, not acute closed glaucoma. In this case, the patient's anterior chamber changes were observed through an intraoperative real-time OCT. Before the double puncture surgery, the depth of anterior chamber was 1.43mm, and the anterior chamber was deepened to 2.63mm after completing hyalonyxis. Then after BSS liquid was injected into the anterior chamber to increase the pressure, the anterior chamber was further deepened, the depth became 5.28 mm. The postoperative examination found that the 90 degree angle of the temporal side was opened, and the intraocular pressure was also reduced. This may be that the depth of the anterior chamber was deepened, which led to the reopening of part of the angle, resulting in restoring partial internal drainage. If there was only an anterior chamber puncture, without vitreum puncture nor increasing the pressure of anterior chamber, the intraocular pressure can only be temporarily reduced, and opening the chamber angle cannot be realized, which means no internal drainage. Subsequently, phacoemulsification, and goniosynechialysis surgery opened a larger part of chamber angle, and after the surgery, the intraoperative pressure is reduced to normal. With time passing, the examination found that the remaining adhesion of the anterior chamber angle was also open automatically, thus further expanding the outflow channel of the aqueous in the anterior chamber. This may be due to the adhesion iris loses its supporting after the anterior chamber angle separation, thus being in a suspended state, the own gravity of the iris caused adhesive anterior chamber angle open further.

4. Conclusion

The effectiveness of treating acute angle closure glaucoma with "double punctures-goniosynechialysis" is understandable because of the short duration of goniosynechia and the ease of separation [4]. The results of this paper show that for some patients with severe chronic angle closure glaucoma, "double punctures-goniosynechialysis" can open part of anterior chamber angle and lower the intraocular pressure, and then phacoemulsification combined with goniosynechialysis should be performed to further open the

anterior chamber angle and further reduce the intraocular pressure. The combination of these two surgical approaches is a novel, minimally invasive, non-filtering bleb dependent surgical approach, and also has no external drainage and no complications of filtering bleb surgery [14, 15]. Therefore, it is the goal pursued by ophthalmologists in the new century [8]. According to incomplete statistics, "double punctures-goniosynechialysis" is rarely reported in treating patients with severe chronic angle closure glaucoma, so its far future effect still needs confirming with further researches.

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