Clinical observation of vitrectomy with internal limiting membrane peeling treatment of traumatic macular hole

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Abstract: Purpose: To review our experience with vitrectomy surgery techniques for the treatment of traumatic macular holes and surgical findings. **Methods:** Retrospective noncomparative, multicenter, case series. Twenty-four patients with traumatic macular hole underwent surgical repair, Vitrectomy with membrane peeling and gas injection followed by prone positioning for 7 to 14. Days，Postoperative evaluation included visual acuity testing, closure of the macular hole, and ocular complications. **Results:** All the affected eye line smooth vitreous cut inside joint boundary film glass, no severe intraoperative and postoperative complications. To the final follow-up, 24 eyes vision improved 2 rows over 17 eyes (70.83%). Within a month after confirmed by OCT 22 eyes (91.67%), macular hole closed completely, no recurrence and postoperative follow-up. Six months after the other 2 eyes macular hole hasn't closed, one eye for preoperative combined with vitreous hemorrhage and macular hole around the choroid injury, 1 eye to blast injury before 2a surgery. **Conclusions:** Vitrectomy surgery can successfully close macular holes associated with trauma and improve vision.
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Key Words: vitrectomy; traumatic macular hole

Severe concussion or contusion make normal eye macular rupture, resulting traumatic macular hole. Traumatic macular hole is the earliest discovered type of macular hole.Vitrectomy with internal limiting membrane peeling is an effective method of treatment of macular holes [1]. Vitrectomy for macular hole carried out so that there is treatment to cure, internal limiting membrane peeling surgery carried out, make hole closure rate has increased more than 90% [2]. Despite spontaneous healing of traumatic macular hole cases [3], but it is generally believed, that four months after the low probability of spontaneous healing, surgery can be used [4],this study collected in our hospital patients with traumatic macular hole 2a of the past, using vitrectomy with internal limiting membrane peeling, postoperative vitreous cavity filled with C3F8 gas, the patient's visual acuity before and after surgery and the hole closed case, to the necessity of traumatic macular hole surgery have a new understanding.

1 Materials and Methods

1.1 General Information :January 2010 to September 2012 in our hospital after a traumatic surgical treatment of full-thickness macular hole 24 cases (24), of which 22 males and 2 females ; eye 13, eye 11. Inclusion criteria : have a clear history of ocular trauma (including eye contusion, blast injury, etc.) ; through the slit lamp, three mirrors (USA Volk Company), direct ophthalmoscope, color fundus photography, optical coherence tomography (optical coherence tomography, OCT) (German Zeiss-Humphrey Company 's 2000 production of optical coherence tomography) and other diagnosed as traumatic macular hole ; has recorded six month follow-up over. Exclusion criteria: idiopathic macular hole who come to our hospital diagnosed outside the hospital before the traumatic macular hole parallel laser or surgical treatment, patients with high myopia.

1.2 All patients were informed of the risks of surgery surgical and non-surgical treatment may exist, follow the principle of voluntariness. All surgeries were performed by the same surgeon.Using the U.S. Bausch & Lomb 's Milliumvitrectomymachine. Preoperative suffering from eye to compound tropicamide eye drops sufficiently dilated pupil, using the ball after anesthesia, do the standard three-channel incision vitrectomy, the negative pressure of 200 to 300 mm Hg (1kPa = 7.5mmHg), the close as the breast plate attractive, until you see the ring after vitreous detachment, intravitreal injection of triamcinolone acetonide can help determine the vitreous cortex cut completely. Before vitreous cortex is not completely stripped vitrectomy can not be used to avoid the island cortical surface residue attached to the retina. After induction of posterior vitreous detachment pole, pole line about the whole vitrectomy, after injection of indocyanine green dye 10s with internal limiting membrane, internal limiting membrane peeling from

the hole near the top and bottom of vascular origin to the bow (Fig. 1), with complete remission of macular retinal traction, then the line fluid exchange, gas-liquid carefully check whether the iatrogenic peripheral retinal breaks, the volume fraction of 14% C3F8 gas fill inside the eye before the exchange. After face-down position 7 ~ 14d.

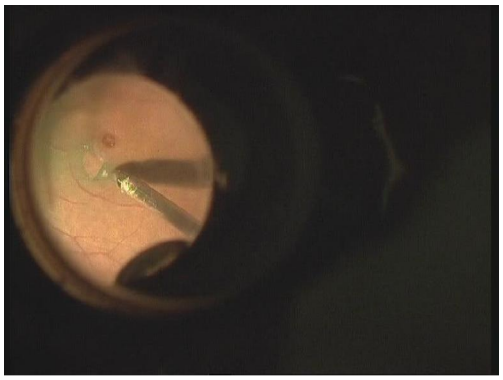

Figure 1 After indocyanine green staining, the internal limiting membrane is peeling indocyanine green staining, the inner limiting membrane peeling

1.3 follow-up 6 to 14 months, an average of 10 months. Recorded best corrected visual acuity and OCT findings in the affected eye.

1.3.1 visual standards of international standards on the vision chart best corrected visual acuity was observed in patients, visual acuity improved by more than 2 lines of visual acuity ; dropped more than 2 lines as decreased vision ; otherwise be regarded as unchanged vision ; visual acuity less than 0.1 changes were 0.02 to 1 per line 5.

Patients before 1.3.2 OCT routine examination OCT, the week after intravitreal C3F8 absorbed through fundus examination showed macular area when checking OCT, dilated eye examination before the test was used to compound tropicamide pupil diameter > 7.0mm, check when using internal fixation (subjects visual acuity ≥ 0.1) or outside the gaze (the subjects visual acuity < 0.1), scanning for the linear scan to foveal center, scan diameter.0 mm, horizontal and vertical scanning, while after scanning the vitreous limiting membrane, after obtaining satisfactory image storage, measuring the maximum aperture of macular hole, macular hole observed morphology.

1.4 Statistical analysis using SPSS13. 0 software for data analysis, the patients before and after surgery to improve vision correction using the chi-square test, with P <0.05 was considered statistically significant.

2 Results

2.1 General situation on the principle of voluntary surgery, all eyes underwent vitrectomy, indocyanine green stained internal limiting membrane surgery, internal limiting membrane peeling smoothly, vitreous cavity filled with C3F8 gas. Successful surgery, intraoperative no serious complications.

2.2 visual acuity improved in 17, visual acuity improved rate of 70.83%. Preoperative visual acuity < 0.1 14 eyes, visual acuity improved in seven (50.00%), preoperative visual acuity ≥ 0.1 in 10 eyes, visual acuity improved in 9 (90.00%), visual acuity improved in both groups compared to the rate of the difference was statistically significant (x2 = 4.200, P = 0.04).

2.3 hiatus Form 24 patients with macular holes, two with preoperative vitreous opacities, accompanied by a retinal detachment, a choroidal rupture, and the remaining 20 were not significantly associated with other serious eye injury Simple by macular hole. The average preoperative hole diameter (623 ± 303) μm(Figure 2-5). Figure 2 shows the preoperative fundus photography, this is a boxing injury caused by macular hole, preoperative visual acuity 0.2 ; Figure 3 shows the patients underwent vitrectomy, internal limiting membrane peeling after surgery in June Caizhao, visual acuity was 0.6. Figure 4 shows the results of preoperative OCT examination, the hole diameter of 473μm, 7 days after the line again OCT examination, hole has been closed.

Within 1 month after 22 (91.67%) macular hole confirmed by OCT completely closed, and postoperative follow-up no recurrence ; another two macular hole after 6 months is not always closed before a surgery which combined with glass the volume of blood and macular holes around choroidal contusion, preoperative and postoperative visual acuity worse postoperative visual acuity was 0.08,3 months later OCT, macular hole closure and there is no open trend, given the laser treatment, six months after the review, no macular hole closure, but the hole is attached around good visual acuity was 0.05 ; another one for the blast injury patients, operative time was 2a, narrow aperture hole after hole and well attached to the retina after injury, visual acuity 0.5, 3 months after the hiatus is not closed, the patient is asked follow-up observation, after six months yet to see closure trend followed up to 14 months, visual acuity was maintained at 0.5, but the hole is not closed, the hole around the omentum attached well, not treated.

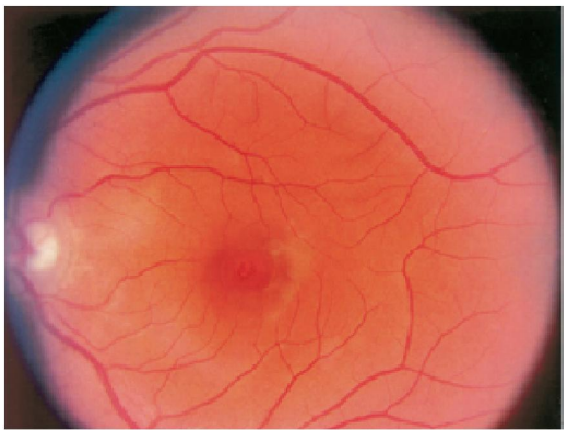

Figure2 traumatic macular hole surgery the previous figure

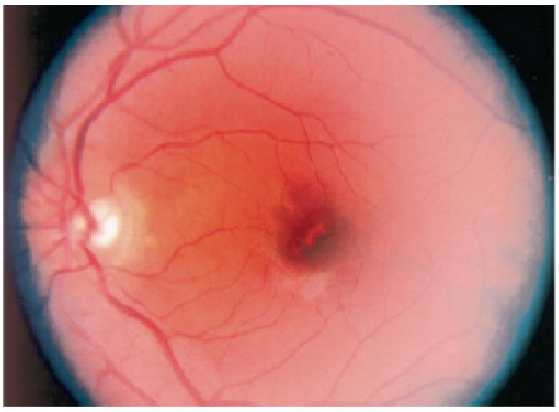

Figure 3 the same patient vitrectomy with internal limiting membrane peeling surgery, macular hole closure, visual acuity was 0.6, unchanged fundus photography vision follow-up to 6 months.

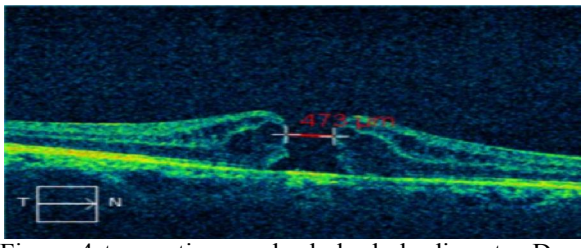

Figure 4 traumatic macular hole, hole diameter D = 473μm

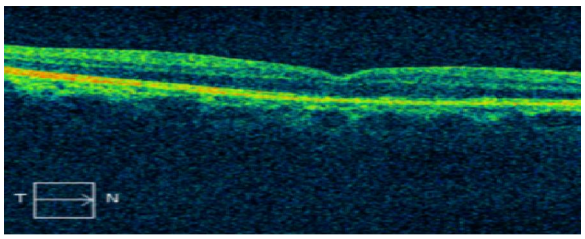

Figure 5 Figure 4 patients, one week after the closing lines OCT examination hiatus

2.4 postoperative complications because the use of 14% C3F8 gas-filled vitreous cavity, effectively prevent the occurrence of postoperative ocular hypertension. All surgery was uneventful, until the end of follow-up, 5 patients had nuclear cataract, vitreous cavity may be filled with C3F8 about. No iatrogenic peripheral retinal breaks.

3 Discussion

Accompanied by a series of eye trauma retinal complications, including Berlin edema, peripheral retinal tear and vitreous hemorrhage, choroidal rupture, retinal hemorrhage and macular hole [5]. Traumatic macular hole in the incidence rate of blunt ocular trauma 1.4% [6], the exact mechanism of not very clear, initially thought to be caused by direct trauma damage the eye. Currently traumatic macular hole on the mechanism There are two main views, a view that traumatic macular hole early after injury showed cystoid macular edema, the progressive development of cystic degeneration, eventually forming a macular hole [7]; another kind of view is that in idiopathic macular hole formation, vitreous plays a very important role : the typical idiopathic macular hole formation usually after a few weeks to several months, and traumatic macular hole formation is not a progressive process, contusion caused a sudden compression force filling the eye, resulting in significant pressure in the vitreous and retina attachment points, resulting in the formation of a macular hole [8-10]. This view became traumatic macular hole surgery theoretical basis,vitrectomy macular hole, surgical release is pulled back and forth through the hole direction and the tangential direction, and the application of swelling filled with inert gas to make the hole closed, retinal nerve fiber layer repair, reconstruction of the neural network, compensatory collagen fibers, so as to achieve the purpose of improving central vision [11-13]. Studies show that a large number of foreign vitrectomy help macular hole repair, and surgical outcomes result of traumatic macular hole with idiopathic macular hole similar. Thus, surgical intervention can be performed. Although the formation mechanism of traumatic macular hole with idiopathic macular hole is different, but the results proved vitreous surgery indeed play an important role in the occurrence of traumatic macular hole mechanism.

In the cases we collected, 24 had traumatic macular hole after the hole 22 is closed, the closing hole surgery was 91.67%, 2 ovale one who is associated with preoperative vitreous hemorrhage and macular hole bruising around the choroid, the other one is 2a after injury required surgery, is not closed and retinal choroidal reason may damage range heavy, prolonged surgery from injuries related to

research and the number of cases in this group is also less ; also found that patients with preoperative visual acuity there are significant differences and improve visual acuity due to small number of cases, the impact of postoperative aperture hole is closed or not needs further analysis and study of a large sample.

Currently vitrectomy with internal limiting membrane peeling and intraocular gas tamponade macular hole is commonly used surgical treatment internationally, reported on the international surgical access to more than 90% of the hole closure rate, over 70 % of patients can improve visual acuity 2 line above [14]. In this study, we used vitrectomy with internal limiting membrane peeling, intraoperative fill C3F8 gas, also achieved similar results. We found that indocyanine green staining of internal limiting membrane has little effect on visual acuity, we used a modified indocyanine green dye, changing the concentration of stains while reducing the application time, visual acuity improved significantly.

In summary, vitrectomy with internal limiting membrane peeling, intraoperative intravitreal gas tamponade can be effective in the treatment of traumatic macular hole and improve the patient's best corrected visual acuity.

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