

Application of sodium hyaluronate to the operation of suturing the corneal perforation

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Abstract

- **AIM:** To evaluate the effect of the application of sodium hyaluronate on the operation of suturing the corneal perforation.
- **METHODS:** Sodium hyaluronate was used in the operation of suturing the corneal perforation in 76 patients to form the anterior chamber, protect eye tissues and separate the anterior iris synechia.
- **RESULTS:** In the procedure of operation, the anterior chamber was stable, the prolapsed iris was easily restored, the corneal wound was easily sutured and there was no damage to the lens. Postoperatively, the corneal wound was closed well, the anterior chamber formed and there was no anterior iris synechia. Fifty-four cases had round pupils and the pupils of 22 cases were not round with defect of iris.
- **CONCLUSION:** Sodium hyaluronate in the operation of suturing the corneal perforation can help form the anterior chamber, protect the eye tissues and make the suturing corneal wound easier. It can reduce the rate of complication and promote the wound healing.
- **KEYWORDS:** sodium hyaluronate; corneal perforation; suturing

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INTRODUCTION

The injury of corneal perforation is common in the injury of the eye ball. If the treatment is not right and prompt, the prognosis and the outcome of vision can be affected. The perfect suturing of corneal perforation is the base of good prognosis. We performed the operation of suturing the corneal perforation with the application of sodium hyaluronate in 76 cases from August 2008 to October 2009. Now, we report the result in this article.

MATERIALS AND METHODS

Materials Seventy-six cases (male: 57, female: 19) with mean age 27.3 years were all injured in only one eye (in right eyes: 33, in left eyes: 43). Of them, 41 cases were puncture injury, 9 cases were blunt injury, 15 cases were traffic accident, 4 cases were explosive injury, 5 cases were injured by animals such as chicken, goat, or ox, and 2 cases were injured by unknown cause. The perforation of only cornea 55 cases, the perforation of both cornea and sclera 21 cases. The iris prolapse could be detected in all cases. The anterior chamber became shallow in 54 cases, and the anterior chamber disappeared in 19 cases. The hyphema could be seen in 38 cases. Twenty-one cases had injury of lens, and 13 cases had vitreous loss. The timing for clinic after injury: the shortest was 1 hour, while the longest was 5 days. The visual acuity before operation: light perception to 0.1 was in 57 cases, 0.12 to 0.5 in 17 cases, better than 0.5 in 2 cases.

Methods All the operations were performed under operative microscope. Washing the prolapsed iris, the wound and the conjunctival sac in use of saline with Gentamycin. Clearing off the exudations from prolapsed iris and corneal wound. After making a side port stab at the opposite side of the corneal wound, injecting sodium hyaluronate through the stab to form the anterior chamber. After the formation of anterior chamber, the slight iris prolapse could be restored. If the synechia between the iris and corneal wound was tight, we used the blunt needle through the stab to restore the prolapsed iris by pulling the

iris to the corneal wound direction parallel to the iris plateau. Then after injecting sodium hyaluronate again to deepen the anterior chamber, 10-0 nylon sutures were used to suture the corneal wound to no water leakage. If the corneal wound was large, an intermediate suture should be done first to avoid the loss the sodium hyaluronate. The next procedure was the same as the regular ones. After injecting the sodium hyaluronate through the stab to deepen the anterior chamber, interrupted sutures were made to reach the condition of no water leakage with 10-0 nylon sutures. The residual sodium hyaluronate could be washed out or left partly in the anterior chamber. Gentamycin 20 000U and dexmethasone 2.5mg were injected subconjunctivally. Padding the operated eye. Antibiotic eye drops such as Levofloxacin or Tobramycin and steroid eye drops such as dexmethasone were used everyday postoperatively. The pupils were dilated with Tropicamide 1 to twice everyday. Systemic antibiotics and steroids could also be used according to the diseases. If there was traumatic cataract, phacoemulsification or extracapsular cataract extraction and intraocular lens implantation would be performed after the uveitis was controlled.

RESULTS

In the procedure of the operation, after using the sodium hyaluronate, the depth of anterior chamber was stable, the prolapsed iris could easily be restored, the process of suturing corneal wound was not difficult, and we did not damage the lens in the operation. Postoperatively the corneal wound was closed well, the anterior chamber formed and no anterior iris synechia. Fifty-four cases had round pupils and the pupils of 22 cases were not round with defect of iris. The postoperative visual acuity: 0.1 to 0.3 in 45 cases, 0.4 to 0.6 in 21 cases, 0.8 to 1.0 in 10 cases. No increased intraocular pressure and infection were detected postoperatively.

DISCUSSION

The injury of corneal perforation is very common in ophthalmology clinic. After the perforation of cornea, due to the loss of aqueous humor and the decreased intraocular pressure, the iris is easily prolapsed out of the corneal wound. The traditional method is to cut off the prolapsed iris or restore the iris and suture the corneal wound. These can result in hyphema and damage the endothelium cells of cornea to make the wound healing worse. If the operation is done on condition that the anterior chamber disappears, the risk will be increased. This can easily cause lens damage in the operation. So the formation of the anterior chamber is very important preoperatively. In traditional method, the

balanced saline solution was injected into anterior chamber. But the liquid can so easily flow out that it is difficult to maintain the depth of anterior chamber. These make the operation a tough task.

Sodium hyaluronate is used widely in the procedures of ECCE+IOL, phacoemulsification^[1-3], perforated corneal transplation and trabeculectomy. In recent years, some new operations such as deep anterior lamellar keratoplasty also apply sodium hyaluronate in the procedure of operation^[4]. Some new usage included Viscoelastic (Healon GV) aiding in the reattachment of the dislocated graft in eyes with a history of vitrectomy and/or iris-lens diaphragm injury. The presence of viscoelastic in the anterior chamber (AC) in the early period of post-DSAEK (Descemet- stripping automated endothelial keratoplasty) was well tolerated in the small series^[5]. And some ophthalmologists also use sodium hyaluronate in the operation of primary repair and intraocular lens implantation after perforating eye injury^[6]. In recent years, sodium hyaluronate was used to protect the corneal endothelium in Fuchs' dystrophy during phacoemulsification in patients with hard lens nucleus^[7,8]. So we apply sodium hyaluronate in the procedures of suturing corneal perforation and achieve good results. The advantages are: (1)To prevent the contents of eyeball such as iris from prolapsing. With the help of sodium hyaluronate, the hyphema is less and the corneal wound can easily be sutured. This make the operation easily be performed. (2)Sodium hyaluronate is a kind of viscoelastic substances. Its elasticity, flexibility and pseudoplasticity can help protect the cornea, iris and lens in the operation. (3) With the effect of surface tension of sodium hyaluronate, it can help form the anterior chamber avoiding the loss of aqueous humor. And it can also help decrease the rate of synechia between iris and wound and restore the round pupils postoperatively. (4)Sodium hyaluronate can be metabolized through the aqueous humor circulation system. It will be cleared out gradually and replaced by aqueous humor. It can not cause bad effects in the eyeball. So it can not result in increased intraocular pressure and there is not a single case of secondary glaucoma postoperatively. (5) Sodium hyaluronate has a high appetency to corneal endothelium and it can form a protective membrane along the endothelium layer to lower the rate of endothelium cells damage. Postoperatively no obvious corneal endothelium opacity can be detected and the iris reaction is mild. This can shorten the timing of phacoemulsification or ECCE+IOL after the suturing corneal wound and help recover fast. In recent years, Neumayer *et al*^[9] reported that there was no

significant difference between Neocrom Cohesive (sodium hyaluronate 1.4%) and Healon(sodium hyaluronate 1.0%) in the changes in central corneal thickness (CCT), endothelial cell density (ECD), and intraocular pressure (IOP) after cataract surgery. This showed that the concentration of sodium hyaluronate wasn't demanding the same in the protection of corneal endothelial cells. (6)With the help of sodium hyaluronate, most cases have no water leakage and formation of anterior chamber is good. Sodium hyaluronate can promote the healing of wound, intenerate horniness and protect the wound. The healing of corneal wound is so fast that it can reduce the degree of astigmatism postoperatively. This can help recover the best postoperative visual acuity. (7)Sodium hyaluronate can restrain inflammation, obstruct the diffusion of inflammatory substances and alleviate inflammation. These can reduce the rate of postoperative infection.

In our study, we injected sodium hyaluronate into all the anterior chamber through side port stab because if we put viscoelastic substances into the eye through the wound it would aggravate the corneal wound damage resulting in more edema of corneal wound and delaying wound healing. The damage of side port stab is much less than that of corneal wound caused by apparatuses passing in and out of the wound. And this provides the best entrance to the

apparatuses passing in and out of the anterior chamber.

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