Removal of a Giant Nonmagnetic Intraocular Foreign Body Using Micro Alligator Forceps

Shenzhi Liang, PhD; Guangming Wan, MD; Xiujuan Li, MD; Xiaoqiang Liu, MD; Yu Zhu, MD

PURPOSE: To introduce a new method for removal of a giant nonmagnetic intraocular foreign body using micro alligator forceps.

PATIENTS AND METHODS: Eleven patients underwent pars plana vitrectomy and lensectomy. The micro alligator forceps were used to grasp and extract the giant nonmagnetic intraocular foreign body through a sclerocorneal tunnel.

RESULTS: All patients underwent surgical removal of the intraocular foreign body successfully without any intraoperative complications. The alligator forceps were operational in the intraocular environment and effective in surgical maneuvers. There was no accidental slippage during the procedures.

CONCLUSION: Micro alligator forceps are a feasible option for removal of giant nonmagnetic intraocular foreign body during vitreoretinal surgery and offer advances in terms of operating stability and surgical safety.

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VIDEO

INTRODUCTION

Intraocular foreign body injuries are a relatively common, serious form of eye trauma.[1] Pars plana vitrectomy and the use of specially designed instruments such as intraocular magnets and forceps allow surgeons to remove intraocular foreign bodies safely. However, removal of very large and especially nonmagnetic foreign bodies remains challenging. Sometimes a foreign body may be too large to be extracted with general foreign body forceps and inadvertently falls posteriorly during surgical extraction, causing secondary damage to the retina. Here we describe a new technique to remove a giant nonmagnetic intraocular foreign body using micro alligator forceps during 20-gauge vitrectomy. The method can facilitate the removal of giant intraocular foreign bodies and reduce the rate of iatrogenic retinal injury.

SURGICAL TECHNIQUE

All 11 consecutive patients had open-eye injuries, traumatic cataract, and intraocular foreign body. Primary repair of the corneal and scleral lacerations had been performed. All patients underwent computed tomography (Figure 1) and complete ophthalmic examination to identify the size, shape, and location of the foreign body. Surgical procedures for intraocular foreign body removal were performed by a single surgeon (GMW).

Conventional 20-gauge pars plana vitrectomy was performed. Lensectomy was performed first to improve visualization of the posterior segment of the eye. After core vitrectomy, the intraocular foreign body

From the Department of Ophthalmology, The First Affiliated Hospital of Zhengzhou University, Zhengzhou, China (SZL, GMW, XJL, YZ); and the Department of Ophthalmology, Shanghai Tenth People's Hospital, Shanghai, China (XQL).

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Address correspondence to Guangming Wan, MD, Department of Ophthalmology, First Affiliated Hospital of Zhengzhou University, No.1 East Jianshe Road, Zhengzhou, Henan 450052, China; +86 13837106279; email: wgmzzdx@126.com.

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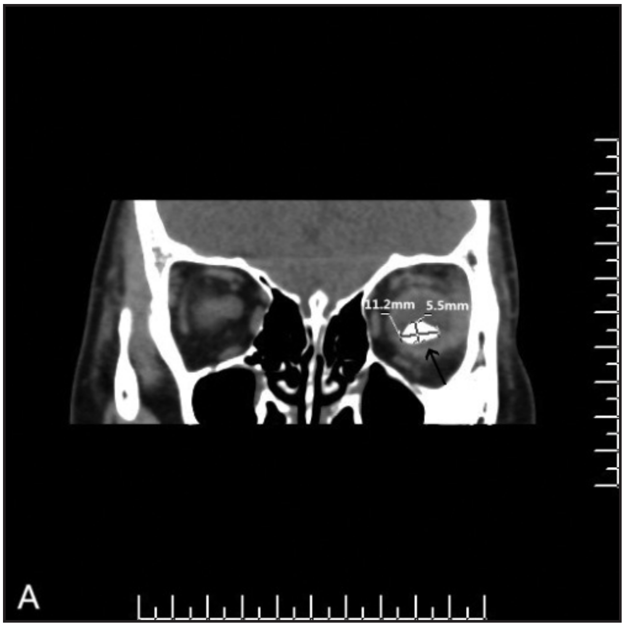

Figure 1. Computed tomography scan showed a glass intraocular foreign body with a maximum diameter of 11.2 mm and minimum diameter of 5.5 mm located in the vitreous cavity (arrow).

Figure 2. The micro alligator forceps: a 45°-angle long shaft, serrated jaws (arrow), 4-mm jaw length, 6-mm maximum opening width, and 1.5-mm tip width.

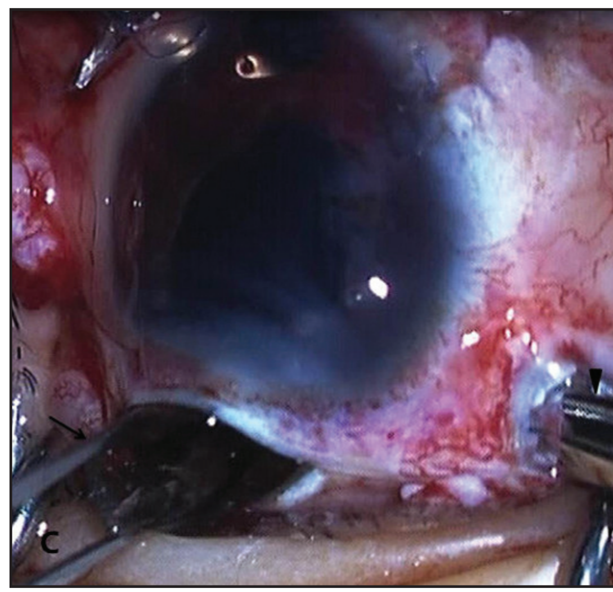

Figure 3. The foreign body was grasped and lifted into the anterior chamber using the micro alligator forceps (arrowhead) and extracted through the sclerocorneal tunnel with the help of the forceps (arrow).

was separated completely from surrounding tissues. A 6-mm superior sclerocorneal tunnel was made, and through it the viscoelastic agent was injected to protect the corneal endothelium. After perfluorocarbon liquid (PFCL) was infused to the vitreous cavity, the sclerotomy previously housing the vitrectomy cutter was enlarged slightly (1.8 mm) to accommodate micro alligator forceps (Figure 2) in the vitreous cavity. An endoilluminator was used to manipulate the foreign body with the forceps. The intraocular foreign body was grasped and lifted into the anterior chamber then extracted through the sclerocorneal tunnel with the help of the forceps (Figure 3; *video available at www.Healio/OSLIRetina*). The sclerocorneal tunnel incision was then sutured, and the residual vitreous was cleared off with the vitrectomy cutter. Endolaser and endotamponade were used in cases with a retinal detachment. An intraocular lens was implanted during the same procedure if there was a small or no retinal injury; otherwise, IOL implantation was postponed to a second surgical procedure.

DISCUSSION

The advent of modern vitrectomy techniques and instruments facilitates intraocular foreign body extraction. Choice of instrument for removal depends on the size, shape, and magnetic properties of the foreign body. For a small (less than 1.0 mm) ferromagnetic intraocular foreign body, an intraocular magnet is the most ideal instrument. Small nonmagnetic and medium-sized (1.0 to 3.0 mm) metallic, stone, or concrete intraocular foreign bodies are more readily removed with basket forceps. Larger intraocular foreign bodies (3.0 to 5.0 mm) or glass fragments (Figure 4, page 230) require diamond-coated forceps to facilitate removal.[1] However, in the case of a giant nonmagnetic foreign body (greater than 5.0 mm), most foreign body forceps have a bite size insufficient to grasp it. When surgeons extract the intraocular foreign body through the sclerotomy or sclerocorneal tunnel, accident slippage may occur and cause serious retina or optic nerve injury.[2] The impact force from a dropped foreign body may produce deep retinal and choroidal breaks, with severe intraoperative hemorrhage and postoperative

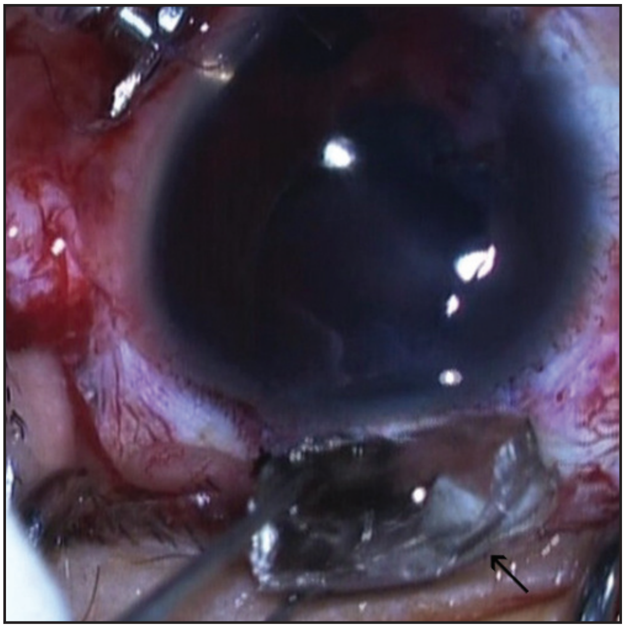

Figure 4. A glass foreign body (arrow).

proliferation. If the object strikes the optic nerve or macula, the visual loss can be profound. To decrease the incidence of these complications, choosing the most appropriate forceps is crucial.

The micro alligator forceps described here have a 45°-angle long shaft and a small set of serrated jaws at the tip. The overall length is 15 cm, the shaft length is 8 cm, and the tip width is 1.5 mm. The jaw length is 4 mm, which enables it to grasp a foreign body with a maximum width of 6 mm. The serrated jaws ensure a firm grasp and a minimal chance of slippage of the intraocular foreign body during engagement and extraction. In addition, the forceps are inexpensive and accessible because they are widely used in otolaryngological surgery or neurosurgery for capturing foreign bodies in a narrow canal.

Because slippage of an intraocular foreign body is possible even when maximal precautions are taken, we used PFCL to cushion and protect the macula in the event of accidental slippage during extraction.[3,4] PFCL also aids in supporting the globe to prevent collapse during extraction of a giant intraocular foreign body through a large incision. In addition, it is helpful in preventing the spread of hemorrhage and maintaining a clear surgical view.

Due to the relatively large tip of the alligator forceps, surgeons may involuntarily apply excessive force to the foreign body when trying to pick it up. This may pose the threat of iatrogenic injury to the retina beneath the foreign body, especially in the case of irregularly shaped or sharp-edged intraocular foreign bodies, which may produce deep retinal and choroidal breaks. Therefore, in order to protect the retina, surgeons should exercise extreme caution in capturing the foreign body gently with the alligator forceps. Moreover, vitreous under the foreign body can be reserved temporally before removal of the foreign body.

Another challenge is that the tip of the alligator forceps is constructed to be 1.5 mm in diameter. It requires a slight enlargement of the sclerotomy (1.8 mm) to ensure that the forceps can be introduced into the vitreous cavity. Although the slight enlargement of the sclerotomy is acceptable clinically and does not affect the final surgical result, further improvements in the manufacture of small-scale alligator forceps will be beneficial.

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