Endoscope-assisted vitrectomy in the management of retinal detachment with corneal opacity

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Abstract:
A 51-year-old male who had suffered from right eye rhegmatogenous retinal detachment with proliferative vitreoretinopathy received surgical treatments which included the following procedures: lens extraction, scleral buckle, vitrectomy, membrane peeling, photocoagulation, and silicone oil injection. The presenting visual acuity of the right eye was light perception. Slit-lamp examination revealed corneal opacity without a visible fundus. B-scan ultrasonography revealed retinal detachment. Endoscope-assisted vitrectomy was then performed in December 2014. The procedure also included photocoagulation and silicone oil tamponade. Postoperative follow-up confirmed retinal attachment through B-scan ultrasonography. To assess the feasibility of a penetrating keratoplasty, an endoscopic evaluation was performed in May 2015. A temporal retinal break was noted, and photocoagulation was applied around the break as well as the peripheral retina. Endoscopy later confirmed the retinal attachment. From the present case, we concluded that endoscope-assisted vitrectomy could be an option for patients with corneal opacity indicated for vitreoretinal surgery. We report the first case of endoscope-assisted vitrectomy in the management of retinal detachment in Taiwan.

Keywords:
Corneal Opacity, endoscope-assisted vitrectomy, retinal detachment

Introduction
The first application of endoscope to surgical ophthalmology was in 1934 when some nonmagnetic intraocular foreign bodies needed to be removed. The technique was later improved by Norris and Cleasby in 1978 by introducing a rigid shaft of 1.7 mm diameter (around 13–14 gauge). By 1990, flexible 20-gauge video endoscope had been invented for remote visualization of the retina in real time.¹⁻³ Today, endoscope-assisted vitrectomy is widely used particularly with the E4 Endoscopy System (Endo Optiks, Inc., Little Silver, NJ, USA). This system incorporates a 300 or 175 W xenon light source with adjustable luminosity, an 810 nm diode laser with a 640 nm aiming beam, and probes of different sizes (19–23 gauge).¹⁻³ Endoscope-assisted ocular surgery is commonly performed to treat glaucoma (coupled with endocyclophotocoagulation), hypotony (with cyclitic membrane peeling), retinal detachment, severe endophthalmitis, and vitreoretinal trauma in children, or to remove intraocular foreign bodies.⁴

Wide-angle viewing system with 23-, 25-, and even 27-gauge sutureless transconjunctival microincision vitrectomy is currently the most widely used modality in vitreoretinal surgery. These techniques require a clear optic medium for viewing during the surgery. Corneal opacities require combined surgery consisting of a temporary keratoprosthesis followed by a permanent keratoplasty. For patients with corneal opacity indicated for vitreoretinal surgery, endoscope-assisted vitrectomy is another option. Here, we report the first case of endoscope-assisted vitrectomy in Taiwan.
Case Report

A 51-year-old male patient had developed recurrent rhegmatogenous retinal detachment of the right eye. Scleral buckle was performed in October 2009. Due to proliferative vitreoretinopathy and recurrent (three times) retinal detachments, the patient received multiple operations for treatment during a 3-year period thereafter (from January 2010 to March 2013). These surgical procedures included vitrectomy, lensectomy, silicone oil tamponade and removal, and membrane peeling.

Corneal opacification secondary to chronic intraocular silicone oil was noted in his right eye. He received regular follow-ups. The visual acuity of the right eye was light perception. The slit-lamp examination revealed corneal opacity [Figure 1] without a visible fundus. On B-scan ultrasonography, retinal detachment over the lower portion was noted [Figure 2]. Due to corneal opacification, vitreoretinal procedure was not feasible. We therefore arranged endoscope-assisted vitrectomy for the patient. In December 2014, he received surgery under general anesthesia. A 19-gauge three-port pars plana vitrectomy was performed in combination with E4 laser and endoscopy system (Endo Optiks, Inc., Little Silver, NJ, USA). Transconjunctival sclerotomies were created using a microvitreoretinal blade in the inferotemporal, superotemporal, and superonasal quadrants 3.5 mm from the limbus. An integrated, filtered xenon light source (250 W) was used to provide adequate illumination. The endoscope was passed through the sclerotomy to visualize the posterior segment. The endoscopy revealed retinal detachment and proliferative vitreoretinopathy [Figure 3a and b]. Blood clot removing and membrane peeling were then performed [Figure 3c]. Flattening of the retina was achieved by fluid-air exchange. We then applied retinal photocoagulation and injected silicone oil [Figure 3d].

On postoperative follow-up, visual acuity of the right eye was light perception, and the intraocular pressure (IOP) was around 9 mmHg. B-scan ultrasonography revealed no obvious retinal detachment under silicone oil tamponade [Figure 4]. To confirm the patient’s retina and optic disc condition before arranging penetrating keratoplasty, we arranged the second endoscopic-assisted evaluation in May 2015. During the procedure, temporal retinal break was noticed, and photocoagulation was applied around the break and the peripheral retina. Retinal attachment was already noted during surgery. The patient received penetrating keratoplasty to the right eye in January 2016. Before endoscope-assisted vitrectomy, visual acuity was light perception, and on latest examination in May 2016, visual acuity had improved to counting fingers at
Ophthalmic endoscopy has been reported to be a useful adjunct to vitreoretinal surgery for the management of rhegmatogenous retinal detachment, proliferative vitreoretinopathy, neovascularization glaucoma, endophthalmitis, proliferative diabetic retinopathy, and in the removal of retained intraocular foreign bodies. One of the advantages of intraocular endoscopy is that it allows surgeons examine the most peripheral part of the retina without manipulating the anterior chamber or performing scleral indentation, besides viewing the vitreous base, pars plana, pars plicata, posterior iris surface, and ciliary bodies.

Mihori and Nagahisa reported cases in which the endoscopic approach is more sensitive than the conventional microscopy surgery in detecting retinal breaks and it is useful in the management of pseudophakic and aphakic retinal detachments with retinal breaks undetected before surgery. Farias et al. reviewed a case series in which intraocular videoendoscopic examination was used for the preoperative evaluation of keratoprosthesis and concluded that this technique is useful for appraising the visual outcome of the patients. With respect to other endoscopic vitreoretinal operations, Ciardella et al. reported the use of endoscopic vitreoretinal surgery with a 20-gauge instrument for complicated proliferative diabetic retinopathy. Ryan performed combined endoscopic pars plana vitrectomy and a glaucoma tube shunt with a 19-gauge sclerotomy. Kawashima presented a case of 20-gauge endoscopic vitrectomy for posttraumatic endophthalmitis. Morishita et al. reported a 23-gauge vitrectomy assisted by combined endoscopy and a wide-angle viewing system to treat retinal detachment with severe penetrating corneal injury. We used a relatively large endoscope probe (19 gauge) partly due to our limited experience with this modality, and partly due to the existing complications of this patient on top of retinal detachment (severe proliferative vitreoretinopathy and neovascularization glaucoma).

Discussion

The first endoscope-assisted vitreoretinal surgery was introduced in 1934 for the removal of intraocular foreign bodies. Technological improvements in ophthalmological surgery have resulted in using endoscopes of smaller diameters. Image quality has also improved, providing 17,000 pixels and a wider view.

Microscope-assisted vitrectomy is currently the most common vitreoretinal surgery. Conventionally, 0.9 mm (20-gauge) probes were employed although the use of smaller sutureless systems with probes as thin as 23-, 25-, or 27-gauge is becoming increasingly popular, due to shorter operating time, less trauma or scarring, and faster rehabilitation. The microscopic system requires a clear and adequate optic medium, and an opaque cornea, anterior chamber hyphema, small pupil, or cataract would interfere with the operating field. Posterior chamber surgery would not be possible under corneal opacity or with edema. Vitrectomy using a temporary keratoprosthesis during microscopic-assisted vitrectomy followed by keratoplasty has been shown to be beneficial. However, this approach increases the risk of intraoperative complications, such as suprachoroidal hemorrhage and failure of the corneal graft. Endoscope-assisted vitrectomy is an option for those patients with corneal opacity but indicated for vitreoretinal surgery.

Ophthalmic endoscopy has been reported to be a useful adjunct to vitreoretinal surgery for the management of rhegmatogenous retinal detachment, proliferative vitreoretinopathy, neovascularization glaucoma, endophthalmitis, proliferative diabetic retinopathy, and in the removal of retained intraocular foreign bodies. One of the advantages of intraocular endoscopy is that it allows surgeons examine the most peripheral part of the retina without manipulating the anterior chamber or performing scleral indentation, besides viewing the vitreous base, pars plana, pars plicata, posterior iris surface, and ciliary bodies.

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multiple prior surgeries). As a result, good imaging quality was desirable for this challenging case with the use of a thicker probe.

In previous reports, B‑scan ultrasonography was mainly used to evaluate the postoperative condition of patients or to check on the posterior segment after keratoplasty. In our case, we arranged B‑scan ultrasonography during a follow‑up visit at the clinic. However, B‑scan ultrasonography is well known for its low sensitivity and low false‑negative rate. The incidence of retinal break undetected preoperatively in the aphakic eye is between 7% and 16%.[6] To determine if the patient could receive penetrating keratoplasty, it was necessary to assess the visual potential in advance. We therefore arranged endoscope‑assisted evaluation to confirm his retinal condition for the patient.

The limitations of endoscope‑assisted vitrectomy include the lack of stereopsis, unsatisfactory image resolution, steep learning curve, and a mild movement‑image delay. The current image quality depends on the endoscopic fiber diameter. There were light source, camera, and photocoagulation device in the fiber. The image resolution in a 19‑gauge fiber as in our case report was 17,000 pixel. Moreover, smaller fiber diameter provides less precise images. Despite these shortcomings, endoscope‑assisted vitrectomy provides an alternative choice for patients with inadequate optic media.[1,2,3]

Conclusion

Endoscope‑assisted vitrectomy is a promising technique for patients who require posterior segment surgery to manage corneal decompensation. We reported here the first case of endoscope‑assisted vitrectomy for the management of retinal detachment in Taiwan. However, more patients with longer follow‑up durations are mandatory to confirm the efficacy of this treatment.

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Conflicts of interest
There are no conflicts of interest.

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