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CLINICAL STUDY

Minimally invasive surgery—endoscopic retinal detachment repair in patients with media opacities

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Abstract

Purpose **Evaluate the use of an ophthalmic endoscope in patients with a retinal detachment and anterior media opacity.**
Materials and methods **A retrospective interventional case series. Search of a comprehensive database of retinal detachment patients with pre-operatively impaired anterior segments such that lens extraction, a keratoprosthesis, or extensive anterior segment manipulation was required for adequate repair. Pars plana vitrectomy was carried out with an endoscope without manipulation of the anterior segment. Characteristics of the detachment were recorded, as were complications/subsequent surgeries, pre-operative, 3-month post-operative, and final follow-up visual acuities.**
Results **Before surgery, five patients had a gas-induced cataract after a failed pneumatic retinopexy; one patient had a Reis–Buckler's dystrophy and corneal ulcer; three patients had synechiae around iris-fixed lenses. One patient had proliferative vitreoretinopathy. The median pre-operative vision was hand motion (20/30 to light perception). The median final visual acuity was 20/30 (20/20–20/200). Two patients required a subsequent lens extraction, one patient had a recurrent detachment.**
Conclusion **In appropriate retinal detachment patients, endoscopy can be safe and effective, while limiting the scope of the surgical intervention.**
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Keywords: endoscopy; pars plana vitrectomy; retinal detachmentcornealc opacity; cataract; minimally invasive surgery

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Introduction

The first ophthalmic endoscope was introduced by Thorpe[1] in 1934 for the extraction of non-magnetic intraocular foreign bodies. Since then numerous technical improvements have led to the possibility of routine use of endoscopic instrumentation in ophthalmic surgery. Although the resolution is not yet comparable to the operating microscope and stereopsis is absent, the ophthalmic endoscope has proved to be a useful alternative to more invasive surgeries when the image in the standard microscope is limited by poor ocular media. Ophthalmic endoscopy has been reported as a useful adjunct to vitreoretinal surgery for the management of proliferative vitreoretinopathy, neovascular glaucoma, removal of retained intraocular foreign bodies, endophthalmitis, subluxated intraocular lenses (IOL), proliferative diabetic retinopathy, and rhegmatogenous retinal detachments.[2–12]
Successful repair of a retinal detachment requires the identification and handling of all tears. The chosen technique: vitrectomy, buckle, or combination depends as much on the surgeon's choice as on the characteristics of the retinal detachment and its visibility. More extensive and invasive surgery is often required for tears that are poorly visible. Cataract extraction or the use of a keratoprosthesis may be required.[13] Alternatively by using an endoscope inserted via the pars plana, manipulation of the eye can be kept to a minimum while allowing adequate visualization and treatment of the tear.[14]
The present retrospective interventional case series describes such a use in patients with poor visibility through the anterior segment.

Methodology

A comprehensive database of surgical cases performed by one of the authors over the last 5 years was reviewed to identify retinal detachment patients repaired using an endoscope and for whom the decision to use the endoscope was taken before surgery, based on the presence of media opacity in the anterior segment. Patients were considered candidates for an endoscopic procedure if their detachment was of recent onset and when no or limited proliferative vitreoretinopathy (PVR) was expected. Furthermore, the media opacity in the anterior segment needed to be of transient nature, expected to recover spontaneously, or with medical therapy, or of such a nature that intervening, in the anterior segment would have been harmful or lead to a prolonged recovery. Only patients with a minimum follow-up of 6 months are considered in this series.

The surgical field, sclerotomies, and infusion were prepared and placed using a standard operating microscope. If possible, a core vitrectomy was carried out using the microscope. The remainder of the procedure identification of the tear, vitreous shaving around the tear, air-fluid exchange, and endolaser were all carried out endoscopically using a 30 000 pixel fused fiber 18 G endoscope containing both the light and the video input (Ophthalmic Technologies Inc., Toronto, Canada).

The patient records were reviewed for age, gender, the nature of the media opacity, nature and extent of the detachment, and the surgical procedure. Pre-operative vision, at 3 months ($\pm$2 weeks), and at final follow-up was recorded. In two patients, the referring physician was contacted to provide follow-up beyond the 3-month visit. The need for further surgical interventions within the follow-up period was recorded in all patients.

Results

Nine patients (six male patients and three female patients) fitting the inclusion criteria were identified. Their age ranged from 49 to 71 years (median, 55 years). Four patients had primary retinal detachments, four had recurrent inferior detachments and one had a recurrent detachment with grade C PVR. All patients had media opacities which under normal circumstances would have lead to additonal surgical steps in the anterior segment.

Five patients had gas-induced cataracts, three patients had iris-fixated IOL with synechiae and consequent small pupils of 1 mm or less, and one patient had Reis–Buckler's dystrophy complicated by a corneal ulcer (Table 1).

Eight patients underwent pars plana vitrectomy, air-fluid exchange, endolaser and gas (four of them SF6 20% and the remainder four C_3F_8 12%). Four of the previous patients required the use of perfluoro-carbon liquid to flatten the retina before endolaser could be applied.

One patient with recurrent inferior retinal detachment and multiple tears at the vitreous base received silicone

Table 1 Patient characteristics, nature of surgery and outcomes

Patient No.	*Age*	*Sex*	*Nature of media opacity*	*Nature of RD/retinal pathology*	*Surgical procedure*	*Complications*
1	51	F	Artisan lens, synechiae, small pupil <1 mm	Hole at 3; RD from 2 to 6; lattice	PPV AFX EL SF6	None
2	49	M	Artisan lens, synechiae, small pupil 1 mm	Hole at 12; RD from 10 to 2	PPV AFX EL SF6	None
3	62	M	Sputnik iris fixated lens, synechiae, capsule opacity pupil 1 mm	Hole at 5 along vitreous base; RD from 1 to 7	PPV PFCL AFX EL C_3F_8	None
4	71	F	Gas induced cataract	Recurrent RD inferiorly; no hole observed	PPV PFCL AFX EL SF_6	Phaco 2 mo post
5	63	M	Gas induced cataract	Recurrent RD from 3 to 9; holes at 6 and 7	PPV PFCL AFX EL C_3F_8	Phaco 3.5 mo post
6	54	M	Gas induced cataract	Recurrent RD inferiorly; multiple holes at the vitreous base at 6	PPV AFX EL SO	Recurrent RD 3.5 mo post - PPL PPV SO
7	55	M	Reis–Buckler's dystrophy, corneal ulcer	RD from 2 to 8; hole at 2	PPV AFX EL SF_6	None
8	51	F	Gas induced Cataract	Recurrent RD from 5 to 9; hole at 7	PPV PFCL AFX EL C_3F_8	None
9	69	M	Gas induced Cataract	Recurrent RD from 10 to 3; 4 tears; PVR grade C	PPV AFX EL C_3F_8	None

Abbreviations: AFX, air-fluid exchange; C_3F_8, perfluoropropane; EL, endolaser; PFCL, perfluorocarbon liquid; PPV, pars plana vitrectomy; PVR, proliferative vitreo retinopathy; RD, Retinal detachment; SF_6, sulphur hexafluoride; SO, silicone oil.

Table 2 Visual acuity results

Patient no.	*Pre-operative vision*	*Post-operative vision at 3mo*	*Post-operative vision final*
1	20/60	20/60	20/60 (6 mo)
2	20/30	20/40	20/30 (12 mo)
3	HM	20/20	20/20 (6 mo)
4	20/125	HM	20/50 (11 mo)
5	20/30	20/50	20/20 (12 mo)
6	HM	20/40	20/50 (8 mo)
7	LP	20/50	20/30 (6 mo)
8	HM	20/200	20/30 (22 mo)
9	LP	20/200	20/200 (12 mo)

Abbreviations: HM, Hand Motion; LP, Light Perception.

oil as an endotamponade agent. The same patient 3.5 months later developed a recurrent detachment that was treated succesfully by pars plana lens extraction, additional endolaser and silicone oil. Eight months after the first operation the retina was attached and the vision improved from HM to 20/50. Two patients needed cataract extraction 2 and 3.5 months after the first operation. The remainder of the patients did not have any complication.

The pre-operative visual acuity ranged from light perception to 20/30 (median Hand Motion). Post-operative visual acuity at 3 months ranged from hand movement to 20/20. The final visual acuity (follow-up 6–22 months) ranged from 20/200 to 20/20 (median 20/30). Seven patients had a final visual acuity better than 20/50 (Table 2).

Discussion

Managing retinal detachments when there is poor visualization through the cornea has always been a challenge. Additional surgical steps are often required to improve the view when using a microscope as visualizing instrument. Iris hooks together with manipulations of the anterior chamber IOLs may be attempted to dilate small pupils, removal of the cataract via pars plana or phacoemulsification may solve the visibility problem related to the lens,[15] temporary keratoprosthesis may be necessary when the media opacity lies at the level of the cornea.[13] An alternative approach via an endoscope presents several advantages. It allows direct localization and observation of the tear with its associated vitreous traction, allowing one to decide on the most expedient means of re-attaching the retina, thus avoiding unnecessary surgery.[16,17] By-passing the anterior segment opacities shortens the surgical intervention and avoids extensive eye surgery. This allows for a more rapid recovery, as it minimizes trauma to ocular structures. To our knowledge, the use and indications of endoscopic surgery have not been studied in patients with retinal detachment. The current series demonstrates the feasibility of this approach in a selected population of patients with media opacities which were severe enough to prevent successful surgical repair using wide-field viewing systems, without additional anterior segment surgery, such as cataract removal, extensive synechiolysis, or removal of an iris-fixated intraocular lens.

In this current series, few complications related to the endoscope or the surgical procedures were observed. Surgical time is not lengthened by using the endoscope, set-up takes at most 10 min. Considering the additonal steps required without an endoscope, on average 15–30 min of surgical time was spared. The anatomical and functional results after a follow-up period ranging from 6 to 22 months (median 11 months) were very satisfactory with only two patients requiring additional surgical intervention on the anterior segment. One patient developed recurrent detachment (the PVR case) that was successfully repaired after lens extraction and a standard vitrectomy. The use of the endoscope was not associated with iatrogenic breaks, although in the presence of a natural lens, contact with the posterior lens surface is a potential problem. If a tear is located close to the ora serrata, the sclerotomies must be appropriately placed to allow the break to be viewed tangentially.

Presently, ocular endoscopy is limited by a fairly steep initial learning curve as a new proprioceptive sense must be developed, before one can comfortably operate in the vitreous cavity.[12] Two important positional cues are lost; namely depth perception and shadows cast by instruments onto the retinal surface from eccentric incident light (in current endoscopes, the light and video ports are co-axial). Therefore, it is important that the retinal surface be approached slowly. Despite its current limitations, endoscopy can be a significant help in the management of patients with retinal detachment in whom the retina is poorly visualized.

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