Incorporating current trials and technology into clinical practice

The most common and dreaded complication after primary retinal detachment (RD) repair is proliferative vitreoretinopathy (PVR), which occurs in approximately 7% to 8% of patients. In my tertiary retina practice, PVR is present in 25% to 30% of patients.

What is PVR?
The hallmark of PVR is overzealous cellular proliferation from glial cells and retinal pigment epithelial (RPE) cells stemming from the presence of partial or full-thickness retinal breaks or holes. These cells form membranes on and/or beneath the retinal surface, creating epiretinal and subretinal membranes and fibrosis. Contracture and shortening of the retina mark the next pathologic step. The shortening, in turn, distorts and holds open the retinal breaks and can lead to persistent or progressive RD. Chronic RD, numerous or large retinal breaks, giant retinal tears, trauma, aphakia, previous intraocular surgery, vitreous hemorrhage, and uveitis are significant risk factors for PVR in RD. Another factor is patient age. The proliferative healing response is more aggressive in younger patients, and a young patient with trauma has an even greater potential for developing PVR. This proliferative process can occur in untreated eyes or eyes that have undergone primary RD repair. In either case, PVR management and repair are challenging and require strategic planning before surgical intervention.

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For this Practical Retina column, Dr. Ross Lakhanpal from Baltimore was asked to comment on the current state of thinking and management options for proliferative vitreoretinopathy (PVR) after retinal detachment (RD) surgery.

We are all aware that PVR continues to be an important cause of recurrent RD after successful repair. This feared complication has been reported to occur in up to 8% of patients after undergoing RD repair. Despite the historic progress made in managing various vitreo-retinal diseases over the past decade, most retina specialists will agree that an unmet need remains in this landscape. Fortunately, advances in various surgical technologies such as instrumentation, lighting, and visualization have improved the outcomes after PVR management.

Dr. Lakhanpal discusses causes of PVR, management goals, surgical techniques, and pearls to avoid complications after managing PVR. His experience working in an urban tertiary surgical retina practice enables him to offer insights that will be highly valued by our community.
Management goals
My main goals for managing a case of RD with PVR are the following: (1) locate and mark all the offending retinal holes; (2) relieve all the traction from the PVR epiretinal and subretinal membranes; (3) in extreme PVR scenarios, relieve all foreshortening; (4) reattach and flatten the retina; (5) determine and implement the best tamponade required. To avoid failure, all of these steps must be successfully implemented. In my experience, inability to relieve the foreshortening of the retina is the most common cause of failure. This should be remembered when peeling the membranes, because removing all the visible scar tissue may be inadequate if one fails to adequately relax the retina. In numerous instances, the retina may be reattached intraoperatively but re-detaches during the postoperative period, most likely from the areas that are foreshortened and not adequately supported.

Management options in the new vitrectomy era
In determining the best surgical approach for PVR management, the following factors should be considered: (1) RD duration; (2) PVR membrane chronicity; (3) the location of the most significant detachment component; (4) anterior PVR presence or absence; (5) the number of prior surgical procedures.

Oftentimes, the duration of the RD with PVR coincides with the chronicity of the membranes involved, with the epiretinal and subretinal membranes being more mature and well-defined in these chronic RD scenarios. Generally, these have a poorer long-term prognosis for vision and successful surgical outcome despite the fact that they may be easier to peel intraoperatively than less mature, fresh membranes. The location of the most significant PVR allows me to determine whether I need to place an encircling element. I will generally place a type 240 or 41 band scleral buckle if the PVR is inferior and I am not planning to perform a large retinectomy. Also, if anterior PVR is present, then a buckle can help to support the PVR in this area. The number of previous procedures is an important factor that increases the likelihood of performing a retinectomy and using silicone oil, because numerous prior procedures will usually consecutively worsen the PVR to the point that it will not be relaxed and flattened. Intraoperative perfluoro-octane can be invaluable once the peeling process has begun.

With these factors in mind, advances in technology with current sutureless, small-gauge, high-speed, flow-controlled vitrectomy systems and methodology have steadily improved the safety and overall outcomes of PVR management. These enhancements are vast improvements over the first systems 10 years ago. Small instrumentation with high speed and low suction can be on the retinal surface to peel membranes or can dissect between membranes without the use of scissors. Valved cannulas allow for a low-flow, closed system and a more stable intraoperative experience, particularly if utilizing perfluoro-octane. Modern viewing systems allow for easier peripheral visualization of the membranes requiring peeling. Relaxing retinotomies and retinectomies are now mainstays of treatment if the peeling is insufficient to flatten the retina adequately.

Having a plan of action
As with any surgery, PVR cases require a plan of action. If the pathology is mostly inferior and I do not foresee employing a large retinectomy, I place a low-lying type 240 band in order to support the retina peripherally and combat the foreshortening that may already be present. Once that is in place, I perform as complete a vitrectomy as possible. If bimanual surgery will be necessary or if I do not have an assistant and will require my nondominant hand to perform scleral depression, I employ an external chandelier-illumination light source. Excellent visualization is paramount. Therefore, the lens may often have to be removed in cases of severe anterior PVR or if there is inadequate visualization of the retina. I never allow the lens opacity to impede my visualization, mainly because I view these as “one and done” cases.

Another cause of failure is inadequate removal of the posterior hyaloid; therefore, complete removal of this along with complete peripheral dissection with scleral depression are important. I often employ triamcinolone in a dilute solution to visualize these areas, because it assists me in peeling more completely. I also use a diluted concentration of indocyanine green on the macular surface to detect any remaining posterior hyaloid and any significant epiretinal proliferation in this area. It can be a significant cause of vision impairment postoperatively even if the retina is reattached and can also be a scaffold for further proliferation and surgical failure. I then utilize diluted triamcinolone to assist in visualization and peeling of the PVR membranes peripherally. I used to employ forceps for this step, but more recently I have been using the 25-gauge cutter.
with alternating low suction and high cut rates in order to prevent more retinal trauma. Occasionally, in order to make the retina more mobile, forceps are still required. After peeling the membranes, the retina should be more mobile. Retina mobility at this stage generally indicates that it can be flattened without employing a retinectomy.

Perfluoro-octane can then be utilized to flatten the retina, suction out subretinal fluid, and then add laser photocoagulation prior to placing air and either gas or silicone oil tamponade. If the retina is not mobile after exhaustive peeling, I use cautery to create the borders for a retinectomy. I determine which tamponade agent to employ based on how well the retina flattened. If the retina became mobile and flattened well with air, I employ a mildly expansive concentration of C3F8 (usually 14%). If the pathology was inferior, the retina was grossly shortened or has had multiple procedures with extensive PVR, and/or a large retinectomy was used, I prefer silicone oil. I inform the patient that the oil may be removed at a later date but not for at least 6 months.

PVR repair complications

Do what is necessary in these cases, but do not try to do too much. I employ this philosophy in PVR cases because problems and complications arise if the retinectomy is unnecessarily large or if too much viable retina is removed. Removing too much retinal tissue is a setup for postoperative hypotony and can lead to phthisis. This often occurs due to ischemia of the ciliary body after numerous surgeries and lack of aqueous production or can be due to the anterior PVR creating a fibrous membrane around the ciliary body. In these cases, silicone oil invariably must be instilled as a secondary procedure. Also, aggressive peeling can actually induce more retinal breaks, more PVR, and ultimately re-detachment. I peel what is necessary to create retinal mobility. I do not peel every single membrane if the retina appears mobile and can be reattached.

Conclusion

Recent advances in surgical systems, instrumentation, lighting, and visualization all assist in improving surgical outcomes in cases of RD with PVR. Success rates vary, but retinal reattachment may be achieved in nearly 90% of cases. The surgeon should always have a plan of action and discuss at length with the patient and family that there may be a prolonged recovery in order to restore visual function. Overzealous treatment can result in postoperative failure due to worsened PVR and hypotony. Multiple procedures also portend poorer prognosis.

REFERENCES


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Disclosure: Dr. Lakanpal is a consultant for Alcon Surgical.