Avoiding and Managing Complications of Vitreoretinal Procedures

BY HARRY W. FLYNN JR, MD, AND ROYCE W.S. CHEN, MD

Modern surgical techniques and instrumentation for vitreoretinal procedures have helped reduce the rates of complications. There are no guarantees in medicine, however, and complications can never be eliminated entirely. A surgeon must try to avoid and be ready to deal with unexpected problems. When they do occur, complications should be properly documented, and steps taken to resolve or correct the problem should be included in the medical report. Selected complications that retinal surgeons may face in their everyday practices will be discussed here. This manuscript is not intended to be an exhaustive review of all complications, but rather it will focus on selective areas and treatable issues.

ENDOPHTHALMITIS

One of the most dreaded complications is postoperative endophthalmitis. If patients present postoperatively with symptoms of blurred vision, pain, red eye, and signs of hypopyon and fibrin in the anterior chamber, endophthalmitis should be strongly considered. Studies report variable rates of endophthalmitis after pars plana vitrectomy (PPV), but it may occur less often following intravitreal injections.[1-5] In both postsurgical and postinjection settings, it is important to clinically distinguish infectious from noninfectious causes of intraocular inflammation following a procedure. Noninfectious inflammation usually does not have hypopyon and fibrin when compared to the typical infectious inflammation which does have both of these signs (Figure 1). Management of suspected infectious endophthalmitis typically requires prompt initiation of treatment, including administration of intravitreal antibiotics.

The benefits of prophylactic topical antibiotics for vitreoretinal procedures remain controversial. Most vitreoretinal surgeons do not use antibiotics prior to performing PPV. However, some surgeons continue to use topical antibiotics prior to intravitreal injections for various reasons, including the so-called "standard of care" in their particular region.

Many studies have documented a very low rate of endophthalmitis without topical antibiotics. In 2007, the Diabetic Retinopathy Clinical Research Network (DRCR.net) and the SCORE study group reported a single case among 2,009 pooled injections of intravitreal steroid agents.[6] Other more recent reports have shown a lower risk of endophthalmitis in eyes not receiving topical antibiotics compared to those eyes receiving topical antibiotics.[7]

In 2 separate metaanalyses, coagulase negative *Staphylococcus* remains the number 1 cause of infectious endophthalmitis after injection. *Streptococcus* is the second most frequent cause and occurs much more often than in endophthalmitis following cataract surgery.[8] Of note, Streptococcal infections tend to have very poor visual prognosis and often end up requiring enucleation or evisceration in spite of early treatment.

The risk of endophthalmitis should always be included in the informed consent, as this devastating problem can result in loss of all sight. This complication should especially be considered for those surgeons considering "in-office vitrectomy," a setting in which the high standards of Ambulatory Surgical Centers or hospital ORs may not be present.

The following preprocedure guidelines may minimize the risks of postoperative endophthalmitis. Povidone Iodine (PI) prep should generally be used for every patient. It is the most effective prophylaxis against endophthalmitis, and, unlike intravitreal antibiotics, its

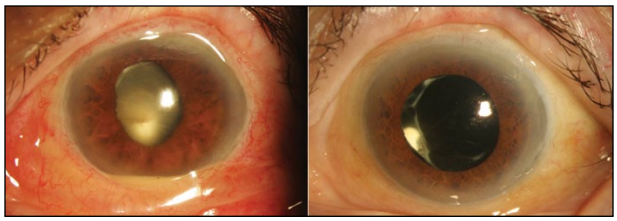

Figure 1. Four days after intravitreal injection of ranibizumab, a patient has developed endophthalmitis with hypopyon and hand motions vision (left). Fibrin strands were visible in the anterior chamber. Six months after vitreous tap and injections of vancomycin, ceftazidime, and dexamethasone, the eye was white and quiet, and vision had improved to 20/50 (right). An intravitreal culture was positive for coagulase-negative *Staphylococcus*.

use does not increase the incidence of microbial resistance.[9,10] Although some patients report an allergy to PI, true allergy is rare, and no cases of anaphylaxis have ever been reported after ophthalmic use of PI.[11] In surgical cases, the lashes should be completely covered under the sterile drape. Small-gauge incisions may be protective against endophthalmitis with the caveat that leaking sclerotomies must always be closed.

ANTI-VEGF CRUNCH

The anti-VEGF crunch is another infrequent complication following intravitreal injection of anti-VEGF agents. This occurs in patients with tractional retinal detachment secondary to fibrovascular traction in proliferative diabetic retinopathy. The condition results from regression of the vascular component of fibrovascular proliferation and a concurrent increase in fibrosis, resulting in worsening retinal traction. The role of intravitreal anti-VEGF therapy before, during, and after vitrectomy remains controversial. The goal of this therapy is to reduce potential bleeding in eyes with proliferative diabetic retinopathy with marked fibrovascular tissue, but the risks of worsening traction and retinal detachment must also be considered (Figure 2).

THE "DOUGHNUT" DETACHMENT

Phakic patients undergoing primary vitrectomy without scleral buckling for new-onset retinal detachment may be at an increased risk for anterior peripheral retinal detachment occurring between the equator and the ora serrata. This so-called doughnut detachment has a characteristic peripheral retinal ring appearance at presentation (Figure 3).[12] Often in these cases, the surgeon has placed a single row of laser spots around the equator or slightly posterior to it, but the anterior periphery remains untreated. After the gas bubble has been resorbed, the

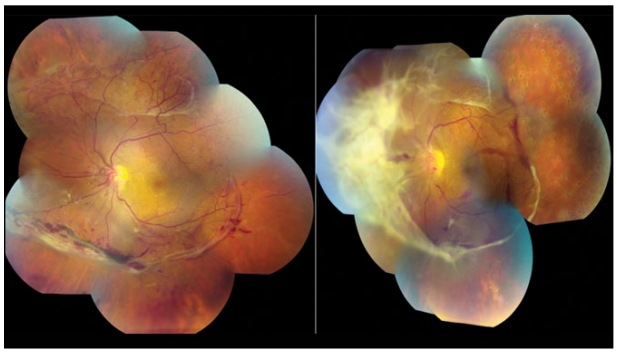

Figure 2. A patient with proliferative diabetic retinopathy and localized inferonasal traction retinal detachment received an intravitreal injection of bevacizumab (left). Two weeks after injection, there was significant contraction of membranes, with worsening of traction retinal detachment (right).

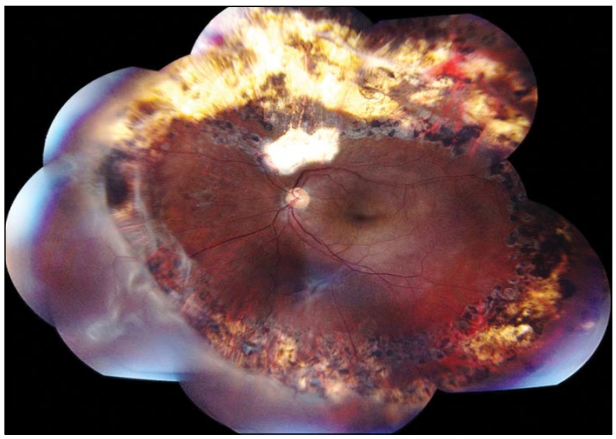

Figure 3. One year after successful retinal detachment repair in a high myope, a recurrent doughnut detachment developed anterior to the area of encircling laser.

surgeon may be surprised to find that although the posterior quatorial retina is successfully attached, there is a 360° retinal detachment anterior to the row of laser.

These cases can be difficult to photograph using standard fundus cameras, although ultra-widefield imaging has not been reported in these cases. Because the visual potential in these eyes is often poor, these cases are typically managed by observation. If PPV is indicated due to a recurrent posterior retinal detachment, placement of an encircling scleral buckle can be considered.

IATROGENIC BREAKS

The occurrence of an iatrogenic break following PPV has been reported frequently in the literature. It is likely that eyes undergoing surgery for the repair of a traction retinal detachment are at a higher risk for this event. Phakic lens status and a need to induce a posterior vitreous detachment also appear to be risk factors

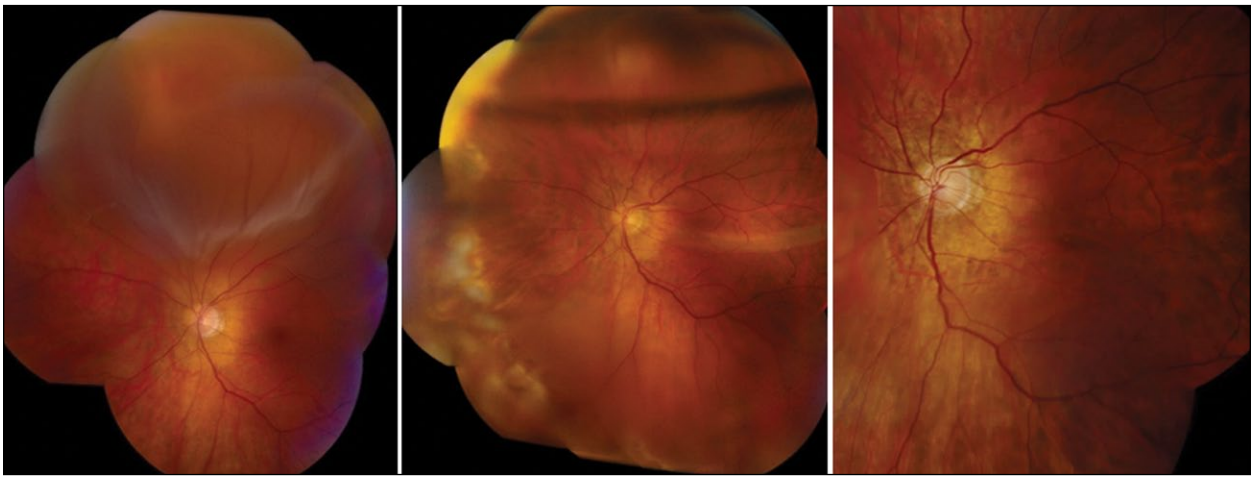

Figure 4. A patient presented with a superior bullous rhegmatogenous retinal detachment (left). Following PPV, the retina is reattached, but a macular fold across the fovea developed (middle). Visual acuity was 20/400. Following a second PPV, the fold released, and visual acuity improved to 20/60 (right).

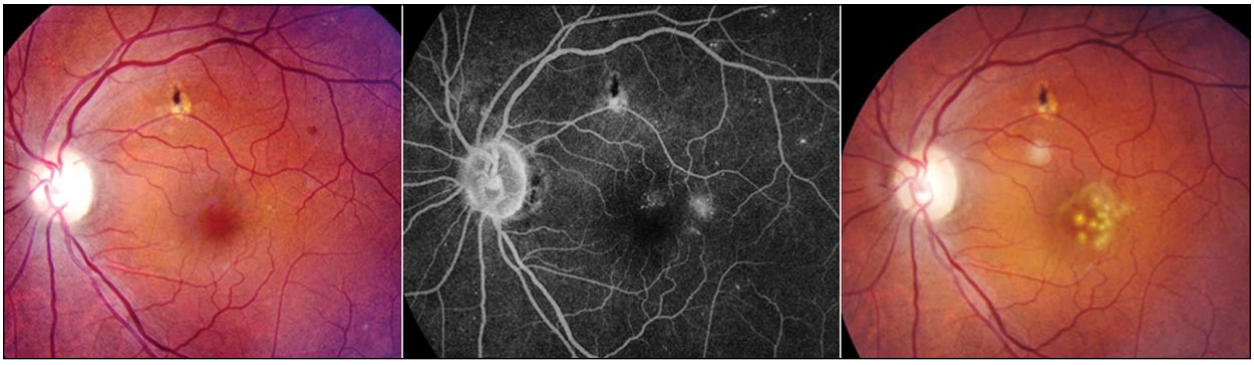

Figure 5. A 75-year-old diabetic patient had 20/25 visual acuity but complained of blurriness and distortion (left and middle). A fundus photograph showed microaneurysms temporal to the foveola, and fluorescein angiography revealed leakage in this area. Following focal laser treatment, the patient developed a scotoma, and visual acuity decreased to 20/200 (right).

for a retinal break. A review of 2471 PPV procedures by Dogramaci and colleagues found that eyes with an iatrogenic break were more likely to have undergone a membrane-removing maneuver (eg, internal limiting, epiretinal, or proliferative).[13]

MACULAR FOLDS

There is ongoing debate about the requirement and duration for face-down positioning, both in macular hole surgery and following detachment repair.[14] There has also been a shift towards a more relaxed policy of face-down positioning, especially as surgeons have moved away from scleral buckling with external drainage and toward primary vitrectomy with internal drainage of subretinal fluid. It is common fallacy to believe that internal drainage results in a completely flattened retina, when in actuality, there are often pockets of subretinal fluid left behind. Sutureless sclerotomies may lead to a transiently hypotonous eye in the immediate postoperative period and incomplete gas fill. The combination of residual subretinal fluid, inadequate patient positioning following surgery, and inadequate gas fill can lead to the dreaded complication of a macular fold—a condition that may lead to permanent visual distortion despite an otherwise anatomically corrected retinal detachment (Figure 4).[15]

Prompt and persistent face-down positioning reduces the chance of subretinal fluid moving under the central retina and contributing to the development of a macular fold. Careful attention to leaking sclerotomies at the conclusion of surgery will also ensure that transient hypotony is avoided, and a good gas fill can be maintained.

ACCIDENTAL LASER TO THE FOVEA

Traditionally, the gold standard for the treatment of diabetic macular edema has been focal/grid laser. In

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these patients, optical coherence tomography demonstrates retinal thickening involving or threatening the fovea, and fluorescein angiography confirms juxtafoveal leaks. In recent years, anti-VEGF agents have begun to displace focal laser as primary therapy for diabetic macular edema. The advantage of anti-VEGF agents is the avoidance of permanent macular scotomas from treatment too close to the fovea (Figure 5); however, injections run the risk of endophthalmitis and potentially increased intraocular pressure. In patients with very good visual acuity, the ideal management strategy is not yet known, but future studies will determine the best strategies with evidence-based data.

CONCLUSION

Thanks to the increasing use and availability of video recording in ophthalmology, surgeons all over the world can benefit from observing techniques and avoiding problems that arise during the various steps of surgery. Although advances in technology have improved outcomes and the ability to perform more complex surgery, 1 element remains vital: the surgeon's attention to detail and judgment in order to avoid complications. ■

This article is based on Harry W. Flynn Jr, MD's Mentorship Award Lecture at the 2014 Meeting of the Vit-Buckle Society, March 13-15, 2014; Las Vegas, NV.

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