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Pars plana vitrectomy for vitreous floaters: Is there such a thing as minimally-invasive vitreoretinal surgery?

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Vitreoretinal surgery has undergone remarkable transformations since the first successful pars plana vitrectomy (PPV) was performed by Robert Machemer in 1970. Modern instrumentation and surgical techniques have led to shorter operating times and faster recovery for many patients. This has broadened indications for even lower thresholds of incident visual acuity, but has PPV evolved to the degree to where it can be considered "minimally-invasive?"

In the present issue of *Retina*, Mason et al and Sebag et al describe sutureless, 25-gauge PPV as a successful treatment modality for the management of vitreous floaters associated with posterior vitreous detachment (PVD), myopic vitreopathy, vitreous syneresis, and asteroid hyalosis.[1,2] Both studies report low complications rates and describe a minimalistic approach to surgery that generally involves performing a core vitrectomy, leaving the posterior hyaloid attached in most eyes without pre-existing PVD and preserving the anterior hyaloid face in an attempt to delay cataract formation. More extensive vitreous removal with shaving of the vitreous base is advocated only in cases with retinal breaks.

In both of these series, the reported surgical outcomes are favorable. Mason et al retrospectively reviewed 168 eyes of 143 patients undergoing PPV for symptomatic vitreous floaters. Their high surgical success rate was based on 94% of patients rating their experience as a "complete success" and 92% of patients reporting either no symptoms or extremely mild symptoms of floaters after surgery. Complications were relatively few and included 12 eyes (7.1%) with iatrogenic retinal breaks, 2 eyes with transient vitreous hemorrhage, 1 eye with cystoid macular edema, and no eyes with postoperative retinal detachment or endophthalmitis at a mean follow up of 18 months. A visually significant cataract requiring phacoemulsification developed in 9 (16.1%) of the 56 phakic eyes. The authors demonstrated a statistically significant improvement in best corrected visual acuity, which improved from a mean of 20/40 preoperatively to 20/25 postoperatively.

In the series by Sebag et al, 76 eyes with symptomatic vitreous floaters underwent PPV. They prospectively evaluated contrast sensitivity in 16 patients and demonstrated a significant improvement using Freiburg Acuity Contrast Testing following surgery.

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Complete resolution of symptoms was seen in 15/16 (93.8%) patients in this group. Complication rates were retrospectively assessed in 60 patients and were low, with 1 eye (1.7%) developing a macular pucker and no eyes experiencing iatrogenic retinal breaks, vitreous hemorrhage, postoperative retinal detachment or endophthalmitis at a mean follow up of 17.5 months. A visually significant cataract requiring phacoemulsification developed in 8 (23.5%) of the 34 phakic eyes.

It is not at all surprising that PPV is successful in resolving symptoms associated with primary vitreous floaters. The most important concern in these patients, however, must be long-term safety. As the authors appropriately emphasize, many of these patients are young, a high percentage are phakic, and nearly all have good preoperative visual acuity, thus there is potential for substantial complications. The excellent surgical outcomes described in these two papers must be contrasted to previous reports in this regard. Two recent large retrospective series out of Europe by De Nie et al and Schulz-Key et al, with longer average follow up of 26.4 and 37 months respectively, report higher complication rates including cataract formation requiring phacoemulsification in 50.0-60.5% of phakic eyes, postoperative retinal detachment in 6.8-10.9% of eyes, and cystoid macular edema in 5.4-5.5% of eyes, some of which was refractory to treatment and resulted in permanent vision loss.[3,4] Other patients lost vision as a result of glaucoma, macular hole formation and photoreceptor disruption. Although patients in these studies underwent primarily 20-gauge and 23-gauge PPV, it is notable that the majority of patients developing retinal detachment did so in a delayed fashion, often years following the original PPV. Tan et al reported a lower retinal detachment rate of 2.5% in a series of mostly 25-gauge PPV cases, but mean follow up was limited to 10.1 months.[5] Additionally, long term data shows an increased risk of open angle glaucoma after pars plana vitrectomy, occurring at a mean of 46 months after surgery in phakic eyes and 18 months in nonphakic eyes.[6] Other rare, but serious risks of PPV include suprachoroidal hemorrhage and endophthalmitis. Furthermore, risks associated with retrobulbar anesthesia should not be dismissed and include vision threatening complications such as retrobulbar hemorrhage, strabismus, and globe perforation as well as life-threatening complications associated with central nervous system spread of anesthesia or adverse reactions to anesthetic agents.

Sebag et al suggest that with “modern surgical instrumentation and judicious technique” the risks of surgery can be mitigated and that their study demonstrates that “treating floaters with sutureless 25-gauge vitrectomy without PVD induction can be uniformly safe.” While Mason et al and Sebag et al demonstrate low complication rates in a significant number of eyes, it is important to recognize that these are primarily retrospective studies that are not sufficiently powered to evaluate safety.

The authors bring up several other interesting and worthwhile points. Mason et al suggest the following in regards to patients who are bothered by symptomatic vitreous floaters: “From the patient's perspective, the ophthalmologist who has ruled out pathology such as retinal breaks has failed to address their health and quality of life.” Here arises the age-old ethical dilemma of balancing beneficence and non-maleficence. As physicians we have an obligation to acknowledge and to be responsive of patient concerns. On the other hand, we have a commitment to our patients to first do no harm. Is a reduction in contrast sensitivity

enough of an indication to support this procedure, when a patient has excellent visual acuity? Additionally, patients with vitreous floaters often improve spontaneously as they gravitate out of the visual axis, as opacities move anteriorly and out of focus with progressive vitreous collapse, or as individuals' psychophysical attention is no longer stimulated as strongly. Subjecting patients to surgery may place them at unnecessary risk when they may have improved with observation alone. The authors of these studies cite impairment in activities of daily living (Mason et al and Sebag et al), contrast sensitivity (Sebag et al) or well-being (Sebag et al) as the primary inclusion criteria for surgical intervention. It is somewhat surprising, however, that hundreds of patients presenting to these centers, over a short time period, would be impaired to the extent that PPV is required. The potential for severe complications should give patients and surgeons a reason to pause before undertaking this procedure for modest levels of functional impairment.

In the case of a patient with symptomatic vitreous floaters, we must seek to understand their degree of impairment and to weigh these concerns against potentially-blinding risks of PPV. As the authors in both studies emphasize, vitreous floaters can have a negative impact on quality of life.[1-5,7-8] In fact, a utility analysis performed by Wagle et al found that patients with floaters were willing to trade away an average of 1.1 out of every 10 years of their remaining life to get rid of their floaters, and were willing to take an 11% risk of death and a 7% risk of blindness to get rid themselves of symptoms associated with vitreous floaters.[7] Previous data also demonstrates, using National Eye Institute Visual Function Questionnaire-39, that general vision, near activities, distance activities, and mental health significantly improve in selected patients undergoing PPV for floaters.[9] But, as Mason et al are careful to point out, only in a minority of patients with symptomatic vitreous floaters will activities of daily living be significantly affected. While PPV should be considered in this small subset of patients, it is important that these patients receive proper informed consent in regards to the risks of PPV.

This group of patients might be fertile for abuse. One wonders if this movement will evolve to the point where we see the retina specialist advertising "floaterectomies" on billboards or offering office-based PPV for "simple cases" such as these. Only time will tell. However, we do know that all cases of PPV are associated with potential ocular, anesthetic, and systemic risks. Therefore, retina specialists need to be careful in referring to PPV as "minimally-invasive." Such language has the potential to trivialize the performance of PPV and does a disservice to our profession and our patients. The overriding principle must be good principles.

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