Incidence of Management Changes at the Postoperative Day One Visit After Pars Plana Vitrectomy for Retinal Detachment

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• PURPOSE: To evaluate the incidence of unexpected management changes on the first day after pars plana vitrectomy (PPV) for retinal detachment repair.
• DESIGN: Retrospective cohort study.
• METHODS: The medical and billing records of a large academic private practice were electronically queried for all cases of PPV for retinal detachment performed between January 1, 2017, and December 31, 2017. All cases of PPV for rhegmatogenous or tractional retinal detachment with completed postoperative day 1 (POD1) and postoperative week 1 (POW1) visits were included. The preoperative consultation, operative report, and POD1 and POW1 (postoperative days 5-14) visits were reviewed. Main outcome measures were incidence of unexpected management changes (change in or extended positioning, additional procedure, change in drop regimen, or shortened interval follow-up) at the POD1 visit after uncomplicated PPV for retinal detachment.
• RESULTS: Overall, 418 surgeries from 364 eyes and 355 patients were included. Eleven cases (2.6%) had an intraocular pressure (IOP) over 30 mm Hg at POD1. IOP-lowering drops were prescribed for 30 cases (7.2%). Silicone oil tamponade was positively associated with high IOP at POD1 (relative risk = 3.23, 95% confidence interval 0.96-10.84, P = 0.06). No additional management changes were made besides treating elevated IOP.
• CONCLUSIONS: Management changes on POD1 after vitrectomy for retinal detachment repair are relatively uncommon and were solely IOP related in this patient group. There may be flexibility regarding the type of POD1 encounter necessary, including an IOP check with an ophthalmic technician or non–retinal eye care provider. Larger, prospective studies are needed to better determine the most efficient follow-up routine. (Am J Ophthalmol 2021;222:271–276. © 2020 Elsevier Inc. All rights reserved.)

CURRENTLY, THE TYPICAL POSTOPERATIVE VISIT schedule following routine pars plana vitrectomy (PPV) for rhegmatogenous retinal detachment is an examination at postoperative day 1 (POD1), week 1 (POW1), month 1 (POM1), and month 3 (POM3).[1] Complications screened for at the POD1 visit include elevated intraocular pressure (IOP), endophthalmitis, wound leaks, hypotony, choroidal detachments, corneal decompensation, and failure of retinal reattachment.[2,3] All of these adverse effects could have serious long-term consequences on vision if left untreated. However, anecdotal evidence and prior smaller studies suggest that the primary problem detected at the POD1 visit is an elevation in IOP, especially in eyes treated with silicone oil and gas tamponade.[2]

Recently, the efficiency of the POD1 visit for routine PPV has been called into question.[2-4] Owing to advancements in surgical techniques, such as smaller gauge vitrectomy, adverse events following PPV has decreased.[2,4] For example, elevated IOP on POD1 after 20 gauge vitrectomy was seen in 14.9% of patients.[5] However, elevated IOP on POD1 from a 23 gauge, 25 gauge, or 27 gauge vitrectomy occurred in only 3.9% of patients.[1] Hypotony is less common and was reported in 6 out of 310 eyes evaluated on POD1 (1.9%).[1] If present, hypotony is typically transient and self-resolving. Additionally, postoperative endophthalmitis is rare, particularly in an asymptomatic patient on POD1.[6-9] The incidence of any postoperative adverse events at the POD1 time point has been reported as 0.5% with these newer, routinely used surgical platforms.[4]

Streamlining postoperative care following PPV may ease the burden of care for patients, particularly those who need to travel long distances for office visits.[2,3] For many elderly patients, any additional office visit burden can be tasking and uncomfortable, and often another adult family member needs to accompany the patient for the visit. The purpose of this study was to evaluate the incidence of unexpected management changes at the POD1 visit after routine PPV for retinal detachment.

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METHODS

INSTITUTIONAL REVIEW BOARD APPROVAL WAS OBTAINED at Wills Eye Hospital for all aspects of this study involving retrospective review of patient data. All work was performed in accordance with the Health Insurance Portability and Accountability Act of 1996 and adhered to the tenets of the Declaration of Helsinki.

The electronic medical and billing records of the Mid Atlantic Retina practice were queried for all cases of rhegmatogenous or tractional retinal detachment repair performed between January 1, 2017, and December 31, 2017. Specifically, Classification of Procedural Terminology (CPT) codes 67108 (retinal detachment repair) and 67113 (complex retinal detachment repair) were used to identify cases. Cases performed with PPV, with or without scleral buckle, were included; any cases with a scleral buckle alone or pneumatic retinopexy were excluded. Detailed chart review of the electronic medical record was then performed for each case by 2 trained study personnel, each of whom underwent training with a study investigator (D.S.B.) to understand the study design, aims, and standard definitions of all variables reviewed.

For each case, the preoperative consultation closest to the date of surgery, operative report, POD1 visit, and POW1 (postoperative days 4-14) visit were reviewed. Cases were excluded if a scleral buckle alone was performed, significant intraoperative complications were noted, or the case was performed in conjunction with cataract extraction and intraocular lens insertion.

The preoperative consultation was reviewed for baseline demographic characteristics, as well as clinical characteristics including history of prior ocular surgeries, ocular hypertension or glaucoma, and all ophthalmic medications. The operative report was then reviewed to note gauge used, complications, peripheral pathology, performance of a scleral buckle, and tamponade agent. The POD1 evaluation was evaluated for examination information. A patient was considered to have an unexpected management change at the POD1 visit if there was (1) a change in the standard steroid or antibiotic drop regimen typically prescribed by the provider, (2) an addition of an IOP-lowering drop and/or IOP greater than or equal to 30 mm Hg, (3) a change in the positioning instructions compared to what was initially prescribed, and (4) a shortened follow-up interval specifically noted in the plan.

The charts of all patients who were noted to have a POD1 management change were reviewed again by 1 of the other study investigators (D.S.B., D.P.) to confirm that a management change had occurred at the POD1 visit. STATA 12.0 (StataCorp, College Station, Texas, USA) was used for all descriptive statistics provided in this study.

TABLE 1. Baseline Characteristics of Study Cohort of 355 Patients

Characteristic	Result
Female, n (%)	205 (57.7)
Male, n (%)	150 (42.3)
Age (years)[a]	60.7 ± 13.2
Laterality (n = 364 eyes)[b]	
OD	181 (49.7)
OS	183 (50.3)
Indication (n = 418), n (%)	
Primary rhegmatogenous RD	144 (34.4)
Diabetic TRD	143 (34.2)
Recurrent RD	131 (31.3)

RD = retinal detachment; TRD = tractional retinal detachment.
[a]Age at the time of first surgery.
[b]Nine patients had surgery performed on both eyes.

RESULTS

OVERALL, 418 SURGERIES FROM 364 EYES AND 355 PATIENTS were included in this study. No eyes were excluded owing to significant intraoperative complications. Fifty-four eyes were included more than once owing to multiple vitrectomies within the study period. Two hundred and five of these patients were female (57.7%), and the average age was 60.7 ± 13.2 years (Table 1). The indication for PPV in this study was broken down into primary rhegmatogenous retinal detachment (144 eyes or 34.4%), diabetic tractional retinal detachment (143 eyes or 34.2%), and recurrent retinal detachment (131 eyes or 31.3%). Approximately 12.9% of the cohort had a history of ocular hypertension or glaucoma. The preoperative characteristics of this entire cohort are outlined in Table 2.

Of the 418 surgeries reviewed, 87.1% were PPV without additional scleral buckling (Table 3). Intraoperative tamponade consisted of silicone oil (35.6%), C3F8 (33.9%), SF6 (25.6%), and air (5.9%). Over 70% of surgeries had subconjunctival steroids. The intraoperative characteristics for the surgeries in this study are outlined in Table 3.

At the POD1 visit, 69 of 418 cases (16.5%) had an IOP over 21 mm Hg; however, only 11 of 418 cases (2.6%) had an IOP over 30 mm Hg (Table 4). The highest IOP measured was 51 mm Hg. None of these 11 eyes reported severe pain. Seven of these 11 eyes (63.6%) had a silicone oil fill, while 3 eyes had C3F8 gas and 1 eye had SF6 tamponade. There was a positive association between silicone oil tamponade and increased IOP at POD1 (relative risk = 3.23, 95% confidence interval 0.96-10.84, $P = .06$).

The examining physician made a management change for 30 of 418 cases (7.2%), all of which were for elevated

TABLE 2. Preoperative Characteristics at the Time of Surgery

Characteristic	N (%)
Total study cohort, surgeries	418
Posterior vitreous detachment	393 (94.0)
Prior PPV	127 (30.4)
Ocular hypertension or glaucoma	54[a] (12.9)
1 IOP-lowering medication	19 (36.5)
2 IOP-lowering medications	19 (36.5)
3 IOP-lowering medications	11 (21.2)
4 IOP-lowering medications	3 (5.8)
Lens status at the time of surgery	
Phakic	169 (40.4)
PCIOL	234 (56.0)
ACIOL	2 (0.5)
Aphakic	13 (3.1)
History of laser retinopexy	22 (5.3)
History of pneumatic retinopexy	10 (2.4)

ACIOL = anterior chamber intraocular lens; IOP = intraocular pressure; PCIOL = posterior chamber intraocular lens; PPV = pars plana vitrectomy.

[a]In 2 cases, patients were not receiving IOP-lowering medications.

TABLE 3. Intraoperative Characteristics

Characteristic	N (%)
Total study cohort, surgeries	418
Type of surgery	
Scleral buckle + PPV	54 (12.9)
PPV	364 (87.1)
Gauge	418
23	338 (80.9)
25	76 (18.2)
27	4 (0.96)
Tamponade	418
Silicone oil	147 (35.6)
C3F8	139 (33.9)
SF6	106 (25.6)
Air	26 (5.9)
Number of sutured sclerotomies by tamponade[a]	295
Gas tamponade	174 (59.0)
3 sclerotomies	96 (55.2)
2 sclerotomies	4 (2.3)
1 sclerotomy	10 (5.7)
No sutures	64 (36.8)
Silicone oil tamponade	106 (35.9)
3 sclerotomies	104 (98.1)
2 sclerotomies	0 (0)
1 sclerotomy	0 (0)
No sutures	2 (1.9)
Subconjunctival steroids	296 (70.8)

PPV = pars plana vitrectomy.

[a]Data only available for 295 of 418 surgeries (174 with gas tamponade and 106 with silicone oil).

IOP, including the 11 eyes with an IOP >30 mm Hg. For these 11 eyes, all changes involved the addition of an IOP-lowering drop. One patient who had an IOP of 51 mm Hg also required a vitreous tap to normalize the IOP to 25 mm Hg on POD1.

Eight of these 11 eyes had normalization of IOP at the POW1 visit. One eye had an additional ocular antihypertensive drop added at POW1 with normalization of pressures by POM3. One eye needed to return to the operating room at POW1 for silicone oil removal and anterior chamber washout owing to IOP of 62 mm Hg. One eye was lost to follow-up after the POW1 period.

For the remaining 19 eyes with an IOP between 22 and 30 mm Hg, the addition of an IOP-lowering drop was the only management change. Ten of these 19 eyes had IOP normalization by POW1. Six had normalization of IOP by POM1. One patient had normalization of pressure by POM3. One patient had a persistently elevated IOP of 30 mm Hg at POM3. One patient was lost to follow-up after the POM1 visit. None of the 30 patients were found to have hypotony or epithelial defects.

There were 54 of 418 surgeries (12.9%) with a history of glaucoma or ocular hypertension. Of note, a subgroup analysis of eyes without a history of ocular hypertension or glaucoma showed that 8 of 364 eyes (2.2%) had an IOP greater than 30 mm Hg at the POD1 visit. In contrast, 3 of 54 eyes (5.6%) with a history of ocular hypertension or glaucoma had an elevation in IOP greater than 30 mm Hg at POD1 (relative risk = 2.58, 95% confidence interval 0.69-9.24, $P = .16$).

Other than for IOP, no other management changes, including changes to the steroid or antibiotic drop regimen, a change in positioning, a change in follow-up, or performance of any other additional procedures, were necessary.

DISCUSSION

THE STANDARD POSTOPERATIVE VISIT SCHEDULE AFTER PPV for rhegmatogenous and tractional retinal detachment requires a visit at POD1, POW1, and POM1. While there have been a few studies evaluating the utility of a POD1 visit, additional evidence is needed.[2-4] However, there is interest in increasing postoperative visit efficiency. This interest is highlighted by the severe acute respiratory syndrome coronavirus 2 pandemic. There is now a need to stagger patient appointments and limit waiting room times. Scheduling a POD1 visit with a local eye technician or qualified eye care provider primarily for an IOP check may aid with these additional goals and may be an option for some patients. This study showed that the only finding that required a change in management

TABLE 4. Postoperative Day 1 Examination Findings in Total Study Cohort (418 Surgeries)

Finding	N (%)
IOP >21 mm Hg	69 (16.5)
IOP >30 mm Hg	11 (2.6)
Severe pain	14 (3.3)
Nonstandard steroid	0 (0)
Nonstandard antibiotics	0 (0)
Addition/change in ocular hypertension drops	30 (7.2)
Change in positioning	0 (0)
Change in follow-up	0 (0)
Additional procedure	1 (1.4)
Management change	30 (7.2)
Management change not IOP related	0 (0)

IOP = intraocular pressure.

at the first postoperative visit was an elevated IOP. IOP was elevated for a number of possible reasons, including gas or oil tamponade, preexisting history of glaucoma or ocular hypertension, and hyphema.

In this cohort, 2.6% of patients had an IOP greater than 30 mm Hg. An IOP greater than 30 mm Hg has been shown to be well tolerated for a short period of time under observation with no medical intervention.[10] There are many factors that must be considered with regard to elevated IOP. Preexisting glaucoma or a family history of glaucoma is a positive predictor of elevated IOP following PPV.[11] Some patients may not have been accurately diagnosed with glaucoma prior to their surgery, which can affect the interpretation of postoperative results. In our study, the number of cases with elevated IOP after PPV was 2.2% at POD1 without a known preexisting history of glaucoma or ocular hypertension. If streamlined postoperative visits were used, it could be focused on patients without a history of preexisting glaucoma or ocular hypertension as well as those without silicone oil tamponade. Patients with a history of moderate-to-severe glaucoma should be screened for IOP elevation on POD1, given the potential for irreversible vision loss, even with mildly elevated IOP.

In our study, the incidence of unexpected management changes at the POD1 visit after routine PPV for retinal detachment was 7.2%. These changes in management were all related to elevated IOP. A prospective study of 25 patients showed that IOP increased after simple PPV and peaked at 2 hours. However, by the 24-hour time mark, all but 1 patient had values return to normal levels.[12] Similarly, another study examining 138 patients and 102 eyes looked at the rate of IOP after PPV and changes in management. The rate of IOP elevation on POD1 was 9.8% and transient, returning to baseline after an average of 11.2 days.[13] However, only 1.4% of patients in that study required significant changes to their management for IOP control.[13] Some eyes will present with a benign rise in IOP following vitrectomy that will normalize early in the postoperative course; few cases in our study required additional management. However, it is notable that we do not have long-term follow-up data on these patients and there is a long-term risk of developing open-angle glaucoma from vitrectomy itself.[14]

The tamponade used has also been studied with respect to IOP elevation. Silicone oil has been found to have the highest rates of long-term elevation in IOP when compared to C3F8 and SF6.[11,15] Silicone oil can damage the aqueous outflow tract, leading to persistent ocular hypertension. In our study, there was an association between elevated IOP at POD1 and silicone oil tamponade; however, it did not reach statistical significance. These early IOP increases could be owing to silicone oil affecting the inflammatory response, pupillary block, or migration of the oil into the anterior chamber.[16] The other tamponade agents, SF6 and C3F8, did not have a significant association with elevated IOP. A larger study could help further clarify this association. If streamlined office visits were considered at the POD1 time point, this initiative could be focused on patients who do not have silicone oil tamponade.

Another potentially serious complication of vitrectomy is endophthalmitis. There were no cases of endophthalmitis in this study; however, rates are typically low, so a study of this size, while large, would not be expected to have any endophthalmitis cases. A recent meta-analysis reported 0.05% of patients were diagnosed with endophthalmitis after vitrectomy.[17] A concern could be patients presenting with asymptomatic endophthalmitis. However, in the Endophthalmitis Vitrectomy Study, 98.8% of patients who developed endophthalmitis after cataract surgery had a presenting symptom.[18] This includes decreased vision, red eye, or eye pain and typically occurs within 1 week postoperatively.[18,19] Additionally, endophthalmitis is very rare on POD1, especially in an asymptomatic patient, and clinically presents on average 3.6 days after PPV.[6-9]

A recent study that included 231 patients showed the effects of changing from a standard POD1 visit within 24 hours to having the first postoperative visit after at least 72 hours.[20] Only 2.0% of patients required management changes that were predominantly IOP related.[20] There were no cases of endophthalmitis, and tamponade was not predictive of postoperative complications.[20] The results align with the findings in the current study.

There are some limitations to this study. This study was conducted in a large academic referral-based private practice and may have limited generalizability to the general population. A number of eyes in our series had retinal detachment repair elsewhere and were referred to our center for additional repair, which accounts for a greater use of silicone oil than would be reported in a series of primary retinal detachment repair. This was a retrospective study, and thus standardization of screenings and follow-up visits was not achieved. Also, the relatively small number of

patients in each subgroup based on baseline, preoperative, intraoperative, and postoperative characteristics made subgroup analysis difficult to conduct. While not routine, some sclerotomies required sutures for closure, but there was inconsistent description in the operative reports regarding which sclerotomies may have been sutured. Eyes with a history of elevated IOP or glaucoma may have had less gas or oil instilled compared to those without such a history. Lastly, this study did not investigate the stages of glaucoma in glaucomatous eyes to account for potential differences in length of periods tolerable to high IOP.

This study has several strengths. Over 400 eyes in this study were analyzed with respect to their POD1 outcomes. This cohort is larger than those analyzed in similar studies, allowing for better generalizability and confidence in creating some flexibility from the standard early postoperative visit schedule. This paper also focused only on retinal detachment repaired with PPV, which helps to limit confounding variables. Lastly, the data from this study were collected from many surgeons at this large academic private practice. This helps increase generalizability compared to studying cases from a single surgeon.

In summary, this study shows that management changes at the POD1 visit after uncomplicated vitrectomy-based retinal detachment repair without concomitant cataract extraction for patients are relatively uncommon, with the main issue at the POD1 visit being related to elevated IOP. Vitrectomy surgeries have become safer with advancements in technology, leading to fewer postoperative complications. Our results suggest that the type of postoperative encounters may not always require a full ophthalmic examination performed on POD1. Other considerations could be to schedule a phone interview with a technician to screen for severe pain or discomfort, a telehealth visit with their physician to review postoperative instructions, or an office visit with an ophthalmic technician or local eye care provider for an IOP check.[2] The office visit with an ophthalmic technician or other eye care provider would still allow for postoperative instructions to be reviewed and allow patients to ask questions they may have regarding their care. This visit could act as a screening tool for practices to determine which patients need additional physician follow-up or may need changes in management. These steps could increase practice efficiency, ease patient burdens, and help with social distancing in select cases. Further studies should be conducted to explore these potential alternatives.

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