

PPV and SB versus PPV alone for Patients with Retinal Detachment

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Abstract

Purpose: To evaluate the anatomical single-operation success rate of scleral buckling (SB) adjunction to pars-plana vitrectomy (PPV) vs PPV alone for the treatment of primary rhegmatogenous pseudophakic retinal detachment.

Methods: Retrospective case series randomized study of patients undergoing PPV or PPV+SB for pseudophakic rhegmatogenous retinal detachment over a 3.5-years period from January 2012 to September 2015, with a minimum of 6 months follow-up. Main outcome measures included primary anatomical success rate, defined as retinal reattachment at final follow-up after a single operation. 300 eyes underwent PPV alone as a first surgery and 128 PPV+SB

Results: Single-surgery anatomical success was achieved in 88.5% of 428 pseudophakic eyes with RD. Final anatomical success after a subsequent surgery reached 99.3% of eyes. Anatomical success rate was higher in the PPV+SB group compared to PPV alone group at final follow-up: 93% versus 86% respectively (P = 0.006).

Conclusion: Adjunction of SB to PPV may lead to significantly higher anatomic success rates when compared to PPV alone in pseudophakic eyes.

Keywords: Pars-Plana Vitrectomy (PPV); Scleral Buckling (SB); Retinal Detachment (RD)

Introduction

Retinal detachment (RD) has an estimated incidence of 1/5,500 to 12 500 subjects yearly as mentioned in the Vision Institute of Paris report. Accordingly, Rhegmatogenous RD (RRD) represents the most frequent cases of RD with an annual risk of 0.01%; Moreover, Vision Institute of Paris reported pseudophakic RD incidence is almost 6 times higher than the RD of the phakic eye and accounts for 30% to 40% of all rhegmatogenous RDs.

Scleral buckling (SB) has historically been the method of choice for repairing of rhegmatogenous retinal detachments (RRDs). However, recent years have witnessed a dramatic increase in the use of pars plana vitrectomy (PPV) due to advances in vitrectomy instrumentation and wide-angle viewing systems that enhances the surgeon confidence. Recently, some randomized control assays and retrospective reviews have evaluated the buckling with or without PPV versus PPV alone in RRD patients who are exempt of other independent complications or diseases. According to our applications at Monticelli center and based on the known pathogenesis of RRD, we estimate that the combination PPV+SB could present more than 85% of single-operation success rate with additional advantages over PPV alone. Our study intended then to evaluate the optimal surgical procedure to reattach pseudophakic retinas.

Patients and Methods

Inclusion and exclusion criterias

428 RRD pseudophakic patients treated between January 2012 and September 2015 at Monticelli-Paradis Center in Marseille, France were included. In this randomized study, patients had either vitrectomy alone or PPV and SB at a time. Patients with less than 6 months follow up and those whose RD was associated with other complications like proliferative vitreo-retinopathy (PVR), hemorrhage, hematoma, macular hole, retinopathy, high myopia and diabetes were excluded. Thus, only were included patients with no other complications than RRD. All patients were operated by the four surgeons of the center.

Surgical Techniques

Patients undergoing vitrectomy received a standard 23- or 25-gauge PPV. Endolaser photocoagulation was applied for in the scleral buckle (SB) group, either around the retinal tear or 360° to the vitreous base to completely surround all retinal breaks. In all cases, patients received a non-expandable concentration of perfluoropropane in air (12% to 16%) for tamponade. Patients in the SB group received a 360° encircling band (2.5–4.0 mm in width) sutured to the sclera and secured with a Watzke sleeve. Patients who had a reattachment were randomly reattributed to either undertake PPV alone or PPV+SB

Data Analysis

All statistical analysis was performed using XLSTAT version 2015. Fisher test and z test (unilateral) were applied for data to respectively compare variances and proportions between the two treatment groups. Kruskal-Wallis and Steel-Dwass-Critchlow-Fligner tests were applied to compare statistical variations in anatomical success rates between the participating doctors. Odds ratios (ORs) and 95% confidence intervals (CIs) were used to compare anatomical success rates. Descriptive statistics with z test (bilateral) were sorted out for age and gender effect on SSAS comparison between patients of PPV group and those of PPV+SB group, then for age effect on SSAS of recidival patients of the two groups.

Anatomical Results

428 patients of the 1046 reviewed were included according to the selection criterias cited above. 300 eyes underwent PPV alone while 128 eyes underwent PPV+SB for the treatment of primary detachment. The main outcome measure for this study was “single surgery anatomical success” (SSAS), defined as successful retinal reapplication after a unique surgery at final follow-up. The overall SSAS rate for the 428 pseudophakic eyes with retinal detachment regardless of the surgical procedure was 88.55% (379 SSAS/428 eyes). This proportion reached 98.59% of success after a second intervention (422 reattachments/428 eyes).

Among The 49 eyes that had a first reattachment 28 were attributed to the PPV group and 21 to the PPV+SB group. Among those 49 eyes, the majority of patients required only one subsequent surgery to obtain anatomical success (23 reattachment/28 recidival eyes in the PPV group and 20 reattachment/21 recidival eyes in the PPV+SB group). Only 6 patients required a third operation and 2 patients a 4th subsequent operation to reach 100% of final reattachment success.

For the PPV group, SSAS was 86,33% (41 redetachment/300 eyes) compared to 93,75% (8 redetachment/128 eyes) for the PPV+SB group. This difference was statistically significant with higher rates in the favor of the use of additional SB (OR of 2.37; 95% CI, [0.000;0.026]; P = 0.006). Whereas at the second intervention for recidival, no significant difference was shown in the success proportions between the two treatment groups (OR of 4.35; 95% CI, [0.000;0.011]; P = 0.094). Only 2 patients required 4 interventions before the final success. Baseline demographics, including mean age and gender did not differ between the PPV–SB and PPV-alone groups (Table 1). Mean age of patients in the PPV group was 69.365 years whilst that of patients in the PPV+SB group was 69.943 years (95%CI, [-2,723; 1,566]; P = 0.597). Mean age of recidival patients of the PPV group was 69.755 years while that of recidival patients of the PPV+SB group was 73.696, (95% CI [-3,702; 11,586]; P = 0.312).

	PPV+SB (n = 128)	PPV (n = 294)	P (Method)
Mean age \pm SD (range), years	69.943 \pm 10.346 (41; 90.42)	69.365 \pm 10.191 (33.33; 94.58)	0.597 (Z)
Mean age of Male	69.342 \pm 10.575 (41; 90.42)	68,222 \pm 9,641 (33.33; 91.17)	0.399 (Z)
Mean age of Female	71,267 \pm 9.692 (48.25; 89,670)	71,684 \pm 10,864 (45.17; 94.58)	0.827 (Z)
Mean age resections \pm SD (range), years	73.696 \pm 9.549 (58.83; 88.75)	69.755 \pm 9.350 (46.92; 94.58)	0.312 (Z)
Male, n (%)	88 (68.75)	197 (67.01)	0.75 (Z)
Female, n (%)	40 (31.25)	97 (32.99)	0.698 (Z)

Table 1: Characteristics of Study Patients. 6 patients of the PPV group were excluded for all their characteristics weren't available in our database. (Z) = test z/test bilatéral

Other data like duration of symptoms, axial length, average number of breaks, number of inferior breaks and average clock hours detached were not examined in our study, because we expected no significant difference between both groups, as vigorously supported by a previous study of Kinori, *et al* [3].

Discussion

A number of retrospective studies have also evaluated ideal surgical management of RRDs and results have been conflicting. One study found no difference in anatomical success between PPV and the PPV+SB for pseudophakic eyes [1-3]. One large retrospective study of 7,678 cases found that in uncomplicated RRDs of pseudophakic eyes, the surgeon should balance the risks and benefits of vitrectomy versus SB, as eyes treated with PPV alone had a bit higher rates of anatomical success than those treated with simultaneous PPV-SB [4]. Another study showed a preference for adding SB in the treatment of pseudophakic eyes with high risk of PVR [5]. However, our data suggest that a supplemental buckle can be helpful to treat less to moderate risky pseudophakic eyes. There was a significant trend toward PPV-SB having superior surgical success compared with PPV alone.

PPV and SB both showed success rate higher than 85%. We had 86,33% of surgical reattachment rates with PPV versus 93,75% with additive SB while all patients were reattached within 1 year of follow-up.

The reason for our differing results is unclear. Recidival retinal detachments that underwent PPV+SB belonged all to male patients except for 1 female patient (Table 1). Although we had more success anatomical rate with PPV/SB comparing to PPV alone, we didn't investigate post-operative complications. Weichel, *et al.* [1] compared PPV alone with combined PPV+SB in the repairing of pseudophakic RRD. Their study demonstrated a single surgery anatomical success rate of 92% for the PPV group and 94% for the combined treatment group. Shaal, *et al.* found 86% of anatomical success rate with SB alone, vs 90% with PPV vs 94% with PPV/SB [2]. However this procedure took almost twice as long as scleral buckling or vitrectomy alone and there were increased postoperative complications in the SB/PPV group, including diplopia, epiretinal membrane, and cystoid macular edema [1,2].

Our study didn't consider too the differences in individual risk categories such as the association of retinal detachment with macular hole. In the investigation of recidival occurrences, we neglected the effect of lens status and the effect of the type of gas placement and tear location based on the accuracy of previously reported literature where subset analysis revealed no statistically significant difference in outcomes between the treatment groups [5,6]. Also, there was no difference based on gauge surgery whether 20 G or smaller-gauge was applied as shown in previous studies [6-9]. As the mean improve in vision was similar between both groups in numerous previous studies [5,6] and as Devin, *et al.* acknowledge BCVA evolution may present no statistical difference, we deliberately omitted to study BCVA outcomes. Patient age and gender did not significantly affect SSAS score or retinal redetachment for the two surgery groups (Table 1). However, Storey, *et al.* showed that patient age at high risk of proliferative vitreoretinopathy had an effect on anatomical outcomes of the surgical procedures. There was more success rate for PPV-SB for patients younger than 65 years compared with PPV alone 5. Surgeons in our study may have used SB for longer duration and/or wider extent retinal detachment cases and for younger patients, resulting in the appearance of SB being associated with higher anatomic success rates.

Results of previous randomized trial comparing PPV alone vs SB alone suggested that primary PPV offers potential advantages over SB surgery in the treatment of pseudophakic RD, including less operating time, accurate diagnosis of breaks, higher reattachment rate with a single surgery, and no postoperative axial length changes, though the number of reoperations and the final reattachment rate did not differ in a statistically significant fashion between the two groups [10]. Miller, *et al.* [11] reported that the single operation anatomical success rate is comparable with rates reported for primary vitrectomy with 20-gauge instrumentation, scleral buckling, and combined vitrectomy/scleral buckling.

Numerous other authors have questioned the need for combined surgery for RRD involving inferior breaks [3-7] but evidences for the addition of an encircling buckle to improve the success rates are still not clear. In fact the location of retinal breaks can have an impact of anatomical success rate for RRD repair. The presence of an inferior break enhances the failure rate of the operation. Therefore, adding a SB can be sometimes required, in spite of its controversial effects regarding the increased surgery time and the increased risk of choroidal hemorrhage. It is possible that an encircling band can help support small retinal breaks not easily visualized and thus prevent further detachment. Although smaller-gauge vitrectomy instruments has offer advantages, such as improved fluidics, cut rates, smaller cutter diameters, faster wound healing, diminished conjunctival scarring, and improved patient comfort [9], a potential disadvantage includes wound leak resulting in poor gas or oil tamponade fill and lower SSAS.

The strength of this study is the intervention of numerous highly qualified and experienced retina surgeons - which reduces the bias failure rate outcome intra-operatively - across a single large population study within 6 months to 3 years follow up for recidivism. Analysis was also carried out per surgeon, no statistical difference was shown between them ($P = 0.392$ with Kruskal-Wallis Test and $P = 0.749$ with Steel-Dwass-Critchlow-Fligner/bilateral test for both PPV and PPV+SB groups). Our study excluded patients with follow-up inferior of 6 months. Mansouri, *et al.* [8] required a minimum follow-up of 1 month and found that the average time to redetachment was 45 days in the PPV/SB group and 35 days in the PPV group. Additionally, Kinori, *et al.* [3] defined primary failure as redetachment observed within 8 weeks from the surgical procedure. Thus, our minimum follow up is yet stricter and reduces the bias of RD reoccurrence due to unpredictable operative subventions.

Improving the success of RRDs remains an active area of research and the adjuvant use of an encircling SB to PPV may offer potential advantages to PPV alone. Although the choice of the surgery goes back to the comfort of the surgeon and its preference towards a surgery over another, our study advances an exceptional importance to SB in the treatment of retinal detachments and its need has to be evaluated in a personalized manner taking in consideration its advantages and inconvenients.

Conclusion

Adjunction of SB to PPV may indeed lead to significantly higher anatomic success rates when compared to PPV alone in pseudophakic eyes.

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