The Evaluation of Scleral Buckling and Pars Plana Vitrectomy in the Management of Primary Rhegmatogenous Retinal Detachment

Regmatojen Retina Dekolmanı Tedavisinde Skleral Çökertme ve Pars Plana Vitrektomi Sonuçlarının Değerlendirilmesi

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SUMMARY

Purpose: To evaluate the results of scleral buckling (SB) and pars plana vitrectomy (PPV) surgeries for the treatment of rhegmatogenous retinal detachment.

Materials and Methods: This study included cases who received surgical treatment due to primary rhegmatogenous retinal detachment in our clinic, between March 2003 and April 2014. According to surgery techniques, the cases were evaluated retrospectively and divided into two groups as SB and PPV. The groups were evaluated for anatomical and functional success and complications.

Results: Single-surgery anatomic success was achieved in 48 of 52 (94%) eyes that underwent PPV and in 42 of 52 (80%) eyes that underwent SB (p=0.085).

The mean VA improvement in the PPV group was significantly better than in the SB group (PPV, 1.196 logMAR (11 standard ETDRS line); SB, 0.155 logMAR (1.5 standard ETRDS line)) (p<0.001). Subfoveal perfluorocarbon liquid retention was observed in two eyes in the PPV group. Conjunctival pyogenic granuloma occured in one eye in the SB group. Endophthalmitis was not observed in any patient in both groups .

Conclusion: Although both surgical methods seems to be efficient treatment modalities for primary regmatogenous retinal detachment, better anatomical outcomes were achieved with PPV. In addition, complication types are different due to different surgical procedures and adjunctive tamponade, scleral buckling elements and perfluorocarbon use.

Key Words: Retinal detachment, pars plana vitrectomy, scleral buckling.

ÖZ

Amaç: Regmatojen retina dekolmanı tedavisinde skleral çökertme (SÇ) ve pars plana vitrektomi (PPV) sonuçlarının değerlendirilmesi

Gereç ve Yöntem: Mart 2003-Nisan 2014 tarihleri arasında regmatojen retina dekolmanı tanısı ile kliniğimizde opere edilen olgular çalışmaya dahil edildi. Olgular geriye dönük olarak incelendi. Operasyon tekniğine göre; SÇ, ve PPV uygulanan olgular iki gruba ayrıldı. Gruplar anatomik başarı, fonksiyonel başarı ve komplikasyonlar açısından değerlendirildi.

Bulgular: Pars plana vitrektomi uygulanan 52 gözün 48'sinde (%94), SÇ uygulanan 52 gözün 42'sinde(%80) tek cerrahi girişim ile anatomik başarı sağlandı (p=0.085). Ortalama görme keskinliği artışı PPV grubunda SÇ grubuna göre belirgin olarak daha yüksek izlendi (PPV, 1.196 logMAR (11 standart ETDRS sırası); SÇ, 0.155 logMAR (1.5 standart ETRDS sırası), (p<0.001). Pars plana vitrektomi grubunda iki hastada fovea altında perflorokarbon sıvısı gözlenirken SÇ grubunda bir hastada pyojenik granülom gözlendi. Her iki grupta da endoftalmi gözlenmedi.

Sonuç: Her iki cerrahi teknikte yırtıklı retina dekolmanı tedavisinde etkili olmasına rağmen pars plana vitrektomi ile daha yüksek anatomik başarı elde edildi. Bununla birlikte tercih edilen cerrahi yöntem, kullanılan tamponad, çökertme materyali ve perflorokarbon sıvısına bağlı olarak farklı komplikasyonlar izlenebilmektedir.

Anahtar Kelimeler: Retina dekolmanı, skleral çökertme, pars plana vitrektomi.

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Geliş Tarihi - Received: 30.04.2015
Kabul Tarihi - Accepted: 01.08.2015
Ret-Vit 2016;24:41-44

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INTRODUCTION

Retinal detachment occurs as a result of separation of the neurosensory retina from the retinal pigment epithelium. Rhegmatogenous retinal detachment (RRD) is characterized by a breach in the neurosensory retina with seepage of fluid into the subretinal space and is the most common cause of retinal detachment. Scleral buckling, pars plana vitrectomy, and pneumatic retinopexy techniques used alone or in combination are current available options for the management of retinal detachment. Although each technique has potential benefits and disadvantages, there is no consensus on the best surgical approach for the management of uncomplicated RRD.

Historically, SB has been the method preferred over PPV in the repair of phakic RRD in order to avoid the high incidence of post-PPV cataract formation. However, a significant number of vitreoretinal surgeons seem to be moving away from primary scleral buckling toward PPV.

The avoidance of the potential complications of SB, including postoperative myopic shift, epiretinal membrane formation, diplopia, choroidal detachment, eyelid malpositions, and buckle extrusions may be the main reason for this shift.[1-5] On the other hand, cataract formation after vitrectomy can be managed with a very high success rate and short operating time using modern phacoemulsification technology.

We conducted a retrospective, comparative case series evaluating PPV versus SB for the primary repair of uncomplicated phakic and pseudophakic RRD.

MATERIAL AND METHODS

This study was a retrospective observational case series.. The medical records of all patients who were diagnosed with primary RRD at the Celal Bayar University (CBU), Izmir, Turkey, between 2003 and 2014 were reviewed.

According to surgery techniques, the cases were divided into two groups as SB and PPV. The decision to use one technique versus the other was made at surgeon's discretion on a case-by-case basis. Patients with posterior retinal tears, vitreous hemorrhage and grade A proliferative vitreoretinopathy (PVR) underwent PPV.

We excluded patients with any of the following characteristics: retinal tear longer than 3 clock hours, PVR of grade B or worse, combined tractional and rhegmatogenous detachment, prior history of RRD repair by any method in the study eye, ocular surgery of any kind within 3 months prior to RRD repair, documented follow-up of fewer than 3 months or preexisting macular disease, age below 18.

For scleral buckling surgery (SB), silicone sponges and⁄or encircling bands were used according to surgeon's preferences. Primary vitrectomy (PV) was performed as standard 3 port pars plana vitrectomy with sulfur hexafluoride, perfluoropropane or silicone oil endotamponade and cryopexy or endolaser for retinopexy.

Single-surgery anatomic success rate was defined as stable retinal reattachment throughout the entire follow-up period after just one surgery. Silicone removal was not considered an additional surgical intervention for retinal detachment repair. Single-surgery anatomic success rate, visual acuity (VA) improvement, and incidence of postoperative complication were recorded.

Statistical analysis was performed with SPSS software (SPSS 18.0). We compared preoperative and postoperative BCVA and the mean VA improvement between the groups using the Mann–Whitney U test. The two-tailed Fisher exact test and Chi-square test was used to compare baseline characteristics and to calculate differences in anatomic outcomes between the groups. A p value less than 0.05 was considered to be significant.

RESULTS

Preoperative characteristics of patients in the both surgical grous are shown in Table 1. The mean age of scleral buckling and PPV groups was 50.54±18.27 and 55.98±15.21 years respectively (p=0.107). The 104 eligible patients were considered in two groups: PPV (n=52) and SB (n=52). Mean overall follow-up was 10.2 months (range=3 to 48). There were significant differences in symptom duration, preoperative BCVA and location of RD between the PPV and SB groups (p<0.001). Age, gender, lens status, mean number of breaks, location of breaks, involvement of macula showed no significant differences between the two groups(p>0.05).

Postoperative characteristics of patients at 3th month in the both surgical groups are shown in Table 2. Although there was significant difference in preoperative BCVA between the groups (PPV, 2.29±0.10 logarithm of the minimum angle of resolution [logMAR]; SB, 1.01±0.92 logMAR, (p<0.001)), no statistically significant difference in postoperative BCVA between the groups (PPV, 1.09±0.78 logMAR; SB, 0.86±0.72, (p=0.141) was found. However, the mean VA improvement in the PPV group was significantly better than in the SB group (PPV, 1.196 logMAR (=1.1 standard ETDRS line); SB, 0.155 logMAR (=1.5 standard ETRDS line), (p<0.001).

Even though single-surgery reattachment rate was higher in PPV group compared to that in SB group, this difference was not statistically significant (p=0.085).

Table 1: *Baseline characteristics of both surgical groups.*

Variable	PPV (n=52 eyes)	SB (n=52 eyes)	p Value
Mean age±SD (years)	55.98±15.21	50.54±18.27	p=0.107
Males	31	31	p=1
Mean symptom duration (days)	20.33±18.47	14.92±23.29	*p=0.013
Preoperative BCVA(logMAR)	2.29±0.10	1.01±0.92	*p<0.001
Location of RD Total	23	8	*p=0.002
Superior	16	28	*p=0.02
Inferior	13	16	*p=0.6
Macula-off RD	35	26	p=0.6
Mean no. of breaks	0.98±0.61	0.9±0.74	p=0.351
Phakic	28	35	p=0.16

BCVA; Best-Corrected Visual Acuity, logMAR, logarithm of the Minimal Angle of Resolution, PPV; Pars Plana Vitrectomy, SB; Scleral Buckle, PVR; Proliferative Vitreoretinopathy, VA; Visual Acuity.
* Statistically significant differences.

Postoperative patient characteristics are shown in table 2. Redetachment rate in SB group was higher than PPV group (8.6% for SB vs. 2% for PPV). However this difference was not statistically significant (p=0.195). Cataract developed during follow up period in 8 of 28 phakic eyes in the PPV group, whereas it developed in 2 of 35 phakic eyes in the SB group (p=0.016). Postoperative glaucoma occured in six of 52 (11%) eyes in the PPV group and none of the eyes in the SB group (p=0.027). Differences in development of postoperative PVR and retinal redetachment were not statistically significant between the PPV and SB groups (p>0.05).

Subfoveal perfluorocarbon liquid retention was observed in two eyes in the PPV group. Conjunctival pyogenic granuloma occured in one eye in the SB group. Endophthalmitis was not observed in any patients in both groups.

DISCUSSION

Traditionally, SB was considered the procedure of choice for primary RD. Scleral buckling is the most well-established technique, and has the longest published follow-up data.[6] In recent years, the choice of surgical technique for the treatment of medium-complexity rhegmatogenous RD shifted more and more towards PPV.[7,8] Several retrospective and prospective clinical trials comparing SB, PPV and/or combined SB/PPV have appeared in the past few years. The majority of these series found no statistically significant difference in single-surgery anatomic success rate among the various procedures.[9-15] It has been reported that, single-surgery anatomic success rates were between 63% and 95% in PPV group, and 68% and 98% in SB group.[16] In our study, single-surgery anatomic success rates were 94% in the PPV group and 80% in the SB group.

SB has a high single-surgery anatomic success rate and is considered for many primary retinal detachments, except cases with very posterior breaks and cases in which placing the buckling elements is technically difficult, such as eyes with thin sclera, prior strabismus surgery, glaucoma drainage devices, etc. Additional relative contraindications to SB alone (without PPV) include giant retinal tear, proliferative vitreoretinopathy (PVR) grade C, and significant vitreous opacity or hemorrhage.[16]

Table 2: *Postoperative characteristics of patients at 3th month in the both surgical groups.*

Variable	PPV	SB	p Value
Single-surgery reattachment, no. (%)	48 (94%)	42 (80%)	p=0.085
Postoperative BCVA(logMAR)	1.09±0.78	0.86±0.72	p=0.141
Mean VA improvement (logMAR)	1.196	0.155	p<0.001
Redetachment no.(%)	1/49	4/46	p=0.195
Postoperative glaucoma	6 (11%)	0	p=0.027
Cataract development	8/28 (28%)	2/35 (5%)	p=0.016
Subfoveal Perfluorocarbon	2 (3%)	0	p=0.495

LogMAR; logarithm of the Minimal Angle of Resolution, PPV; Pars Plana Vitrectomy, SB; Scleral Buckle, PVR; Proliferative Vitreoretinopathy, VA; Visual Acuity.

However, in the SB surgery, the SRF is usually not drained. Huang et al reported that subretinal fluids could persist for a relatively longer period after scleral buckling.[17]

Pars plana vitrectomy allows for more controlled drainage of subretinal fluid, either with perfluorocarbon liquids or internal drainage techniques.[18] This may achieve complete intraoperative retinal attachment without the risk of hemorrhage or retinal incarceration inherent in external drainage procedures.

One meta-analysis of 29 published studies of pseudophakic RD reported that PPV were associated with higher single-surgery anatomic success rate and better visual acuity outcomes than was SB alone.[19] However, another review of 9 published studies comparing PPV to SB found no statistically significant differences with respect to single-surgery anatomic success rate or visual results.[20] Based on our results, the mean VA improvement was significantly greater in PPV group compared to that in SB group. Because of fact that, patients in PPV group had worse baseline visual acuity, and total retinal detachment was observed more frequently in the PPV group.

Various complications such as new retinal breaks, cataract formation, and intraocular pressure elevation may also occur with SB and PPV for primary retinal detachment.[21-23] In PPV, if perfluorocarbon liquids are used, they may be retained in the vitreous cavity or subretinal space.[23,24] Subretinal perfluorocarbon drops were observed in two patient in PPV group. One of these patient reoperated to remove the subretinal PFC liquid was injected with an infusion liquid using a 38G cannula from the perifoveal area; liquid and decalin droplets were re-aspired using a flute cannula. There were no PFCL droplets in the control examination. Visual acuity, which was 0.2 pre-operatively, increased to 0.3 post-operatively, but the patient had a metamorphopsia complaint. The second patient was followed up without surgery, had a visual acuity of 0.2, and a central scotoma was present in the upper nasal part of the visual field.

In the PPV group, postoperative glaucoma occured in six eyes operated by using slicone oil, and treated with antiglaucomatous medication in 5 of 6 eyes but bullous keratopathy occured in one eye. Conjunctival pyogenic granuloma occured in one eye in the SB group, and for treatment, removal of surgical material and surgical excision of granuloma were sufficient.

The limitations of our study were the small sample size and lack of phakic and pseudophakic subgroups. Additionally, further follow-up is needed to observe the changes of postoperative VA and to determine the long-term complications, such as redetachment of the retina.

In conclusion, pars plana vitrectomy and scleral buckling provide effective treatments for primary retinal detachments. Each procedure has different complication types and should be chosen according to surgeons experience and patients' needs.

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