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Morphological and functional outcome of scleral buckling surgery compared to primary vitrectomy in patients with retinal detachment

Morfološki i funkcionalni ishod klasične hirurške metode u odnosu na *pars plana* vitrektomiju kod bolesnika sa ablacijom retine

Miroslav Stamenković*, Ivan Stefanović†, Ivan Senćanić*, Vesna Jakšić*†, Milka Mavija‡, Siniša Babović*

***Eye Clinic, Clinical Center Zvezdara, Belgrade, Serbia; †Faculty of Medicine, University of Belgrade, Serbia; ‡University Eye Clinic, Banjaluka, Republic of Srpska, Bosnia and Herzegovina**

Abstract

Background/Aim. Among the proposed operative techniques for retinal detachment (RD) the most commonly applied are classical method with scleral buckling and *pars plana* vitrectomy (PPV). The aim of this paper was to determine which surgical intervention of these two leads to better morphological results in terms of the applied retina and better functional outcomes in terms of visual acuity (VA) of the operated eye in patients with RD. **Methods.** A retrospective study on the comparative section of the effects of scleral buckling surgery and PPV in uncomplicated rhegmatogenous RD was performed. In a 2-year period 97 patients, i.e. 98 eyes with RD were operated on (68 eyes with scleral buckling surgery *vs* 30 by PPV). **Results.** In the group with classically operated detachment, the retina was applied in 52 (76.5%) cases *vs* 30 (100%) patients in PPV group ($p < 0.05$). Postoperative VA in logMAR was significantly better in both groups compared to preoperative VA: in the classically operated was 1.89 ± 1.04 preoperatively *vs* 0.98 ± 0.70 postoperatively, while in the PPV group, preoperative value was 2.56 ± 0.67 *vs* 1.31 ± 0.74 postoperatively (p = 0.001). **Conclusion.** PPV in uncomplicated forms of RD gives better anatomical results than scleral buckling surgery. VA was significantly improved in both observed groups, while its mean value was postoperatively better in the group that was operated with the classical method. The reason for this could be due to better VA in baseline in the scleral buckling surgery group.

Key words:
retinal detachment; scleral buckling; vitrectomy; visual acuty; treatment outcome.

Apstrakt

Uvod/Cilj. Najčešće hirurške metode rešavanja ablacije retine su klasična metoda sa serklažom i *pars plana* vitrektomija (PPV). Cilj ovog rada bio je da se utvrdi koja od navedenih hirurških tehnika ima bolje morfološke (u smislu naleganja retine) i funkcionalne rezultate (vidna oštrina). **Metode.** Ova retrospektivna studija sprovedena je tokom dve godine na ukupno 98 očiju kod 97 bolesnika sa regmatogenom ablacijom retine koji su operisani ili klasičnom metodom sa serklažom (68 očiju) ili PPV metodom (30 očiju). **Rezultati.** U grupi bolesnika operisanih klasičnom metodom, retina je nalegla kod 52 (76,5%) oka *vs* 30 (100%) oka operisana PPV ($p < 0,05$). Postoperativna VA (u logMAR) bila je značajno bolja kod obe grupe u odnosu na preoperativne vrednosti: kod klasične metode preoperativna VA iznosila je1,89 ± 1,04 *vs* postoperativno 0,98 ± 0,70. U PPV grupi, preoperativna VA iznosila je 2,56 ± 0,67 *vs* 1.31 ± 0.74 postoperativno ($p = 0.001$). **Zaključak.** PPV kod nekomplikovanih regmatogenih ablacija retine daje bolje anatomske i morfološke rezultate nego klasična operacija sa serklažom. Vidna oštrina je postoperativno bila bolja u obe grupe, ali je srednja vrednost vidne oštrine bila bolja u grupi operisanoj klasičnom metodom, verovatno zato što je PPV grupa imala lošiju inicijalnu vidnu oštrinu.

Ključne reči:
retina, ablacija; vitrektomija; serklaž vitrektomija; vid, oštrina; lečenje, ishod.

Introduction

Despite the continual improvement of surgical techniques applied, retinal detachment (RD) remains an ocular condition that results in a loss or reduction of visual acuity (VA). Among the proposed operative techniques for RD, the most commonly applied are classical method with scleral buckling and *pars plana* vitrectomy (PPV).

Correspondence to: Vesna Jakšić, Eye Clinic, Clinical Center Zvezdara, D. Tucovića 161, 11 000 Belgrade, Serbia.
Phones: +381 11 3810 367, +381 63 8005544. E mail: vjaksic@vektor.net

Classic surgery with scleral buckling is considered to be an effective method for solving uncomplicated rhegmatogenous retinal detachment. It is known, however, that this surgical method is a subject to a number of operative and postoperative complications such as: intrusion, extrusion and implant infection, ocular motility disorder, change of refraction, anterior segment ischemia, macular distortion and cystoid macular edema [1–4]. During external drainage of subretinal fluid the following may occur: subretinal hemorrhage, retinal incarceration or rupture of the retina.

Primary PPV is an alternative to classical surgery. A direct access to the vitreous traction using microsurgical instruments could produce better results with fewer complications. Results in the literature about possible advantages of a primary vitrectomy over the traditional surgery of retinal detachment are controversial. There are papers that report better anatomical and functional results of PPV compared to scleral buckling surgery [5–7], but a number of authors do not find advantages of PPV in uncomplicated rhegmatogenous retinal detachment over classical operation [8–11].

The aim of this paper was to determine which surgical intervention of these two has better morphological results in terms of the applied retina and better functional outcome in terms of VA of the operated eye in the patients with uncomplicated rhegmatogenous RD.

Methods

This retrospective study on the comparative section of the effects of scleral buckling surgery with PPV in uncomplicated rhegmatogenous retinal detachment was conducted at the University Eye Clinic"Prof. Dr. Ivan Stankovic" of the Clinical Hospital Center "Zvezdara". In a 2-year period (January 2010–December 2011) there were 97 patients, i.e. 98 eyes with RD operated on. The analysis did not include eyes with vitreous hemorrhage, proliferative vitreoretinopathy (PVR) in a more distinct stadium (stadium PVR $\geq$ C), with non-rhegmatogenous retinal detachment, traumatic detachment and previously operated eyes. All operations were performed under local peribulbar anesthesia by the some surgeon. In a classical technique 2 mm scleral buckling and 5.5 mm stopping were used. External drainage of subretinal fluid was performed in all cases, while a gas sulfur hexafluoride (SF6) was installed intravitreally when it was necessary. Primary three-port PPV was performed by releasing vitreous traction around the rupture and removing of the front vitreous by scleral indentation. An internal drainage of subretinal fluid was performed through a rupture or retinotomy as well as retinopeksy using endolaser photocoagulation. Tamponade was performed with silicone oil, for the cases with retinal rupture in three and more quadrants, and gas. The patients with gas installed were ordered positioning of the head in the first 24 hours after the surgery. All the patients underwent the same postoperative local therapy consisted of antibiotics, corticosteroids and cycloplegics for 1–2 months. Postoperative controls were carried out on a daily basis the first 7 days, then after 1, 3 and 6 months following the surgery. The following data were collected: age and sex of patients, right/left eye, lens status (phakia, aphakia, pseudophakia), refraction (emetropia, myopia/hyperopia < 5 and $\geq$ 5 dioptre), localization and number of retinal ruptures, undetected retinal ruptures, localization and size of retinal detachment, the presence of proliferative vitreoretinopathy, affected or unaffected macula, morphological outcome i.e. applied retina, best corrected visual acuity before and after the surgery. Visual acuity was presented from the Snellen chart to the LogMAR chart (logarithm of the minimal resolution angle) in a way that the mark 0 in the LogMAR chart is equivalent to the VA of 1.0 in the Snellen chart, while +1.0 is equivalent to the VA of 0.1 in the Snellen. Counting fingers before the eye corresponds to the value of +2.0 LogMAR, while hand moving in front of the eye is marked by + 3.0 LogMAR.

Data were analyzed by descriptive statistical methods and statistical tests (*t*-test, χ^2-square test, Fisher exact probability test, and Wilcox on matched- pairs test), with a *p* value equal or less than 0.05 (two-sided) considered to indicate statistical significance.

Results

During the observed 2-year period 98 eyes with retinal detachment were operated on. In 68 (69%) eyes retinal detachment was operated by the classic method and these cases were considered as the first group of examinees. In 30 (31%) eyes retinal detachment was operated with PPV method and these cases accounted for the second group of examinees. Clinical characteristics of the patients are shown in Table 1. Two groups of patients were not differentiated by the age and gender. The right eye was statistically more frequently surgically treated classic method than by PPV ($p < 0.05$). Clinical status of lens did not differ in the two groups. Namely, in the group with classical surgery there were 51 (75%) phakic eyes versus about 23 (76.6%) phakic eyes with PPV. There was no significant difference between the groups regarding lens status ($p = 0.90$). Preoperative refraction could be determined in only 47 (69.1%) eyes in the first group and in 16 (53%) eyes in the second group. Emetropia was demonstrated in 7 cases in the first group *vs* 4 cases in the PPV group, hyperopia in 14 cases in the first group *vs* 4 cases in the PPV group, myopia > -5 dioptre in 11 cases in the first group *vs* 4 cases in the PPV group, and myopia $\leq$ 5 dioptre in 15 casesin the first group *vs* 4 in the PPV group.

Regarding the presence of retinal rupture, 48 (83.33%) cases in the first group and 18 (72.2%) in the second group demonstrated it. In vitrectomised eyes giant ruptures were more represented than in the eyes operated on with classical method. The two groups did not differ statistically regarding the localization of ruptures (p = 0.82), but they differed regarding the involvement of the macula with detachment ($p = 0.05$). In the first group detachment mostly affected two quadrants of the retina in 28 (41%) eyes, while in the second group it was mostly registered that four quadrants of retina were affected by detachment, in 19 (63%) eyes.

Anatomical success differed statistically between the two groups (Table 2). In the group with classically operated

Table 1

Epidemiologic and clinical data about the patients with retinal detachment

Parameter	Scleral buckling surgery	*Pars plana* vitrectomy	*p*
Number of patients, n (%)	68 (69)	30 (31)	
Age of patients (years), $\bar{x} \pm SD$	56.9 ± 10.5	57.9 ± 16.9	0.78
Sex, n (%)			
male	39 (57)	20 (67)	0.52
women	29 (43)	10 (33)	
Eye with retinal detachment, n (%)			
right	48 (71)	14 (46)	0.04
left	20 (39)	16 (54)	
Lens status, n (%)			
phacic	51 (75)	23 (77)	0.90
aphakia/pseudophakia	17 (25)	7 (23)	
Refraction, n (%)			
unknown	21 (31)	14 (46)	
emetropia	7 (10)	4 (13.5)	
myopia < 5D	15 (22)	4 (13.5)	
myopia ≥ 5D	11 (16)	4 (13.5)	
hyperopia	14 (21)	4 (13.5)	
Retinal rupture, n (%)			
0	20 (29)	12 (40)	
1	40 (58)	13 (43)	
2	7 (10)	3 (10)	
≥ 3	1 (3)	2 (7)	
Retinal rupture localization, n (%)			
superior	33 (70)	12 (67)	
inferior	13 (28)	5 (28)	0.82
giant rupture	2 (2)	6 (5)	
Macular involvement, n (%)			
yes	34 (50)	22 (73)	
no	34 (50)	8 (27)	
Retinal detachment localization, n (%)			
superior	17 (25)	3 (10)	
inferior	19 (28)	4 (13)	
superior and inferior	32 (47)	23 (77)	
Retinal detachment size, n (%)			
1 quadrant	12 (18)	1 (3)	
2 quadrants	28 (41)	7 (24)	
3 quadrants	17 (25)	3 (10)	
4 quadrants	11 (17)	19 (63)	

Table 2

Morphologic and functional outcome of different surgery methods in the patients with retinal detachment

Outcome of retinal detachment surgery	Scleral buckling surgery (n = 68)	*Pars plana* vitrectomy (n = 30)	*p*
Morphologic outcome, n (%)			
retina attached	52 (76.5)	30 (100)	0.006
re-detached retina	16 (23.5)	0 (0)	
Functional outcome (log MAR), $\bar{x} \pm SD$			
preoperative VA	1.89 ± 1.04	2.56 ± 0.67	0.001
postoperative VA	0.98 ± 0.70	1.31 ± 0.74	0.04

VA – visual acuity.

detachment, the retina was applied in 52 (76.5%) cases, while in the other group with performed vitrectomy the retina was applied in all 30 (100%) of the patients ($p < 0.01$).

Compared groups regarding the preoperative and postoperative VA, the mean value of VA (expressed as log MAR), was significantly better postoperatively than preoperatively ($p = 0.0001$) as shown in Table 2. The mean VA was higher in the scleral buckling surgery group but, however, it should be noted that the initial VA was worse in the PPV group.

Discussion

The goal of retinal detachment surgery is closure of retinal ruptures and release of vitreous traction on the retina. Classic surgery leads to release of the radial vitreous traction and bringing the retina into closer contact with the retinal pigment epithelium. Most retinal detachments can be favorably solved with this surgical method. The exceptions are patients with posterior ruptures and giant ruptures of the retina as well as patients facing technical difficulties fraught with scleral buckling

placement (patients with thin sclera, with previous strabismus surgery, glaucoma patients with drainage implants, etc.). Favorable results are achieved also with PPV that enables instrumental release of vitreous traction, gas instillation and internal subretinal fluid drainage in order to achieve the attached retina at the operating table itself. After primary PPV tamponade by intraocular gas and head positioning are always performed [12]. It is known that PPV increases the risk of developing cataracts and increased intraocular pressure (IOP). For these reasons, PPV is traditionally considered the second therapeutic option for resolution of primary RD, especially in cases with inferior ruptures. The exceptions to this are RD with giant ruptures where PPV is recommended as the first surgical procedure or PPV combined with scleral buckling. However, as reported by a number of authors, PPV gives good results if applied as the first surgical method for solving retinal detachment, too [7, 13, 14]. This is especially valid for patients with pseudophakia [12, 13]. According to de la Rúa et al. [15], scleral buckling surgery increases the risk of PVR, especially in pseudophakic eyes. The study of Heimann et al. [16] shows a benefit of scleral buckling in phakic eyes with respect to BCVA improvement. For pseudophacic patients, from the point of anatomical outcome, Heiman et al. [16] recommend PPV. Also, in the second study, the same authors analyzed the influence of the surgeon on anatomical and functional outcome ant they state that there is a statistically significant correlation between the surgeon and functional success in phakic group who underwent RD surgery while anatomic outcomes in both subgroups of phakic and pseudophakic patients showed no statistically significant correlation between surgeon and anatomic success [17].

By retrospective analysis of our results we find that the functional outcome of operation of retinal detachment performed in two methods differs. Namely, VA was significantly improved in both groups observed, while its average value was postoperatively better in the group operated with the classical method. The reason for this result may lie in the fact that the average preoperative VA was better in the group of classically operated detachment. Achieved functional improvement agrees with the results of recent retrospective studies [4, 5, 18]. Thus, a better anatomical success was achieved with primary vitrectomy than with classic retinal detachment surgery. This result agrees with the announcement of Azad et al. [19] and differs from some studies that reported failure of primary vitrectomy in 8% to 20% cases [4, 5] The difference is probably attributable to the advanced PVR changes in their cases. One of the arguments in favor of primary vitrectomy for rhegmatogenous retinal detachment was also faster eyesight recovery [4]. The argument against it could be the development of cataracts as a complication of primary vitrectomy [4, 5].

Conclusion

Classical operation with scleral buckling is a surgical procedure suitable for solving primary uncomplicated rhegmatogenous retinal detachment with transparent optical media that allows good visualization of the ocular fundus. *Pars plana* vitrectomy as primary operation of uncomplicated forms of rhegmatogenous retinal detachment, gives good anatomical and functional results. Bearing in mind cataract development, however, and increased intraocular preasure in some cases as a complication, it is reserved for retinal detachment with giant ruptures, posterior ruptures, as well as for redetachments after scleral buckling surgery.

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