25 Gauge and 23 Gauge Vitrectomy for the Primary Repair of Rhegmatogenous Retinal Detachment

Regmetojen Retina Dekolmanı Primer Onarımında 23 Gauge ve 25 Gauge Vitrektomi Sonuçları

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ABSTRACT

Purpose: To compare the anatomical and visual outcomes, intraoperative and postoperative complications of 25 gauge (G) and 23 G transconjunctival vitrectomy system for the primary repair of rhegmatogenous retinal detachment.

Materials and Methods: Retrospective comparative analysis of 149 consecutive eyes from 149 patients undergoing pars plana vitrectomy. Nineteen patients, who did not satisfy the inclusion criteria, were excluded from the study. Sixty-one patients underwent 23 G patients and 69 patients underwent 25 G vitrectomy. The outcome measures were the retina re-attachment rates, peroperative and postoperative complications, and postoperative visual acuity.

Results: Demographic and preoperative ocular characteristics were similar in both groups. Single operation success rates were 94.2% for 25 G cases and 88.5% for 23 G cases (p=0.246). Intraoperative iatrogenic retinal break rates were higher in 23 G group (p=0.041), and sutured sclerotomies were more common with 23 G system (p=0.001). Postoperative hypotony occured in four patients in both groups (p=0.85). We observed postoperative macular hole in one and subretinal perfluorocarbon liquid in one eye in 25 G group. One patient in 23 G had endophthalmitis, which was the only case in both groups.

Conclusion: Both 23 G and 25 G systems are suitable, effective and safe surgical approaches for primary repair of RRD. Surgical outcomes and anatomical and functional results were similar in 25 G and 23 G groups. Minor differences between groups were the higher incidence of intraoperative retinal breaks and suturing sclerotomy sites with 23 gauge system.

Key Words: Vitrectomy, 25 gauge, 23 gauge, retinal detachment, retina.

ÖZ

Amaç: Regmatojen retina dekolmanının primer tamirinde 23 ve 25 gauge (G) transkonjonktival vitrektomi cerrahilerinin anatomik ve görsel sonuçlarını, intraoperatif ve postoperatif komplikasyonlarını karşılaştırmak.

Gereç ve Yöntem: Pars plana vitrektomi yapılan 149 hastanın 149 gözü retrospektif olarak karşılaştırıldı. Kriterleri karşılamayan 19 hasta çalışmaya dahil edilmedi. Altmış-bir hastaya 23 G vitrektomi ve 69 hastaya 25 G vitrektomi yapıldı. Retinanın anatomik bütünlüğü, peroperatif ve postoperatif komplikasyonlar, postoperatif görme keskinliği değerlendirildi.

Bulgular: Her iki grupta demografik ve preoperatif oküler bulgular benzerdi. Tek ameliyatla başarı oranı 25 G vitrektomili hastalarda %94.2 ve 23 G hastalarda %88.5'di (p=0.246). İntraoperatif iyatrojenik retinal yırtık oranları ve sklerotomi sütürasyonu 23 G grupta daha yüksekti (p=0.041, p=0.001). Her iki grupta 4 hastada postoperatif hipotoni izlendi (p=0.85). 25 G grupta bir gözde maküler delik ve bir gözde subretinal perflorokarbon sıvı gözlendi. 23 G vitrektomili bir olguda endoftalmi izlendi.

Sonuç: Regmatojen retina dekolmanında 23 G ve 25 G vitrektomi uygun, etkili ve güvenilir cerrahi tekniklerdir. Cerrahi, anatomik ve fonksiyonel sonuçlar 25 G ve 23 G gruplarda benzerdi. Her iki grup arasındaki minör farklılıklar ise 23 G grupta intraoperatif retinal yırtıklar ve sklerotomi sütürasyon oranlarının daha yüksek olmasıydı.

Anahtar Kelimeler: 23 gauge, 25 gauge, vitrektomi, retina.

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Geliş Tarihi - Received: 24.10.2014
Kabul Tarihi - Accepted: 21.02.2015
Ret-Vit 2015;23:297-300

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INTRODUCTION

Rhegmatogenous retinal detachment (RRD) remains an important cause of visual morbidity despite the steady progress in the technique and instrumentation of vitreoretinal surgery. Currently available surgical alternatives for repair of primary RRD are scleral buckling, pneumatic retinopexy and pars plana vitrectomy (PPV).[1] Treatment is often individualized according to the presence of proliferative vitreoretinopathy (PVR), the status of the lens, location of the tears, and the presence of ocular co-morbidity. In the recent years, PPV is gaining popularity among ophthalmologists for the primary repair of RRD.

After the advent of the transconjunctival 25 gauge (G) system, the utilization of this technique was limited to non-complex cases like; epiretinal membrane peeling, macular hole surgery and core vitrectomy[2], the reason being the undesired flexibility of the instruments allowed less manipulations during the surgery. 23 G vitrectomy system was introduced to overcome those limitations.[3] The development of a second generation 25 G system facilitated the vitreous base shaving and allowed the surgeons to use the system in more complex cases like RRD, PVR and diabetic tractional retinal detachment.[4-5]

In recent years, numerous papers about the clinical outcomes of transconjunctival 23 G and 25 G PPV for repair of RRD were published.[6-11] The results revealed that the transconjunctival small gauge procedures had been suitable and safe with no specific complications. To the best of our knowledge, none of them compared the outcomes of the 25 G with the 23 G system in primary RRD. In this retrospective study, we compared the anatomical and visual outcomes as well as the intraoperative and postoperative complications of 25 G and 23 G transconjunctival vitrectomy system for the primary repair of RRD in phakic and pseudophakic eyes.

MATERIAL AND METHODS

One hundred forty nine eyes of 149 patients, who underwent primary PPV for repair of RRD between November 2010 and October 2012 with a 25 G or 23 G system, were enrolled in this retrospective comparative interventional study. The exclusion criteria included a follow-up period less than 3 months, a history of any previous vitreoretinal surgery, RRD with giant retinal tear, patients younger than 18 years, traumatic RRD, re-detachments, PVR of grade C2 or greater, significant ocular co-morbidities like uncontrolled glaucoma, advanced age related macular degeneration, and uveitis. Nineteen patients were excluded from the study because of the exclusion criteria. The interventions were non-randomized; the choice of 23 G or 25 G was made according to the availability of the system and the instruments. The surgeon did not select which system to use for a particular RRD case. The procedures were done by a single surgeon (A.B.B.) as outpatients at Akdeniz University School of Medicine, Department of Ophthalmology. The institutional review board approved the study, and all patients were provided written informed consent before the surgery. The study was undertaken in accordance with the Declaration of Helsinki. The main outcome measure of the study was the anatomical attachment rate with one surgery. The secondary outcome measures were the peroperative and postoperative complications including iatrogenic retinal tear formation, endophthalmitis and postoperative hypotony, the suturing rates of the sclerotomy sites (at least one sclerotomy), and postoperative visual acuity.

Any postoperative intraocular pressure below 10mmHg was considered hypotony. The postoperative best corrected visual acuities were evaluated with Snellen chart. We added +5 or +6 diopter sphere to the preoperative refractive error, for the patients with silicone oil tamponade. The measured visual acuity was converted to logarithm of the minimum angle of resolution (LogMAR) acuity for the statistical analysis.

Surgical Technique: The surgical technique was similar in both 23 G and 25 G cases. Most of the surgeries were done under local anesthesia (peribulbar injection with an additional subtenon injection if needed). After the displacement of the conjunctiva, the sclerotomy was made with one-step technique. We completed the core vitrectomy and liquid perfluorocarbon (PFC) was used in cases with anterior retinal tears. The vitreous base was shaved, as close to retina as possible, under scleral indentation. We performed flapectomy in the case of a horse shoe tear. The subretinal fluid drainage was performed during the fluid - air exchange. The 532 nm laser photocoagulation was done under air. After the photocoagulation, the tamponade was injected. In the case of wound leakage, we sutured the sclerotomies, transconjunctivally or directly.

Statistical Analysis: Data were analyzed by using commercially available SPSS 18.0 software (Chicago, IL, USA). Wilcoxon rank sum, chi square, and Mann-Whitney U tests were used for comparisons between groups. A 2-tailed P value of less than 0.05 was considered statistically significant.

RESULTS

We summarized the demographic and etiological characteristics of the patients in Table 1. There were no statistical differences in patient characteristics between 23 G and 25 G groups. The follow-up period for 23 G group was significantly longer ($p<0.001$). The longer follow-up period was due to the availability of the 23 G instruments at an earlier period during the study.

Table 1: *Preoperative characteristics of the patients in treatment groups.*

	23-G (n=61)	25-G (n=69)	p Value
Age	61.2±12.1 (22-87)	59.5±11.5 (30-88)	0.841
Male/Female	36/25	44/25	0.578
Follow up period (months)	12.3±5 (5-23)	8.6±4.7 (3-20)	<0.001
Phakic/pseudophakic/aphakic	36/24/1	36/30/3	0.63/0.43/0.37
Macula on/macula off	15/46	15/54	0.7
RD inferior/superior	16/45	16/53	0.69
Total RD	13	18	0.52
PVR C1	5	4	0.591

RD; Retinal Detachment, PVR; Proliferative Vitreoretinopathy.

The intraoperative procedures and complications were listed in table 2. Intraoperative iatrogenic retinal break rates were higher in 23 G group (p=0.041), and sutured sclerotomies were more common with 23 G system (p=0.001). The retinal breaks were sclerotomy related in two cases in each group, the remainder breaks were caused by inadvertent cutting of the retina during vitreous base shaving.

Table 2: *Intraoperative procedures and complications.*

	23-G (n=61)	25-G (n=69)	p Value
Combined phacoemulsification	10	13	0.715*
Tamponade			
SF_6	7	33	<0.001
C_3F_8	21	14	0.07
Silicon oil	33	22	0.01
Perfluorocarbon liquid used	39	43	0.849*
Microcanula related complications	8	8	0.792
Infusion related complications	7	4	0.246
Iatrogenic retinal tear formation	9	3	0.041
Crystalline lens touch	4	3	0.578
Choroidal effusion (intraoperative)	2	2	0.9
Sutured sclerotomies	27	12	0.001

* chi square test.

One hundred and nineteen among 130 eyes were attached with one surgery. Surgical success rate with one operation in all groups was 91.5%. The surgical success rate for all patients with a second procedure was 95.3%. The primary re-attachment rates were similar in both groups; 88.5% for 23 G, and 94.2% for 25 G group (p=0.246). The re-attachment rates after second surgery were 93.4% for 23 G and 97.1% for 25 G groups (p=0.102).

The mean preoperative logMAR visual acuity was 1.9±0.8 in 23 G and 2.1±0.9 in 25 G groups (p=0.294). Final logMAR acuity was 0.6±0.6 and 0.5±0.4, respectively, in 23 G and 25 G groups, with no statistical difference (p=0.180).

At postoperative day one, we observed hypotony in four patients in both groups, with no statistically significant difference (p=0.85). The intraocular pressure was above 21 mmHg in nine patients in the 23 G and in 10 patients in the 25 G group (p=0.68). We observed temporary choroidal effusion in two patients in each group.

We observed postoperative macular hole in one and the subretinal perfluorocarbon liquid in one eye in the 25 G group. One patient with sutured sclerotomy in 23 G had endophthalmitis, which responded favorably to intravitreal ceftazidime and vankomicin.

DISCUSSION

Small gauge vitrectomy systems are gaining popularity among vitreoretinal surgeons owing to a decreased operation time, faster visual recovery and less patient discomfort.[2,12-13] The advances in vitrectomy cutters, illuminating probes and accessory instruments allow the surgeons for an easier access to the vitreous base, and surgical maneuvers can be performed in a greater range of motion. This study reports the single surgeon results of a retrospective comparison of 23 G and 25 G vitrectomy systems in the primary repair of RRD. According to our findings, both 23 G and the 25 G vitrectomy systems seems to be similarly safe and effective in primary repair of RRD.

We observed intraoperative iatrogenic retinal breaks 14.75% with 23 G and 4.75% with the 25 G system (p=0.041). Ehrlich et al.,[14] reported iatrogenic retinal breaks in 15.7% of the patients who were operated with either a 23 G or a 25 G system, and the tears were more frequent with the 23 G surgeries. In our study most of the retinal breaks were caused by inadvertent cutting of the retina during vitreous base shaving.

Since the flow rate of the vitrectomy system is directly effected by the inner diameter of the cutter; the larger cutter diameter of the 23 G probe may have caused an increased traction of the detached retina. Iatrogenic tears were treated with laser photocoagulation and did not cause any postoperative complications.

The necessity of placing a suture on at least one sclerotomy site was more common with 23 G vitrectomy than with 25 G vitrectomy; 44.2% and 17.4% respectively. After the massaging of the sclerotomy site for nearly 30-40 seconds, any visible leakage of tamponade was our indication for suturing the sclerotomy. Bourla et al.,[8] placed a suture on at least one sclerotomy site, because of intraoperative gas leakage, in 36.4% of the patients who were performed 25 G vitrectomy. Interestingly, when using 23 G vitrectomy for RRD, Tsang et al.,[15] needed no suturing of any sclerotomies at all. We place a suture in any doubt of a wound leakage. Our primary concern is to avoid postoperative hypotony and the potential for endophthalmitis. We think that the great variability in the suture rates is a result of particular surgeon's choice.

Kunikata et al.,[10] Dell'omo et al.,[16] and Von Fricken et al.,[6] reported primary success rate of 25 G vitrectomy system was over 90%; our rate of achieving re-attachment was 94.2% with one surgery. Initial success rate with 23 G system was reported between 83.3%[17] and 91.7%[15] in different studies. We achieved 88.5% initial success rate with 23 G system. The success rates were not statistically significantly different between 23-G and 25 G groups. Like success rates, final logMAR visual acuities were similar between the groups.

In our study, hypotony rates were similar between two groups (p=0.85). In the literature, hypotony rates in transconjunctival vitrectomy systems vary between 0-20% for 25-G system.[6,9] Acar et al[7] reported postoperative hypotony in 9% of the eyes that had undergone 25-G vitrectomy after RRD. Yanyalı et al.,[12] reported ocular hypotony in 16.9% of their patients who underwent 25 G PPV. Shaikh et al.,[18] described a greater prevalence of hypotony and choroidal effusions in the 25 G system. We observed postoperative hypotony in 5.8% of the eyes that had undergone 25 G vitrectomy. Postoperative hypotony following 23 G vitrectomy has also been raised as a complication in the literature.[2,19] In our series, IOP was lower than 10 mmHg in 6.5% of the eyes in 23 G group.

We observed postoperative endophthalmitis in one patient in 23 G group, compared with no patients in the 25 G group. Sutureless sclerotomies may present a theoretical increase in the risk of endophthalmitis, [20-21] but with 130 eyes, this study is not adequately powered to detect any difference in postoperative endophthalmitis rates.

The retrospective nature and small sample size of our study limit the strength of our conclusions. Another limitation of the study is the inclusion criteria that were limited to simple and fresh RRD cases with early PVR.

In conclusion; our study showed that, anatomical and functional results were comparable in 25 G and 23 G groups. Minor differences between the groups regarding the complications were; the higher incidence of intraoperative retinal breaks and sclerotomy suture rates with the 23 G system. Twenty three gauge and 25 G systems are suitable, effective and safe surgical alternatives for repair of RRD.

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