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Outcomes Of Microincision Pars Plana Vitrectomy In Rhegmatogenous Retinal Detachment

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ABSTRACT

Background: With the technological advances, microincision pars plana vitrectomy is commonly used method for primary treatment of eyes with rhegmatogenous retinal detachment. Objective of this study is to evaluate anatomical and visual outcomes of microincision pars plana vitrectomy in eyes with rhegmatogenous retinal detachment.

Methods: This was a hospital based prospective observational study done in Tilganga Institute of Ophthalmology, Kathmandu, Nepal. All consecutive cases of rhegmatogenous retinal detachment who underwent primary microincision pars plana vitrectomy from October 2020 to March 2021 were included in the study. Patients were evaluated at baseline, postoperative day 1, 1 week, 6 weeks and 3 months. Outcome measures evaluated were anatomical results, visual outcomes and complications of the surgery.

Results: Forty-nine eyes with rhegmatogenous retinal detachment treated with primary microincision pars plana vitrectomy with minimum follow up of at least 3 months were evaluated. Anatomical success was achieved in 91.8% of cases (45/49). Baseline mean best corrected visual acuity was logMAR 1.63±0.88 and median best corrected visual acuity was 2.00 (range 0.00 to 2.70) while at 3 months follow up mean best corrected visual acuity was logMAR 1.22±0.66 and median BCVA was 1.00 (range 0.00 to 2.70). There was significant improvement in median BCVA (p= 0.005). There were no cases of postoperative hypotony and endophthalmitis. Other complications were also minimal such as silicon oil in anterior chamber in 1 eye, epiretinal membrane in 3 eyes and macular hole in 2 eyes.

Conclusions: Microincision pars plana vitrectomy is an effective surgical method of primary treatment for rhegmatogenous retinal detachment with good anatomical and visual outcomes with minimal complications.

Keywords: PPV; RRD; visual outcome

INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is one of the common cause of ocular morbidity which may result in severe visual impairment and irreversible blindness if not treated promptly. It occurs when at least one retinal tear allows vitreous humor to penetrate into the subretinal space and separate the neurosensory retina from the underlying retinal pigment epithelium (RPE).

Incidence of RRD has been reported between 6.3 and 17.9 per 100,000 population and demonstrates significant geographical variation.[1] In Bhaktapur Retina Study, the prevalence of RRD was 0.16 % in elderly population above 60 years.[2] Different surgical procedures for RRD are available: pneumatic retinopexy, scleral buckling and pars plana vitrectomy (PPV). Previous retrospective studies have reported high anatomic success rate of all three of these methods.[3-5]

As result of technological advances in vitreoretinal surgical instrumentation and wide field viewing system, PPV has become increasingly used as a method for primary treatment in eyes with RRD.[6] Micro-incision vitrectomy surgery (MIVS) with smaller sutureless sclerotomy wounds (23 and 25 G) result in less postoperative inflammation, greater patient comfort and possibly faster visual recovery.[7,8]

METHODS

This was a hospital based, prospective observational study conducted in Vitreo-Retina department of Tilganga Institute of Ophthalmology (TIO), Kathmandu, Nepal from October 2020 to March 2021 with minimum follow up of 3 months. The purpose of this study was to

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evaluate the anatomical and visual outcomes including complications of microincision PPV in the adult patients as a primary treatment with RRD.

All consecutive cases at the age 18 years or more presenting at Vitreo-Retina department of TIO during the study period, that were diagnosed as RRD and undergone PPV fulfilling all the criteria were included in the study. Patients of pediatric age group (below 19 years of age), recurrent retinal detachment, tractional retinal detachment, combined rhegmatogenous & tractional retinal detachment, exudative retinal detachment, traumatic retinal detachment and RRD secondary to uveitis were excluded.

Informed written consent was taken from every patient before evaluation and inclusion in the study. Patients were evaluated at baseline, postoperative day 1, 1 week, 6 weeks and 3 months. During each visit detailed history was taken followed by complete ophthalmic examination including best corrected visual acuity (BCVA), anterior segment and dilated fundus examination with slit-lamp biomicroscope with 90 D lens and binocular indirect ophthalmoscope using 20 D lens. Attached macula or detachmentwith subretinal fluid was recorded as macula on or macula off respectively. B-Scan was done in cases with hazy media and Intraocular pressure (IOP) was measured using noncontact tonometer and Goldman applanation tonometer when needed.

Surgical procedure was standard 3 port microincision (23 or 25 G) PPV with endolaser and silicone oil or gas (C_3F_8) tamponade under peribulbar block. All vitrectomies were performed with Alcon constellation vitrectomy system Transconjunctival sclerotomies were made with either 23G or 25G trocar with cannula with slight displacement of conjunctiva and oblique insertion for bevelled incision. Superior sclerotomies were made at 2 and 10 o'clock for illumination and cutter. Inferior sclerotomy for infusion was made just below the insertion of lateral rectus muscle. All sclerotomies were made 3.5 mm and 4 mm posterior to limbus in phakic and nonphakic eyes respectively. Core vitrectomy was performed followed by posterior vitreous detachment if not persent. Peripheral shave vitrectomy was performed with scleral depression. All retinal breaks were marked with endodiathermy, internal drainage of subretinal fluid was done with active suction using soft tipped cannula through the break and drainage retinotomy followed by fluid air exchange. Retinopexy was done with endolaser photocoagulation of all retinal breaks, retinotomy and peripheral retinal degenerations. Intraocular tamponade used was either 16% C_3F_8 gas or 1000 centisokes (cSt). Silicone oil injection was done in eyes with multiple retinal breaks, inferior breaks and proliferative vitreoretinopathy (PVR) grade C and D. Gas tamponade was done in eyes with superior single break and PVR grade A and B.. Patient's ability to maintain postoperative position was also be taken into account. PVR grading was done according to the classification system provided by Retina Society Terminology Committee in 1983.[9]

Phacoemulsification was performed without intraocular lens as additional procedure in eyes with associated cataract. Inferior peripheral iridectomy (PI) was performed for silicone oil tamponade in aphakic eyes. In cases with gas, leaking sclerotomies were sutured using 8-0 vicryl. All sclerotomies in cases with silicone oil were sutured.

Data management was done using MS-Excel 2007 and statistical analysis using SPSS version 20.0. For comparison of categorical data, chi square test was done. For comparison of normally distributed numerical data, independent t test was used. For the non-normally distributed difference of pre-post numerical data, Wilcoxon signed rank test was used.

For all statistical tests, P value <0.05 was considered significant.

This study followed the international norms and the tenets of the Declaration of Helsinki. Approval was taken from the Institutional Review Committee of TIO. Study was approved by Institutional Research Committee of TIO. All the individual data of the study participants were kept confidential.

RESULTS

Forty-nine eyes of 49 patients diagnosed with RRD and treated with primary microincision PPV with internal tamponade were included in the study. Twenty-eight patients (57.1%) were male and 21 (42.9%) were female with overall mean ± SD age of 47.65±15.77 years. The average age ± SD of male and female were 46.11 ± 16.14 and 49.7 ± 15.5 respectively years (p =0.431).

Right eye was affected in 59.2% of cases. Most common chief complaint was diminution of vision in 37 (75.5%) cases followed by floaters and flashes. High myopia was present in 10 eyes (20.4%) and fellow eye retinal detachment was present in 10.2% of cases. Demographic characteristics are tabulated in Table 1.

Table 1. Demographic characteristics of study participants.	
Patient no.	49
Mean age (years)	47.65±15.77
Gender (male/female)	28/21
Laterality (RE/LE)	29/20
Chief complain	
DOV *, n † (%)	37 (75.5%)
Flashes, n (%)	4 (8.2%)
Floaters, n (%)	6 (12.2%)
Visual field defect, n (%)	2 (4.1%)
Past ocular history	
None, n (%)	32 (65.3%)
High myopia, n (%)	10 (20.4%)
RRD ‡ in fellow eye, n (%)	5 (10.2%)
Complicated cataract surgery, n (%)	2 (4.1%)

*Abbreviation: *DOV: diminution of vision, n†: number, ‡RRD: rhegmatogenous retinal detachment*

During preoperative evaluation, the macula was on in 8 and off in 41 eyes. The mean number of retinal breaks was 1.84±1.49, range 1 to 3 and break was not found in 8 eyes (16.3%)). Horseshoe tear was the most common type of retinal break. Giant retinal tear was present in one patient. Superotemporal quadrant was the most common location of retinal break. Thirty-seven eyes were phakic, 11 eyes pseudophakic and 1 eye aphakic. Proliferative vitreoretinopathy (PVR) grade A was most common (30 eyes) followed by grade C in 10 eyes. Two eyes were complicated by PVR grade D. Baseline characteristics are tabulated in Table 2.

Table 2. Baseline characteristics of study participants	
Patient No.	49
Lens status	
Phakic, n (%)	37 (75.5%)
Pseudophakic, n (%)	11 (22.4%)
Aphakic, n (%)	1 (2%)
Mean no. of retinal breaks	1.84±1.49
Macular status	
On, n (%)	8 (16.3%)
Off , n (%)	41 (83.7%)
Types of break	
HST*, n (%)	28 (57.1%)
Round hole, n (%)	9 (18.4%)
Both tear and hole, n (%)	2 (4.1%)
GRT†, n (%)	1 (2%)
Lattice with hole, n (%)	1 (2%)
Break not found, n (%)	8 (16.3%)
PVR Grade	
A, n (%)	30 (51.2%)
B, n (%)	7 (14.3%)
C1, n (%)	7 (14.3%)
C2, n (%)	3 (6.1%)
D1, n (%)	1 (2%)
D2, n (%)	1 (2%)

*Abbreviation: *HST: Horse shoe tear, †GRT: Giant retinal tear, PVR: proliferative vitreoretinopathy*

Standard microincision PPV with endolaser photocoagulation and gas or Silicone oil tamponade was performed in all eyes. Additional procedures like membrane peeling was performed in 5 eyes, ILM peeling in 2 eyes and , lensectomy in 3 eyes.. Silicone oil was placed in 38 eyes (77.6%) and C_3F_8 gas was placed in remaining 11 (22.4%) eyes.

Anatomical outcome: Retinal reattachment was achieved in 91.8% of cases (45/49). Re-detachment occurred in 4 cases (8.2%) over 3 months follow-up. PVR grade was C2, C1, A and D3 in the failed cases. Buckle plus silicone oil reinjection was performed in 3 re-detached cases and membrane peeling with gas tamponade was performed in 1 case.

Visual Outcome: At baseline examination, mean best corrected visual acuity was logMAR1.63±0.88 and median BCVA was 2.00 (range 0.00 to 2.70) while at 3 months follow up mean BCVA was logMAR1.22±0.66 and median BCVA was 1.00 (range 0.00 to 2.70). The median preoperative and postoperative BCVA were significantly different with p-value 0.005. Anatomical outcome as retinal reattachment and functional outcome as BCVA logMAR are provided in table 3.

Table 3. Anatomical and functional outcomes following PPV						
Variables	Baseline	Day 1	1 week	6 weeks	3 months	p-value baseline Vs 3 mth
Anatomical success (retinal reattachment)						
Number (%)	0	49 (100%)	48 (92%)	42 (85.7%)	45 (91.8%)	
Functional outcome (BCVA log MAR)						
Median (range)	2.00 (0-2.7)	2.30 (1-2.7)	1.78 (0.6-2.3)	1.48 (0-2.7)	1.00 (0-2.7)	0.005

Complications: Intraoperative complication occurred in 1 eye (subretinal perfluorocarbon liquid). There was no any postoperative hypotony. IOP was raised in 7 patients (14.3%) in first postoperative day and 5 patients (10.3%)

at 3 months follow up. Epithelial defect of cornea was present in 2 eyes (4.1%) at day 1. New break occurred in 1 eye (2%) at 1 week. At 6 weeks follow up, new break was seen in 4 eyes (8.2%), open old break in 1 eye (2%), re-detachment in 2 eyes (4.1%), oil in AC in 1 eye (2%), macular hole in 1 eye (2%) and vitreous hemorrhage in 1 eye (2%) for which additional procedures were performed like silicone oil reinjection in 3 eyes, band buckle with silicone oil reinjection in 3 eyes (6.1%), internal limiting membrane (ILM) peeling with gas tamponade in 1 eye (2%) and vitreous wash in 1 eye (2%). Cataract was developed in 5 eyes (10.2%) at 6 weeks.

At 3 months follow-up, new break occurred in 1 eye (2%) and open old break was seen in 1 eye (2%). Epiretinal membrane was formed in 3 eyes (6.1%) and macular hole in 2 eyes (4.1%). Cataract occurred in 16 eyes (32.7%). The details of postoperative complications at different follow-up intervals are shown in table 4.

Table 4. Postoperative complications of microincision PPV among study participants

Complications	Day 1	Week 1	Week 6	3 Month
	n (%)	n (%)	n (%)	n (%)
new break	0 (0)	1 (2)	4 (8.2)	1 (2)
open old break	0 (0)	0 (0)	1 (2)	1 (2)
recurrent RD	0 (0)	0 (0)	2 (4.1)	0 (0)
CD*	0 (0)	0 (0)	0 (0)	0 (0)
shallow AC†	0 (0)	0 (0)	0 (0)	0 (0)
Oil in AC	0 (0)	0 (0)	1 (2)	1 (2)
Epithelial Defect	2 (4.1)	0 (0)	0 (0)	0 (0)
cataract	1 (2)	1 (2)	5 (10.2)	16 (32.7)
endophthalmitis	0 (0)	0 (0)	0 (0)	0 (0)
glaucoma	0 (0)	0 (0)	0 (0)	0 (0)
ERM‡	0 (0)	0 (0)	0 (0)	3 (6.1)
macular hole	0 (0)	0 (0)	1 (2)	2 (4.1)
hyphema	1 (2)	2 (4.1)	0 (0)	0 (0)
oil in AC	0 (0)	0 (0)	0 (0)	0 (0)
VH§	0 (0)	0 (0)	1 (2)	0 (0)
Total	49 (100)	49 (100)	49 (100)	49 (100)

*Abbreviation: *CD: Choroidal detachment, †AC: anterior chamber, ‡ERM: epiretinal membrane, §VH: vitreous hemorrhage*

DISCUSSION

Previously conventional 20 G vitrectomy was performed especially in eyes with complicated retinal detachments. With the technological advances in the vitrectomy instrumentations, microincision (23G/25G) PPV has become one of the popular operating technique for primary treatment of RRD. High speed cutters, better fluidics and lighting systems have resulted in better anatomical and visual outcomes.[6,7]Smaller guage transconjunctival systems have resulted in the greater postoperative comfort especially with sutureless technique.

In the previous studies, primary success rate of 23-Gauge vitrectomy with more than 10 patients is between 71 and 93%.[10] Success rate of 91.7% was reported in a prospective series on 24 eyes treated with 23-Gauge transconjunctival PPV for RRD, with one case of hypotony in the first postoperative day.[11] Prospective series of 20-Gauge Vitrectomy or buckle surgery show primary success rates ranging from 71 to 95% and 76 to 91%, respectively.[4,12]In our study, primary anatomical success rate was 85.7% (42/49 cases) which increased to 91.8% with additional procedures. These results are comparable to prevoius studies with anatomical success rate of 82% with single surgery which rose to 98% with additional procedures.[13] There was relatively low mean IOP with cases of postoperative hypotony in their study. This was probably due to postoperative wound leak as all of their procedures were sutureless. Considering the risk of postoperative wound leak, in our study we performed selective wound suturing and thus there were no cases of any postoperative hypotony. Kunikata, H. and Nishida, K have reported greater initial anatomical success rate of 95.2% in their retrospective consecutive case series.[14] Similarly, more recently Lai, Chun-Ting, et al in 2019 have reported single operation anatomical success rate of 93.6% following microincsion vitrectomy with gas tamponade in 110 patients.[15] Greater success rates compared to our result is probably due to exclusion of complicated cases with PVR, giant retinal tear and those requiring silicon oil tamponade.

Romano et al have reported significantly increased mean BCVA from logMAR 0.48 (SD 0.36) to 0.26 (SD 0.31), $P < 0.001$. Similarly in our study median BCVA was significantly increased from logMAR 2.00 to 1.00 (p=0.005) at 3 month follow up. Kunikata, H. and Nishida, K also found significantly improved BCVA following microincision vitrectomy (from 0.78 to 0.17 log MAR units).

In our study, there were no cases of endophthalmitis and other complications were also minimal. ERM was formed in 3 of 49 cases (6.1%) and macular hole in 2 cases (4%). This is comparable to 6% of occurrence of ERM reported by Campo et al.[16]

Limitations of our study include limited follow up (3

months) and lack of control group. Further prospective randomized trials are suggested to determine whether microincision PPV is superior to other conventional surgeries for RRD.

CONCLUSIONS

In conclusion, microincision PPV is an effective method of primary treatment for RRD with good anatomical and visual outcomes with minimal complications. Transconjuctional sutureless technique offers better postoperative comfort with slight risk of postoperative wound leak and hypotony which can be avoided with selective suturing of sclerotomies. This study may provide insight regarding good outcomes of primary microincision PPV and add to data pool available in this part of world.

CONFLICT OF INTEREST

The authors declare no conflict of interest

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