ORIGINAL ARTICLE

Surgical Outcomes of 25-Gauge Trans-Conjunctival Sutureless Vitrectomy for Posterior Segment Disease

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ABSTRACT

Purpose: to evaluate the safety and efficacy of 25-gauge pars plana vitrectomy for posterior segment disease.

Design: single centre, prospective, interventional case series.

Participants: 24 eyes of 24 patients underwent 25-gauge pars plana vitrectomy at ophthalmology department of Sir Ganga Ram Hospital, Lahore from July 2010 to January 2012.

Intervention: all eyes were operated using Alcon Accurus vitrectomy system and 25-gauge (Alcon) instruments.

Materials and Methods: 24 eyes of 24 patients with posterior segment disease e.g vitreous hemorrhage alone (18 eyes) and combined vitreous hemorrhage with epiretinal membrane (6 eyes) were included in the case series. 25-gauge transconjunctival sutureless vitrectomy alone or combined with epiretinal membrane peeling was done in these respective cases, followed by fluid/ air exchange and post-operative pan-retinal photocoagulation.

Main Outcome Measures: post-operative visual acuity, intraocular pressure, complication (intra-operative and post-operative) and any suturing of sclerotomy ports needed

Results: Out of a total of 24 patients, 16 (66.7%) were males and 8 (33.3%) were females. 18 eyes (75%) had vitreous hemorrhage and 6 eyes (25%) had vitreous hemorrhage combined with tractional membranes involving macula. No intra-operative complication occurred and no case required conversion to 20-gauge vitrectomy. No suturing of any sclerotomy port was needed. The 25-gauge instruments were fragile. Bending of endoillumination probe was seen during the procedure but no breakage of any instrument took place. Peripheral vitreous shaving was difficult due to fragile instruments and indentation was required. Post-operative day 1 follow-up, visual acuity improved in 14 eyes (58.3%), reduced in 8 eyes (33.3%) due to recurrent vitreous hemorrhage and remained the same in 2 (8.3%) eyes. Day 7 follow-up showed further improvement in visual acuity from day 1 in 12 eyes and remained the same in 12 eyes. Final follow-up (3 months) showed visual acuity improvement in all patients from their pre-operative level. Subconjunctival hemorrhage was seen in 4 eyes (16.7%) which cleared spontaneously within a week's time. Recurrent vitreous hemorrhage (6 eyes 25%) which was mild (blurred disc view) cleared within the follow-up period. Intra-ocular pressure remained within normal range throughout post-operative period.

Conclusion: primary 25-gauge transconjunctival sutureless vitrectomy is an effective procedure in treatment of relatively uncomplicated posterior segment disease that requires minimal intraocular manipulation. It hastens postoperative healing.

Key Words: pars plana vitrectomy (PPV), proliferative diabetic retinopathy (PDR), vitreous hemorrhage (VH), epiretinal membrane (ERM), transconjunctival sutureless vitrectomy (TSV).

INTRODUCTION

It was in early 1970s that pars plan vitrectomy found a role in the treatment of various retinal conditions like retinal detachment, diabetic retinopathy etc. Recently, the procedure has undergone a series of revisions towards making smaller sutureless self-sealing incisions and potentially laying the groundwork for a more efficient and patient-friendly procedure. In 2002, Fuji et al [1, 2] first introduced the 25-gauge transconjunctival sutureless technique and three years later, based on the same surgical principle, Eckardt [3] modified and developed the 23-gauge TSV. Compared to the 20-gauge pars plana vitrectomy where sutures retain infusion cannula, the newer techniques (25-gauge/ 23-gauge) are equipped with self retaining cannulas and use smaller sized, narrow instruments. This offers some potential advantages including reduced surgical time, reduced surgical trauma, less

postoperative inflammation and faster postoperative recovery.

The purpose of this study is to evaluate the newer 25-gauge transconjunctival sutureless technique, in terms of its efficacy, operative difficulties and post-operative findings especially day 1 intraocular pressure.

The Alcon Accurus vitrectomy system was used in all cases.

MATERIAL AND METHODS

A total number of 24 eyes of 24 patients were included in the study which was conducted in ophthalmic department of Sir Ganga Ram Hospital, Lahore during July 2010-January 2012. The indications for surgery were vitreous hemorrhage alone in 18 eyes (75 %), vitreous hemorrhage plus tractional membranes involving macula in 6 eyes (25%). Of 24 patients, male to female ratio was 2:1(16 males/8 females). Age ranged between 30-60 years. All cases were operated by a single vitreoretinal surgeon in a single centre (Sir Ganga Ram Hospital, Lahore). Surgical procedure was explained to each patient and informed consent was taken. Consent was also taken from the ethical committee.

Inclusion criteria: vitreous hemorrhage with tractional retinal membranes.

Exclusion criteria: rhegmatogenous/ tractional retinal detachment requiring oil temponade.

Out of 24 patients, 18 cases (75%) underwent 25-gauge pars plana vitrectomy in local anesthesia and remaining 6 (25%) were operated under general anesthesia. Operating site was prepared using povidone-iodine solution. The surgical technique required transconjunctivoscleral insertion of 25-gauge cannula mounted on trocar. Conjunctiva was slightly displaced in order to avoid alignment between conjunctival and sclera incision and 0.5mm conjunctivo-scleral entry port was created. Trocar was withdrawn leaving 3.6mm long self retaining polyamide cannula in place. Three similar incisions were made in the infero-temporal, supero-temporal and supero-nasal quadrant. Infusion cannula was secured in the infero-temporal quadrant. Alcon Accurus vitrectomy unit was used in all cases. 25-g instruments available for use was vitrectomy cutter (1500 cpm), halogen endoillumination, end-gripping forceps and curved micro-scissors and soft-tip back flush needle. Vitrectomy cutter was also used as back flush needle, thus performing dual function.

Simple vitrectomy was performed in 18 (75%) eyes while vitrectomy plus epiretinal membrane peeling was done in 6 (25%) eyes. A small quantity of triamcenolone was injected in vitreous cavity to visualize invisible vitreal membranes and help in peeling of epiretinal membranes over the macula. On completion of vitrectomy, the vitreal cavity was given fluid temponade. The cannulas were pulled out one by one with gently massaging the wound site with Q-tips. Conjunctival and/ or scleral suturing was not required as wound self-sealed. Subconjunctival injection of antiboitic/steroid combination was given and eye padded.

Post-operatively, patients in this series were examined on day 1, day 7, 1 month and finally 3 month and results recorded.

RESULTS

In this series, 25-gauge sclerotomy ports were easier to form with self-retaining infusion cannula than the routine 20-gauge ports where infusion cannula has to be secured to sclera with sutures. Thus, less time was wasted and vitrectomy was started almost immediately. Vitrectomy technique was the same as 20- gauge and it was possible to easily use the respective 25- gauge instruments like cutter, endoilluminator, membrane peeler, endodiathermy probe, back- flush needle. Fluid or air temponade was easily done through narrow 25-gauge cannulas. However, silicone oil (1000 or 5000 cst) cannot be injected through such narrow lumen of the cannula and neither our patients required it.

Of 24 patients, 16 (66.7%) were males and 8 (33.3%) were females. Age ranged between 30-60 years. The most common indications for surgery were vitreous hemorrhage in 18 eyes (75%) and vitreous hemorrhage with epi-retinal membranes in 6 eyes (25%). Vitreous hemorrhage resulted due to complications of proliferative diabetic retinopathy in 22 eyes (91.7%) and branch retinal vein occlusion in 2 eyes (8.3%). Pre-operative visual acuity was hand movement in 6 eyes (25%), counting fingers in 14 eyes (58.3%), 6/60 in 2 eyes (8.3%) and 6/36 in 2 eyes (8.3%). Pre-operatively, slit-lamp examination showed quiet anterior chamber with clear lens in 8 eyes (33.3%), early lens changes in 12 eyes (50%) and pseudophakia in remaining 4 eyes (16.7%). Intra-ocular pressure was within normal range 10-21mmHg in all cases.

Overall pre-operative data are summarized in Table 1. Minimum follow-up period was 12 weeks.

Sub-conjunctival hemorrhage around entry site due to accidental puncture of conjunctival blood vessel by sharp trocar occurred in 4 (16.7 %) cases.

No intra-operative complications were encountered during surgery and conversion to 23-g or 20-g pars plana vitrectomy was not required in any case. Intraocular 25-g trocar cannula entry into sclerotomy site was easy with little or no resistance. The 25-g vitrectomy instruments were quite fragile, and bending of the fibro-optic light was observed in all cases, although breakage never happened (Fig 1). Thus, extra care was taken during vitrectomy while handling the cutter and light pipe. Intraocular manipulation was easy in the central area (macular and extramacular zone), but peripheral rotation of the globe to shave the peripheral vitreous was difficult due to fragility of instruments. Thus, scleral indentation had to be done for peripheral vitreous shaving. During peeling of epiretinal membranes, thin delicate membranes could be easily lifted with end-gripping forceps or cutter and or cut with 25-g scissors. However, the stiffer membranes were not easily cut as the 25- g scissors is curved and not sharp enough. So they were actually lifted from the retinal surface with the help of cutter in aspiration mode. This increased vitrectomy time in these cases.

On completion of vitrectomy, the cannulas were gently pulled out (one by one) with minimal or no leakage from wound site. No case required sutures for wound closure.

Post-operative day 1

Visual acuity improved in 14 eyes (58.3%) from pre-operative vision of HM to CF (2 pts), from HM to 6/60 (2 pts), from HM to 6/36 (2 pts)], from CF to 6/36 (4 pts), from CF to 6/24 (2 pts) and from 6/60 to 6/36 (2 pts). Visual acuity reduced in 8 eyes (33.3%) from pre-operative value of CF to HM (6 pts)], from 6/36 to 6/60 (2 pts) and remained unchanged from preoperative vision of counting fingers (CF) in 2 eyes (8.3%).

Intra-ocular pressure was taken and no hypotony was seen in any case. Highest intraocular pressure recorded was 16mmHg in 2 eyes (8.3%), 15mmHg in 2 eyes (8.3%), 14mmHg in 7 eyes (29.2%), 10mmHg in 10 eyes (41.7%), and least was 8mmHg in 3 eyes (12.5%).

No clinically significant intraocular inflammation was observed in the post-operative period.

Postoperative complication like residual vitreous hemorrhage was observed in 6 eyes (25%). The bleeding could have been from the the retinal neovessels or from the sclerotomy site. The hemorrhage was transient and resolved on its own within a few weeks (less than a month).

All patients were lased (pan-retinal photocoagulation) post-operatively.

1 week follow-up

All eyes were quiet and no symptoms like photophobia, lacrimation, foreign body sensation etc were reported by the patients. On examination, visual acuity had improved further in 12 patients from their post-operative day 1 vision of HM to 6/36 (2 eyes), from CF to 6/36 (4 eyes), from 6/60 to 6/18 (2 eyes)], and 6/36 to 6/24 in 4 eyes) and remained the same in 12 cases. Sub-conjunctival hemorrhage resolved completely in all 4 patients. The intra-ocular pressure improved to normal range in 3 eyes with 8mmHg IOP.

As vitreous hemorrhage was clearing up spontaneously, thus no intervention was planned except to observe till next follow-up.

Pan retinal photocoagulation was done in all eyes except the ones with resolving vitreous hemorrhage.

1 month, 3 month

Vitreous hemorrhage cleared completely in all 6 eyes and pan retinal photocoagulation was applied to these eyes. Visual acuity improved 2-3 lines in these eyes. No further change occurred in any case. Overall, at last follow-up visual acuity had improved in all eyes from the pre-operative levels.

Visual acuity results are highlighted in Table 2 while postoperative complications are tabulated in Table 3.

Table 1: Pre-operative features Number of eyes=24

Males (%) Females (%)	16 (66.7%) 8 (33.3%)
Age (range in years)	30-60
Lens status Clear lens Early lens changes Pseudophakia	 8 (33.3%) 12 (50%) 4 (16.7%)
IOP (10-21mmHg)	 24 (100%)
Vitreous hemorrhage (%)	18 (75%)
Vitreous hemorrhage with ERM (%)	6 (25%)

Table 2: Visual acuity Number of eyes=24

Preoperative	Post-operative				
		Day 1	Day 7	1 month	3 month
HM	6 (25%)	6			
CF	14 (58.35)	4			
6/60	2 (8.3%)	4	2		
6/36	2 (8.3%)	8	14	10	10
6/24		2	2	8	8
6/18			6	6	6

Table 3: Postoperative features Number of eyes=24

	Day 1	Day 7	1 month 3 month
Subconjunctival hemorrhage	4 (16.6%)	Cleared	Cleared
Recurrent vitreous hemorrhage	6 (25%)	Present	Cleared
Intraocular pressure			
16mmHg	2 (8.3%)		
15mmHg	2 (8.3%)		
14mmHg	7 (29.2%)	Normal range in all eyes	Normal range in all eyes
10mmHg	10 (41.7%)		
8mmHg	3 (12.5%)		

Figure 1: Bend 25- g fibroptic light after vitrectomy

DISCUSSION

Minimally invasive vitreoretinal surgery has been proposed by authors in the past [4] and modified by others but it was in 2005, when Fuji et al [1] first introduced the 25-g sutureless sclerotomy technique.

The sclerotomy ports in our 25-g pars plana vitrectomy cases were self sealing requiring no sutures. This was due to a small (0.5mm), bevelled scleral incision. On completion of vitrectomy, cannulas were easily pulled out of the wound sites with no leakage, thus requiring no suturing of scleral ports in our case series. Rohit R Lakhanpal et al [5] in their case series had 10 cases requiring suture placement of one sclera site. They did so as they had to enlarge a site for membrane peeling/cutting scissors that was difficult to pass through the relatively smaller 25-gauge port in tractional retinal detachment cases. In our case series which is less in number (24) than Rohit et al [5] cases (140), we did not need to enlarge the sclerotomy site and could readily take the instruments through the ports into the vitreal cavity.

The 25-gauge vitreoretinal instruments were too flexible making it difficult to do peripheral vitreous shaving as the globe would not rotate well. Thus, scleral indentation was done to visualize and shave peripheral vitreous. The 25-gauge instruments especially endoillumination probe is quite delicate and flexible and it would bend during surgery (Fig 1), though fortunately it did not break and neither did any other instruments. Z Tomic et al [6] also reported bending of flexible light pipe during 25-g pars plana vitrectomy (100 case series) which made it impossible to guide the eye during manipulations in the far periphery. Inoue M et al [7] reported breakage of the 25-g vitrectomy cutter during surgery.

No case of hypotony was seen in the immediate post-operative period (day 1) and even on later follow-ups. This advantage is probably due to smaller sclerotomy site as well as the fact that the infusion cannula was removed as the last step, thus maintaining chamber stability till the end of surgery. Lakhanpal et al [5] have reported hypotony in few of their cases which is in contrast to our study but they did not specify the number of eyes (out of total of 140 eyes) that showed hypotony. Z Tomic [6] also reported transient post-operative hypotony (<10mmHg) which occurred in 41% of their cases (100 eyes in all). Sunil K Warrier et al [8] also reported no persistant cases of hypotony in their study group (85 eyes).

Subconjunctival hemorrhage occurred in 4 eyes (16.7%) due to sharp trocar which accidently punctured the conjunctival vessel on sclera entry. This however resolved on its own within a week. All the eyes were quiet and no inflammatory reaction was observed in follow-ups.

In our present study, visual acuity improved from the baseline in all eyes. Visual acuity was 6/18 or better in 2 eyes (8.3%), 6/24 in 6 eyes (25%), 6/36 in 10 eyes (41.7%) and 6/60 in 6 eyes (25%). Our visual results are comparable with the visual outcomes of other vitrectomy procedures. Faith Horozoglu et al [9] in their study showed visual improvement in all (15) of their patients. However, in their study group, 25-g pars plana vitrectomy is done only for peudophakic retinal detachment in contrast to our cases that had both pseudophakic and phakic eyes and surgical cases included vitreous hemorrhage and tractional retinal detachment.

Vitreous hemorrhage was seen in 6 eyes (25%) which resolved within a few weeks, improving final visual acuity at 3rd month follow-up. The result of postoperative vitreous hemorrhage is higher in our series than that reported by Z Tomic et al [6] (2% transitory vitreous hemorrhage). This is probably due to the fact that they have a greater number of cases of macular hole (30%), idiopathic epiretinal membranes (32%) and fewer cases of proliferative diabetic retinopathy (5 cases) and non-diabetic vitreous hemorrhage (6 cases) whereas our series had all cases of proliferative diabetic retinopathy complicated with vitreous hemorrhage (75%) alone and vitreous hemorrhage with fibrovascular epiretinal membranes (25%), making the eyes more prone to postoperative bleed.

No other complication was seen in our study in the 3 month follow-up period. Suneil et al [d] reported only one complication of recurrent retinal detachment at 6 weeks follow-up in 4 eyes (3.4%) which was successfully repaired by second procedure.

In conclusion, 25-gauge sutureless vitrectomy is an exciting innovative minimally invasive technique. It is important to select those vitreoretinal conditions that require minimal intraocular manipulation and tissue dissection. It induces minimal ocular trauma, reduces conjunctival scarring, inflammation reaction and promotes rapid visual recovery.

Further study is warranted with a large number of patients and longer follow-ups are required to determine if this procedure should be performed on extensive fibrovascular proliferative tissue.

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