

# COMPARISON OF TWO TYPES OF 23 GAUGE TROCAR SYSTEM USED IN PARS PLANA VITRECTOMY FOR SIMPLE VITREOUS HAEMORRHAGE

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## ABSTRACT

**Background:** Management of simple vitreous haemorrhage is problematic for eye surgeons.

**Objective:** To compare two types of 23 gaugetrocar system used in pars plana vitrectomy for simple vitreous haemorrhage.

**Methodology:** Study design: Interventional study.

Place and duration of study: This study was carried out from February 2016 to March 2018 at vitreoretina department of Bahawal Victoria Hospital, Bahawalpur.

Sixty patients with simple vitreous hemorrhage were divided into two equal groups. Group 1 underwent pars plana vitrectomy using Alcon made 23 gauge trocar and cannula while group 2 underwent pars plana vitrectomy using local made 23 gauge trocar and cannula. Patients were followed postoperatively. Ease to insertion, wound related complication and intraocular pressure were recorded.

**Results:** Mean age of patients in group 1 was 45.27±7.56 years while mean age of patients in group 2 was 45.77±9.89 years. Difficulty to insert trocar and cannula was encountered in 1 (3.33%) case in group 1 and in 10 (33.33%) cases in group 2. Hypotony at week 1 was present in 2 (6.67%) cases in group 1 and 4 (13.33%) cases in group 2. Cannula dislocation was encountered in 2 (6.67%) cases in group 1 and 7 (23.33%) cases in group 2. Wound vascularization at week 1 was present in 5 (16.67%) cases in group 1 and 9 (30%) cases in group 2. Mean pain score at day 1 was 1.20±0.49 in group 1 and 1.33±0.61 in group 2.

**Conclusion:** Although Alcon made 23 gauge systems of trocars is superior in terms of wound creation, surgeons comfort during surgery, wound sealing, less postoperative wound vascularization and IOP control but local made autoclavable 23 gauge trocar system is cost effective and comparable with it.

**Keywords:** Cannula, Vitrectomy, Vitreous haemorrhage, Hypotony.

## INTRODUCTION

Pars plana vitrectomy (PPV) was introduced by Robert Mechemer in 1971. Before it open sky scissor vitrectomy was used during complications of cataract surgery.<sup>1</sup> In the following years PPV was done with 20 gauge instruments after cutting conjunctiva and using cautery.<sup>2</sup> In recent years microincision vitreoretina surgery (MIVS) surgery has revolutionized the procedure. Also named as trans-conjunctival suture less vitrectomy, MIVS has been changed between 25 gauge, 23 gauge and 27 gauge system (valve or non valved).<sup>3</sup> It has reduced the surgical time, reduced surgical trauma, reduced conjunctival inflammation and scarring, increased surgeon comfort/ease to handle the tissue during surgery especially in patients with narrow orbits and pediatric patients. Moreover beauty of trocar system is ability to switch between these ports during vitreous

shaving.<sup>4-6</sup> Postoperative need to stitch the wound is reduced but immediate post-operative hypotony is very common. Wound construction in small gauge vitrectomy is very important step to achieve water tight self-sealing closure after removal of cannula. The architecture of sclerostomy depends on the shape and sharpness of the trocar system and the method of insertion.<sup>7-10</sup>

Cost effectiveness is major issue in this part of world where surgical disposable cost matters a lot. Large no of patients cannot afford surgery due to rising dollar to rupee conversion ratio. Meanwhile local industry is working hard to meet the needs of modern surgical goals. We started using locally made 23 gauge trocar system for PPV and tried to modify it with manufacturer collaboration. By reducing prices of consumables prompt surgical treatment would be

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**Received:** 15-02-2019

**Accepted:** 11-03-2019

**Published:** 29-03-2019

given that otherwise could be delayed or denied due to financial constraints. The purpose of this study was to compare the two types of 23 gauge trocar system in terms of safety efficacy and wound healing.

## METHODOLOGY

This prospective interventional study was carried out from February 2016 to March 2018 at Vitreo-Retina Department of Bahawal Victoria Hospital, Bahawalpur. Single surgeon performed all surgeries. Sixty eyes of sixty patients having vitreous haemorrhage without TRD involving macula were operated. Written permission was taken from hospital ethical committee. Patients were enrolled from outpatients department after informed written consent. Patients were selected by simple random sampling method then equally divided in two groups. After recording vision, detailed slit lamp examination and B scan PPV was done in group 1 with Alcon 23 gauge trocar system while in group 2 PPV was done with local made 23 gauge trocar system. Standard 3 port trans-conjunctival micro-incision vitrectomy was done in all cases with Alcon Accurus.

In group 1 single go entry was done with cannula mounted on trocar while in group 2 entry was done with 23 gauge MVR blade and cannula was inserted in second step while mounted on blunt tip inserter. Patients were examined on Day 1, Day 7, Month 1 and Month 3. Data collected was patient age, sex, primary pathology for which PPV was done; need to stitch the sclerostomy, IOP with applanation Goldman tonometer, postoperative hypotony and frequency of postoperative wound vascularization with large conjunctival vessels. Post-operative patient discomfort was recorded with visual analogue system (VAS). It is a scale graded 1 to 4 where 4 shows most discomfort. This VAS is used in many epidemiological surveys to measure discomfort or pain. Patients requiring revision surgery/internal/ external tamponade due to any complication were excluded.

We used SPSS version 21. Mean and standard deviation was calculated for age of patients and intraocular pressure. Frequency was calculated for gender of patients, etiology of vitreous hemorrhage, ease to insertion of cannulas, hypotony at 1st day and 1<sup>st</sup> week, sub-conjunctival

hemorrhage, cannula dislocation, need to stitch sclerostomy site and wound vascularization at 1 week. Chi square test was used to compare frequencies between two groups. Mann-Whitney test was used to compare Visual analogue pain score of patients at day 1 in two groups.

## RESULTS

In this study, there were 60 eyes of 60 patients. Mean age of patients in group 1, was  $45.27 \pm 7.56$  years while mean age of patients in group 2 was  $45.77 \pm 9.89$  years. In group 1, there were 16 (53.33%) males and 14 (46.67%) females. In group 2, there were 15 (50%) males and 15 (50%) females. Etiology of vitreous hemorrhage in two groups is shown in table I. Etiology of vitreous hemorrhage in group 1 was found to be Eale's disease in 5 (16.67%) cases, Retinal vein occlusion in 6 (20%) cases, proliferative diabetic retinopathy in 15 (50%) cases and trauma in 4 (13.33%) cases. Etiology of vitreous hemorrhage in group 2 was found to be Eale's disease in 6 (20%) cases, Retinal vein occlusion in 8 (26.67%) cases, proliferative diabetic retinopathy in 13 (43.33%) cases and trauma in 3 (10 %) cases. Difference in etiology of vitreous hemorrhage between two groups was not statistically significant, with p value was 0.882 and chi-square value was 0.662. Difficulty to insert trocar and cannula was encountered in 1 (3.33%) cases in group 1 and in 10 (33.33%) cases in group 2. Difference between the two groups was statistically significant with p value being 0.003. Chi-square value was 9.02. Hypotony at day 1 was present in 5 (16.67%) cases in group 1 and 9 (30%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.222. Chi-square value was 1.491. Hypotony at week 1 was present in 2 (6.67%) cases in group 1 and 4 (13.33%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.389. Chi-square value was 0.74. Sub-conjunctival hemorrhage was present in 9 (30%) cases in group 1 and 15 (50%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.071. Chi-square value was 3.27. Cannula dislocation was encountered in 2 (6.67%) cases in group 1 and 7 (23.33%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.071. Chi-square value was 3.27.

Sclerostomy wound was stitched in 4 (13.33%) cases in group 1 and 8 (26.67%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.14. Chi-square value was 2.22. Wound vascularization at week 1 was present in 5 (16.67%) cases in group 1 and 9 (30%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.20.

**Table I: Distribution of Cases according to Etiology of Vitreous Hemorrhage in two Groups**

Group of Patients	Etiology of vitreous hemorrhage				Total
	Eale's disease	Retinal Vein Occlusion	Proliferative Diabetic Retinopathy	Trauma	
Group 1	5	6	15	4	30
Group 2	6	8	13	3	30
Total	11	14	28	7	60

Key:

Group 1: Sclerostomy was made by using alcon trocar and cannula

Group 2: Sclerostomy was made by using local made trocar and cannula

**Table II: Intraocular pressure in Group 1 and Group 2**

Intraocular pressure	Group of patients	N	Mean	Standard Deviation
Preoperative	Group 1	30	15.07	3.562
	Group 2	30	15.23	3.588
Postoperative at 1 day	Group 1	30	11.50	3.749
	Group 2	30	10.83	4.268
Postoperative at 1 week	Group 1	30	16.07	3.562
	Group 2	30	16.23	3.588
Postoperative at 1 month	Group 1	30	14.77	3.401
	Group 2	30	15.87	3.794
Postoperative at 3 month	Group 1	30	15.50	3.160
	Group 2	30	15.97	2.953

Key:

Group 1: Sclerostomy was made by using alcon trocar and cannula

Group 2: Sclerostomy was made by using local made trocar and cannula number of cases in each group.

Chi-square value was 1.67. Patients' pain at day 1 was graded according to visual analogue pain score. In group 1 twenty five (83.33%) patients experienced no pain, 4 (13.33%) patients experienced mild pain and 1 (3.33%) patients experienced moderate pain. In group 2 twenty two (73.33%) patients experienced no pain, 6 (20%) patients experienced mild pain and 2 (6.66%) patients experienced moderate pain. Mean pain score at day 1 was  $1.20 \pm 0.49$  in group 1 and  $1.33 \pm 0.61$  in group 2. Difference between the two groups was not statistically significant with p value being 0.34. Mann-Whitney U value was 404. Mean preoperative intraocular pressure in group 1 was  $15.07 \pm 3.56$  mmHg preoperative intraocular pressure in group 2 was  $15.23 \pm 3.59$  mmHg. Mean postoperative intraocular pressure at day 1 was  $11.50 \pm 3.75$  mmHg in group 1 and  $10.83 \pm 4.27$  mmHg in group 2. Mean postoperative intraocular pressure at 1<sup>st</sup> week was  $16.07 \pm 3.56$  mmHg in group 1 and  $16.23 \pm 3.58$  mmHg in group 2. Mean postoperative intraocular pressure at 1<sup>st</sup> month was  $14.77 \pm 3.40$  mmHg in group 1 and  $15.87 \pm 3.79$  mmHg in group 2. Mean postoperative intraocular pressure at 3<sup>rd</sup> month was  $15.50 \pm 3.16$  mmHg in group 1 and  $15.97 \pm 2.95$  mmHg in group 2. Mean intraocular pressure in two groups is given in table II.

## DISCUSSION

This study was carried out at Vitreo-Retina department of Bahawal Victoria Hospital, Bahawalpur. In this study, there were two groups. There were 30 patients in each group. In group 1, sclerostomy was made by using 23 gauge Alcon trocar and cannula. In group 2 sclerostomy was made by using 23 gauge local made trocar and cannula. Mean age of patients in group 1 was  $45.27 \pm 7.56$  years while mean age of patients in group 2 was  $45.77 \pm 9.89$  years. The mean age of patients in our study was less than the age of patients in the study, conducted by Tayyab and coauthors.<sup>4</sup> In their study mean age of patients who underwent pars plana vitrectomy for vitreous hemorrhage was  $51.33 \pm 14.98$  years and  $54.66 \pm 12.87$  years in two groups. In our study, In group 1 there were 16 (53.33%) males and 14 (46.67%) females. In a study conducted by Kayani et al,<sup>5</sup> vitrectomy was performed for vitreous hemorrhage. In their study, there were 16 (66.7%) males and 8 (33.3%) females.

Our results are similar to the results of Kayani et al, in that majority of patients undergoing vitrectomy were male. In the present study, etiology of vitreous hemorrhage in group 1 was found to be Eale's disease in 5 (16.67%) cases, Retinal vein occlusion in 6 (20%) cases, proliferative diabetic retinopathy in 15 (50%) cases and trauma in 4 (13.33%) cases. Etiology of vitreous hemorrhage in group 2 was found to be Eale's disease in 6 (20%) cases, Retinal vein occlusion in 8 (26.67%) cases, proliferative diabetic retinopathy in 13 (43.33%) cases and trauma in 3 (10%) cases. Difference in etiology of vitreous hemorrhage between two groups was not statistically significant. p value was 0.882 and chi-square value was 0.662.

Kayani et al, reported cause of vitreous hemorrhage was complication of diabetic retinopathy and venous occlusion disease in majority of cases.<sup>5</sup> Goff et al,<sup>6</sup> reported leading causes of vitreous hemorrhage were proliferative diabetic retinopathy, vitreous detachment with or without retinal detachment and trauma. In our study proliferative diabetic retinopathy and retinal venous occlusion accounted for majority of cases of vitreous hemorrhage. Vitreoretina surgery has come a long way from the time of open sky vitrectomy to 17 gauge Machemer's vitrectomy to 27 gauge vitrectomy. Attaching the retina is not enough. Other considerations like functional visual outcome, ease of doing surgery, patients' comfort, affordability, postoperative rehabilitation and cosmetic outcome are increasingly becoming important. Difficulty to insert trocar and cannula was encountered in 1 (3.33%) case in group 1 and in 10 (33.33%) cases in group 2. Difference between the two groups was statistically significant with p value being 0.003. Due to its geometry and architecture Alcon made trocar and cannula experience less resistance during insertion.<sup>11-13</sup> Although it was easy to insert Alcon made trocar and cannula as compared to local made trocar and cannula, local made trocar and cannula was more economical. Apart from being cheap local made trocar and cannula was autoclavable. In a poor country like Pakistan this difference is cost of consumables matters a lot.

Hypotony (IOP less than 8 mmHg) at day 1 was present in 5 (16.67%) cases in group 1 and 9 (30%)

cases in group 2. Difference between the two groups was not statistically significant with p value being 0.222. Chi-square value was 1.491. Hypotony at week 1 was present in 2 (6.67%) cases in group 1 and 4 (13.33%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.389. Chi-square value was 0.74. In a study done by Gosse et al, mean day 1 post 23 gauge pars plana vitrectomy intraocular pressure was  $15 \pm 5.5$  mmHg while Hypotony (IOP less than 5 mmHg) occurred in 2% of patients. Difference in results of our study and the study done by Gosse et al. may be due to the cut point of Hypotony. In our study we defined hypotony as less than 8 mmHg intraocular pressure, while Gosse et al,<sup>9</sup> defined hypotony as being less than 5 mmHg intraocular pressure.

Sub-conjunctival hemorrhage was present in 9 (30%) cases in group 1 and 15 (50%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.071. Chi-square value was 3.27. Source of sub-conjunctival hemorrhage was accidental puncture of small conjunctival or episcleral vessels during trocar and cannula insertion. In group 2 there was more manipulation during trocar and cannula insertion so does more sub conjunctival hemorrhage occurred in this group. But the difference was not statistically significant between the two groups. In a study done by Kayani et al,<sup>5</sup> sub-conjunctival hemorrhage was present in 23.5% cases of 23 gauge parsplana vitrectomy that is less than that was present in our study. Cannula dislocation was encountered in 2 (6.67%) cases in group 1 and 7 (23.33%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.071. Chi-square value was 3.27. Cannula dislocation is related to construction of sclerostomy, stability and architecture of cannula and instrument manipulation. Sclerostomy wound was stitched in 4 (13.33%) cases in group 1 and 8 (26.67%) cases in group 2. Difference between the two groups was not statistically significant with p value being 0.14. Chi-square value was 2.22. Suturing of sclerostomy is needed in cases of leaking ports. Sclerostomy port leakage is related to its construction and failure of self-sealing valve mechanism. In a study conducted by Gosse et al.<sup>9</sup> 22% cases required suturing after 23

gauge pars plana vitrectomy. In another study, conducted by Tayyab et al, 40.48% cases required suturing of sclerostomy after 23 gauge pars plana vitrectomy.<sup>4</sup> Wound vascularization at week 1 was present in 5 (16.67%) cases in group 1 and 9 (30%) cases in group 2. More wound vascularization in group 2 may be due to increased inflammation that occurred as a result of increased manipulation during trocar and cannula insertion. Difference between the two groups was not statistically significant with p value being 0.20. Chi-square value was 1.67. Patients' pain at day 1 was graded according to visual analogue pain score. In group 1, twenty five (83.33%) patients experienced no pain, 4 (13.33%) patients experienced mild pain and 1 (3.33%) patients experienced moderate pain. Mean pain score was  $1.20 \pm 0.49$ . In group 2, twenty two (73.33%) patients experienced no pain, 6 (20%) patients experienced mild pain and 2 (6.66%) patients experienced moderate pain. Mean pain score was  $1.33 \pm 0.61$ . Difference between the two groups was not statistically significant with p value being 0.34. Mann-Whitney U value was 404. Pain score in our study was higher than the pain score in a study conducted by Kim et al.<sup>12</sup> where mean pain score was 0.59. Pain score in our study was less than the pain score in a study conducted by Chaudhary and co-authors where mean pain score after peribulbar anesthesia was  $2.67 \pm 0.91$ .<sup>13</sup> Limitations of our study include small sample size and short follow up time. Strengths of our study include it was single centered and all surgeries were performed by one surgeon.

## CONCLUSION

Although Alcon made 23 gauge systems of trocars is superior in terms of wound creation, surgeons comfort during surgery, wound sealing, less postoperative wound vascularization and IOP control but local made autoclavable 23 gauge trocarsystem is cost effective and comparable with it.

**Authors Contribution:** MYT & AF: Article writeup and supervision of study. AZJ & MA SM: Data Collection. SF: Data analysis and interpretation. All authors critically revised and approved its final version.

**Conflict of Interest:** None

**Sources of Funding:** None

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