

INTRA OPERATIVE COMPLICATIONS DURING VITRECTOMY PERFORMED BY POST GRADUATE RESIDENTS

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ABSTRACT

Objective: To determine intra operative complications during pars plana vitrectomy performed by vitreo retinal residents.

Methodology: A hospital based case series study was carried out over a period of 6 months. Intra operative data of 62 patients who underwent vitrectomy by Vitreo Retina (VR) residents, who already held fellowship in ophthalmology, were collected. Demography, indications of vitrectomy and intra operative complications were recorded. The data were analyzed using SPSS version 20.

Results: The most frequent intra operative complication was iatrogenic retinal break (27.41%), followed by capsular breach lens touch (22.58%). Vitreous cutter and light probes were the most frequent causes of these complications.

Conclusion: Iatrogenic retinal break was the commonest complication encountered by residents during vitreoretinal surgery followed by lens touch.

Key Words: Intra operative complications, Pars plana vitrectomy, Vitreo retina, Postgraduate residents

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INTRODUCTION

Vitrectomy, introduced by Machemer in 1972, has been the mainstay of surgical treatment for various retinal diseases that were previously considered inoperable. This included indications such as persistent vitreous hemorrhage, rhegmatogenous & tractional retinal detachment, intra ocular foreign body (IOFB), dropped nucleus fragments or , intra ocular foreign body (IOFB), dropped nucleus fragments or intra ocular lens (IOL) and failed buckling surgery. Conventionally 20-gauge pars plana vitrectomy (20-g PPV) has been the gold standard and remained so, for at least, 3 decades till microsurgical vitrectomy systems (MVS) of 23-g and 25-g were introduced. However, 20-g PPV is still commonly performed surgery by vitreoretinal surgeons. Its basic steps consist of limited conjunctival peritomy, construction of 3-standard pars plana ports, securing of infusion cannula, anterior vitrectomy, induction of surgical posterior vitreous detachment (PVD), completion of vitrectomy, peeling of fibro vascular membranes, air-liquid-fluid exchange maneuvers, injecting tamponading agents, doing laser and ports closure¹.

Despite the vast surgical experience and advancements in vitrectomy systems, complications still occur even in good surgical hands. Perioperative anesthesia or surgery related complications do occur in all intra-

ocular surgeries, however, some of them are unique to vitrectomy procedure. One of the main concerns in vitrectomy is poor ports construction with potential risk of wound leakage and hypotony. Postoperative hypotony, cystoid macular edema and retinal detachment were found to be significantly higher in fluid -filled eyes as compared to eyes with air or gas tamponade. Similarly, supra choroidal or sub retinal placement of infusion cannula can cause serious eye damaging, supra choroidal hemorrhage or choroidal detachment. Other complications are retinal injury associated with air infusion; and mechanical trauma to the optic nerve head during air-fluid exchange maneuvers². Retinal tears continue to be a major complication despite small-gauge cannulated systems and skilled vitreoretinal surgeons³⁻⁵. Ramkissoon et al³ reported iatrogenic intraoperative breaks occurring in 15% and postoperative retinal detachments in 1.7% cases among 600 PPVs. In another study conducted on diabetic cases, iatrogenic retinal tear was observed in 13.5%, and retinal hemorrhage in 4% of cases⁶.

Surgical complications represent sad moments particularly in vitreoretinal surgery with feeling of causing harm to a patient either through an error in judgment or deficit of skill. Therefore, training supervisors are much concerned about the harm occurring to their patient's eye while training their vitreoretinal residents. During

vitrectomy, residents commonly encounter various intraoperative complications. Though complications are an unavoidable aspect of any surgery even in the hands of the best available surgeons, yet vitreoretinal resident must aim successful surgical outcomes with minimum complications. Getting used to the parameters of vitrectomy machine, focusing retina and mastering handling of probes are the key factors to become highly proficient to carry out smooth and successful completion of vitrectomy with minimum complications.

To our knowledge, no previous studies at national level have so far evaluated the intra operative complications of primary 20 gauge PPV performed by vitreoretinal residents. Therefore, this study was designed to determine how vitreoretinal (VR) residents perform and what intraoperative complications do they come across during their fellowship training. The data availed would be instructive and helpful to evolve the future strategies in training of VR residents and management of patients requiring vitreoretinal surgical intervention.

METHODOLOGY

A hospital based observational case series study was carried out over a period of 6 months, from 1st January 2019 to 30th June 2019 in a tertiary care hospital on 62 patients. Patients of any gender or age group with different indications of primary vitrectomy were selected in the study using consecutive (non-probability) sampling technique. Research purpose and operative procedure was explained and written informed consent taken from the patients before surgery. Patients who underwent primary vitreoretinal surgeries performed by VR residents (who already held fellowship in ophthalmology ophthalmologists and doing their 2nd fellowship) were included in the study. Patients undergoing re-vitrectomy surgery were excluded from the study. Complications occurring after supervisor take over the case were also excluded from the data.

In all cases, a standard 3-ports 20 Gauge PPV was performed by a single resident using a non-contact wide-angle viewing system either under general or local anesthesia. Endo laser was applied either around the retinal tear wherever needed or at 360° to the vitreous base. Heavy liquid oil or air oil exchanged were performed with either non-expansile perfluoro-n-octane (C3F8) diluted in air (14%) or SO (1000 Centistokes) as tamponade at the end of the surgery. SO was instilled in cases with long standing rhegmatogenous retinal detachment (RRD), extended retinectomies or giant tears. The occurrence of intra operative complications were documented in a predesigned proforma and managed accordingly. The collected data were entered on SPSS version 23 for analysis. Descriptive statistics were calculated for all the variables. Mean and Standard deviation was calculated for the quantitative variables. Frequency

and percentages were calculated for the qualitative variables of indications and intra operative complications.

RESULTS

A total of 62 eyes of 62 patients, 39 (63%) males and 23 (37%) females, were included in the study with male to female ratio of 1.7:1. The mean age of the study population was 38.87 ±16 years with age range of 14 -72 years and patients mostly from the age group 20-40 years. Of the total sample, 58% of the cases underwent vitrectomy for right eye and 42% of left eye. Most of the patients in our study data were phakic (66.13%). Out of 62 patients, the most common indication for PPV was the rhegmatogenous retinal detachment (35.48%) followed by traction retinal detachment (20.97%) and vitreous hemorrhage (14.51%) respectively (Table 1).

Among 62 cases, the commonest intra operative complication was iatrogenic retinal break (tear) which occurred in 27.42%, followed by capsular breach lens touch in 22.58% (Table 2). Vitreous cutter and light probes were the most frequent causes of these complications.

DISCUSSION

Adverse events are an unavoidable aspect of any aspiring surgeon's path while striving for excellence and perfection and they are more common to residents. Male gender and age group of 30-45 years were found more common in our study probably due to the aggressive and curious behavior prevailing and easy access to services due to local customs and predominantly male society and the active working age predisposing them to hostile risk factors for vitreoretinal diseases. RRD was the most common indication (35.48%) for vitrectomy surgery followed by traction retinal detachment (20.97%).

Overall in our study, iatrogenic retinal tear was found the most frequently encountered complication to residents (27.4%), followed by capsular breach lens touch (22.58%). However, overall in phakic eyes capsular breach lens touch was more frequently observed than iatrogenic retinal tears (34.15%). In a study by Elhousseini et al⁷ the frequency of lens touch was 3.7% with 5 cases (11%) who had a posterior capsule rupture. Ruptured lens capsule, in comparison to intact lens capsule, may be associated with significantly rapid progression of cataract in a relatively shorter time period⁸. Therefore, performing subsequent cataract surgery on an eye with lens touch needs great care as it carries a significantly increased chance of posterior capsule rupture. We observed the lack of surgical skills, expertise with handling probes and smooth working environment as the possible factors for considerably higher lens touch rate among the residents.

Table 1: Demographic data of patients (n=62)

Characteristics		Male n (%)	Female n (%)	Total cases n (%)
Gender Distribution		39 (63)	23 (37)	62 (100)
Age Range	<20 years	11 (17.74)	5 (08.06)	16 (25.81)
	21-40 years	17 (27.42)	11 (17.74)	28 (45.16)
	>40years	11 (17.74)	7 (11.29)	18 (29.03)
Lens Status	Phakic	27 (43.55)	14 (22.58)	41 (66.12)
	Pseudophakic	12 (19.35)	9 (14.52)	21 (33.88)
Indications of Surgery	Rhegmatogenous Retinal Detachment	15 (24.19)	7 (11.29)	22 (35.48)
	Tractional Retinal Detachment	8 (12.90)	5 (8.06)	13 (20.97)
	Non-Clearing Vitreous Hemorrhage	6 (9.68)	2 (3.23)	08 (14.52)
	Intraocular Foreign Bodies	5 (8.06)	3 (4.84)	08 (12.90)
	Dislocated Intraocular Lens	2 (3.23)	3 (4.84)	05 (08.06)
	Retained Lens Fragments	2 (3.23)	2 (3.23)	04 (06.45)
	Idiopathic Macular Hole	1 (1.61)	1 (1.61)	02 (03.23)

Table 2: Intraoperative complications and causes (n=62)

Complications	Total cases (%)	Causes of complications
Iatrogenic retinal tears	17 (27.41)	Cutter and Endolaser probes, Flute needle
Capsular breach lens touch	14 (22.58)	Cutter and Light probes, Flute needle
Intraocular bleeding (retinal & choroidal)	13 (20.97)	Iatrogenic trauma, Peeling of fibrovascular membranes & retinectomy
Seepage of silicon oil in Ant. chamber	8 (12.90)	Zonular dehiscence, Capsular breach
Inappropriate scleral ports	7 (11.29)	Oversized / Undersized
Wound leakage	7 (11.29)	Oversized wounds, silicon oil leakage
Subretinal seepage of silicone oil	4 (6.45)	Large/giant tears
Subretinal seepage of heavy liquid	4 (6.45)	Posterior pole retinal tears
Inadvertent corneal injury/edema	4 (6.45)	Probes, Forceps, Speculum

Iatrogenic retinal breaks were observed in 27.4% which occurred mostly due to cutter probe during shaving vitreous of scleral ports and peripheral retina, mostly in cases with total funnel RRD. However, in diabetic traction retinal detachment (TRD), retinal breaks were more frequent during dissection and peeling of fibrovascular membranes apart from fluid air oil exchange maneuvers and during endo laser. In a retrospective analysis from the United Kingdom on 11618 vitrectomy operations, complications were not observed in 10937 (94.1%) cases; while 3.2% had iatrogenic retinal tears, 0.9% had lens touch and 0.7% had iatrogenic retinal trauma⁹. Vitrectomy for tractional retinal detachment is more frequently associated with intra operative break formation and ranges from 27-50% of eyes¹⁰⁻¹³. Lack of experience, handling of various probes and poor visualization of peripheral retina were the causative factors for retinal breaks. Among these, the handling of various probes is considered the hardest skill to master by the vitreoretinal fellows.

We observed intraoperative bleeding in 20.9% of cases, which constitute vitreous bleed in 69.23%, sub retinal in 23.08% and supra choroidal bleed in 7.69%. Of eyes with intraoperative bleeding, 76.92 % were operated for diabetic TRD and vitreous hemorrhage, 15.38 % for RRD while 7.68% for intraocular foreign body. Bleeding occurred either during peeling of fibrovascular membrane in TRD or accidentally due to intra operative vascular trauma with surgical instruments. In pars plana vitrectomy incidence rates for supra choroidal hemorrhages (SCH) of 0.4% to 0.6% have been reported in one study¹⁴. SCH is a rare complication which makes interpretations of its cause and prevention challenging. Intra operative bleeding is a common problem during vitrectomy especially in diabetic eyes. Silicone oil migration into anterior chamber was noted in 12.9% of cases. It was more common in pseudophakic eyes due to lens capsular and zonular breach caused due to trauma or iatrogenic injury. Inappropriate scleral ports with regards to site, size and distance from the limbus were noted in 11.29%. Due to inappropriate scleral ports, handling and maneuvering of probes become difficult and it is hard to maintain intraocular pressure with repeated globe collapse and uveal incarceration in the sclerotomy. Damage to uveal tissue with zonular and capsular breach occurred in 3.23% cases due to ports too near to limbus. A recent study reports a 3.1% risk of early sclerotomy-related retinal breaks in addition to a 2.9% (10 of 350 eyes) risk of late entry-site-related retinal tears¹⁵. Sutured sclerotomies induce astigmatism in many eyes following 20-G vitrectomy¹⁶ which is uncommon following 23-G and 25-G vitrectomy^{17,18} helping rapid visual recovery.

Wound leakage though more common with small-gauge sutureless vitrectomy, is still one of the concerns in 20-G vitrectomy. Wound leakage or hypotony, even

if transient, may lead to serious complications, such as endophthalmitis, suprachoroidal hemorrhage, choroidal detachment and hypotony maculopathy¹⁹⁻²¹. We noted soft eye in 11.29% which were due to either under filling with silicon oil or leaky wounds that were re-sutured after giving full tamponade. Silicone oil penetration and inadvertent placement into the subretinal space was noted in 6.45% cases due to intra operative poor visibility of fundus. Sub retinal silicone oil interferes with retinal detachment repair by forming large retinal cysts and emulsification.

Perfluoro carbon was migrated in sub retinal space in 6.45% cases which was successfully removed in 75% cases while removal was not successful in 25% cases. This was due to multiple factors such as large peripheral breaks and poor visibility due to intraocular bleed and mild nuclear sclerosis. Risk factors for retained sub retinal perfluoro carbon include large peripheral retinotomies greater than 120 degrees, as well as lack of a saline rinse after perfluoro carbon liquid removal²². Complications from perfluoro carbons are rare and result due to retention with subsequent toxicity. We observed corneal abrasions in 6.45% of cases in our study. Prolonged surgery time with repeated corneal dryness and frequent exchange of probes were the possible risk factors for corneal epithelial defects and corneal edema and abrasions. The incidence of corneal epithelial defects has decreased dramatically after the introduction of noncontact wide-angle viewing system²³. In previous reports, 2.3% to 32% of patients needed intraoperative epithelial debridement to improve visualization during PPV^{24,25}.

CONCLUSION

Iatrogenic retinal break was the most frequent intra operative complication of vitrectomy encountered by residents followed by lens touch. Vitreous bleed during surgery was more common to sub retinal and choroidal bleeding.

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CONTRIBUTORS

AUR conceived the idea, planned the study and drafted the manuscript. UA and SJ carried out literature search, helped acquisition of data, did statistical analysis and critically revised the manuscript. All authors contributed significantly to the submitted manuscript.