Original Article

Corneal Endothelial Cell Loss after Vitrectomy with Silicone Oil Tamponade in Phakic Versus Pseudophakic Patients with Rhegmatogenous Retinal Detachment

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Purpose: To evaluate the corneal endothelial cell loss in patients of rhegmatogenous retinal detachment after vitrectomy with silicone oil tamponade.

Study Design: Randomized control study.

Place and Duration of Study: Eye Unit-III, Institute of Ophthalmology, Mayo Hospital, Lahore. 1st May 2016 to 30 April 2017.

Material and Methods: 50 patients were selected from the outpatient department of Institute of Ophthalmology, Mayo hospital who were diagnosed with rhegmatogenous retinal detachment. They were divided into two groups A and B. Group A included 25 patients who were phakic in the involved eye while group B contained 25 patients who were pseudophakic in the involved eye. The fellow eyes of all the patients were phakic. Patients diagnosed with Tractional retinal detachment, combined Tractional & rhegmatogenous retinal detachment, any coexisting corneal or retinal disease and those having history of ocular surgery other than cataract surgery were excluded from study. All the patients underwent 23 gauge pars plana vitrectomy with silicone oil tamponade. All patients underwent pre-operative and three months post-operative bilateral specular microscopy for endothelial cell count, percentage of hexagonal cells and coefficient of variation. Specular microscopy was done by researcher and findings were recorded.

Results: The endothelial cell count was decreased in both the groups showing a cell loss of 30.48 ± 25.78 in phakic patients group and 77.52 ± 40.03 in pseudophakic patients group. The decrease in the endothelial cell count was statistically insignificant.

Conclusion: Vitreo retinal surgery with silicone oil tamponade decreases endothelial cell count and it may affect the corneal anatomy in the long run and affect visual prognosis.

Key words: Rhegmatogenous retinal detachment, Specular microscope, Corneal endothelial cell count, Phakic, Pseudophakic.

Twenty three gauge pars plana vitrectomy has emerged as a popular vitreo ratinal surgical technique over the past few years. Main reasons of success of this surgical modality are easier pars plana access with less conjunctival scarring, shorter surgical time, increased patients comfort and decreased post- operative inflammation. As a result of less post-operative inflammation and minimal corneal astigmatism by avoiding scleral sutures leads to early visual recovery with minimal post-operative

complaints[1]. Cornea is a vital ocular structure which is responsible mainly for the dioptric power of the eye so in any ocular surgery the condition of the cornea pre and post operatively assumes major importance[2]. The condition of the cornea is assessed by specular microscope which measures the corneal endothelial cell count, mean cell density, percentage of hexagonal cell, coefficient of variation and corneal thickness[3,4,5]. It is widely accepted that anterior segment surgery[6,7,8] decreases corneal endothelial cell count and may lead to corneal decompensation if the cornea is not healthy. But a very few number of studies are present on the effects of posterior segment surgeries[9,10,11] on cornea especially when the surgery is aided by endotamponades. Silicone oil is a widely used tamponade after surgery for retinal detachment. It is kept in eye for a period of at least three months after which it is removed depending upon state of posterior segment of eye. Intra ocular silicone oil is associated with many complication which are raised intra ocular pressure, cataract, uveitis and band keratopathy on cornea[12]. Studies have shown that vitreoretinal surgery with silicone oil affects corneal endothelium in aphakic and pseudophakic patients but its effects in phakic patients are unknown. Silicone oil is commercially available in 5000 and 1000 centistoke formulations. 5000 centistoke silicone oil is widely used now a days due to its less side effects[13].

MATERIALS AND METHODS

50 patients presenting to the outpatient department of Institute of Ophthalmology, Mayo hospital were selected. Patients diagnosed with rhegmatogenous retinal detachment were included in study. They were divided into two groups A and B. Group A included 25 patients who were phakic in the involved eye while group B contained 25 patients who were pseudophakic in the involved eye. The fellow eyes of all the patients were phakic. Patients diagnosed with Tractional retinal detachment, combined Tractional & rhegmatogenous retinal detachment, any coexisting corneal or retinal disease and those having history of ocular surgery other than cataract surgery were excluded from study. All the patients underwent 23 gauge pars plana vitrectomy with 5000-centistoke silicone oil tamponade. All patients underwent pre-operative and three months post-operative bilateral specular microscopy for endothelial cell count, percentage of hexagonal cells and coefficient of variation. Specular microscopy was done and findings were recorded. All the surgeries were performed under local anesthesia. After aseptic measure three ports were made into the posterior segment through pars plana with the help of 23 gauge trocars. Core vitrectomy was done and posterior vitreous detachment was induced then. After that complete vitreous shave was performed. After that localization of the primary break was done and then fluid air exchange was performed. The sub retinal fluid was aspirated with the help of extrusion needle under air tamponade through the primary break but in some pseudophakic patients drainage retinotomy had to be made as the primary break could not be localized. Once retinal reattachment was achieved, air oil exchange was done so that the cavity was filled with silicone oil bubble at the end of surgery. Post operatively steroid and antibiotic eye drops were prescribed. Post operatively

The patients were discharged after confirming retinal reattachment on slit lamp funds examination. After three months of surgery patients were followed up for secular microscopy and recording of findings.

RESULTS

50 patients were included in study out of whom 25 were male and 25 were female. The mean age of the patients was 52.44 ± 6.51. The age range in group A was 35 – 62 years and in group B it was 38-61 years. In group A mean pre-operative count in operated eye was 2469.06 ± 39.62 while in group B mean preoperative count in operated eye was 2342.56 ± 62.48. In group A mean post-operative endothelial count in the operated eye was 2439.08±38.31 while in group B mean post-operative count in operated eye was 2265.04 ± 75.72 (Table 1).

The mean change in hexagonality in the operated eye was 3.54 ± 1.79 (p 0.0001). In group A mean change in hexagonality in operated eyes was 2.52 ± 1.19 (p 0.0001). In group B mean change in hexagonality was 4.50 ± 1.73 in the operated eyes (p 0.0001) (TABLE 2). In group A the mean change in coefficient of variation was 5.84 ± 0.85 in the operated eyes and 0.88 ± 0.72 in the non-operated eyes while in group B.

Mean change in coefficient of variation in operated eye was 5.24 ± 3.00 and in non-operated eyes it was 0.68±0.69 (p 0.0001) (Table 3).

Table 1: Changes in the Corneal Endothelial Cell Count.

Sr. No.	Corneal Endothelial Cell Count	Group A		Group B	
		Operated Eye	Non Operated Eye	Operated Eye	Non Operated Eye
1	Pre-Operative	2469.06 ± 39.62	2476.28 ± 34.66	2342.56 ± 62.48	2439.24 ± 50.55
2	Post-Operative	2439.08 ± 38.31	2472.80 ± 34.19	2265.04 ± 75.72	2433.36 ± 51.28
3	Change	30.48 ± 25.78	3.48 ± 3.47	77.52 ± 40.03	5.88 ± 3.64

P 0.0001

Table 2: Changes in Coefficient of Variation.

Sr. No.	Co Efficient of Variation	Group A		Group B	
		Operated Eye	Non Operated Eye	Operated Eye	Non Operated Eye
1	Pre-Operative	41.60 ± 1.95	41.36 ± 1.70	40.00 ± 1.73	41.84 ± 1.57
2	Post-Operative	35.76 ± 1.80	40.48 ± 1.68	34.76 ± 2.50	41.16 ± 1.46
3	Change	5.84 ± 0.85	0.88 ± 0.72	5.24 ± 3.00	0.68 ± 0.69

P 0.0001

Table 3: Changes in Hexagonality.

Sr. No.	Percentage of Hexagonal Cells	Group A		Group B	
		Operated Eye	Non Operated Eye	Operated Eye	Non Operated Eye
1	Pre-Operative	63.00 ± 2.59	64.88 ± 2.43	55.52 ± 3.01	63.52 ± 2.36
2	Post-Operative	60.48 ± 2.93	64.28 ± 2.38	50.96 ± 3.56	62.92 ± 2.32
3	Change	2.52 ± 1.19	0.60 ± 0.70	4.50 ± 1.73	0.60 ± 0.64

P 0.0001

DISCUSSION

In this study the authors present the corneal changes after primary vitrectomy with silicone oil tamponade in Pakistani population. It is well known that the anterior segment surgery decreases corneal endothelial cell count but a few studies have been conducted to observe the effects of pars plana vitrectomy with internal tamponade on human cornea. The authors believe that this is the first time such data was gathered from local population. Our study shows that three port pars plana vitrectomy with silicone oil tamponade decreases the corneal endothelial counts in both phakic and pseudophakic patients. The authors also compared the changes in the endothelial count in the fellow non-operated eye of the patients. The study shows that corneal endothelial cell count was decreased more in the pseudophakic patients as compared to phakic patients suggesting that presence of crystalline lens has some protective effect. More over the pre-operative endothelial cell count in the pseudophakic patients was less as compared to the pre-operative endothelial cell counts in phakic patients which is explained by the history of previous anterior segment (cataract) surgery. Despite this endothelial cell count, no patient presented with corneal decompensation on follow up suggesting that the

endothelial count was not significant clinically. During the follow up period no patient presented with early complication of silicone oil tamponade such as raised intra ocular pressure or silicone oil bubble in anterior chamber. Now a days 23 gauge system of pars plana vitrectomy has become the system of choice for retinal detachment surgery owing to less surgical time, more patient comfort, less post- operative complications and negligible corneal astigmatism owing to the avoidance of scleral sutures[14,15,16,17].

Goyal JI et al[18] studied corneal endothelial cell changes in pediatric population after pars plana lensectomy without any intra ocular tamponade. They concluded that the pars plana lensectomy resulted in 8.02 ± 76% corneal endothelial cell loss which was 2% less as compared to when the same procedure was done through the anterior chamber. Setala K et al[19] studied changes in corneal endothelium after vitrectomy with silicone oil tamponade. Their study showed a lower mean corneal endothelial cell density (2076 ± 196 cell/mm^2) as compared to the control fellow eyes (2738 ± 86cells/mm^2) suggesting that intraocular tamponade with silicone oil definitely affects the corneal endothelium. Goezinne et al[20]studied corneal endothelial cell density after vitrectomy with silicone oil in complex retinal detachments. Their prospective control study showed an endothelial cell loss of 19% in patients who underwent additional phacoemulsification procedure in addition to vitrectomy with silicone oil tamponade while in the second group mean endothelial cell loss was 39% in eyes which underwent lens/IOL removal in addition to vitrectomy with silicone oil tamponade. Their results also suggest that the presence of an intact crystalline lens or artificial lens/ Iris diaphragm may act as a protective barrier against corneal endothelial cell damage from long term silicone oil tamponade.

Friberg TR et al[21] studied corneal endothelial cell loss after multiple vitreoretinal procedures with the use of silicone oil. Their results showed 68.8% endothelial cell loss after three vitreoretinal procedures with the use of silicone oil. The average cell loss was higher in aphakic eyes (66.63%) as compared to pseudophakic eyes (51.66%). Their results also suggest that the presence of artificial lens/ Iris diaphragm may have protective effect on corneal endothelium from silicone oil tamponade. In another study Friberg TR et al[22] studied the effects of vitreous surgery on corneal endothelium. They concluded that phakic eyes suffered an endothelial cell loss of 1.3% after vitrectomy and aphakic eyes had an average cell loss of 12.6 ± 2.3% after combined vitrectomy and scleral buckling. The cell loss was 8.5 ± 1.8% when the vitrectomy and sclera buckling was combined with lensectomy. Cinar E et al[23] compared different endotamponades during vitreoretinal surgery in relation to their effect on corneal endothelium. The patients who underwent vitrectomy with silicone oil tamponade showed endothelial cell loss of 4.6 ± 5.4% in the operated eye and a cell loss of 0.14 ± 0.52% in the fellow eye.

CONCLUSION

Based on the results of our study we conclude that Vitreo retinal surgery with silicone oil tamponade does effect the corneal endothelium irrespective of the lens status. But the presence of crystalline lens has the maximum protective effect on corneal endothelium from the long term tamponade of silicone oil. The authors feel the need of a large randomized control trial on local population to get a better understanding of the long term effects of silicone oil on corneal endothelium.

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