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Research Article

Change in Endothelial Cell Count after Silicon Oil Removal in Phakic and Pseudophakic Patients After Retinal Detachment

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Abstract

Purpose: To assess the number of corneal endothelial cells in retinal detachment patients following silicone oil removal.

Study Design: Randomized control study.

Place of Study: Eye Unit-II, Ophthalmology Department, Mayo Hospital, Lahore.

Duration of Study: 1st May 2022 to January 2023.

Material and Methods: A total of 54 patients with retinal detachment were chosen from the Ophthalmology Department of Mayo Hospital Lahore. The group was divided into groups A and B. There were 27 patients in Category A who were pseudophakic in the affected eye, and 27 patients in Category B who were phakic in the affected eye. Patients with a history of eye surgery other than a cataract operation, any retinal disorder, or a corneal disorder diagnosed with tractional retinal detachment were excluded from the study. For the purpose of removing silicone oil, all patients underwent a 23 gauge pars planavitrectomy. All patients have bilateral specular microscopy performed for endothelial cell count, coefficient of variation, and proportion of hexagonal cells both preoperatively and four months after surgery. Following specular microscopy, results were recorded.

Results: The study included 54 patients, of which 29 were men and 25 were women. The patients' average age was 53.45 5.41. Ages ranged from 36 to 63 in category B and from 38 to 64 in category A. The mean preoperative count in the operated eye in category A was 2344.58 ± 62.48, whereas the mean preoperative count in category B was 2472.08 ± 41.67. While group B's mean post-operative count in the operated eye was 2444.09 ± 39.41, category A's mean post-operative endothelial count in the operated eye was 2267.05 ± 76.81. It was statistically significant that the endothelial cell count had decreased.. Endothelial cell counts in both groups dropped, with cell losses of 31.49 ± 26.79 in the group of phakic patients and 78.63 42.05 in the group of pseudophakic patients.

Conclusion: After the silicon oil was removed, the endothelial cell count fell in both categories, with cell losses of 31.49 ± 26.79 in the group of phakic patients and 78.63 ± 42.05 in the group of pseudophakic patients. Endothelial count loss that is statistically significant was observed.

Keywords: Corneal Endothelial Cell Count; Retinal Detachment; Specular Microscope; Phakic; Pseudophakic

Introduction

Retinal detachment (RD) is a sight-threatening condition characterized by the separation of the neurosensory retina from the retinal pigment epithelium. It remains a significant cause of visual impairment worldwide, necessitating prompt and effective management to prevent irreversible vision loss. Among the surgical approaches for RD repair, the use of intraocular silicone oil has become a common practice, particularly in cases with complex retinal detachments or proliferative vitreoretinopathy (PVR).

While silicone oil tamponade serves as an effective tool in stabilizing the retina and promoting reattachment, its removal is often required due to associated complications such as elevated intraocular pressure, cataract formation, and emulsification. Despite its benefits, the removal of silicone oil poses potential risks to ocular structures, including the corneal endothelium.

The corneal endothelium plays a pivotal role in maintaining corneal transparency and optical clarity by regulating hydration and corneal thickness. However, it is vulnerable to various insults, including intraocular surgeries and prolonged exposure to silicone oil. Understanding the impact of silicone oil removal on endothelial cell count is crucial for optimizing postoperative outcomes and minimizing the risk of endothelial decompensation, particularly in patients undergoing RD repair.

Twenty-three gauge pars planavitrectomy has become a popular vitreoratinal surgical method in recent years. As a result of less post-operative inflammation and minimal corneal astigmatism due to avoiding scleral sutures, early visual recovery with minimal post-operative swelling is likely due to a number of advantages of this surgical modality, including easier pars plana access with less conjunctival scarring, shorter surgical time, and increased patient comfort [1-3].

The state of the cornea both before and after surgery is extremely important in any ocular surgery since it is a crucial ocular structure that primarily determines the eye's dioptric power [4]. By using a specular microscope, which evaluates the cornea's endothelial cell count, mean cell density, percentage of hexagonal cells, coefficient of variation, and corneal thickness, the state of the cornea is determined [5]. It is generally acknowledged that anterior segment surgery lowers the number of corneal endothelial cells and, if the cornea is unhealthy, may result in corneal decompensation [6]. The consequences of posterior segment procedures on the cornea, particularly when the surgery is assisted by endotamponades, have, however, only been the subject of a relatively small number of investigations [7]. A common tamponade used following surgery for retinal detachment is silicone oil. It remains in the eye for at least three months before being removed, depending on the condition of the posterior region of the eye [8]. After removing the silicon oil, a drop in endothelial cell count is seen. Increased intraocular pressure, cataracts, uveitis, and band keratopathy on the cornea are only a few of the complications that intra ocular silicone oil is linked to. In aphakic and pseudophakic patients, silicone oil vitreoretinal surgery has been found to influence the corneal endothelium, but its effects in phakic individuals are unknown. Commercially, silicone oil is offered in formulas of 5000 and 1000 centistoke. Nowadays, 5000 centistoke silicone oil is used frequently because it has little adverse effects [9,10].

To address this gap in knowledge, the present study aims to investigate the changes in endothelial cell count following silicone oil removal in both phakic and pseudophakic patients who have undergone RD repair. By evaluating the effects of silicone oil removal on endothelial health in different patient populations, this study seeks to provide valuable insights into the management of RD and optimize surgical strategies to preserve ocular function and vision.

Materials and Methods

54 patients who visited the Mayo Hospital Lahore's Ophthalmology Department were chosen. The study covered patients with rhegmatogenous retinal detachment. The group was divided into groups A and B. There were 27 patients in Category A who were pseudophakic in the affected eye, and 27 patients in Category B who were phakic in the affected eye. Patients who had undergone eye surgery prior to cataract surgery, as well as those with any retinal or corneal disorders identified as being caused by tractional retinal detachment, were excluded from the study. For the purpose of removing silicone oil, all patients underwent a 23 gauge pars planavitrectomy. All patients have bilateral specular microscopy performed for endothelial cell count, coefficient of variation, and proportion of hexagonal cells both preoperatively and four months after surgery. Following specular microscopy, results were recorded. Under local anaesthesia, all vitrectomy procedures were carried out. Three ports were created into the posterior segment through the pars plana following the aseptic measure with the use of 23 gauge trocars. After performing a core vitrectomy, a posterior vitreous detachment was caused. Following that, the entire vitreous was removed. Localising the primary break was done next, and silicon oil was removed after that. In some pseudophakic patients, drainage retinotomy had to be performed since the initial break could

not be localised, requiring the use of an extrusion needle and air tamponade to aspirate the sub retinal fluid via the primary break. Steroid and antibiotic eye drops were recommended following surgery. Following surgery, the patients were released following the removal of silicon oil and slit lamp examination. Patients were observed for secular microscopy and recording of results four months after surgery.

Results

The study included 54 patients, of which 29 were men and 25 were women. The patients' average age was 53.45 5.41. Ages ranged from 36 to 63 in category B and from 38 to 64 in category A. The mean preoperative count in the operated eye in category A was 2344.58 62.48, whereas the mean preoperative count in category B was 2472.08 41.67. In group B, the average post-operative endothelium count in the operated eye was 2444.09 39.41, compared to 2267.05 76.81 in category A (Table 1).

Sr. No	Corneal Endothelial Cell Count	Category A		Category B	
		Operated Eye	Non-Operated Eye	Operated Eye	Non-Operated EYE
1	Pre-Operative	2344.58 ± 62.48	2441.25 ± 51.56	2472.08 ± 41.67	2478.21 ± 34.68
2	Post operative	2267.05 ± 76.81	2435.38 ± 51.26	2444.09 ± 39.41	2472.80 ± 34.22
3	Change	78.63 ± 42.05	6.78 ± 4.67	31.49 ± 26.79	4.48 ± 3.46

Table 1

Discussion

The authors of this study describe the corneal alterations in the Pakistani population following primary vitrectomy with silicone oil removal. Although it is well known that anterior segment surgery lowers the number of corneal endothelial cells, there have been few studies done to look at how the pars planavitrectomy with internal tamponade affects the human cornea. According to the authors, this is the first time that local demographic data of this kind has been collected. In both phakic and pseudophakic patients, our work demonstrates that a three port pars planavitrectomy with silicone oil removal lowers corneal endothelium numbers. The endothelial count in the patients' other, unoperated eye was also compared by the authors. According to the study, the number of corneal endothelial cells fell more in pseudophakic patients than in phakic patients, pointing to a possible protective function of the crystalline lens [11,12]. Furthermore, the pre-operative endothelial cell counts in the pseudophakic patients were lower than those in the phakic patients, which is accounted for by the history of prior anterior segment (cataract) surgery [13]. In spite of this endothelial cell count, no patient on follow-up showed signs of corneal decompensation, indicating that the endothelial count was not clinically significant. No patient experienced an early silicone oil removal problem, such as an increase in intraocular pressure or an anterior chamber silicone oil bubble, during the follow-up period. The 23 gauge approach of pars planavitrectomy is now the method of choice for retinal detachment surgery since it requires less time during surgery, provides better patient comfort, reduces post-operative problems, and results in negligible corneal astigmatism because scleral sutures are not used [14,15]. Goyal JI et colleagues. investigated alterations in corneal endothelial cells in children who had undergone pars planalensectomy without intraocular tamponade [16,17]. They came to the conclusion that the pars planalensectomy caused 8.02 76% fewer loss of corneal endothelial cells, or 2%, than when the identical treatment was carried out in the anterior chamber. After a vitrectomy with silicone oil removal, the corneal endothelium has recently been investigated for alterations [16,17]. Their research revealed that the corneal endothelium was significantly affected by silicone oil intraocular tamponade because the mean density of corneal endothelial cells was lower in the silicone oil-treated eyes (2076 196 cells/mm2) than it was in the control group's eyes (2738 86 cells/mm2) [18]. A study found that using silicone oil during several vitreoretinal surgeries may cause corneal endothelial cell loss. After three vitreoretinal procedures involving the use of silicone oil, their findings demonstrated a loss of 68.8% endothelial cells. After the silicon oil was removed, the average cell loss was higher in aphakic eyes (66.63%) than in pseudophakic eyes (51.66%). Their findings also imply that after silicone oil removal, the presence of an artificial lens or iris diaphragm may have a protective impact on the corneal endothelium [19,20].

Conclusion

Based on the findings of our study, we draw the conclusion that, regardless of the lens situation, vitreoretinal surgery with silicone oil removal does have an impact on the corneal endothelium. After the silicon oil was removed, the endothelial cell count fell in both categories, with cell losses of 31.49 ± 26.79 in the group of phakic patients and 78.63 ± 42.05 in the group of pseudophakic patients. Endothelial count loss that is statistically significant was observed.

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