**ORIGINAL ARTICLE**

# Role of Silicone Oil in Retinal Reattachment

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## ABSTRACT

**Aim:** To study the role of liquid silicone to be used in the procedure to elevate membranes from the detached retina

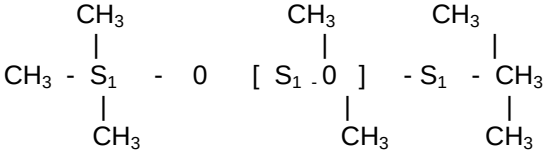
**Methods:** Complicated retinal detachment is one in which vitreous cannot be as internal temponade. This occurs due to the formation of PVR membranes cause massive vitreo retinal retraction. The fundamental problem of massive retinal retraction in the contractual stage is due to formation of contracting membranes. These membranes form both on the surface of the retina, away from the retina and the sub retinal space. These membranes distort and immobilized the retina in such a way that it cannot be treated by buckling alone.

**Results:** The injection of liquid silicone enables the membrane to be stretched to appoint at which these either rupture spontaneously or can be ruptured at weak point by a needle tip. Retina being tremendously elastic tissue is able to stretch further than the membrane. At this point membrane is actively elevated by the injecting needle and separated from the retina as widely as possible. Patients selected for this study were those who presented with complicated retinal detachment in outpatient department of Ophthalmology, BV Hospital Bahawalpur. The technique was different for both the groups. In group-A, we were able to completely reattach the retina in ten cases (62.5%) and partially in four cases (25%). retina could not be reattached in two cases (12.5%).In group B there was no PVD. Out of fourteen cases, we achieved completely reattachment in seven cases (50%) and partial reattachment in 5 (35%). in 2 cases (15%) retina remained detached.

**Keywords:** PVD-Posterior Vitreous Detachment, RPE-Retinal Pigment Epithelium, RTF - Retinal Tear Formation,

## INTRODUCTION

Retina is immobilized by early membrane formation; It is often possible to reposition it by conventional buckling Surgery. The stages of immobilization are the distortion of Retinal tear, visible loss of retinal undulation on eye movements and presence of pigment epithelial cells on the retina and Vitreous. In the early stages the grip which the membranes have on the surface of retina is limited. As the membrane develop, The fibrocyte like cells contract and there adhesions to the retina Increases. At this stage retinal retraction occurs. It is very difficult to detach these membranes from retina. Early treatment depended upon the use of vitreous Injections of saline and gas to force the retina back into place. The cases where vitreo-retinal adhesions were massive, the intra Vitreal gas injections could not work. Recently silicon oil has been Used to dissect the membranes from the retina. Silicon liquids are linear Synthetic polymers made up of repetitive (-si-o) units. Difference among the silicon liquids are determined by the length of polymer. This affects viscosity and hydrocarbon radicals which contribute the side group of polymer. Silicon liquid used clinically is generally



polydimethyl siloxane. Silicone liquid is transparent. It has refractive index of 1.404, which higher than that of the vitreous (1.334). This causes the optics of an eye to change when filled with silicon oil. In the phakic eye it causes the hyperopic change in refraction (about+ 5 d). Since front surface of silicon globule is convex, in aphakics, the refractive error is reduced. Silicon oil being lighter than water contacts retina with an upward buoyant force. Silicon oil has surface tension with water of 40mN/M. this surface tension combined with buoyant force means that silicon globules can affectively support a surgical attached retina above horizontal meridian if it is free of traction.Silicon oil can be used as a surgical tool in the primary procedure to separate the tractional membranes from the retina and there subsequent dissection. So that traction over the retina is relieved and retina goes flat. This technique is based on the finding that if one stretches membrane – retina complex, it is the membrane which splits first because retina is surprisingly very elastic as compared to PVR membrane. The brief history of

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retinal reattachment surgery can be divided into two periods. During early periods, the sclera perforated with the presumption "Effusion of fluid between the choroid and the retina to relieve the patients' pain by wave in 1814. Yellow colored fluid came out. This procedure was modified later on by draining the SRF with needle and syringe. Leber hypothesized that the disease was caused by adhesion of retracting vitreous to the retina. Efforts were than made to cause adhesive chorio-retinitis or push the retina against the choroid. Various methods were proposed to accomplish these aims such as galvano country, electrolysis, retinal sutures and injections of tincture iodine in sub retinal space or vitreous (schepens L. Charles & chedid G. nabil, 1994). Vitreous injections of several substance like saline, CSF and aqueous were tried. In 1895, deutschman used multiple dissection operations to cut vitreo-retinal adhesions and the refill the vitreous cavity with saline. Later on shortening procedures on sclera to reduce the size of eyeball were attempted by alaine in 1893. Since all the techniques were unconcerned with the localization of retinal break, the success rate was less than 1%.The modern area is characterized by two major efforts to reattach the detached retina. Following the theory of dewecker and gonin, a technique was developed. It was aimed to close the retinal break by extraocular surgery and neutralizing or eliminating the vitreous traction by the intra-ocular manipulation. The history of retinal detachment surgery shows that after the first flush over new found ability to treat successfully retinal detachment with tear formation by use of sclera dissection and than by use of sclera buckles. Even after successful localization of tears and correct placement of buckles, retina could not be reattached. Interest moved from tear itself to vitreou Enthusiasts over reacted and a paper entitled vitreology versus vitrectomy were published. Interest in the treatment of massive vitreous traction was aurosed by Paul cibis in early 1960s. It was not until cibis published his historical article that the underlying pathology in the massive vitreous retraction began to be related to the clinical appearance and means of separation the membranes from the retina was first described (J.D. Scott, 1972). At 4-5mm stage, optic vesicles invaginate inwards to form double walled optic cup. Optic vesicles and optic stalk is incomplete and deficient making a notch. This notch is called optic fissure, choroidal fissures or fetal fissure. Mesodermal cells invade through the choroidal fissures and fill the optic cup (Warwick, 1976). These cells develop into hyaloids artery by vasoformative substances (Warwick, 1976). Branches of hyaloids artery called vasa hyoidea propria fill the cavity. This vascular system has no fenestration (sea bag, 1992). Around this vascular system, there are mononuclear cells and fibroblasts. Mononuclear cells act as phagocytes while the fibroblasts form collagen network. This cellular and vascular tissue is called primary vitreous (sea bag, 1992) or primitive vitreous (Snell, 1989).Closure of choroidal fissure starts in the central portion in fifth week of gestation (8 – 10mm stage). It closes both in forward and backward direction. Complete closure takes place in seventh week (10 – 12 mm stage). By now vitreous cavity becomes a closed compartment. The walls of eyeball come in tension which is responsible for the further growth of eye ball (sea bag 1992).At the end of sixth week, a cellular structure begins to appear between the retina and the primary vitreous. This is called secondary vitreous or definite vitreous (Snell, 1989). Blood flow in the hyaloids artery stops in $7^{th}$ month of gestation. While all of the vascularized and cellular primary vitreous is replaced by a vascular and relatively cellular secondary vitreous. Secondary vitreous consists of mainly collagen network and hyaluronic acid. At 4 – 5mm stage the optic vesicles invaginates and form double walled optic cup. Inner wall consists of single layer of epithelial cells called retino blasts. The nuclei of these cells divide and arrange themselves into several layers. At this stage this layer can be divided into two zones. Outer zone consists of 8-9 rows of nuclei while inner zone is devoid of nuclei called marginal zone (Hamming and Apple, 1987).

## METHODOLOGY

Patients selected for this study were those who presented with complicated retinal detachment in outpatient department of Ophthalmology, BV Hospital Bahawalpur.The patients came directly were refereed from remote areas and urban areas. Those patients who presented with tractional retinal detachment due to proliferative diabetic retinopathy, exduative retinal detachment were excluded from the study. The patients with retinal detachment associated with massive vitreous hemorrhage were also excluded from the study. Patients were thoroughly evaluated before surgical procedure by taking history, general physical examination, visual aquity recording, intraocular pressure, slit lamp examination, distant direct ophthalmoscopy, fundus examination, vitreo-retinal drawing, and ultrasound (B-Scan) exam.

## RESULTS

The study was carried out from June, 2016 to August, 2016.During this period, 30 eye patients with retinal detachment were operated. The average age was 40 years (ranges from 10-73 years).Average duration of

decreased vision in the effected eye was 25 days (ranging from 10-60 days).Pre operative visual aquity ranged from faulty projections to counting fingers. The cases with faulty projections were considered for surgery due to blindness in other eye. Two groups of patients were formed depending upon different surgical techniques. Those who have PVD were placed in group A and had no PVD were placed in group B:-

Table 1

| Description | Total | Phakic | Aphakic |
|---|---|---|---|
| PVD | 16(16.3%) | 03(10%) | 13(43%) |
| No PVD | 14(46.66%) | 09(30%) | 5(17%) |

**Grouping on the Basis of Presence of PVD:** Total numbers of patients in Group A was 16(53.33%). Out of these three (10%) were phakic and thirteen (43%) were aphakic. Total numbers of patients in Group B was 14(46.6%). Out of these, nine (30%) were phakic and 5(17%) were aphakic.

Table 2:

| Age of Patients | n | %age |
|---|---|---|
| < 30 years | 9 | 30 |
| 31-50 years | 6 | 20 |
| 51-70 years | 12 | 40 |
| >70 years | 3 | 10 |

Table 3:

| Shape | n | Site | |
|---|---|---|---|
| | | Superior | Inferior |
| H.S.S | 14(48%) | 8 | 6 |
| Round | 03(10%) | 2 | 1 |
| Mixed | 06(20%) | 4 | 2 |
| GRT | 03(10%) | 1 | 1 |
| No Hole | 04(14%) | | |

Table 4:

| Type of PVR | n | %age |
|---|---|---|
| Grade A & B | - | - |
| Grade Cp1 | 5 | 16.66 |
| Cp11 | 14 | 46.66 |
| Cp111 | 4 | 13.33 |
| CA 1v | 7 | 23.33 |
| CA v | - | - |

Table 5: Group A (16 Cases)

| Description | n | %age |
|---|---|---|
| Completer retinal reattachment | 10 | 62.5 |
| Partial Retinal Reattachment | 4 | 25 |
| No Retinal Reattachment | 2 | 12.5 |

Table 6: Group B (Cases)

| Description | n | %age |
|---|---|---|
| Completer retinal reattachment | 7 | 50 |
| Partial Retinal Reattachment | 5 | 35 |
| No Retinal Reattachment | 2 | 15 |

## DISCUSSION

Study comprised of 30 cases. These were divided into two groups. Group A consists of 16 patients (53.3%) having detached posterior hyaloids. Group B comprised of 14 (46.7%) patients. The patients in Group B were not having PVD. In 5 patients shallow inferior detachment persisted. Two of these cases ended in phthsis bulbi. So the patient with retinal detachment should be operated as early as possible. Long duration of detachment prevents the normal nutrition to the neuro sensory retina and visual rehabilitation even after successful anatomical reattachment is not good. As to post operative visual acuity , even after complete anatomical reattachment of the retina, visual acuity ranged from counting fingers to 6/36. Visual acuity of 4/60 to 6/36 in 12 patients during 3-6 months follows up time.

## CONCLUSIONS & RECOMMENDATIONS

- Post operative care should be taken that there should be single large bubble.
- Emulsification of silicone oil can be reduced with optimum fill of the vitreous cavity.
- Silicone oil kertaopathy is prevented if oil is in single bubble form.
- Secondary glaucoma due to liquid silicone does not occur if the inferior iridectomy is patent and working in aphakics.
- Incidence of PVD is more in aphaik retinal detachments than phakic retinal detachment.
- Before proceeding for surgery, thorough clinical examination is mandatory especially dynamic vitreous retinal study.
- Liquid Silicone can be used as surgical tool to manage complicated retinal detachment.

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