



Comparison of Results after Conventional Retinal Detachment Surgery with Sub-Retinal Fluid Drainage versus Non-Drainage

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Objective: To compare the anatomical as well as visual outcome after conventional retinal detachment surgery with sub-retinal fluid drainage versus non-drainage

Study Design: Non-randomized interventional (quasi experimental) study.

Material and Methods: This study was conducted at Institute of Ophthalmology, Mayo Hospital Lahore from February 2011 to July 2012. Total 52 eyes of 52 patients between 20-60 years of age, with uncomplicated primary rhegmatogenous retinal detachment were selected after fulfilling inclusion and exclusion criteria. After informed consent, all patients were randomized into two equal groups. All patients underwent scleral buckling surgery with external drainage (Group-I) or without external drainage (Group-II) of sub-retinal fluid, and followed for complete clinical examination including visual acuity, funduscopy and postoperative complications at 1st, 2nd, 3rd, and 6th month postoperatively to detect the difference in outcome after drainage and non-drainage techniques. Re-attachment of retina at any follow-up visit was considered anatomic success.

Results: Out of total 52, data was calculated of 50 patients because one in each group quit follow-up. Primary anatomical re-attachment rate was 76% in group-I and 64% in group-II after 1 month ($p=0.19$) while this figure was 88% and 84% after 6 month ($p=0.56$). Best corrected visual acuity (BCVA) improved almost equally in both groups from median of 6/36 to 6/24, 6/12 and 6/9 after 1, 2 and 6 months. Complications such as globe perforation, scleral dehiscence, mild sub-retinal hemorrhages, vitreous incarceration and vitreous hemorrhage were also observed and managed.

Conclusions: We did not find any significant difference in anatomical outcome between drainage and non-drainage techniques of scleral buckling surgery in uncomplicated primary rhegmatogenous retinal detachment. Visual acuity (VA) was almost same in both groups as well, although it was dependent upon other factors

Key Words: Rhegmatogenous Retinal Detachment, Scleral Buckling, Sub-retinal fluid



Introduction:

A full thickness defect in neural layer of retina is called Rhegma, a Greek word meaning break or rent. This break allows liquefied vitreous to enter the sub-retinal space between neural layer of retina and retinal pigment epithelium, creating a primary retinal detachment or rhegmatogenous retinal detachment (RRD). Rhegmatogenous retinal detachment is most common type of retinal detachment out of three types other being tractional and exudative retinal detachment.

Retinal breaks were first time described in 1853¹ and their important relation to RRD was noted earlier in 1870². In 1921, Gonin established a schematic mechanism of retinal break causing RRD and demonstrated that closing the break can lead to successful reattachment of retina³.

Normally the retina is kept attached by a variety of mechanical, physical and metabolic forces⁴, including intraocular pressure, osmotic pressure from the extra-choroidal proteins⁵, the possible adhesive effect of inter photoreceptor matrix⁶ and pumping effect of the RPE.

Forces acting to detach the retina include the vitreo-retinal traction and the intra-ocular fluid currents⁷. Normally the forces that keep retina attached are more powerful but when retinal break is present and forces acting to detach the retina exceed, fluid vitreous enters the sub-retinal space through the break leading to RRD.

Scleral buckling (SB), first described by Schepens⁸, is still considered as a standard procedure for the repair of RRD. SB includes encircling buckle and segmental buckles, which can be placed radially, circumferentially, or obliquely depending upon location and number of breaks, configuration and extent of RD.

Closure of the break in RRD is often enough to flatten the retina⁷. Scleral buckling primarily may be associated with complications such as reduced retinal blood flow; extrusion of buckle, changes in refraction, motility defect and post-operative pain. Sometimes SB is combined with sub-retinal fluid drainage and cryotherapy,⁹ which may be associated with their own complications.

SRF drainage is considered the most hazardous part of the conventional retinal re-attachment surgery due to its complications and therefore, in treating patients with RRD, consideration must be given to whether drainage is necessary or not¹⁰. However some surgeons feel that unless the SRF is externally drained anatomical re-attachment of the retina will not happen spontaneously. They say that drainage of sub-retinal fluid during RD surgery is very valuable to facilitate retinal re-attachment, retinal break apposition and placement of a scleral buckle. It can be done in any RRD but specifically indicated in patients with bullous RD, inferior RD, proliferative

vitreo-retinopathy (PVR), aphakic detachments and old detachments¹¹.

Multiple complications are associated with surgical drainage such as sub-retinal haemorrhage¹², choroidal-neovascular membranes¹³, retinal and vitreous incarceration into the drainage site¹⁴, retinal perforation, vitreous haemorrhage and endophthalmitis. Many of the per-operative complications of RD surgery are the consequence of surgical drainage of SRF¹⁵.

Material and Methods:

Total 52 consecutive patients of age between 20-60 years presenting to Institute of Ophthalmology, Mayo Hospital Lahore, with uncomplicated RRD of less than 3 months duration were recruited. Patients with pre-existing macular pathology such as age-related macular degeneration, macular hole, macular scars and vitreo-macular traction syndrome likely to influence retinal flattening after RD surgery were excluded. Similarly patients with previous history of retinal surgery and ocular pathologies such as uveitis, glaucoma, diabetic retinopathy, hypertensive retinopathy and proliferative vitreo-retinopathy of more than grade C2 were also excluded.

After informed consent all patients were randomized into two equal groups for drainage and non-drainage techniques of scleral buckling surgery. Data including ocular and systemic history of all patients who were to undergo surgery by single experienced surgeon was documented and pre-operative ocular examination along with characteristics of RD was recorded. Special care was taken on history to explore the exact duration of retinal and macular detachment. Assessment of best-corrected visual acuity by Snellen's Acuity Chart, pupil reaction by torch, anterior segment examination by slit lamp, retinal examination by indirect ophthalmoscope and slit lamp bio-microscopy using Volk 90-diopters lens after dilatation of pupils and intraocular pressure by Goldman applanation tonometer was done. Similar complete clinical examination was done on each follow-up visit.

Scleral buckling surgery with or without cryo application was done in all patients but intra-operative SRF drainage was done only in group-I. SB was achieved in all patients by 3600 encirclement using silicon band 240S in 24 (48%), 41S in 21(42%), 40S in 2(4%) patients. Additionally tier 276S in 6(12%), 277S in 17(34%), 279S in 6(12%) and sponge 505S in 3(6%).

All patients were examined by same surgeon on 1st postoperative day; postoperative complications were managed accordingly. Follow-up visits were scheduled on 1st, 2nd, 3rd and 6 months postoperatively. If any patient got reattachment at any follow-up visit, he was considered

anatomically successful.

Results:

Out of total 52, data was calculated of 50 patients because one in each group quit follow-up due to unknown reasons. Pre-operative data of all patients is given in Table 1. Age range in both groups was predefined as 20-60 years with slightly different Mean Value of age. Main component of our sample size consisted of Male Gender in both groups as 17(68%) and 15(60%) respectively (Figure 1). In our study we could not observe any statistical difference between two groups with respect to age, gender, laterality, status of lens (phakic or pseudophakic), configuration of RD, location of break (Fig. 3a and 3b), type of break (Fig. 4a and 4b), duration of RD, PVR (Fig 2), risk factors and preoperative best corrected visual acuity.

Figure 1: Gender Distribution

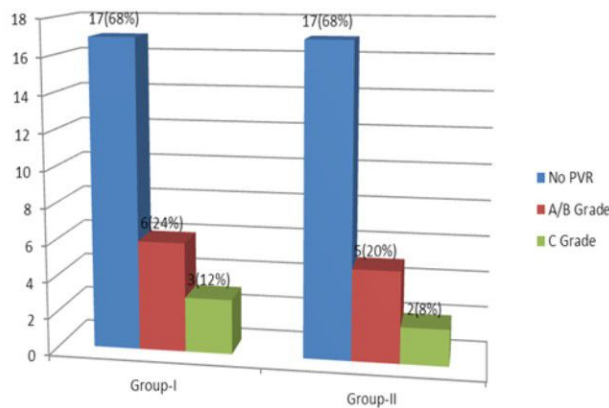
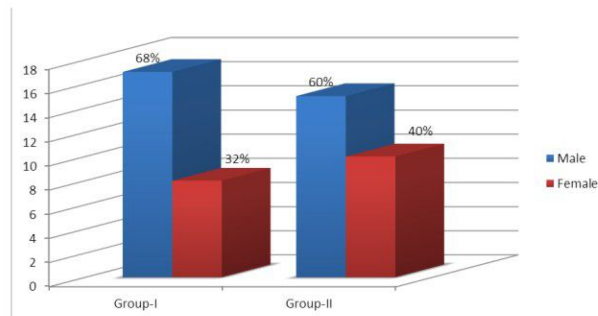


Figure 2: PROLIFERATIVE VITREORETINOPATHY



Variables	Drainage Group-I(n=25)	Non-Drainage Group-II(n=25)
Age (Years): Range Mean	20-60 56.2	20-60 57.1
Gender: Male Female	17(68%) 8(32%)	15(60%) 10(40%)
Eye: Right Left	13(52%) 12(48%)	9(36%) 16(64%)
Lens Status: Phakic Pseudophakic	17(68%) 8(32%)	18(72%) 7(28%)
Macular Detachment: Yes No	10(40%) 15(60%)	11(44%) 14(56%)
Duration of Macular Detachment: <7 Days >7 Days	7(70%) 3(30%)	9(81%) 2(19%)
PVR: No A/B C1, 2	17(68%) 6(24%) 2(12%)	17(68%) 5(20%) 3(16%)
Conf. of RD: Total Partial	10(40%) 15(60%)	11(44%) 14(56%)
Type of Break(Supposed Primary) UST Hole Dialysis Hole+UST	11(44%) 12(48%) 2(8%) 9(36%)	13(52%) 9(36%) 3(12%) 6(24%)
No. of breaks: One Two Multiple	14(56%) 9(36%) 2(8%)	11(44%) 10(40%) 4(16%)
Location Of Break(Supposed Primary) Superotemporal Superonasal Infortemporal Infronasal	16(64%) 4(16%) 3(12%) 2(8%)	14(56%) 4(16%) 3(12%) 4(16%)
Risk Factors: Nd:YAG Myopia	3(12%) 1(4%)	1(4%) 2(8%)
BCVA	Median 6/36, Range HM-6/12	Median 6/36, Range HM-6/12

Table 1:Pre-Operative Demographic Data

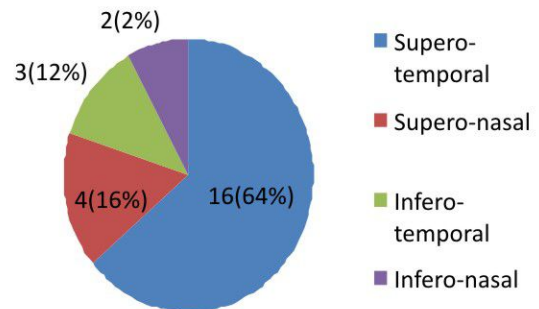


Figure 3a: LOCATION OF BREAK (Group-I)

Figure 3b: LOCATION OF BREAK (Group-II)

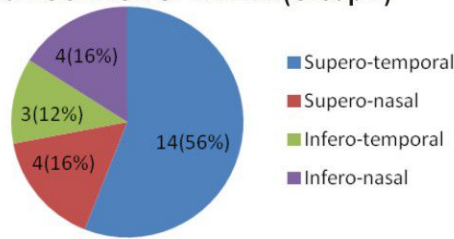


Figure 4a: TYPE OF BREAK (GROUP 1)

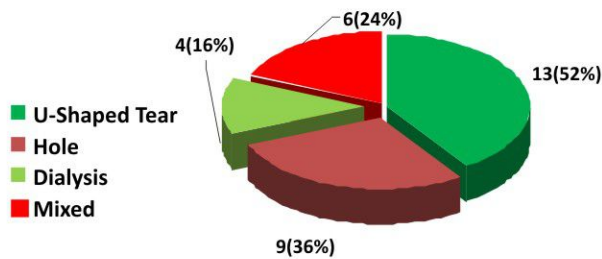


Figure 4b: TYPE OF BREAK (GROUP 2)

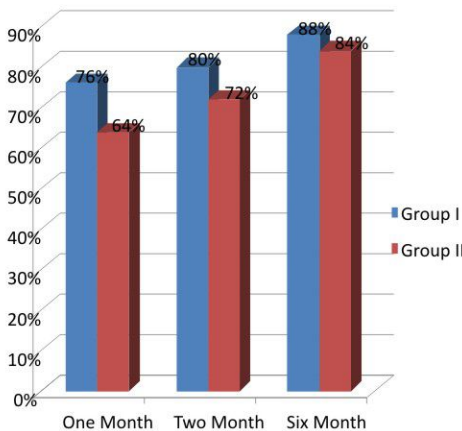
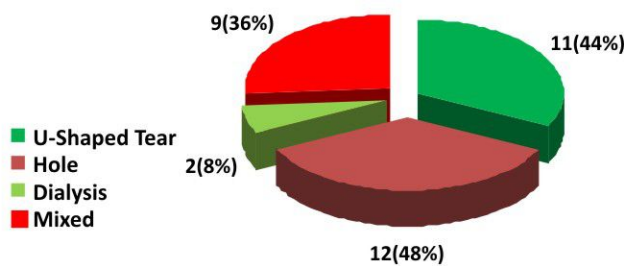


Figure 5: Post-Operative Anatomical Re-Attachment in Different Follow-up Visits

Primary anatomical re-attachment rate was 76% (19/25) in group-I and 64% (16/25) in group-II after 1 month while this figure was 88% (22/25) and 84% (21/25) after 6 months (Figure 5). The p value is 0.159 (> 0.05) at 1 month and 0.56 (>0.05) at 6 months, which shows that the difference between two groups for success rate is insignificant. Almost all patients with failure were having pre-operative PVR grade-

C except one patient in group-II which showed a missed break.

Patients, who failed to achieve re-attachment by conventional surgery or got re-detachment after successful reattachment, underwent pars plana vitrectomy with internal tamponade.

Best corrected visual acuity (BCVA) improved almost equally in both groups from pre-operative Median of 6/36 to 6/24, 6/12 and 6/9 after 1, 2 and 6 months post-operatively (Figure 5). Best corrected visual acuity in 16(64%) patients of group-I and 13(52%) patients in group-II showed improvement of 2 lines on Snellen's Acuity Chart at the end of 1st month (Figure 6). Improvement of 2 lines at the end of follow-up was 20(80%) eyes in group-I and 19(76%) eyes in group-II (Figure 7). At the end of follow-up 18 eyes (72%) in group-I and 17 eyes (68%) in group-II were having BCVA of 6/12 or more.

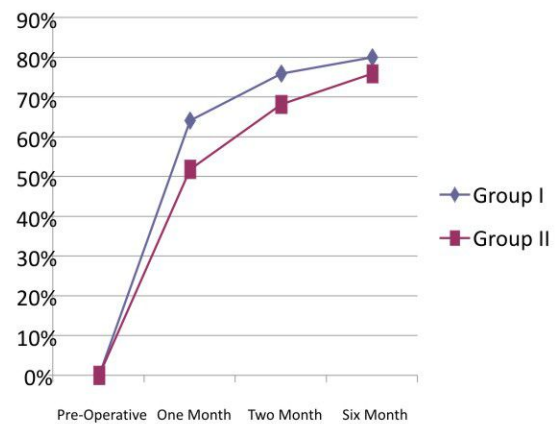


Figure 6: Two Lines Increase in Snellen's Acuity in Both Groups in Follow-up Visits

Post-Operative Median Visual Acuity

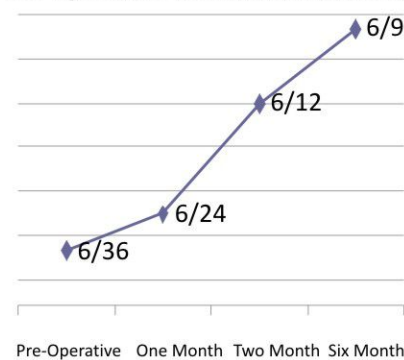


Figure 7: Post-Operative Change in Median Visual Acuity in Different Follow-up Visits in Both Groups.

Factors such as macular detachment, duration of macular detachment and PVR were found to hinder the achievement of good vision in both groups. Complications such as globe perforation, scleral dehiscence, mild sub-retinal hemorrhages, vitreous incarceration and vitreous hemorrhage were also observed in both groups which are given in table-2 and 3 below but no significant sight threatening complication was observed.

All per-operative and post-operative complications were managed accordingly. Silicone sponges were removed due to extrusion in 1(4%) in group 1 and 2 (8%) in group 2

Table 2: Per-Operative Complications

Complications	Drainage Group -I	Non - Drainage Group -II
Scleral Dehiscence	1 (4%)	2 (8%)
Globe Perforation	2 (8%)	1 (4%)
Subretinal Hemorrhages	3 (12%)	1 (4%)
Vitreous Incarceration	1 (4%)	0
Vitreous Hemorrhage	2 (8%)	0

Table 3: Post-Operative Complications

Complications	Drainage Group -I	Non - Drainage Group -II
Intraocular Pressure(IOP)	6 IOP(24%)	3↑ IOP (12%)
Extrusion of Spong e	1 (4%)	2 (8%)
Cystoid Macular Oedema	3 (12%)	2(8%)
Epi-retinal Membrane	5 (20%)	2(8%)
PVR > C2	4 (16%)	5(20%)

Discussion:

Scleral buckling is one of the most commonly performed surgical techniques, especially in developing countries, for the treatment of RRD. RD surgery was proposed by Jules Gonin, who not only performed the first successful RD surgery but also localized the break, drained the sub-retinal fluid and applied thermo-cautery¹⁶. First scleral buckle surgery was performed by Ernst Custodis¹⁷ but

described first time by Charles Schepens after developing indirect ophthalmoscope¹⁸ while silicone sponge and modern cryotherapy was introduced by Harvey Lincoff¹⁹.

Although this conventional procedure is effective in treating the uncomplicated rhegmatogenous RD²⁰, but its intra-operative and post-operative complications along-with the complications of external drainage of sub-retinal fluid cannot be ignored.²¹ Although, multiple new techniques and instruments have been introduced for the surgical management of RD²², even then majority of surgeon still prefer to perform conventional scleral buckling surgery in uncomplicated rhegmatogenous RD^{23, 24}. Along with improvement in surgical expertise, newer techniques instead of conventional technique²⁵ have been introduced for drainage of sub-retinal fluid such as modified external needle drainage of sub-retinal fluid^{26,27}, controlled drainage with continuous monitoring^{28,29}, Nd:YAG laser assisted, argon laser assisted¹¹ and diode laser assisted drainage of sub-retinal fluid¹⁰, self-sealing sclerotomy and many others with lesser complication rates.

In our study we could not observe any significantly different effect of age, gender, laterality, status of lens (phakic or pseudophakic), configuration of RD, location of break, type of break, duration of RD(<3 month), PVR, risk factors and preoperative best corrected visual acuity on final anatomical outcome in both groups but visual outcome depends on duration of macular detachment. Almost similar results were concluded by Banaee et al¹⁵ who evaluated multiple variables in different surgical techniques.

In our prospective study, we could not observe significantly different anatomical and visual outcome in both groups such as proposed by Banaee et al¹⁵ and Salicone et al³⁰. Our study shows primary anatomical re-attachment rate of 88% in drainage and 84% in non-drainage group after 6 month, which is comparable result to study of Hilton et al³¹ and Saw et al²⁴. During the assessment of re-detachment after SB Gezeni et al performed drainage and non-drainage techniques and concluded that 83% eyes showed re-attachment, out of which 7% showed re-detachment after successful re-attachment within 6 month³². All these results of re-attachment and re-detachment are comparable with our study.

In our study, at the end of follow-up 72% in group-I and 68% patients in group-II were having BCVA of 6/12 or more. This visual outcome is different from that of Banaee et al. and Hilton et al. because major proportion of their study sample was with macula-off and duration of RD was not defined which directly affect the visual outcome. We concluded in this study that macular detachment and duration of macular detachment play significant role in visual outcome in both techniques, as explained by Diederer RM et al³³, but



we could not find any relationship between duration of RD and poor anatomical and visual outcome. Not only anatomical re-attachment occurs in old RD but good vision can also be achieved, these findings are observed by Wang et al³⁴ and Sasoh et al³⁵.

Christensen U et al described that pseudophakia and aphakia are associated with poor prognosis but we could not properly evaluate and deduct this result from our study due to small sample size and excluded aphakics just as mentioned by Banaee et al¹⁵. Factors which we observed to be playing role in poor anatomical and visual prognosis were pre-operative PVR (grade C or more) and multiple breaks. Afrashi et al³⁶ also described that only factors which are playing role in poor prognosis are PVR and multiple breaks.

Similarly in our study, we performed the scleral encirclement in all cases which may reduce the choroidal blood flow, while the segmental SB do not seem to reduce choroidal perfusion^{37,38}. However, this is very small group to study the effect of scleral encirclement on choroidal perfusion, so results cannot be concluded. It has also been proposed that scleral encirclement and segmental buckling cause anterior segment ischemia and refractory inflammation which lead to delayed SRF drainage³⁹ but in our study only 4 patients showed minimal inflammation which was associated with cryotherapy and no sign of anterior segment ischemia was seen in any patient.

Controversy among the surgeons regarding the surgical techniques with drainage or without drainage is still there but overall success rate in both conditions is in the range of 83%-95%^{40,41}.

Conclusion:

We did not find any significant difference in anatomical or visual outcome between drainage and non-drainage techniques of scleral buckling surgery in uncomplicated primary rhegmatogenous RD. It seems advisable to avoid SRF drainage to minimize the complications whenever possible.

However a large randomized control trial is required to establish the exact difference between drainage and non-drainage techniques of SB so that we can clearly conclude and recommend that which is better and when is better.

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