

## Influence of systemic steroid on resorption persistent Submacular fluid and visual outcome after successful Scleral Buckling for macular off retinal detachment

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**Abstract: Introduction:** Rhegmatogenous retinal detachment is a sight-threatening disease which can lead to blindness if left untreated. Its prevalence rate is approximately one in ten thousand people per year. Scleral buckling surgery is an effective method in treatment of retinal detachment. The aim of this study was to evaluate the effect of systemic corticosteroid on the incidence and duration of sub-macular fluid absorption and its relationship with visual outcomes after Scleral buckling for retinal rhegmatogenous and macular detachments. **Methods and Materials:** In a clinical trial in 2012 at the Department of Ocular Diseases, Tabriz University of Medical Sciences, the effect of systemic corticosteroid on incidence and duration of sub-macular fluid absorption and its relationship with visual outcomes after Scleral buckling for retinal rhegmatogenous and macular detachments was evaluated. **Results and Conclusions:** 48 male and 24 female patients were studied in two groups of A (receiving systemic corticosteroid) and B (receiving placebo). The mean age of patients was  $45.80 \pm 14.09$  years in corticosteroid group (Group A) and  $45.66 \pm 14.63$  years in Placebo group (Group B). There was no significant difference between the patients of the two groups in terms of the mean IOP before surgery, one week and one month after surgery ( $p=0.967$ ). There was no significant difference between the patients of the two groups in terms of their VA level before surgery ( $p=0.938$ ), one week ( $p=0.165$ ) and one month after surgery ( $p=0.264$ ). In our study, one week after surgery, all patients had fluid; however, a month later, 21 cases (58%) in corticosteroid group and 16 cases (44%) in placebo group had sub-macular fluid; so, there was no significant difference between the two groups ( $p=0.238$ ). Presence of sub-macular fluid had no significant effect on the patients' post-surgical VA level in the two groups. The duration between detachment and the surgery in patients with sub-macular fluid in one month after surgery was longer than in those without fluid; however, this difference was not significant.

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### 1. Introduction

Rhegmatogenous retinal detachment, with a prevalence rate of one in ten thousand people per year, is a sight-threatening disease which can lead to blindness if left untreated (Ivanisević, 1997; Wilkes, 1982).

Scleral buckling surgery is an effective method in the treatment of retinal detachment, which, in most cases, will lead to anatomic and uncomplicated recovery of retinal detachment. Successful surgery for retinal detachment and complete adherence of the retina in fundus examination may not fully recover the sight. This reduced sight may be due to some pre- and post-surgical factors, including pre-surgical sight, duration of retinal detachment, and macular edema after surgery and incidence of epiretinal membrane after surgery (Lecleire-Collet, 2005; Wolfensberger, 2002; Hagimura, 2002).

Some studies recently conducted based on OCT have shown that another factor which may cause reduced sight after surgery is the prolonged presence of sub-macular fluid after a successful Scleral buckling surgery, which may be associated with lack of post-surgical sight recovery. Reports on the prevalence of this complication are very different (approximately 27% to 78%) (Lecleire-Collet, 2005). It has also been reported that absorption may take even up to one year (Hagimura, 2002). In a study by SF-Woog et al, they presume that this complication may be originated from vascular permeability changes due to CRIVE or other surgical traumas. No certain cure has yet been reported for this complication.

Wu et al, evaluating the therapeutic effect of systemic steroids in the incidence and duration of sub-retinal fluid and its relationship with visual outcomes after Scleral buckling surgery, stated that the duration

of sub-retinal fluid absorption was significantly shorter in the group receiving corticosteroid with dose of 1 mg/kg than with dose of 0.5 mg/kg. There was no significant in final BCVA of the two groups.

However, one year after operation, the first group had a higher recovery rate than other groups. This study has stated that postoperative systemic corticosteroid therapy can reduce the incidence of sub-retinal fluid and facilitate its absorption. Patients treated with steroids had higher recovery in BCVA (Wu, 2011).

Given the lack of studies on treatment of sub-retinal fluid, and regarding the possible complications such as delayed recovery of sight acuity, evaluating the efficacy of systemic corticosteroid in reducing the amount and absorption duration of sub-retinal fluid after Scleral buckling surgery, we intended to present an appropriate treatment for this case.

## 2. Material and Methods

In a clinical trial in the Department of Ocular Diseases, Tabriz University of Medical Sciences during 2011 and 2012, the effect of systemic corticosteroids were evaluated on the incidence and absorption duration of macular fluid and its association with the results of the sight outcomes after Scleral buckling for macular and retinal rhegmatogenous detachment.

This study included patients who underwent Scleral buckling surgery for retinal detachment. Initially, all patients underwent a complete preoperative ocular examination including measurement of sight acuity, intraocular pressure, and extent of detachment, lens status, location and number of retinal detachment, macular status, as well as age, sex, and duration of detachment. After surgery, patients underwent ocular examinations at the first week and the first month, and OCT test was taken. Patients with sub-macular fluid in one week after surgery were selected and enrolled into the study. Patients without sub-macular fluid in one week after surgery were excluded. Selected patients were divided into two groups of corticosteroid group (Group A) receiving corticosteroid 1 mg/kg for 10 days since one week after surgery; and Placebo group (Group B) receiving placebo in this period. All of the patients in both groups were blind to the type of received medication (corticosteroids or placebo). Absorption duration of sub-macular fluid and its relationship with sight acuity of the patients in the two groups of A and B were compared.

Inclusion criterion for the study was retinal rhegmatogenous detachment with macular detachment. Patients with sub-retinal fluid in OCT in the first week after surgery were enrolled into the study. Those with recurrent detachment, unsuccessful surgery outcome, macular holes, C-grade PVR,

epithelial membrane, or those suffering systemic diseases such as peptic ulcer or diabetes on whom administration of systemic corticosteroid was not allowed, were excluded from the study.

Prior to study, written consent was taken from all patients for participation in the study. Most of the interventions were in line with therapeutic evaluations and all surplus costs were charged to the researcher and no cost was imposed to the patients. All the extracted information was confidential, total fidelity observed the name and address of the patients will not be mentioned anywhere. Statistical analysis was performed using SPSS ver.16 software. Comparison between groups was made using one-way ANOVA test; and in case of any statistical difference, an appropriate post hoc test was used.  $p < 0.05$  was considered significant.

## 3. Results

In this study, 72 patients (72 eyes) with RD treated by SB were studied in two groups and the following results were obtained.

Age, sex, duration from detachment till surgery, number of detachments, IOP before surgery, IOP in one week and one month after surgery are shown in Table 1.

Patients' VA before surgery, one week and one month after surgery in the two groups are shown in Table 2. According to the statistical analysis of the results of Table 2, there was no significant difference in patients' VA before surgery ( $p=0.938$ ), one week after surgery ( $p=0.165$ ) and one month after surgery ( $p=0.264$ ) between the patients in the two groups.

Table 1. VA of patients in pre, after one week and one month operation

		Group		
		A	B	P
Pre Operation VA	LP	5	5	0.938
	HM	14	16	
	CF	16	11	
	1/10	0	2	
	3/10	0	2	
	6/10	1	0	
One week after operation VA	HM	0	1	0.165
	CF	20	25	
	1/10	7	3	
	2/10	3	2	
	3/10	3	3	
	4/10	1	0	
	5/10	0	1	
6/10	2	1		
One month after operation VA	HM	0	1	0.264
	CF	12	14	
	1/10	5	8	
	2/10	9	5	
	3/10	4	4	
	4/10	2	1	
	5/10	1	1	
6/10	3	2		

Table 2. Evaluation of parameter based on Rhegmatogenous retinal detachment site

	Rhegmatogenous retinal detachment site				P
	Superior	Inferior	Superior/ Inferior	Temporal	
Age	46.96 ± 15.29	43.10 ± 11.72	35.00	48.67 ± 17.21	0.633
Pre operative length	9.55 ± 11.24	63.52 ± 155.07	20.00	62.00 ± 102.20	0.114
Break count	1.49 ± .86	1.38 ± .74	2.00	1.00 ± .00	0.651
Pre Operative IOP	12.34 ± 3.07	12.10 ± 2.47	15.00	15.00 ± 7.00	0.393
One week after operation IOP	12.84 ± 1.95	12.71 ± 1.31	15.00	13.33 ± 2.31	0.625
One month after operation IOP	13.02 ± 1.76	13.00 ± 1.48	15.00	14.00 ± 2.83	0.584

Table 3. Evaluation of parameter based on Pre Operation VA

	Pre Operation VA						
	LP	HM	CF	1/10	3/10	6/10	P
Age	45.10 ± 17.36	49.57 ± 13.76	43.19 ± 14.04	35.00 ± 11.31	42.00	35.00	0.440
Pre operative length	114.30 ± 217.58	12.20 ± 16.79	16.07 ± 34.86	12.00 ± 11.31	4.00	14.00	0.040
Break count	1.30 ± .67	1.47 ± .86	1.44 ± .80	2.00 ± 1.41	1.00	2.00	0.804
Pre Operative IOP	11.80 ± 2.82	12.67 ± 3.12	12.63 ± 3.42	10.50 ± 2.12	11.00	12.00	0.869
One week after operation IOP	12.90 ± 1.10	12.59 ± 1.90	13.37 ± 1.88	12.00 ± .00	11.00	12.00	0.334
One month after operation IOP	13.11 ± 1.27	12.83 ± 1.67	13.59 ± 1.80	12.00 ± .00	11.00	12.00	0.191

Table 4. Evaluation of parameter based on one week after operation VA

	One week after operation VA								
	HM	CF	1/10	2/10	3/10	4/10	5/10	6/10	P
Age	48.00	47.71 ± 13.87	50.00 ± 13.61	34.80 ± 18.65	42.33 ± 12.68	40.00	35.00	31.67 ± 13.32	0.276
Pre operative length	5.00	37.00 ± 110.31	16.00 ± 26.40	9.40 ± 10.48	9.00 ± 6.57	4.00	30.00	8.00 ± 5.29	0.987
Break count	4.00	1.40 ± .72	1.20 ± .63	2.00 ± 1.22	1.33 ± .82	1.00	1.00	1.67 ± .58	0.033
Pre Operative IOP	12.00	12.71 ± 3.03	13.80 ± 3.68	11.00 ± 3.67	10.83 ± 1.17	12.00	12.00	9.33 ± 3.06	0.334
One week after operation IOP	12.00	13.00 ± 1.97	13.33 ± 1.66	13.20 ± 1.64	11.67 ± .52	12.00	12.00	12	0.657
One month after operation IOP	12.00	13.18 ± 1.74	13.56 ± 1.59	13.40 ± 1.95	11.67 ± .52	12.00	12.00	13.33 ± 2.31	0.490

Table 5. Evaluation of parameter based on One month after operation VA

	One week after operation VA								
	HM	CF	1/10	2/10	3/10	4/10	5/10	6/10	P
Age	48.00	46.27 ± 14.12	49.23 ± 11.31	46.57 ± 19.26	41.88 ± 13.29	49.00 ± 14.00	37.50 ± 3.54	38.60 ± 13.67	0.845
Pre operative length	5.00	56.69 ± 142.61	8.62 ± 5.45	12.93 ± 23.20	14.75 ± 19.19	10.33 ± 3.51	17.00 ± 18.38	6.80 ± 4.15	0.743
Break count	4.00	1.54 ± .81	1.23 ± .60	1.43 ± .94	1.38 ± .74	1.33 ± .58	1.00	1.40 ± .55	0.086
Pre Operative IOP	12.00	12.81 ± 2.99	11.92 ± 3.25	13.43 ± 3.96	10.75 ± 1.28	12.67 ± 2.08	12.00	11.60 ± 3.85	0.681
One week after operation IOP	12.00	13.03 ± 1.88	12.92 ± 2.18	13.07 ± 1.82	11.75 ± .46	14.33 ± 2.08	12.00	12.5 ± 1	0.498
One month after operation IOP	12.00	13.28 ± 1.43	13.00 ± 2.27	13.36 ± 1.74	11.75 ± .46	14.33 ± 2.08	12.00	13.50 ± 1.91	0.264

In OCT one month later, the fluid was absorbed in 15 cases in Corticosteroid group (Group A) and 20 cases in Placebo group (Group B); and there was no significant difference in presence of fluid between the patients in the two groups ( $p=0.285$ ).

Macular status before surgery, one week and one month after surgery are shown in Table 3.

There was a significant direct linear relationship between patients' age and their IOP in one month after surgery ( $p=0.018$ ,  $R=0.281$ ). There was a significant direct linear relationship between total detachments and patients' IOP at one month after surgery ( $p=0.036$ ,  $R=0.251$ ).

#### 4. Discussions

Rhegmatogenous detachment is the most common type of retinal detachment affecting one in every ten thousand people per year (Hilton, 1986). Scleral buckling surgery is considered as one of the

effective treatments for RD which has several complications and in many cases, leads to reduced sight and failure of treatment.

In addition to enhanced quality of surgery, efforts have been made to reduce postoperative complications which include using systemic corticosteroid to decrease and control some complications.

Anatomic success of Scleral buckling surgery in RD patients depends on some factors such as presence of vitreoretinopathy, injury, myopia, background disease, retinopathy of prematurity, and the position of intraocular lens, PVR, uveitis and choroidal detachment before surgery. Sight outcomes depend on the status of macula, preoperative sight acuity and type of the disease with Rd (Hartnett, 2000).

Rhegmatogenous retinal detachment (RRD) surgery by Scleral buckling technique has several

complications including choroidal detachment (40%) (Williams and Aaberg, 2001; Packer, 1983) and cystoid macular edema (CME) (Miyake, 1986; Meridith, 1980).

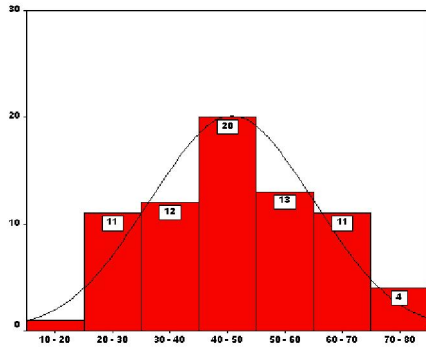


Chart 1. Age distribution of patients

Macular pucker is one of the main causes of sight loss after Scleral buckling surgery caused by the accumulation of retinal pigment epithelial (RPE) cells and retinal glias in the macular area, retinal blade membrane (Ackerman, 1985) that leads to severe sight reduction and has an incidence rate of 3-17% (16 & 18).

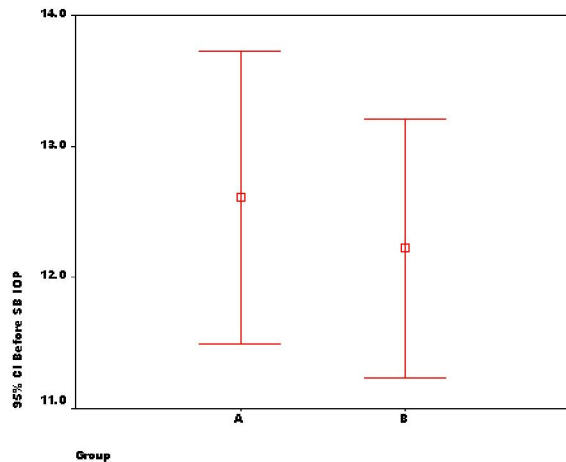


Chart 2. Pre operative IOP distribution of patients in two groups

In a study by Benson et al at Department of vitreous and retina of London Hospital of Ophthalmology in 2006, evaluating the OCT results of RD patients, they stated that OCT is an efficient and noninvasive method to assess the existence of sub-macular fluid after treatment of RD (Hilton, 1986).

In our study as well, OCT has been used to evaluate the fluid level.

Incidence rate of RD is high in the age range of 40-70 years, and is at the peak during the sixth decade of life (Hilton, 1989).

In our study, 48 cases (66%) of RD patients under study were over 40 years old.

In various reports, the most common site of rupture is located at the (40-70 percent) (Hilton, 1989).

In our study as well, the frequency of RD in outer-upper area was higher than in other areas.

In a study by Sheu et al. in 2008 at the Department of Ophthalmology, University of Wenzhou, China, evaluating the sub-macular fluid after SB in RD patients, they stated that the incidence of sub-macular fluid in successful SB was 47.7% (Shen, 2008).

In a study by Benson et al. in London Hospital of Ophthalmology in 2007, they stated that, evaluating by OCT in 6 weeks after SB, PSRF was observed in 55% of the patients (Benson, 2007).

In a study by Kim et al at the Department of Ophthalmology, Seoul National University, South Korea in 2010, they stated that SMF was observed in 55% of patients undergoing SB (Kim, 2010).

In our study, all patients had fluids in one week after surgery; however, in one month after surgery, 21 cases (58%) in corticosteroids group and 16 cases (44%) in the placebo group were observed with fluid. There was no significant difference between the two groups ( $p=0.238$ ) similar to the results of the above mentioned studies.

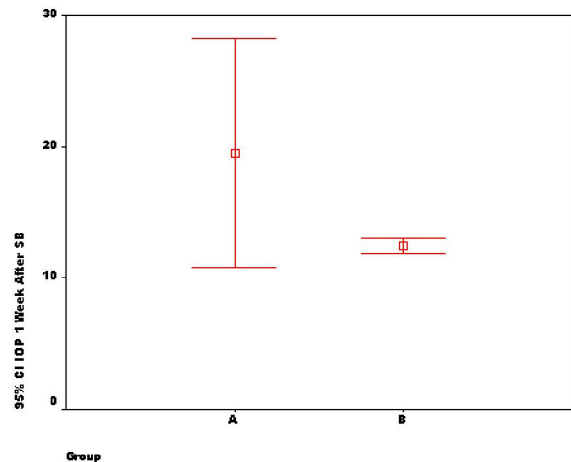


Chart 3. One week after operation IOP distribution of patients in two groups

In a study by Seo et al at the Department of Ophthalmology, University of Seoul, South Korea in 2008, evaluating the effects of sub-macular fluid in patients after successful SB in RD, they stated that the level of sub-macular fluid after successful SB has no significant effect on patients' VA (Seo, 2008).

In our study, there was no significant difference in VA of patients of the two groups.

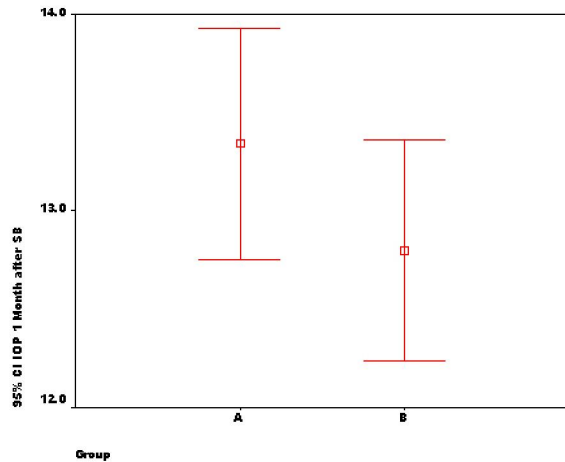


Chart 4. One Month after operation IOP distribution of patients in two groups

In a study by Yans et al at the Department of Ophthalmology, University of Taiwan in 2004, evaluating patients' VA after SB on RD patients, they stated that 30 years old and younger patients had a better VA level than patients in the age range of 31-50 years and higher ( $p=0.003$ ) (Yang, 2004).

In the above mentioned study, it was stated that sub-retinal fluid has no effect on patients' VA level after surgery (Yang, 2004).

Similarly, in our study as well, presence of sub-macular fluid had no significant effect on the patients' VA level after surgery in the two groups under study.

Veekeneer et al stated that PSF was more prevalent in patients who underwent a delayed SB (Veekeneer, 2012).

In our study, duration from detachment till surgery in patients with sub-macular fluid in one month after surgery was longer in people without fluid; however, this difference was not significant.

Corticosteroids were first used in 1950 to reduce intraocular inflammation in ocular diseases (Jonas, 2000). Main mechanism of action of steroids is to inhibit the production of histamine (Peymen, 1994). One of the effects of steroids is the inhibited proliferation of fibroblasts and preventing these cells from protein synthesis which can be effective on the occurrence of PVR (Tano, 1980).

Although only a few studies are so far available published regarding the efficiency of systemic corticosteroid in preventing these complications, in some medical centers, oral Prednisolone is publically used in short term after Scleral buckling surgery (Valone, 1980).

Systemic complications of using corticosteroids include peptic ulcer, Osteoporosis, pathologic bone fractures, aseptic necrosis of the femoral head, skin and muscle atrophy, hyperglycemia, hypertension and weight gain (American Academy of Ophthalmology, 2001).

In a study by Valone and Moser (Valone, 1980) on 134 patients with RRD, they reported the efficiency of systemic corticosteroids in preventing detachment of the choroid, positive anatomic results and improved final sight acuity.

Sharma and Gopal (Sharma, 1998; Sharma, 2005) used oral corticosteroid therapy before surgery in the treatment of retinal detachment associated with choroidal detachment in patients treated with primary vitrectomy, and recommended the use of systemic corticosteroid in these patients; however, since the therapeutic method was vitrectomy, the result cannot be generalized to patients nominated for Scleral buckling surgery.

Valone and Moser (Valone, 1980) used intravenous corticosteroid to prevent choroidal detachment after RD surgery and reported positive anatomic results and improved final sight acuity. Sharma and Gopal (Sharma, 1998; Sharma, 2005) presented the same experience in other studies with oral corticosteroids in patients who underwent primary vitrectomy prior to surgery. In our study, with a control group receiving placebo and considering the incidence of several complications, no significant difference was observed between the two groups.

Generally, in our study, the use of systemic corticosteroids in patients undergoing SB for recovery of RRD had no significant effect on postoperative results including the level of sub-macular fluid and VA in the patients after surgery; thus, in order to prevent complications related to corticosteroids, it is not recommended to be used in patients after surgery and wider studies larger sample sizes are highly recommended to be conducted for further approval of this fact.

## Conclusions

48 male and 24 female patients were studied in two groups that the mean age of patients was  $45.80 \pm 14.09$  years in the systemic corticosteroid group (group A) and  $45.66 \pm 14.63$  years in placebo group (group B) ( $p=0.967$ ). There was no significant difference in terms of the mean IOP before surgery between the patients of the two study groups in one week and one month after surgery. There was no significant difference between the patients of the two groups in terms of their VA level before surgery ( $p=0.938$ ), one week ( $p=0.165$ ) and one month after surgery ( $p=0.264$ ). In our study, one week after

surgery, all patients had fluid; however, a month later, 21 cases (58%) in corticosteroid group and 16 cases (44%) in placebo group had sub-macular fluid; so, there was no significant difference between the two groups ( $p=0.238$ ).

Presence of sub-macular fluid had no significant effect on the patients' post-surgical VA level in the two groups.

The duration between detachment and the surgery in patients with sub-macular fluid in one month after surgery was longer than in those without fluid; however, this difference was not significant.

### Suggestions

Generally, in our study, the use of systemic corticosteroids in patients undergoing SB for recovery of RRD had no significant effect on postoperative results including the level of sub-macular fluid and VA in the patients after surgery; thus, in order to prevent complications related to corticosteroids, it is not recommended to be used in patients after surgery and wider studies larger sample sizes are highly recommended to be conducted for further approval of this fact.

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