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**Research Article**

# Minimal Surgery Technique in Rhegmatogenous Retinal Detachment

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**Abstract:**

**Objectives: The aim of our study is to emphasize that, using minimal detachment surgery in selected cases among patients diagnosed with rhegmatogenous retinal detachment, it is possible to repair the detachment with scleral buckling + cryopexy without the drainage of subretinal fluid and to minimize invasive surgery.**

**Methods: Minimally possible detachment surgery and conventional detachment surgery were applied to 50 eyes of 50 patients between 12 and 69 years old (28 males, 22 females) who were admitted to Şişli Etfal Hospital Eye Clinic Retina Unit and diagnosed with rhegmatogenous retinal detachment, and the data were divided into two groups and analyzed retrospectively. Preoperatively, anamnesis was obtained, visual acuity was measured, biomicroscopic examination was performed, intraocular pressure was measured, detailed fundus examination was performed and the topographical drawing of fundus oculi was made. All operations were performed under local anesthesia, and in the operating room.**

**Results: In the 1st group, minimally invasive detachment surgery was performed on 30 eyes of 30 patients. This group of patients was followed up for a minimum of 5 months and a maximum of 2 years. In these cases, the anatomical success rate was 93.3%, and the visual success rate was 80%. In the 2nd Group, conventional detachment surgery was performed on 20 eyes of 20 patients. This group of patients was followed up for a minimum of 4 months and a maximum of 1.5 years. In these cases, the anatomical success rate is 60%, and the visual success rate is 60%.**

**Conclusion: If patients with rhegmatogenous retinal detachment apply to an ophthalmologist in a timely fashion, very good anatomical and visual success rates can be achieved with the minimally invasive surgical technique. In conditions where vitreoretinal surgery is not possible in the appropriate patient group, the first option should be minimally invasive surgical technique.**

**Keywords: Retinal detachment, Scleral buckling (cerclage), Minimal segmental buckling without drainage, Surgery, anatomical and functional success**

## Introduction

Retinal detachment is the clinical picture where the sensory retina detaches from the retinal pigment epithelium due to the accumulation of subretinal fluid for various reasons. The detachment negatively affects the photoreceptors and depending on the extent of detachment, the outcome can range between decrease in visual acuity and total blindness. Retinal detachments belong to the group of diseases which need urgent treatment because they can cause loss of photoreceptors(1,5).

Today, treatment of primary retinal detachment is being discussed once again. Previously, the scope of the discussion included whether to use surgical drainage or non-drainage technique and whether to use local or circular implant in the treatment of retinal tears. Whereas today, the scope of the discussion has transformed into whether to perform the internal approach, which is vitreoretinal surgery, or the external approach (6). The technique called minimally invasive surgery, which is performed only to close the tear, has been introduced by Custodis in 1953(7). However, it has not been widely used because of its serious complications. Lincoff has recognized the value of this technique in the mid-1960s and developed cryopexy instead of diathermia, and inert silicone sponge instead of the toxic polyviol(8). After it was approved by the animal experiments that adhesion is sufficient in cryosurgery, cryopexy has become very widely used in the detachment surgery(9). The widespread use of the minimally invasive surgical technique is regarded as a relatively new approach(10).

Drainage of subretinal fluid in detachment surgery facilitates the closure of the tear with surgery without causing an excessive increase in the intraocular pressure. On the other hand, drainage is the most important cause of operative complication in detachment surgery. Therefore, subretinal fluid should not be drained unless necessary(9).

The aim of our study is to emphasize that, under conditions where vitreoretinal surgery is not possible, in selected cases it

is possible to repair the detachment with scleral buckling + cryopexy without the drainage of subretinal fluid and to minimize invasive surgery, and that a visual and anatomical success rate close to that of VRC can be achieved without using an expensive technique such as vitreoretinal surgery.

**Methods**

50 eyes of 50 patients who were admitted to Şişli Etfal Hospital Eye Clinic Retina Unit and diagnosed with rhegmatogenous retinal detachment were included in the study. Patients who underwent only scleral buckling + cryopexy due to retinal detachment and patients who had subretinal fluid drainage in addition to these operations were divided into two separate groups and were retrospectively analyzed. Anatomical and functional success rates of the groups and complications of these techniques were discussed.

Group 1 consisted of 17 males and 13 females who were operated with minimally invasive surgical approach. The mean age was 45.46 (12-69), and the patients were followed by a minimum of 5 months and a maximum of 2 years. Group 2 consisted of 11 males and 9 females who underwent subretinal fluid drainage. The mean age was 48.45 (32-69) and the patients were followed up for a minimum of 4 months and a maximum of 1.5 years.The youngest patient was 32, and the oldest patient was 69 and the mean age was 48.45.

The distribution of patients by their age and gender is shown in Table 1.

Table 1: Distribution of the patients by their age and gender

| | Study Group | Control Group | p |
|---|---|---|---|
| Mean Age | 45.46±8.76 | 48.45±7.76 | 0.0665 |
| Gender | 1.56±0,5 | 1.55±0.51 | 0.827 |

None of the 50 patients included in the study had complicated retinal detachment to the extent that required VRC. However, some of the patients who failed to respond to the treatment required vitreoretinal surgery afterwards. None of the patients had cataracts, corneal opacities and vitreous opacities that would disrupt vision during the pre-surgery examinations. All patients underwent detailed fundus examination and the topography of their fundus oculi was drawn.

Whether the macula is detached or not was considered as the most important criteria for the timing of the surgery. Patients without macular detachment were operated within 24 hours. Patients with chronic macular detachment and retinal detachment were operated in the shortest possible time. Dilation of all patients was performed by 3 drops of 1% tropicamide (Tropamid ®, Bilim, Turkey) and 2.5% phenylephrine (Mydfrin ®, Alcon, USA). Fundus drawings and examinations were reviewed once more 24-48 hours prior to the operation. Patients with no macular detachment were put to obligatory rest until the time of operation, and depending on the configuration of the subretinal fluid, the most appropriate head position that would ensure the retreat of the subretinal fluid from the macula was given.

Topical antibiotics were applied with 12-24 hour intervals.

30-45 minutes prior to surgery, 1% cyclopentolate (Sikloplejin®, Bilim, Turkey), 1% Tropamid and 2.5% Mydfrin were applied 3 times at 5 minute intervals. This was done to achieve the complete dilation of the pupil. Non-steroid anti-inflammatory drops were used 2 hours before the surgery at 30 minute intervals to maintain intraoperative pupil dilation.

All operations were performed under local anesthesia, and in the operating room. Lid speculum was placed in a way that would provide sufficient space. Except for reoperations, in all cases, conjunctiva was opened 360 degrees together with the capsule of Tenon from the limbus. Extraocular muscles were revealed using cotton applicators, by performing blunt dissection to the intramuscular tendon. 4 rectus muscles were held by means of muscle hooks and hanged with 4/0 silk. It was knotted at approximately 4 cm distance. All of the fundi was reviewed using 22D lens and indirect ophthalmoscope. Scleral depressor indentation was performed and the precise location of the tears was identified. Buckling material (silicone sponge) that would cover the whole lesion or scleral tapes were used and externally placed locally or circumferentially.

When subretinal fluid drainage was required, it was performed at different areas in each case, in a way that would be away from the locations where the tears are located, at places with maximum retinal elevation and traction that are identified using indirect ophthalmoscope and usually in front of the equator.

Fundus was re-examined before completing the operation. Firstly tenon, then conjunctiva were sutured. 20 mg of Gentamicin and 40 mg of dexamethasone were injected subconjunctivally and the operation was completed.

In the data analysis, IBM SPSS 21.0 software for Windows (Statistical Package fort he Social Sciences, Chicago, II., USA) statistical package program was used. Student's t-test and Mann-Whitney U test were used in the comparison of the variables. Descriptive statistics were given as percentages. A p value less than 0.05 was considered statistically significant.

**Results**

The mean age was 45.46 in Group 1 and 48.26 in Group 2. There were 17 males (56.6%) and 13 females (40.6%) in Group 1, and 11 males (55%) and 9 females (45%) in Group 2.

Pre- and postoperative visual acuity of the patients were identified using Snellen equivalent. The final pre-operative and post-operative visions of the patients in Group 1 and 2 are given in Table 2. The patients were divided into 4 groups, and group 0 comprised those that can see hand motion (HM) and count fingers (CF), group 1 comprised those with 1-5 CF, group 2 comprised that are 0.1-0.4 according to the Snellen equivalent and group 3 comprised those that are 0.5 and higher according to the Snellen equivalent (Table 2).

Table 2: Pre- and post-operative late-term visual acuity of the

patients in Group 1 and 2.

| | Study Group | Control Group | p |
|---|---|---|---|
| Preoperative vision | 0.83±1.05 | 0.45±0.82 | 0.097 |
| Postoperative vision | 1.8±0.8 | 1.45±0.88 | 0.208 |

Postoperative visual acuity was 1/10 in 24 patients (80%) in Group 1, and in 12 patients (60%) in Group 2. In Group 1, 17 patients (56.6%) had preoperative macular involvement. Of these patients, a postoperative visual acuity of 1/10 and more was achieved in 11 (64%). In Group 2, 19 patients (95%) had preoperative macular involvement. Of these patients, a postoperative visual acuity of 1/10 and more was achieved in 12 (63%).

In Group 1, anatomical success was achieved with a single operation in 26 patients (86.6%). Of 30 patients, 8 patients (26.6%) with mobile retinas and with multiple ruptures which did not exceed one or two quadrants and which we were able to localize very well only underwent local implant and cryopexy. Retinal recovery was achieved in these patients without the requirement of an additional surgical procedure. No recurrences were observed during the 5 months of follow up.

Recovery was achieved in a single operation using classical detachment surgery in 12 (60%) of 20 patients in Group 2. Vitrectomy was required due to advanced PVR in 8 patients (40%).

The rate of recovery with a single operation was 73.3% for both groups.Visual acuity of 1/10 and more was considered as the visual success criteria.

In Group 1, 24 (80%) patients had a visual acuity of 1/10 and more in the last postoperative examination. 6 (20%) patients had visual acuity of 1/10 and less. Low visual success rate in these patients was attributed to macular detachment, pre-operative visual acuity of 1/10 and less, and the presence of preoperative macular pathology. In one patient, due to pre-existing glaucomatous optic atrophy, visual acuity of 1/10 and more cannot be achieved. The visual acuity was 1/10 and more in 12 (60%) patients in Group 2. 8 (40%) patients had visual acuity of 1/10 and less. Low visual success rate in this group was attributed to the fact that the detachment lasted for more than 1 month, the extent of detachment was more than two quadrants, low pre-operative visual acuity and the presence of macular pathology.

While a visual acuity of 1/10 and higher was achieved in 80% (24) of the patients in Group 1, this was 60% (12) in Group 2. The average success rate of two groups was 72% (36) ($p>0.005$). Factors negatively affecting visual success for both groups were the duration of presenting to an ophthalmologist was longer than 1 month, presence of extensive detachment, having pre-operative visual acuity of 1/10 and less, and presence of macular detachment. Since these factors were more significantly pronounced in Group 2 than Group 1, visual success rate of Group 2 was lower.

**Discussion**

Since the time elapsed with detachment is important in the prognosis of vision, retinal detachment is a pathology that must be treated urgently. In particular, detachment of macula and delays in surgery due to various reasons cause the postoperative visual acuity to be lower.

Although the incidence of retinal detachment in the whole population is 1/10.000, in the presence of cases predisposing to tear formation, this incidence can be much higher. Etiological factors such as myopia, aphakia, peripheric retinal degeneration and trauma comprise the most important predisposing factors. In the literature, the rates of etiological factors are listed as follows: myopia 30-66%, aphakia 23-40%, LD 20-40% and trauma 6-35%. In our study, myopia was 50%, aphakia was 24%, LD was 14%, pseudoaphakia was 8% and trauma was 12%, which were consistent with the literatüre(12-16).

In many studies in the literature, Rhegmatogenous Retinal Detachment (RRD) was found more frequently in men(17). In our study, the frequency of RRD was 56% in men and 44% in women. In our study, RRD was most frequently seen in the age group 50-69. The median age was 48, and the age interval reported in the literature was 40-61(18).

Nowadays, there are 2 main extraocular and 2 main intraocular repair techniques in the primary retinal detachment surgery. The success of both of these methods depends on a) locating the detachment and b) complete closure of the detachment. In a recent multicenter study, it was shown that scleral buckling technique was more successful than primary vitrectomy in phakic eyes, whereas primary vitrectomy was more successful in pseudophakic eyes. However, this was achieved by the addition of external scleral buckling to the vitrectomy procedure in pseudophakic eyes (19-21).

By using external approach after RRD surgery, anatomical success rate was reported between 75-97% in various studies(22-24). In our study, anatomical success rate is 82%.

Nevertheless, despite the rapid advancements in vitrectomy, minimally invasive surgical technique based on limited buckling without the drainage of subretinal fluid still remains popular (6). With this technique, in appropriate cases, very good success rates without performing primary vitrectomy were reported (10,15,25). (Table 3)

Table 3. Anatomical success rates of various researches using minimally invasive retinal detachment surgery

| Author | (%) |
|---|---|
| Kreissing [10] | 97 |
| Avcı et al.[15] | 93.3 |
| Jin et al. [25] | 100 |
| In our study | 100 |

Pre-operative visual acuity is closely associated with both anatomical and visual success(26). Anatomical success rate is lower in eyes with macular detachment (26-28). In addition, although the anatomical success rate is better in cases with macular involvement, visual success rate is lower (26). The extent of detachment is closely associated with the macular involvement(27). In conclusion, in our study, we attributed the cause of anatomical failure to the fact that the patient presented to the ophthalmologist after 3 or more months, the inability to locate the detachment, presence of 3 or more detached quadrants, presence of PVR and a pre-surgical visual acuity of 1/10 and less.

Visual success is defined as the recovery of both the macular function and the field of vision (27). Preoperative visual acuity; whether dependent on the macular involvement or not, is the most important factor affecting postoperative visual acuity (27). After a successful surgery, in 85-92% of the patients with good pre-operative vision and with no macular involvement, pre-operative visual acuity is maintained (28,29). Despite the anatomical success, poor pre-operative vision is attributed to cystoid macular edema, epimacular membrane formation, recurrent detachment and cataract formation (27).

In a study which compares the postoperative field of vision and nerve fiber thickness of patients who underwent pars plana vitrectomy (PPV) and scleral buckling (SB), the ones who had SB surgery better preserved their field of vision. This phenomenon is explained by some studies through the potential retinal trauma experienced during PPV because of the liquid-air or gas change (30).

Presence of macular involvement is closely associated with pre-operative and post-operative vision (28,29). Again, in cases with a pre-operative visual acuity less than 1/10, the probability of achieving post-operative visual acuity over 4/10 is very low (27). In this study, we attributed our visual failure to the fact that there was macular detachment, pre-operative visual acuity was 1/10 and less, extensive detachment, and that the patient presented to the ophthalmologist after 1 month (Table 4).

Table 4. Visual success rate of various researchers.

| Author | Total Group(%) | Macular detachment(%) |
|---|---|---|
| **Tani et al.**[22] | **51** | **37** |
| **Wilkinson**[29] | **56** | **42** |
| **Hasanreisoglu et al.** [14] | **80 (0.1 and <)** | **---** |
| **Avcı et al.** [15] | **60.4 (0.1 and<)** | **---** |
| **In our study** | **72 (0.1 and<)** | **---** |

## Conclusion

Rhegmatogenous retinal detachment can result in severe loss of vision unless treated in a timely fashion. Considering how late the patients can get hold of a physician in our country, it can be easily understood how hard it is to achieve a good visual success. In rhegmatogenous retinal detachment, very good anatomical and visual outcomes can be obtained with scleral buckling method. The most important complications during surgery are those that accompany subretinal fluid drainage. The most important complications after surgery are PVR development and macular complications. These complications have a major impact on both the anatomical and the visual success rate. Therefore, by avoiding subretinal fluid drainage where appropriate, the most important operative complications are avoided. In addition, by limiting the buckling, the trauma is minimized, and thus the anatomical and visual outcomes are much better. Thus, admitting to an ophthalmologist at an earlier stage and choosing the minimally invasive surgical method will positively affect the prognosis.

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