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original article

Drainage of subretinal fluidduring scleral buckling surgery for rhegmatogenous retinal detachment

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SUMMARY: **Drainage of subretinal fluidduring scleral buckling surgery for rhegmatogenous retinal detachment.**

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Background and objective. *The purpose of the study is to compare the drainage of subretinal fluid (SRF) in a scleral pocket (SP) with incision parallel to the limbus to drainage through a simple radial scleral thinning (ST), during scleral buckling surgery for rhegmatogenous retinal detachment (RRD).*

Patients and methods. *Retrospective cohort study of one hundred sixty-nine consecutive buckling surgery for RRD, where a drainage puncture was performed through SP in eighty-five cases and through previous radial ST in eighty-four cases.*

Results. *PT shows significant lower complication rate. The incidence of retinal incarceration or formation of a retinal hole at the first drainage site is lower in PT group (p=0.0285). During surgery choroidal detachment have been observed in a higher percentage of cases in the SP group (p=0.0379). At the end of the surgery a certain amount of SRF behind the buckling was significant in ST group (p=0.0026).*

Conclusion. *The SP drainage technique appears to be a useful, effective and safe method to drain SRF.*

KEY WORDS: Retinal detachment surgery - Scleral pocket - Drainage of subretinal fluid.

Background and objective

Drainage of subretinal fluid (SRF) is one of the critical stages of scleral surgery for rhegmatogenousretinal detachment (RRD). This operation is useful in order to facilitate precise localization of the tears at scleral level, to assist attachment of the tears to retinal buckling and to assess attachment of the retina at the level of the buckling band during surgery (1-4); moreover, drainage allows reducing the extent of retinal-choroidalcryo-applications implying a smaller risk of vitreous pigment dispersion and vitreoretinal retraction processes.

When performing SRF drainage, choice of the puncture site, control of SRF issue speed and management of any complications are all equally important (5-7). The most significant complications occurring during this stage of surgery are the following: subretinal haemorrhage, retinal perforation, vitreoretinal incarceration, eye hypotony and choroidal detachment. The occurrence of even a single one of the above-mentioned complications may cause surgery to be unsuccessful (8).

A number of techniques for SRF drainage in relation to the scleral plane have already been described in literature: drainage puncture through the whole breadth, drainage puncture of the deeper layers after scleral thinning (ST) both with simple incision radial to limbus and with formation of a scleral pocket (SP) after incision radial to limbus (9-11).

In case of ST before the drainage puncture, diathermy may be employed to avascularise the underlying choroid in order to reduce any risk of bleeding (12).

Drainage puncture may be performed with a scalpel or needle, both in case of whole breadth sclera and in case of prior thinning; however, when a laser source is employed, scleral thinning is required before performing SRF drainage (13-28).

Our aim was to show the advantages offered by a drainage technique through SP with incision parallel to the limbus, which has never before been described in medical literature, versus drainage performed through simple radial ST. We have analyzed the advantages of this technique, which we have recently applied, as to safety and efficiency of SRF drainage and to its lower rate of complications often produced by this surgical technique.

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Patients and methods

In our retrospective cohort study we examined 169 consecutive scleral surgeries for recently developed RRD, which were successfully treated in one single surgical intervention. All persons included in the study gave their informed consent prior to their inclusion.

The surgeries took place over a period of 36 months between November 2009 and October 2012 at our university hospital and were all performed by the same surgeon who is an expert in the field.

The groups were homogeneous as to age, gender and refraction and statistically comparable. We excluded patients with refraction above eight degree of myopia in case of phakic patients and also pseudophakic patients with previous history of myopic refractive error above eight degree of myopia before cataract surgery. Any patients who had previously undergone RRD surgery were excluded from the study. We also excluded those patients who had suffered a relapse after the first surgery, since in no case it was possible to retrospectively determine the drainage process as main cause of such relapse.

During surgery drainage puncture was performed with two different methods: in the first group, consisting of 85 cases, drainage puncture was implemented in the bed of a SP, while in the second group (84 cases) drainage puncture was implemented after simple scleral thinning radial to limbus ST.

Indirect ophthalmoscopy was performed during surgery for retina examination in order to determine the distance of the buckling from the limbus on the basis of the localization of the posterior traction line of the vitreous body's basis, as well as the localization of the SRF drainage site on the basis of the extent of retina elevation and the localization of any tears and choroidal vascularisation. Drainage is performed behind the buckling in relation to the highest retina elevation, preferably near the upper or lower edge of the horizontal rectus muscles or beneath the vertical rectus muscles and far from the choroidal area of the vorticous veins. Surgical operations were performed with the aid of loupes with 4.3x magnification and 400mm focus (Carl Zeiss).

Drainage through radial ST requires a 3 mm long incision and diathermic cauterization of the choroidal bed. Moreover, a non-absorbable polyester 6.0 suture (ticron) may be put in place on the incision edges. Once gradual levelling of the retina has been achieved at the end of the drainage process, the two margins of the scleral incision are closed with the suture thread previously passed. The site of the drainage puncture is later supported by silicone buckling or by subsequent application of a narrow band.

Drainage in a SP requires a first vertical scleral incision, 3mm long, parallel to the limbus, and not radial as was usual with the previous methods down to the deeper layers of the sclera (Figure 1). This operation is performed with ultrasharpsclerotomy, straight 2.5 mm (Alcon-Grieshaber). Thereafter dissection of the deeper sclera layers is performed to obtain a 3 mm long and deep SP (Figure 2). A non-absorbable 6.0 (ticron) suture thread is pulled through the two edges of the vertical scleral incision in view of closing the margin of the pocket to protect the

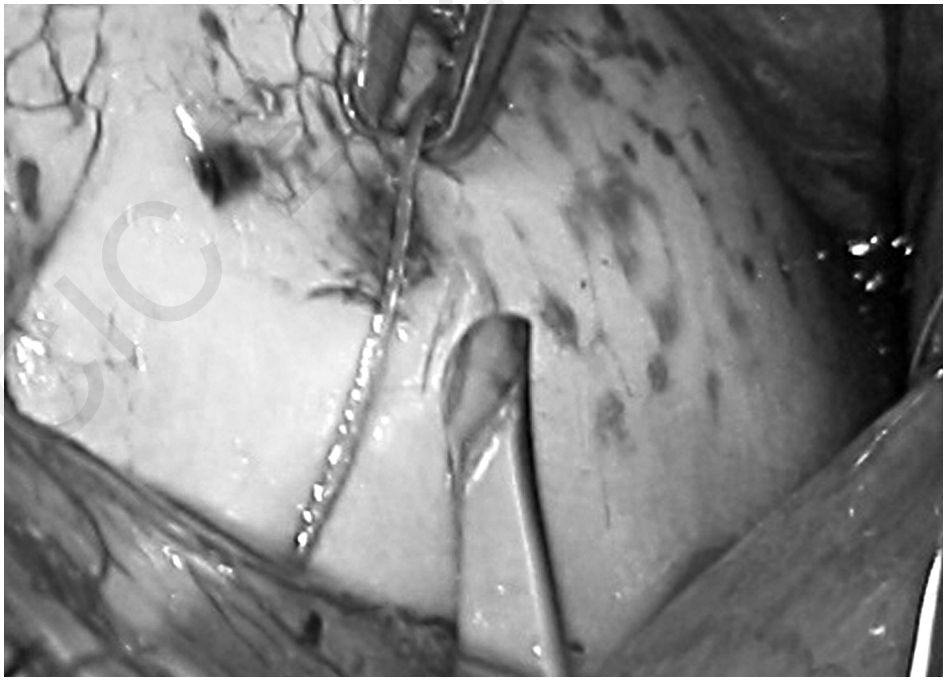

Fig. 1 - Vertical incision of the scleral pocket.

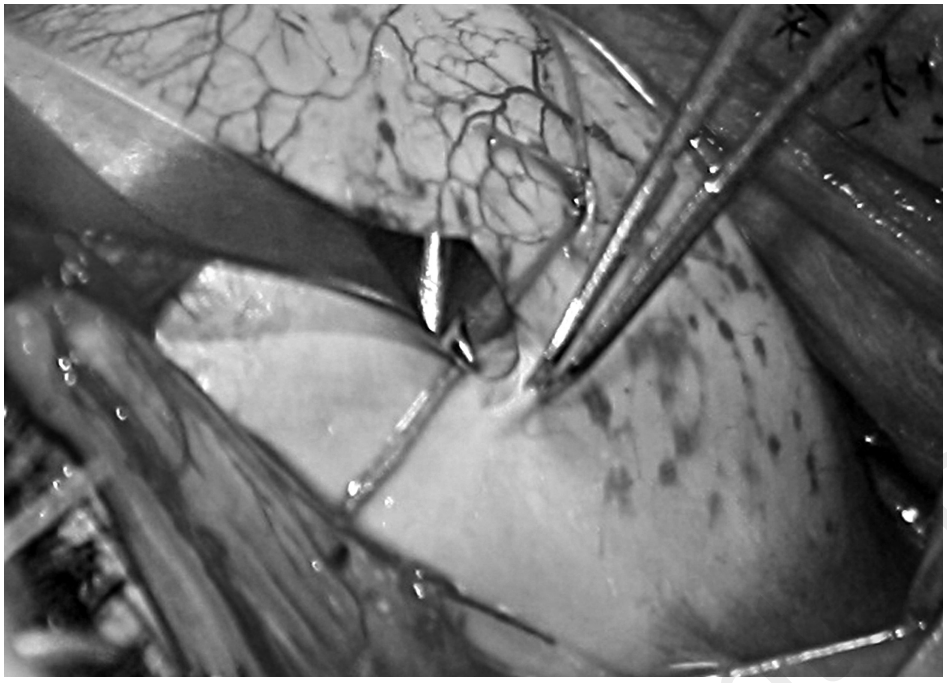

Fig. 2 - Horizontal dissection of the scleral pocket.

underlying drainage. Subsequently, devascularization of the choroid is performed with a fine diathermic tip within the pocket bed. In order to achieve the drainage, an incision is made into the residual deep layer of the sclera and of the underlying choroid in the innermost part of the SP with micro scalpel straight 15° (Mani) (Figure 3). After suture of the pocket edges, the site of the drainage puncture is then supported by silicone buckling or by subsequent application of a narrow band.

When comparing the two techniques, we have assessed in terms of efficiency the need for one or more drainage processes and the more or less complete drainage of SRF.

In terms of complications, we assessed the occurrence

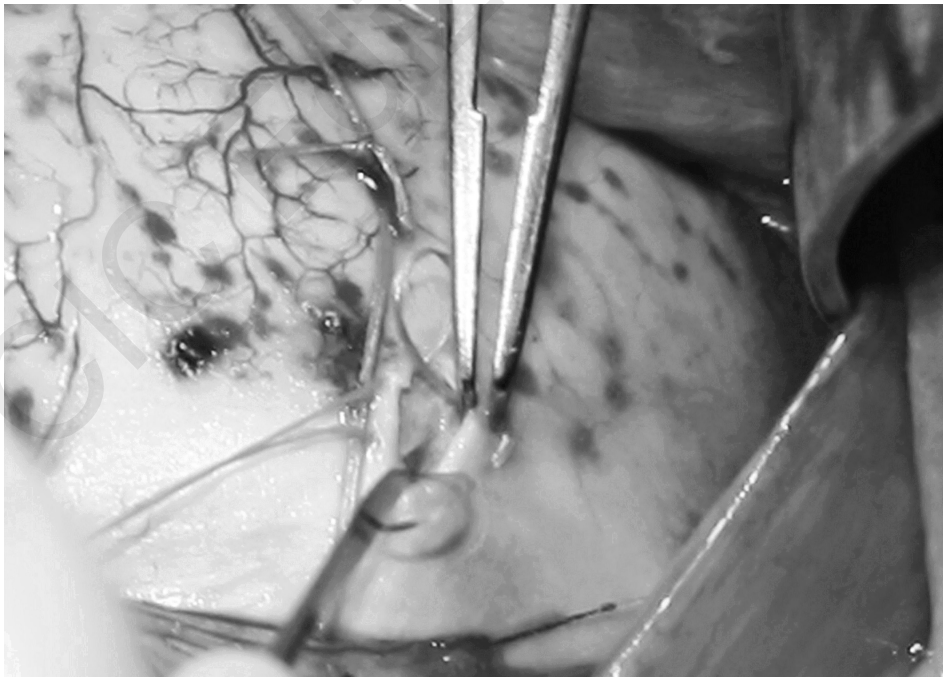

Fig. 3 - Needle drainage in the deepest portion of the scleral pocket.

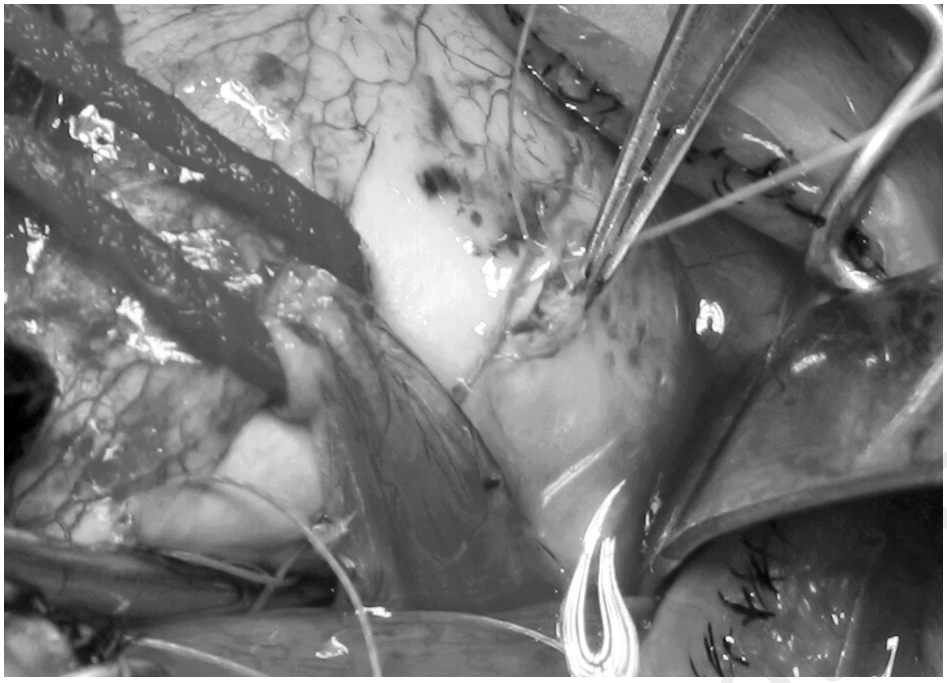

Fig. 4 - Forceps traction of the scleral margin of the pocket.

of bleeding, incarceration or retinal hole at the drainage site as well as any choroidal detachment and subretinal haemorrhage during the SRF drainage process.

The data concerning the two study groups were analysed by "R" program. Contingency tables with Fisher's exact test calculation, linear regression and correlation with Pearson's coefficient were used for statistical analysis. P values lower than 0.05 were considered significant.

Results

In the 85 cases of the SP group, we succeeded in obtaining issue of the SRF in 79 cases (92.9%) with one single drainage. In 6 cases, a second drainage point had to be chosen: in 5 cases (5.9%) following impossibility to implement drainage at the point first chosen due to congestion and external bleeding of the choroidal bed at the level of the pocket, and in 1 case (1.2%) due to retinal focal levelling. As far as the 84 cases of the ST group were concerned, in 14 cases (16.7%) (p=0.0602) a second drainage puncture was required at another site following impossibility to continue drainage of the SRF at the site first chosen: in 5 cases (5.9%) (p=1) due to choroidal congestion and external bleeding at the level of the radial incision, in 4 cases (4.8%) (p=0.2104) due to focal retinal flattening at the drainage point, and in another 5 cases (5.9%) (p=0.0285) due to retinal incarceration or formation of a retinal hole at the first drainage site.

In the SP and the ST group where a second drainage puncture was required no further complication occurred at the second drainage site.

At the end of the drainage, under ophthalmoscopy during surgery the retina appeared to be reattached in 81(95.3%) cases of the SP group and in 79 (94%) (p=0.7464) cases of the ST group; a certain amount of SRF behind the buckling was left in 3 cases (3.5%) in the SP group and in 15 cases (17.8%) (p=0.0026) of the ST group. However, this SRF residue was completely reabsorbed during the first 48 hours following surgery in all cases.

Regarding complications caused by the drainage puncture, we have noted occurrence of bleeding limited to the drainage area as follows: 3 cases (3.5%) in the SP group, and 4 cases (4.8%) (p=0.7199) in the ST group. Wider subretinal haemorrhage with involvement of the posterior pole was found in 1 case (1.2%) of the SP group and 1 case (1.2%) (p=1) of the ST group.

As far as choroidal detachment during surgery is concerned (due to hypotony following the drainage procedure), 6 cases (7%) have been observed in the SP group, while the ST group presented as many as 15 cases (17.8%) (p=0.0379). Detachment relapses were found in 3 cases of the SP group and in 4 cases of the ST group; they occurred one month after surgery in patients who had not shown any drainage complications during surgery, and they were caused by vitreoretinal traction with formation of secondary tears. In all five cases, subsequent vitrectomy was performed, which led to final reattachment of the retina.

Conclusions

The data of this study show the higher efficiency rate in SRF drainage obtained by the SP technique as compared to a simple radial incision of the sclera; this information may be drawn both from the fact that a second puncture was required in a smaller number of cases in the SP group versus the ST group (p=0.0602) and from the possibility to completely drain the SRF during the surgery phase (p=0.0026).

Regarding complications, there is no significant difference between the two groups when it comes to smaller or bigger bleeding. This data must certainly be attributed to the fact that choroidal perforation is implemented in the same manner in both group. However, the results are different when it comes to the other two kinds of complications, i.e. holes and retina incarcerations (p=0.0285) as well as choroidal detachments (p=0.0379), since the pathogenic mechanisms causing these complications are reduced to a minimum by the SP technique as compared to the simple radial incision.

As a matter of fact, in the technique we propose, a traction of the scleral edge to the outside is exercised during the drainage puncture, which means that the choroidal plane is exteriorized, as compared to the underlying plane of the detached retina, in order to avoid any possible retina perforation. Such traction towards the outside is implemented also during the actual drainage phase and allows avoiding any retinal incarceration, since the drainage hole is kept away from the overlying retinal plane, which draws gradually nearer the choroidal plane. This safety feature is especially important during the final phases of the drainage process, since at that time the retina tends to lie down on the choroidal plane.

With respect to efficiency of the technique herein described in the drainage of SRF, the presence of the scleral edge allows increasing or decreasing the amount of SRF issued, insofar as it produces a self sealing mechanism providing the opportunity for an excellent control of the eye tonus.

Gradual and progressive drainage of SRF produces a smaller statistically relevant number of choroidal detachments during surgery (p=0.0379). Moreover, during the final drainage phases it is possible to obtain a larger gap between the choroidal plane and the retinal plane through forceps traction on the scleral margin (Figure 4), and this again allows completer drainage of SRF. We have indeed found a significant difference between the two study groups with respect to persistence of SRF upon intra-operative examination behind the buckling (p=0.0026).

Gradual issue of the SRF is implemented until ophthalmoscopic monitoring shows that the tears at the levels of the buckles have been closed and that the peripheral retina has again attached itself to the choroidal plane at the level of the band.

Suture of the scleral margins of the pocket and subsequent buckling of the drainage area offer a further safety margin for this surgical procedure. Any relapses of retinal detachment should not be attributed to the draining process, but rather to further evolution of vitreoretinal tractions.

The method for SRF drainage in a scleral pocket has proven more effective as an SRF draining procedure as well as safer for the patient due to its lower complication rate as compared to drainage implemented in the bed through simple radial incision of the sclera. Moreover, compared to the pocket with radial incision proposed by Yepez et al. (11), the technique with an incision running parallel to the limbus has unquestionable advantages, in particular facility of implementation and exposition of the pocket bed, and possibility to perform the drainage puncture in the deepest portion of the pocket, which produces a greater self sealing effect as compared to the issue of SRF.

Moreover, the pocket running parallel to the limbus allows easier exposition of the pocket bed during the drainage stage, implemented through forceps traction of the scleral margin towards the outside. It also allows a safer and more effective issue of SRF with constant visualization of the amount of fluid issuing from the drainage puncture and accumulating in such pocket, especially during the final phases in view of the complete and safe drainage of SRF.

We also believe it is essential that the scleral margin be closed by suture so as to avoid that any increase in intraocular pressure caused by indentation of the buckles and the band produces complication affecting the retina at the site of the choroidal perforation.

The technique we have described allows reducing surgery time thanks to its lower complication rate. This is a further essential aspect considering the steady increase in the use of local-regional anaesthesia also in scleral surgeries for retinal detachment. Moreover, greater efficiency in drainage of SRF allows reducing the rest period during the post-surgery phase to a minimum thus permitting to mobilize the patients much sooner.

On the basis of our experience and the data collected through our study, we believe that drainage in a SP with an incision running parallel to the limbus has unquestionable advantages versus other techniques previously described and should be applied in scleral retinal detachment surgery.

Disclosure

The Authors have no financial interest in any of the products mentioned in the manuscript.

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