CASE REPORT

Scleral Buckling for Rhegmatogenous Retinal Detachment

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SUMMARY

Rhegmatogenous retinal detachment (RRD) is the separation of the sensory retina from the pigment epithelium (RPE). RRD is caused by a retinal tear in the periphery and the vitreoretinal (VR) traction, which allows access of the vitreous fluid to the subretinal space. Treatment of symptomatic retinal detachment is currently surgical only. Surgical options are intraocular and extraocular. This is the retrospective evaluation of the group of 17 eyes of 17 patients with RRD, which were operated by scleral buckling. Patients were 9 men and 8 women, age range 19-61 (median 46) years. The observation period is 1-13 months (median 7). The possible types of external interventions procedure were used only two: the radial plombage (in one case double) and cerclage. 15 patients (88 %) were phakic, and 2 were pseudophakic. In 12 eyes (71 %) were the quadrant RRDs, 2 eyes had dialysis in periphery of the retina, 1x it was the top half and 1x bottom half, and 1 patient had a subtotal RRD. In 9 (53 %) cases were used type of operation cryocoagulation with radial buckle and in 8 cases cryocoagulation with the cerclage. In four cases, was injected the gas tamponade into the vitreous at the end of the surgery. Primary attaching the retina occurred in 16 cases (94 %) and the retina remained flat in 14 eyes (82.4%), in 2 cases occurred re-detachment (11.7 %). Preoperative best corrected visual acuity (BCVA) ranged from hand movement to 20/20 (average Snellen equivalent 20/63) and postoperative BCVA was 1/50 - 20/20 (average 20/50). Improving BCVA was statistically significant (Wilcoxon p=0.01). We consider the cryosurgical procedure for phakic eyes as the gold standard of the surgical treatment of uncomplicated rhegmatogenous retinal detachment. The main reason for the eventual failure of this technique is persistent vitreous traction and proliferative vitreoretinopathy (PVR).

Key words: retina detachment, scleral buckling, radial buckle, cerclage

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INTRODUCTION

Rhegmatogenous retinal detachment (amotio) is the separation of the sensory retina from the pigment epithelium (RPE). Every year it afflicts approximately 1 in 10 thousand of the population. Over the course of time it also afflicts the other eye in approximately 10 % of cases. Amotio is caused by a retinal tear in the periphery and by vitreoretinal (VR) traction, which allows the access of vitreous fluid into the subretinal space. In physiological circumstances, the outer segments (OS) of the photoreceptors are coated with fine projections of RPE cells [1]. These cells actively phagocytise, separating the terminal membranous discs of the photoreceptors. In the opposite direction, the RPE cells saturate photoreceptors with nutritive components. The photoreceptors and their proper function are thus entirely dependent on functional intimate contact with the RPE. Retinal detachment induces a significant change in the biochemical composition on the interface of the OS and RPE, and in the newly-formed space. Ionic and metabolic imbalances thus occur, which generate molecular and degenerative changes of the photoreceptors and cells of the RPE [3]. Timely reattachment of the retina may lead to biochemical, function and anatomical restoration of the condition on the OS/RPE interface [4]. However, from its initial phase onwards, retinal detachment also leads to the following consequences: 1. Partial de-differentiation of the RPE cells in the sense of reduction and retraction of the surface projections, 2. Proliferation and migration of RPE cells into the subretinal area, 3. Degeneration of outer segments of the photoreceptors and their synaptic ending, 4. Disappearance of a variable number of photoreceptors, 5. Structural remodelling on the level of the second and third neuron of visual pathway, 6. Proliferation of all retinal glial cells, 7. Hypertrophy of Müller cells of retina with potential development of fibrotisation (5, 6).

At present, treatment of symptomatic retinal detachment is surgical only. Surgical options are extraocular and intraocular. External techniques include cryosurgical surgery and pneumatic retinopexy. Intraocular surgery is a synonym for pars plana vitrectomy (PPV).

The principle of successful surgery for retinal detachment by scleral buckling is perfect localisation of the primary tears and the treatment thereof. In order to increase certainty in localisation, we rely on the following generally valid rules: the primary tear is most frequently located in the upper outer quadrant (up to 60 % of cases), also in the upper nasal quadrant (15 %) and the lower temporal quadrant (15 %).

In approximately 50 % of cases there is more than one tear, mostly located within 3 clock numbers on both sides of the primary tear. The subretinal fluid has a tendency to respect the law of gravity and the anatomical limits set by the ligament of the retina on the papilla and in the ora serrata. As a result it is possible to estimate the position of the tear also according to the shape of the detachment: if the primary tear is localised in one of the upper quadrants, the subretinal fluid first of all spreads downwards on the same side, and only afterwards rises upwards on the other side from the tear. For this reason the tear is generally on the side of the higher part of the detachment. If the detachment of the lower half is flat, the tear is generally localised in the lower half (subretinal fluid slowly "rises against gravitation"). Protruding (bullous) detachments of the lower half, by contrast, generally have the tear localised high in the upper quadrants (fluid rapidly flows downwards). Retinal detachments of the upper half generally have a primary tear close to no. 12, which is closer to the side on which the detachment reaches lower.

The technique of retinal detachment surgery by scleral buckling procedure covers cryoretinopexy (or preoperative laser photocoagulation by indirect ophthalmoscopy) and stitching of an episcleral implant, which permanently indents the sclera, thereby blocking the tear and restricting vitreoretinal traction (7, 8). We can stitch the implant to the sclera vertically onto the limbus (radial buckle), parallel to the limbus (limbus-parallel segmented plombage for more extended lengthwise pathologies), or it is possible to use a strip placed around the entire perimeter of the eye (cerclage).

METHODOLOGY

We present a retrospective evaluation of a sample of 17 eyes in 17 patients with rhegmatogenous retinal detachment. This concerned 9 men and 8 women, with an age range of 19-61 years (median 46 years). The observation period is 1-13 months (median 7).

Best corrected visual acuity (BCVA) was evaluated on ETDRS tables. We evaluated the intraocular finding biomicroscopically, by indirect ophthalmoscope, and we observed the details with a trilateral Goldmann contact lens.

The indications for performance of retinal detachment surgery by scleral buckling procedure were similar in almost all cases: a young patient with a clear own lens, finding of local non-fixed detachment, clearly evident primary pathology, short period of duration without advanced manifestations of proliferative vitreoretinopathy (PVR). An essential precondition is due instruction of the patient about the finding and the options for surgery, which results in consent to the performance of the procedure.

Of the possible types of surgery by exterior procedures, only two were used: radial buckle (in one case double) and cerclage. Pneumatic retinopexy and segment limbus-parallel plombage were not performed on any of the eyes. We performed drainage of the subretinal fluid by means of a needle of the fixing suture before stitching the buckle, without performing prior sclerotomy.

The BCVA values obtained on the ETDRS table (whole row reading method) were converted into a logarithm of the minimum angle of resolution (logMAR) and then statistically evaluated by non-parametric Wilcoxon test for pair observation.

RESULTS

The preoperative findings were as follows: 15x phakic patients (88 %) and 2x artephakic patients; 12x (71 %) this represented a quadrant retinal detachment (one of which was with two tears), 2 eyes had abrasion of the retina, 1x concerned detachment of upper and 1x lower half, and 1 patient had subtotal retinal detachment. Overall this therefore concerned simpler, uncomplicated cases (Fig. 1), and the advanced finding in the nineteen year old myopic female patient was an exception (Fig. 2).

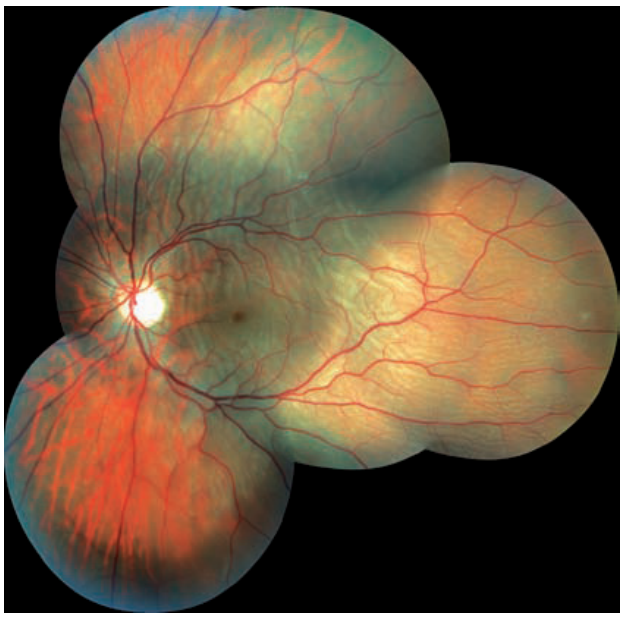

Fig. 1 Quadrant retinal detachment affecting central area

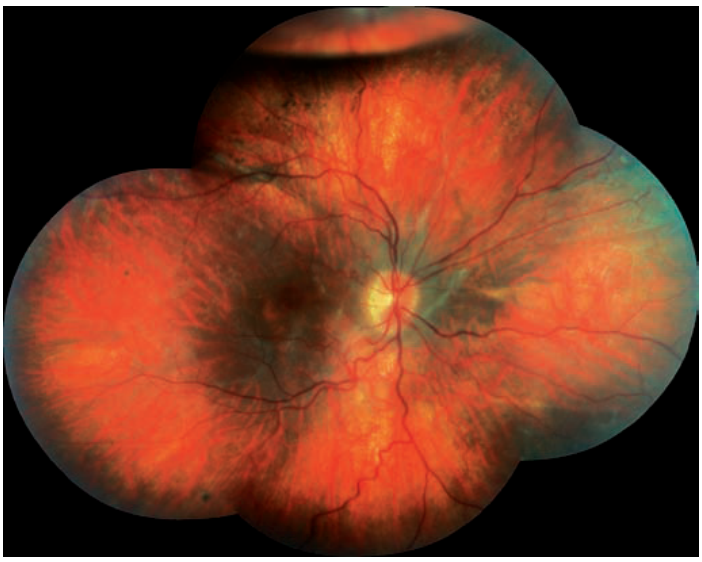

Fig. 2 Early postoperative finding of myopic female patient who underwent exodrainage, stitching of cerclage and intraocular injection of gas: in the central area there is evident atrophy of RPE, round the papilla subretinal gliosis, above the macula an old demarcation line crosses the upper arcade, in the upper periphery there is an evident residue of gas.

Two patients were operated on (at their own request) under general anaesthesia, the others (88 %) with uncomplicated retrobulbar anaesthesia. In 9 cases (53 %) cryocoagulation with radial plombage was used as the type of surgery, and in 8 cases cryocoagulation with cerclage was used. Cerclage was not stitched as standard "blind", but also according to careful perioperative localisation of the pathology on the periphery, which in certain cases led to eccentric placement of the cerclage strip. This technique is essentially partially modified limbus-parallel plombage, which secures a series of tears, a large tear, or the outline of the retina. In two cases it was necessary to perform perioperative exodrainage of the subretinal fluid due to excessively high detachment. In four cases we injected a gas tamponade into the vitreous area at the end of the surgery (see Table 1).

Preoperative BCVA was within a range from movement in front of the eye up to 20/20 (average Snellen equivalent calculated according to logMAR 20/63), and postoperative BCVA was 1/50 – 20/20. The improvement of BCVA was statistically significant ($p = 0.01$).

During the course of the observation period we recorded the following four (23.5 %) complications: 1x (5.8 %) reattachment of the retina did not take place and the condition was resolved at an interval of 5 days by the PPV technique (with gas tamponade), 2x (11.7 %) re-detachment occurred and the condition was later resolved by PPV (1x with gas tamponade, 1x with silicon tamponade) and 1x an epimacular membrane (ERM) developed, operated on with the aid of PPV (with gas tamponade).

DISCUSSION

Within the observation period of 13 months we performed a total of 17 surgeries for rhegmatogenous retinal detachment by cryosurgical procedure. There were another 136 rhegmatogenous retinal detachments operated on by PPV within the same period (88.8 % of all). The proportion of use of expansive gas and silicon tamponade upon primary PPV for rhegmatogenous retinal detachment was virtually exactly 1:4 within the period in question.

We explain the very good anatomical results, in which primary reattachment of the retina took place in 16 cases (94 %) and the retina remained lying in 14 eyes (82 %) due to correct selection of suitable candidates for this procedure, and careful localisation of the primary pathologies. From a large multicentric study by the European Vitreoretinal Society, incorporating 4 179 uncomplicated retinal detachments, it ensues that primary failure of scleral buckling procedure is in as many as 14.3 % of cases due to phakic and in 23.4 % due to artephakic eyes. From a meta-analysis of further randomised and controlled trials we see the advantages of scleral buckling (as against PPV) in phakic eyes, which have better resulting visual acuity than eyes after PPV. The main reason for deterioration of BCVA following PPV is the relatively frequent development of a cataract in the postoperative period [9].

It has also been demonstrated that surgery by scleral buckling is economically more advantageous (cheaper) for healthcare facilities than PPV in the case of phakic eyes [10]. However, the main financial difference in this American study was due to the remuneration of the surgeon ($ 940 for radial buckle, $ 1 200 for PPV) …

The advantages of PPV in comparison with scleral buckling include: easier visualisation of peripheral pathologies, removal of vitreous opacities and especially removal of vitreoretinal traction, which shared to a considerable extent in the occurrence of our re-detachments (in one case a new traction tear appeared between two radial buckles, in the second patient there was a very firmly adhering posterior vitreous membrane, creating constant traction on the retina, in the case of degenerative myopia). The success rate of PPV following the primary procedure is 74 %, and ultimate anatomical reattachment can be expected for 92 % of eyes [9, 11]. On the other hand, the advantages of better resulting BCVA

Table 1 List of patients

Patient no.	Age	BCVA before logMAR	BCVA after logMAR	tamponade	lens	amotio	Type of operation
1	61	1.00	0.50	Without	Artephakia	Local amotio	Cryo + radial buckle
2	56	0.10	0.00	50% SF6	Phakia	Local amotio	Cryo + radial buckle
3	50	0.00	0.00	Without	Phakia	Local amotio	Cryo + radial buckle
4	43	0.10	0.00	Without	Phakia	Local amotio	Cryo + cerclage
5	19	1.70	1.70	50% C3F8	Phakia	Subtotal amotio	Exodrainage, cryo + cerclage
6	46	0.50	1.30	Without	Phakia	Local amotio	Cryo + 2x radial buckle
7	60	0.10	0.00	Without	Artephakia	Local amotio	Cryo + radial buckle
8	33	0.10	0.20	Without	Phakia	Local amotio	Cryo + cerclage
9	32	0.00	0.30	Without	Phakia	Local amotio	Cryo + cerclage
10	29	0.10	0.00	Without	Phakia	Lower ½	Cryo + cerclage
11	30	0.10	0.00	Without	Phakia	Abrasion	Cryo + cerclage
12	55	0.70	1.00	100% SF6	Phakia	Local amotio + schisis	Exodrainage, cryo + cerclage
13	45	0.10	0.00	Without	Phakia	Abrasion	Cryo + cerclage
14	42	1.70	0.40	Without	Phakia	Upper ½	Cryo + radial buckle
15	60	2	1.00	Without	Phakia	Local amotio including centre	Cryo + radial buckle
16	59	0.50	0.00	Without	Phakia	Local amotio	Cryo + radial buckle
17	60	0.10	0.10	100% SF6	Phakia	Local amotio	Exodrainage, cryo + radial buckle

following PPV (in contrast with scleral buckling) apply for complex and complicated retinal detachments [12]. However, PPV is also linked with a higher risk of trauma of the lens, progression of cataract [13] and more frequent development of PVR [14]. The usual complications of the cryosurgical procedure are: dysfunction of extraocular muscles [15], ablation of choroidea, anisometropia, postoperative pain and extrusion of the radial buckle. The most frequent cause of failure of scleral buckling is PVR [16].

We evaluate the functional results of BCVA as satisfactory, with an awareness of the fact that normal morphology of the retina may not necessarily be completely renewed even after rapid reattachment. In certain cases, a period as long as months and even years during which the condition may functionally adjust, has been described [17]. Processing of the image by the retina does not depend on mere renewal of the photoreceptors, but mainly on the normalisation of the electrical function of the retina as a whole, which is conditioned by the individual regenerative capacity of this tissue.

On the basis of our results and the literary data, we continue to regard the cryosurgical procedure on phakic eyes as the gold standard of surgical solution for uncomplicated rhegmatogenous retinal detachment. We see persistent vitreous traction and PVR as the main cause of eventual failure of this technique.

LITERATURE

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