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Research Article

Vitrectomy Compared with Focal Laser or 360° Endolaser Photocoagulation in Non-Complex Primary Pseudophakic Retinal Detachment

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Abstract

Purpose: To compare the effect of vitrectomy combined with focal laser or with intraoperative 360 endolaser photocoagulation in the treatment of primary pseudophakic rhegmatogenous retinal detachment.

Methods: In this retrospective, comparative, interventional study, two case series cohorts in rhegmatogenous retinal detachment (RRD) were considered. One which received vitrectomy with intraoperative prophylactic 360° laser treatment and one which received vitrectomy with intraoperative focal laser treatment. For the 360° laser treatment group, three rows of medium-white burns were positioned at the periphery, at/anterior to the equator. The recidivism occurance over time was analyzed and compared between the groups.

Results: Prophylactic intraoperative 360° laser treatment was performed on 47 RDD cases, and compared to 244 RRD cases of focal laser treatment. The focal laser treatment group showed significantly less retinal re-detachment than in the 360° laser group [12.7% (31/244 eyes) vs 27.6% (13/47 eyes) respectively; P=0.016].

Conclusion: Intraoperative 360° laser retinopexy following vitrectomy resulted in a significant higher postoperative retinal redetachment rate than focal laser, in pseudophakic RDD cases.

Keywords: *Vitrectomy; Focal Laser; 360° Laser; Pseudophakic Retinal Detachment; Rhegmatogenous Retinal Detachment (RRD)*

Introduction

Pseudophakic retinal detachment is one of the most severe complications following cataract surgery or vitrectomy. Due to the vision-threatening nature of this complication, many attempts have been made to prevent retinal detachment. Encouraging results have been published with a combined surgical approach requiring vitrectomy, scleral buckling/cryopexy, laser photocoagulation and gas tamponade to support the retina while avoiding difficult posturing [1-4]. However, no previous study considered the impact of laser photocoagulation in primary anatomical success rate, defined as retinal reattachment at final follow-up after a single operation. The purpose of this study was to evaluate the effect of intraoperative 360° prophylactic laser retinopexy on the incidence of retinal detachment after vitrectomy using a case-control design in rhegmatogenous retinal detachment (RRD) cases.

Patients and Methods

Inclusion and exclusion criteria's

Have been included 291 RRD pseudophakic patients of Monticelli Clinic operated with vitrectomy combined either to 360° or focal endolaser treatment, since 2012 to current 2015. Have been excluded the patients having received less than 6 months follow up and those whose RD is associated with other complications like PVR, hemorrhage, hematoma, macular hole, retinopathy, high myopia and diabetes.

Surgical Techniques

Patients undergoing a vitrectomy received a standard 3-port 23- or 25-gauge PPV using a noncontact wide-angle viewing system (Binocular Indirect Ophthalmomicroscope). Endolaser photocoagulation was applied either around the retinal tear or 360° to the vitreous base to completely surround all retinal breaks. Any 23 G or 25 G sclerotomy sites that were found to be leaking at the end of the surgery were sutured with 7-0 vicryl suture. In all cases, patients received non-expansile perfluoro-n-octane (C3F8) in air (12 - 16%), sulfur hexafluoride (SF6) in air (20 - 26%), or silicone oil (1,000 or 5,000-centistokes) for tamponade.

Data Analysis

All statistical analysis was performed using XLSTAT version 2015. z test (unilateral) was applied for data to compare retinal detachment recidivism proportions between the two treatment groups. Odds ratios (ORs) and 95% confidence intervals (CIs) were used to compare anatomical success rates.

Anatomical Results

291 patients were retained according to the selection criteria's cited above. 244 eyes underwent pas plana vitrectomy (PPV) with focal laser treatment while 47 eyes underwent PPV with 360° endolaser photocoagulation for the treatment of primary detachments. The main outcome measure for this study was "single surgery anatomical success" (SSAS), defined as 1 operation to anatomically reattach 100% of the retina for a minimum of 6 months duration or until the end of the patient follow-up. The overall SSAS rate for the 291 pseudophakic eyes with retinal detachment regardless of the surgical procedure was 15.12%.

For the first group patients (treated with PPV with focal laser), SSAS was 0.873 (31/244 of recidivism) compared to 0.723 (13/47 of recidivism) for the second group patients (operated with PPV with 360° laser). This difference was significant with higher rates in the favor of the use of only focal laser with the vitrectomy surgery (OR of 2.634; 95% CI, [0.000-0.037]; P = 0.016).

Discussion

Degree of laser photocoagulation ranges from a core demarcation followed by sealing the retina layers adherent to breaks, to a complete 360° encircling.

In our study, although only few retinal re-detachment occurred after surgery (13/47 eyes) in the intraoperative 360° laser group following vitrectomy, significantly better results were obtained with the focal laser group (31/244 eyes). Certain facts may account for 360° laser treatment as an option for preventing retinal detachment postoperatively in vitrectomy. A 360-degree search of the entire retina is made before the end of the surgery, in order to identify any pre-existing or iatrogenic breaks (e.g. posterior tears or entry site breaks). If found they are treated with laser photocoagulation in conjunction with a tamponading agent (air, expanding gas or silicone oil). In fact, the presence of a gas bubble can induce traction on the peripheral retina, an inflammation reaction, or vitreoretinal proliferation (PVR) development [5], leading to formation of peripheral breaks and retinal detachment. Thus, laser photocoagulation is always applied in order to decrease the neovascular drive and so minimize recurrent or delayed hemorrhage. 360° laser photocoagulation anterior to the equator may be also adequate to reduce the incidence of retinal breaks and detachment by causing strong chorioretinal adhesion, and by preventing their progression similar to demarcation laser treatment. In addition it may prevent or stabilize the intraocular vasoproliferative process. This procedure can easily be performed during the vitrectomy procedure with the endolaser probe. Takeshi Iwase., *et al*. [6] found no significant difference between the two groups. However, some of the laser-treated patients experience thermal complications such as subretinal fibrosis or enlargement of laser scars, favoring iatrogenic side effects. We may reduce these iatrogenic side effects by different ways like sparing the neurosensory retina while applying subthermal intensity to the vitreous base or to the RPE cells or adding a supplementary scleral buckling; using longer wavelength 810-nm diode lasers to reduce burn intensity and avoid absorption to macular chromophores; applying micropulsar techniques that increases the delay between pulses and reduces the size of retinal lesions by eliminating heat diffusion and lesion growth after treatment.

Yet the cause of iatrogenic retinal re-detachment after vitrectomy is probably multifactorial. The use of vitrectomy combined with laser photocoagulation has been identified as a risk factor for PVR development [5] by causing increased inflammatory response while removing inflammatory and responsive cells and their vitreous collagen. A recent study showed that RPE cells at the margins of laser burns modulate various cytokines via photoreceptors [7]. Additionally, the scleral encirclement opposing tractional forces resulting from contraction of vitreous base can occasionally cause troubles in the choroidal circulation. It can also increase the anterior-posterior opening of the retinal break with sliding of its posterior edge, facilitating the tendency of PVR. The breakdown of the blood–retinal barrier with leakage of serum proteins into the intraocular fluids can be the source of cellular migration and proliferation resulting in epiretinal membrane formation, thus promoting RRD incidence.

Furthermore, two main causes of iatrogenic retinal detachments would be associated with vitrectomy itself. One is that insertion of an instrument may cause traction on the adjacent vitreous, and the other is the vitreous which may become immobilized within the sclerotomy site during withdrawal of an instrument causing traction along the posterior border of the vitreous base postoperatively. However in this study, 23- or 25-G vitrectomy was performed in all of the cases, which may be preferable because using smaller gauge instruments might decrease trauma in and near the vitreous base adjacent to the sclerotomies.

Conclusion

In conclusion, a combination of vitrectomy with focal laser around the breaks had a better efficacy in the primary repair of pseudophakic retinal detachment than the vitrectomy with encircling endolaser therapy, limitating the burns over the retina, avoiding vascular leakage, cell migration and inflammatory responses.

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