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Use of systemic steroid after successful macular surgery in eyes with epiretinal membrane: a randomized, controlled clinical study

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Learning objectives

Upon completion of this activity, participants will be able to:

1. Describe the factors predictive of recovery after ERM surgery
2. List ophthalmic conditions that benefit from postoperative use of steroids
3. Describe the morphological classification system for retinal layer pathology
4. Describe the visual outcomes associated with vitrectomy and membrane peeling

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Use of systemic steroid after successful macular surgery in eyes with epiretinal membrane: a randomized, controlled clinical study

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CLINICAL STUDY

Abstract

Purpose To evaluate the functional and morphological outcomes of postoperative systemic steroid therapy after successful macular surgery in eyes with macular edema due to idiopathic macular epiretinal membranes (ERMs).

Design Prospective, randomized, investigator-masked, controlled clinical study.

Methods Twenty-eight patients scheduled for 23-gauge vitrectomy combined with ERM and inner limiting membrane (ILM) peeling for macular edema due to ERM were included in this single center trial. Patients were randomized to receive oral steroid therapy (Prednisolone, 100 mg per day for 5 days) or no oral steroid (control group) after surgery. Main outcome measures included best corrected visual acuity (BCVA; Early Treatment Diabetic Retinopathy Study), central retinal thickness (CRT), retinal volume (RV), and macular morphology as determined by spectral domain optical coherence tomography (SD-OCT, Cirrus). Examinations were carried out preoperatively and at week 1, at months 1 and 3, postoperatively.

Results At month 3, mean BCVA improved to a eight-letter gain in each study group ($P < 0.01$ compared with baseline for both groups), showing no statistically significant difference between both the groups ($P = 0.19$).

Morphologically, retinal surface folds resolved within 1 month after surgery in both treatment groups, followed by a progressive recovery of retinal layer integrity and a statistical significant ($P < 0.01$) decrease in CRT and RV without significant differences between both

groups ($P = 0.62$, $P = 0.13$, respectively, ANOVA between the groups).

Conclusion The early postoperative use of systemic steroid treatment after successful vitrectomy combined with ERM and ILM peeling does not seem to improve significantly the anatomic and functional outcomes in eyes with ERM.

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Introduction

Vitreomacular traction syndrome by epiretinal membranes (ERMs) is a common macular pathology leading to morphological distortion of the retinal surface because of the proliferation of myofibroblasts, the contractile element of the ERM, followed by functional changes such as metamorphopsia and visual deterioration.¹ The current standard of care for this epimacular pathology is vitrectomy and membrane peeling, a procedure that is thought to relieve epiretinal traction and macular edema, followed by regeneration of the intraretinal architecture and recovery of visual function.² Despite the successful removal of the ERM, it is known that retinal morphology in the macula does not completely return to normal structure after macular surgery, and the functional results are not always satisfactory, probably due to some irreversible damage of photoreceptors as well as postoperative inflammation and scarring.

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The most significant prognostic factors for the clinical outcome of ERM surgery have been identified as being preoperative visual acuity (VA), duration of symptoms, and macular edema.^{3,4}

The postoperative reduction of inflammation, fibrosis, and macular edema may significantly influence the prognosis of a successful postoperative treatment after macular surgery. It is well known that glucocorticoids reduce early inflammatory reactions such as increased permeability of capillaries, capillary dilatation, leukocyte extravasation, and fibrin deposition, as well as late inflammatory reactions such as proliferation of fibroblasts and collagen deposition.⁵ Steroid treatment may, therefore, lead to accelerated reduction of macular edema and less severe scarring after macular surgery, resulting in faster recovery of visual outcome.

Although studies could demonstrate the undisputed anti-inflammatory and anti-proliferative effect of steroids in different macular diseases such as diabetic macular edema⁶ or exudative age-related macular degeneration (AMD),⁷ there is no standardized scheme regarding the application, duration, and dosage as a postoperative therapy. Overall, looking at the currently available literature, the widespread use of steroids after intravitreal surgery in clinical practice lacks any scientific basis in terms of evidence-based medicine. Moreover, steroid treatment was combined with other medications or with additional surgical procedures in most of the published studies, therefore, the results cannot be attributed to the steroid effects alone.^{8,9} As steroids also have a number of unwanted systemic side effects such as diabetes mellitus, increased infection risk, wound healing disorders, osteoporosis, psychiatric disorders,¹⁰ as well as increase in intraocular pressure (IOP) and cataract formation in the eye,^{11,12} the uncritical use of a systemic steroid therapy should be put into question until its effectiveness has been proven.

The aim of the present study was to evaluate short-term outcomes of patients who received standardized postoperative systemic steroid treatment after successful 23-gauge vitrectomy combined with ERM and inner limiting membrane (ILM) peeling for macular edema due to ERM compared with patients without postoperative steroid treatment.

Patients and methods

Patients and examination procedures

This prospective, randomized, controlled, investigator-masked single center clinical trial was conducted at the Department of Ophthalmology at the Medical University of Vienna. The study and data accumulation were approved by the local institutional review board

(Ethics Committee of the Medical University of Vienna), were registered within the EudraCT database for clinical trials (No. 2006-006871-19), and followed the tenets of the Declaration of Helsinki. Informed consent for the research was obtained from all participants.

Patients scheduled for ERM surgery without any prior treatment and a VA of 20/40 to 20/400 were enrolled. After inclusion into the study, the participants were randomly assigned 1:1 to either the treatment group or to the control group using a computer-generated randomization list. Patients with any changes in the central retina (eg, diabetic retinopathy or neovascular AMD), with high myopia (< -6 spheres), any history of intraocular surgery, aphakia, uveitis, glaucoma, significant cataract, or eye trauma were excluded from this study.

All patients underwent a complete ophthalmological examination 3 days before surgery, including best corrected VA (BCVA) using early treatment diabetic retinopathy study (4-m distance) charts, IOP measurements using applanation (Goldmann) tonometry, slit-lamp biomicroscopy, fundus examination with dilated pupils and spectral-domain optical coherence tomography (SD-OCT) imaging using the Cirrus OCT (Carl Zeiss Meditec AG, Jena, Germany). Follow-up examinations were performed at week 1, months 1 and 3 including BCVA, SD-OCT, and laser cell flare meter (LFCM) measurements.

Surgery and postoperative management

Vitrectomy was performed in all cases by two experienced surgeons (SS and CP) using the OS3 vitreoretinal system (Oertli, Berneck, Switzerland). Oblique-angled incisions were made in the conjunctiva and in the sclera through the pars plana with a 23-gauge blade in the inferotemporal, superonasal, and superotemporal quadrants. Trocars were inserted through these wounds and the infusion cannula was placed in the inferotemporal quadrant, whereas the superonasal and superotemporal quadrants were used for the retinal instrumentation. A core vitrectomy was performed and the posterior hyaloid membrane was separated from the retina. A plano-concave contact lens was used for the visualization of the macula during peeling. The ERM as well as the ILM were peeled in the macular area using end-gripping forceps with the additional use of 0.15% Membrane-blue (Dutch Ophthalmic USA, Exeter, NH, USA). Thereafter, peripheral retina was examined under indentation and air-fluid exchange was performed. Finally the inserts were removed and when necessary the sclerotomies were closed using 7/0 Vicryl suture (Ethicon, Brussels, Belgium). The treatment group received four Prednisolone (25 mg) tablets (100 mg) (Aprednislon, Merck, Darmstadt,

Germany) combined with daily one Pantoprazole (40 mg) tablet (Pantoloc, Altana Pharma, Konstanz, Germany) to prevent gastric side effects, for 5 days. The control group did not receive systemic steroids. All patients received a combination of dexamethasone/gentamicin ointment (Dexagenta ointment; Croma Pharma, Leobendorf, Austria) immediately after surgery. The eye was then covered overnight. At day 1 postoperatively, the eyes were treated with dexamethasone/gentamicin eyedrops (Dexagenta eyedrops) and ketorolac-trometamol eyedrops (Acular eyedrops, Pharm Allergan, Ettlingen Germany) four times a day for 4 weeks.

Morphological imaging using SD-OCT

OCT images were obtained using SD, high-definition OCT. The Cirrus SD-OCT produces high-resolution B-scan images by a raster scanning technique with an axial resolution of 5 μm within a 6 \times 6-mm ($20^\circ \times 20^\circ$) area. The 512 \times 128 \times 1024 scan was used to document the course of central retina thickness (CRT) and retinal volume (RV). For morphological analysis, a high-resolution B-scan was performed. The presence or absence of intraretinal cysts and foveal depression, as well as the appearance of retinal layer integrity and the severity of epiretinal surface folding was graded. Retinal layer pathology was characterized by three different grades: grade 1 with an intact layer structure; grade 2 when the retinal layer structure was recognized but disturbed; and grade 3 when no layer pattern could be distinguished. Retinal surface folds (RSFs) were characterized as no detectable retinal folding (grade 1), mild (grade 2), or severe (grade 3). All morphological gradings were performed by a certified OCT reader of the Vienna Reading Center, Austria (MR).

Flare measurements

Anterior chamber flare measurements were performed 30 min after pupil dilation with one drop of 1%

tropicamide (Mydriatikum Agepha; Agepha, Soeding, Austria) and 2.5% phenylephrine (sterile solution produced by the hospital's dispensary), using a Kowa FC-1000 LFCM (Kowa Co. Ltd, Tokyo, Japan), before the OCT examinations were carried out. Two trained doctors (GM and RD) took all measurements. Calibration of the LFCM was performed according to the manual. Seven readings were taken with a background scatter of <10%. The highest and lowest readings were discarded and the remaining five values were averaged to obtain the flare value documented (expressed in photons per millisecond).

Statistical analyses

All calculations were performed using SPSS for Windows Version 17.0 (SPSS Inc., Chicago, IL, USA). The repeated ANOVA test and the repeated measures *t*-test was used for statistical analysis of changes in BCVA, CRT, RV, IOP, and LFCM values compared with baseline. For analysis of changes in retinal morphology, the χ^2 -test was used. A value of $P \leq 0.05$ was considered as statistically significant after Bonferroni–Holm's multiple test correction.

Results

Twenty-eight eyes of 28 consecutive patients (mean age 71 years, range 63–87, 22 women, 6 men) were included in this study; 14 patients were randomly enrolled into each study group. One patient was excluded from the study because of the additional use of Indocyanin green dye (ICG-Pulsion, Medical AG, Munich, Germany) for ILM visualization during macular surgery. Baseline characteristics were well balanced between the two groups. There was no statistically significant difference with regard to BCVA, CRT, RV, or IOP at baseline (Table 1).

At the time of surgery, in the steroid group, 3 eyes (21%) were pseudophakic and 11 eyes (79%) were phakic, and in the control group, 1 eye (7%) was pseudophakic

Table 1 Best corrected visual acuity, central retinal thickness, retinal volume, intraocular pressure, and flare measurements during follow-up

	Preoperative		Week 1		Month 1		Month 3	
	Steroid (n = 13)	Control (n = 14)	Steroid (n = 13)	Control (n = 14)	Steroid (n = 13)	Control (n = 14)	Steroid (n = 13)	Control (n = 14)
Mean BCVA \pm SD (ETDRS L)	34 \pm 8	29 \pm 10	38 \pm 8	36 \pm 12	41 \pm 5	40 \pm 13	42 \pm 4	37 \pm 12
Mean CTR \pm SD (μm)	496 \pm 57	470 \pm 107	431 \pm 45	418 \pm 62	406 \pm 47	404 \pm 66	380 \pm 55	370 \pm 51
Mean RV \pm SD (mm^3)	12.5 \pm 1.2	12.0 \pm 1.3	12.1 \pm 1.0	11.6 \pm 1.1	11.7 \pm 0.7	11.1 \pm 1.1	11.3 \pm 1.1	10.7 \pm 0.6
Mean IOP \pm SD (mm Hg)	14 \pm 3.3	15 \pm 1.7	15 \pm 2.3	17 \pm 4.3	17 \pm 3.4	17 \pm 2.5	16 \pm 2.9	19 \pm 4.5
Mean flare \pm SD (Ph/sek)	Not measured	Not measured	17.4 \pm 8.7	11.8 \pm 5.7	12.5 \pm 7.0	8.3 \pm 3.3	13.6 \pm 8.3	11.7 \pm 5.6

and 13 eyes were phakic. None of the phakic eyes had significant clinical worsening of cataract during the follow-up period, and none underwent cataract extraction and intraocular lens implantation.

Visual acuity outcomes

Mean BCVA of eyes enrolled into the control group showed an increase from 29 ± 10 letters at baseline to 36 ± 12 letters at week 1, 40 ± 13 letters at month 1, and then a decrease to 37 ± 12 letters at month 3. Compared with baseline, changes in BCVA were statistically significant ($P < 0.01$) at month 1 (Table 1, Figure 1).

Mean BCVA of eyes enrolled into the steroid group improved from 34 ± 8 letters at baseline to 38 ± 8 letters at week 1, 41 ± 5 letters at month 1, and 42 ± 4 at month 3. Compared with baseline, changes in BCVA were statistically significant ($P < 0.01$) at month 1 (Table 1, Figure 1). Comparing the mean BCVA of both groups

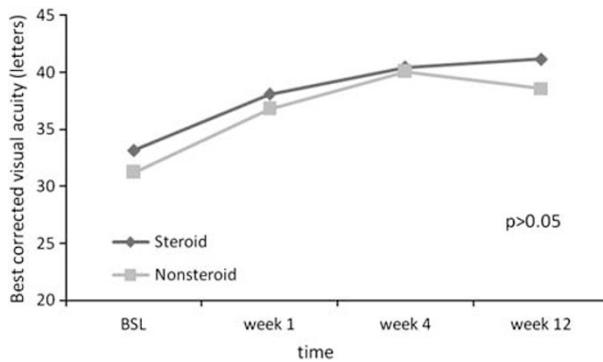


Figure 1 Course of BCVA at 12 weeks follow-up comparing steroid treatment with no steroid treatment after macular surgery for macular edema due to idiopathic ERM. Data are presented as means. $P > 0.05$ between the groups. ETDRS, early treatment of diabetic retinopathy study protocol vision chart.

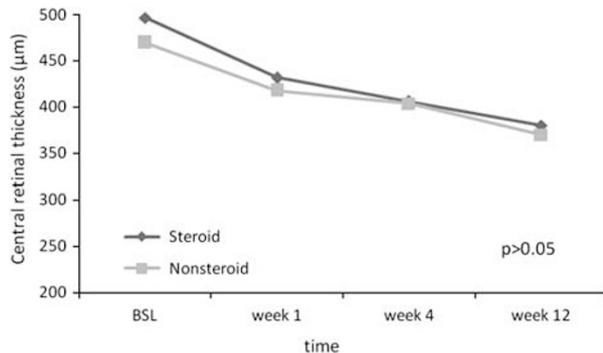


Figure 2 Course of CRT at 12 weeks follow-up comparing steroid treatment with no steroid treatment after macular surgery for macular edema due to idiopathic ERM. Data are presented as means. $P > 0.05$ between the groups.

showed no statistically significant difference between the groups ($P = 0.19$, ANOVA between groups).

Central retinal thickness, retinal volume, and retinal morphology outcomes

Mean CRT and RV values showed similar changes for both groups up to month 3 follow-up. In the control group, CRT decreased from $470 \pm 107 \mu\text{m}$ at baseline to $418 \pm 62 \mu\text{m}$ at week 1, $404 \pm 66 \mu\text{m}$ at month 1, and $370 \pm 51 \mu\text{m}$ at month 3. RV decreased from $12.0 \pm 1.3 \text{ mm}^3$ at baseline to $11.6 \pm 1.1 \text{ mm}^3$ at week 1, $11.1 \pm 1.1 \text{ mm}^3$ at month 1, and $10.7 \pm 0.6 \text{ mm}^3$ at month 3 (Table 1, Figure 2). Compared with baseline, the decrease in mean CRT and RV became statistically significant as early as week 1 ($P < 0.01$). In the steroid group, mean CRT decreased from $496 \pm 57 \mu\text{m}$ at baseline continuously to $431 \pm 45 \mu\text{m}$ at week 1, $406 \pm 47 \mu\text{m}$ at month 1, and to $380 \pm 55 \mu\text{m}$ at month 3 ($P < 0.01$). Mean RV values decreased from $12.5 \pm 1.2 \text{ mm}^3$ at baseline to $12.1 \pm 1.0 \text{ mm}^3$ at week 1, $11.7 \pm 0.7 \text{ mm}^3$ at month 1, and $11.3 \pm 1.1 \text{ mm}^3$ at month 3 ($P < 0.01$, Table 1, Figure 2). Compared with baseline, the decrease in CRT and RV became statistically significant as early as week 1 ($P < 0.05$). There was no statistically significant difference between the groups with regard to CRT and RV ($P = 0.62$, $P = 0.13$, respectively, ANOVA between the groups).

Retinal morphology, as documented by high-resolution B-scans of SD-OCT, recovered substantially after macular surgery with complete removal of the ERM and ILM in all eyes of both treatment groups. SD-OCT images allowed for identification of intraretinal cysts, presence of a foveal contour, and the varying degree of distortion of the neurosensory layers from the ILM to retinal pigment epithelium. The presence and severity of such intraretinal disturbances vary at baseline presentation and demonstrate a characteristic recovery process over time. The grading system described above was used to quantify the intensity of RSF and retinal layer integrity, as well as the presence of intraretinal cysts and a foveal contour.

RSFs resolve most rapidly as early as 1 week after surgery, representing the fastest postoperative morphological improvement, showing no significant difference between the two treatment groups ($P > 0.05$). The restoration of retinal layer integrity proceeds more slowly and incompletely in both the groups with no significant difference between the groups ($P > 0.05$). The resolution of intraretinal cysts and recovery of the foveal contour proceeds similarly in both the groups, most intensively during the first postoperative month. Absolute and relative values of the morphological grading are presented in Table 2.

Table 2 Morphological grading of retinal layer integrity, retinal surface folds, presence of intraretinal cysts, and visible foveal contour

	Preoperative		Week 1		Month 1		Month 3	
	Steroid (n = 13)	Control (n = 14)						
<i>Retinal layer integrity</i>								
Grade 1 (n/%)	0/0	0/0	0/0	0/0	0/0	0/0	2/15	4/29
Grade 2 (n/%)	4/31	5/36	8/62	6/43	11/85	10/71	11/85	10/71
Grade 3 (n/%)	9/69	9/64	5/38	8/57	2/15	4/29	0/0	0/0
<i>Retinal surface folds</i>								
Grade 1 (n/%)	0/0	0/0	9/69	7/50	11/85	11/79	12/92	11/79
Grade 2 (n/%)	10/77	10/71	4/31	7/50	2/15	3/21	1/8	3/21
Grade 3 (n/%)	3/23	3/29	0/0	0/0	0/0	0/0	0/0	0/0
Intraretinal cysts (n/%)	7/54	5/35	5/38	4/29	1/8	2/14	1/8	2/14
Foveal contour (n/%)	1/8	0/0	3/23	3/21	6/46	4/29	8/61	5/36

Retinal layer integrity: grade 1: intact retinal integrity; grade 2: retinal layer continuity altered; grade 3: retinal layer continuity lost. Retinal surface folds: grade 1: no retinal surface folds; grade 2: presence of mild folding; grade 3: presence of severe folding. (n/%) : absolute/relative values.

Figure 3 shows representative cases from each study group.

Flare measurements

During the study period, there was no significant difference between the treatment groups regarding changes in anterior chamber flare measurements. The values within the two groups showed no significant difference between the three postoperative visits (Table 1).

Safety

Within the follow-up of 3 months, none of the participants showed any local or systemic adverse event related to steroid therapy. No cataract development or retinal detachment was observed during the follow-up time. Mean preoperative IOP was 14 ± 3.3 in the steroid and 15 ± 1.7 in the control group ($P = 0.20$). During the study period, there was no statistically significant difference between the follow-up visits within and between the groups (Table 1); none of the patients needed anti-glaucoma treatment.

Discussion

The overall results of this prospective, randomized, controlled study show that 23-gauge vitrectomy, ERM and ILM peeling for idiopathic ERMs is an effective and safe technique for the treatment of macular edema due to idiopathic ERM. The results of both treatment groups compare favorably with previous studies. Fine *et al*¹³ reported that VA improved from a mean of 0.16 to 0.22

(decimal equivalent), after 23-gauge vitrectomy in 20 patients with idiopathic ERMs. Gupta *et al*¹⁴ investigated the short-term outcomes and reported VA improvement from a mean of 0.23 to 0.36 (decimal equivalent) after ERM peeling in 36 eyes. Tewari *et al*¹⁵ also described favorable visual outcomes in 20 eyes with a mean VA improvement from 0.3 to 0.4 (decimal equivalent). However, all of these studies were performed purely by peeling the ERM mechanically and the associated macular edema disappeared spontaneously over several months during the postoperative phase.

Corticosteroids have been used in ophthalmology since the early 1950s to suppress intraocular inflammation by reducing inflammatory exudation and inhibiting proliferation of fibroblasts and formation of granulation tissue.^{16–19} They have been applied topically as eyedrops, locally by subconjunctival, peribulbar, or by intravitreal injections, or systemically as oral medications or by intravenous or intramuscular injections. Besides their use in conditions such as proliferative diabetic retinopathy,²⁰ diabetic macular edema,⁶ exudative AMD,⁷ or central retinal vein occlusion,²¹ steroids have also been applied in combination with intraocular surgery. Körner *et al*²² reported a trend to a reduction of postoperative fibrosis after systemic cortisone therapy. Valone *et al*²³ report in their study about 134 patients with complete retinal detachment. They found a reduction of inflammatory signs and the rate of postoperative choroid detachment after combined systemic therapy with cortisone and antibiotics.

The aim of the present study was to investigate a potential advantage of combining macular surgery for idiopathic ERM with postoperative short-term treatment with systemic steroid. It is widely assumed that adjuvant

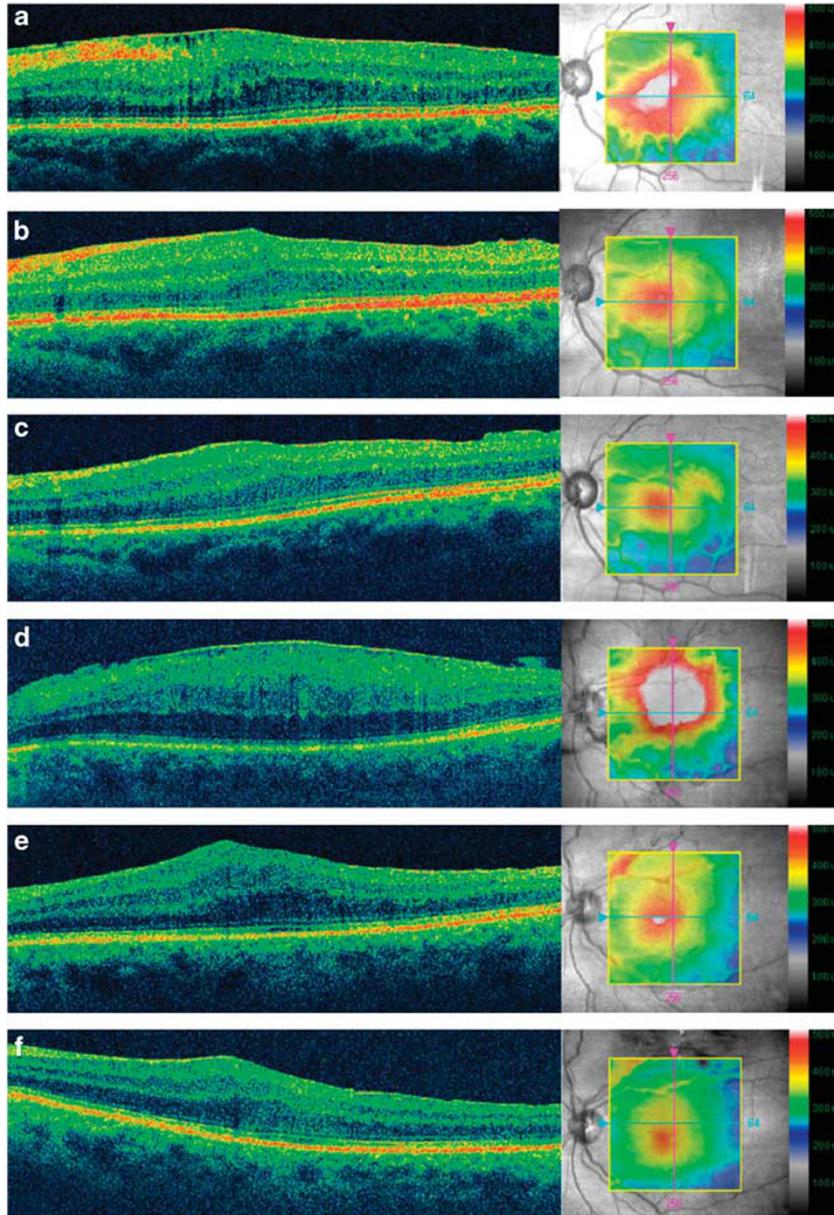


Figure 3 Macular morphology. Cirrus SD-OCT B-scans (left column) and retinal thickness maps (right column) of a representative case from each treatment group during follow-up. Panels (a–c) show scans of a patient from the steroid group: 3a = baseline, 3b = month 1, and 3c = month 3. Panels (d–f) show scans of a patient from the control group: 3d = baseline, 3e = month 1, and 3f = month 3. In both the cases, the mild preoperative retinal wrinkling similarly resolved, the retinal thickness decreased, and the retinal layer integrity was restored.

pharmacological therapy of steroid treatment, administered locally or systemically in association with vitreomacular surgery, may have a beneficial effect on the progress of visual recovery. Although macular edema, secondary to ERM, is likely to be of more mechanical than of primarily inflammatory nature, it has been shown that the initial mechanical traction of the retinal surface is associated with secondary biochemical pathways involving different cytokines, which may contribute to

the development of macular edema. Therefore, it is considered that steroids may function to combat the secondary inflammatory effects triggered by the mechanical distortion and thus accelerate the resolution of macular edema. A previous report on concomitant administration of intravitreal triamcinolone (IVTA) with macular surgery for ERM described the short-term visual recovery after use of IVTA.²⁴ It was noted that the level of achieved vision within 1 week is almost identical to the

final VA data after 6 months. On the basis of these data, the authors suggest that the use of IVTA gives an important benefit by accelerating visual recovery. However, these observations are based on a retrospective uncontrolled case series.

Our study was designed as a prospective, controlled, investigator-masked single center trial, using systemic Prednisolone instead of IVTA, providing the most reliable setting for the assessment of a potential advantage of steroid treatment after macular surgery. Short-term results of this investigation show no treatment benefit of macular surgery combined with oral Prednisolone compared with macular surgery alone. BCVA significantly improved, and CRT as well as RV significantly decreased in both groups compared with baseline. No statistically significant difference was observed between both treatment groups during the entire study duration. Even analysis of retinal morphology, being the most sensitive parameter for assessment of any difference in postoperative restoration of the retinal surface and recovery of neurosensory layer integrity, showed no significant difference between the groups. One reason for this might be that the concentration of 100 mg Prednisolone per day for 5 days was not high enough to show a significant effect. In addition, a possible effect of the topical treatment with ketorolac-trometamol eyedrops in both groups for 4 weeks postoperatively should be considered.

Some potential complications of steroid treatment include cataract formation and increase in IOP. The incidence of cataract progression after steroid treatment appears to differ considerably between reports (7–24%).^{25,26} No clinical cataract progression was observed and none of the patients required cataract surgery with intraocular lens implantation during the follow-up period. This result indicates that the present study is able to show the influence of systemic steroid on the functional outcome without any additional vision disturbing pathology of the eyes. There is limited knowledge regarding IOP changes after intravitreal injection or short-term systemic application of steroids in vitrectomized eyes. Tsujikawa *et al*²⁷ reported an IOP increase of >21 mm Hg in 9 of 17 (53%) vitrectomized eyes after IVTA injection of 10 mg. In our study, no statistically significant elevation of the IOP after vitrectomy was seen in both groups.

In summary, the present study shows that 23-gauge vitrectomy combined with ERM and ILM peeling is a safe and effective technique for the treatment of macular edema in eyes with idiopathic macular ERM. The postoperative administration of systemic steroid treatment does not seem to significantly improve the anatomic and functional outcomes. Further randomized clinical studies should be conducted to investigate the

effect of local steroids (s.a., intravitreal Osurdex, IVTA, or subconjunctival dexamethasone) on different vitreoretinal surgeries.

Summary

What was known before

- Several studies could demonstrate the anti-inflammatory and anti-proliferative effect of steroids in macular diseases such as diabetic macular edema or exudative AMD.
- There are no reliable data regarding the efficacy of steroids as a postoperative therapy after macular surgery.

What this study adds

- The postoperative uses of systemic steroid treatment after successful vitrectomy combined with ERM and ILM peeling does not improve the anatomic and functional outcomes in eyes with ERM.

Conflict of interest

The authors declare no conflict of interest.

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Use of systemic steroid after successful macular surgery in eyes with epiretinal membrane: a randomized, controlled clinical study

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- A patient with vitreomacular syndrome undergoes vitrectomy with membrane peeling. Which of the following is least likely to be a significant predictor of clinical outcome?
 - Preoperative visual acuity
 - Macular edema
 - Duration of symptoms
 - Visual field loss
- According to the authors, the literature suggests that which of the following procedures is most likely to benefit from postoperative steroid use?
 - Cataract removal
 - Diabetic macular edema
 - Vitrectomy
 - Intravitreal surgery
- A patient is found to have disturbed, but recognizable, retinal layer with mild retinal surface folding. Which of the following best describes his grade of retinal layer and fold pathology, respectively?
 - Grade 1 and 2
 - Grade 2 and 2
 - Grade 2 and 1
 - Grade 1 and 1

- A patient who underwent vitrectomy with membrane peeling is given oral Prednisolone 100 mg daily for 5 days. Which of the following outcomes is most likely to be improved?
 - Best corrected visual acuity at 3 months
 - Retinal fold pathology at 1 month
 - Central retinal thickness recovery
 - None of the above

Activity evaluation

- The activity supported the learning objectives.

Strongly disagree				Strongly agree
1	2	3	4	5
- The material was organized clearly for learning to occur.

Strongly disagree				Strongly agree
1	2	3	4	5
- The content learned from this activity will impact my practice.

Strongly disagree				Strongly agree
1	2	3	4	5
- The activity was presented objectively and free of commercial bias.

Strongly disagree				Strongly agree
1	2	3	4	5