

Cystoid Macular Edema Following Rhegmatogenous Retinal Detachment Repair Surgery: Incidence, Pathogenesis, Risk Factors and Treatment

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Purpose: To review the incidence, risk factors, and treatments for cystoid macular edema (CME) following rhegmatogenous retinal detachment (RRD) repair surgery.

Methods: A comprehensive literature search was conducted across multiple databases. Relevant studies published within the last 20 years were selected and reviewed.

Results: The incidence of CME following RRD repair ranges from 6% to 36%, with higher rates associated with silicone oil tamponade. Key risk factors include recurrent RRD, pre-existing proliferative vitreoretinopathy, older age, and post-RRD cataract surgery. Treatment options primarily focus on anti-inflammatory approaches, with topical NSAIDs and corticosteroids as first-line treatments. For persistent cases, intravitreal corticosteroid injections, particularly dexamethasone implants, have shown potential.

Conclusion: CME remains a significant complication following RRD repair, impacting visual recovery. While various treatment options exist, management of persistent CME remains challenging. Better understanding of the underlying mechanisms of CME is required to develop more effective treatment strategies, particularly for cases resistant to current therapies.

Plain Language Summary: Cystoid macular edema is a common complication following rhegmatogenous retinal detachment repair, affecting visual recovery. Its incidence varies widely, influenced by surgical approach and patient factors. Treatment primarily involves anti-inflammatory medications, with intravitreal corticosteroids showing promise for persistent cases. Further research is needed to improve management of this challenging complication.

Keywords: retinal detachment, cystoid macular edema, vitrectomy, scleral buckle, silicone oil, steroids, retinectomy, PVR

Introduction

Surgery for repair of rhegmatogenous retinal detachment (RRD) often achieves anatomical repair, however, functional results are suboptimal in some cases. Significant microvascular changes have been detected in superficial and deep capillary plexuses in eyes with RRD, associated with poorer post-operative visual acuity.^{1,2}

Among the most frequent macular changes following rhegmatogenous retinal detachment (RRD) repair surgery, cystoid macular oedema (CME) represents a common complication.^{3–6} This condition is characterized by the accumulation of intraretinal fluid, leading to a subsequent decline in visual acuity, which can persist for months following RRD repair, impeding visual rehabilitation efforts.⁷ Functional recovery subsequent to RRD repair has garnered considerable attention,

with CME emerging as a primary factor hampering such recovery, alongside post-operative changes such as epiretinal membrane formation (ERM), cellular and subcellular pathological processes which underlie the loss of visual function.^{8–11}

The specific etiology of this post-operative complication remains debated, but several risk factors, such as age, lens status, macular status, the severity of the retinal detachment, surgical technique and especially proliferative vitreoretinopathy (PVR), have been reported in multiple papers.¹²

Conservative treatment, including steroidal and non-steroidal anti-inflammatory (NSAID) eye drops, guarantees a resolution in the vast majority of post RRD CME cases within 6 weeks after the therapy is started. There is, however, a number of eyes in which the CME becomes chronic. In these cases, more invasive treatments are usually needed.

This article presents a comprehensive overview of the incidence, risk factors, and treatments for this condition, based on the available literature on the subject.

Materials and Methods

A comprehensive literature search was done to find all published studies on these topics and the following databases were searched: Medline, PubMed, Web of Science Core Collection, and the Cochrane Library. Controlled vocabulary and keywords related to “macular edema” and “cystoid macular edema” were used in combination with terms “retinal detachment”, “vitrectomy”, “postoperative”. Prospective and retrospective clinical studies, as well as narrative reviews, were considered. We limited our search to studies that were relevant to our subject, written in the English language, and published within the last 20 years. A comprehensive review of 112 publications by 2 authors (EB and NS) was conducted, with relevant articles being selected for an in-depth review based on their significance to the topic. Furthermore, reference lists of the eligible articles were manually scrutinized to identify additional pertinent studies. Ongoing research was also explored by examining clinical trial registries, including www.clinicaltrials.gov.

Incidence

RRD requiring surgical repair is a common condition, affecting between 6 and 18 patients per 100,000 people worldwide each year.¹³ The incidence of CME is influenced by a number of factors, including the type of surgery, the presence of PVR and the tamponade. Following any of the different techniques used to repair RRD, the rate of post-operative CME incidence usually ranges from 6% to 36% (see Table 1).^{14–17} More extreme numbers regarding are, however, also reported, with mere 5.5% after PPV for symptomatic floaters to 40% after complicated retinal detachment repairs.^{15,18,19} Smaller studies have shown a range of 12–45% of postoperative CME following RRD repair although a majority of these eyes had PVR preoperatively which likely increased the incidence of CME.^{19–22}

Merad et al reported that 34% of patients receiving multiple different tamponades (gases and silicone oil) experienced at least one episode of CME within the first year of follow-up, while the rate of CME at 12 months was 28%.²³

The highest incidence of CME development occurs usually when silicone oil (SO) is used as tamponade. In these cases, the incidence of CME varies between studies and possibly depends on the interval between the operation and the SO removal,²⁸ and is reported to be between 14% and 36%.^{16,21,29–32} Gharbiya et al reported an incidence of 14.95% in

Table 1 Incidence of Post RRD Repair Surgery Macular Edema Development

| Study | Sample Size | Type of Surgery | Tamponade Used | Incidence of ME (%) |
|--|-------------|----------------------------|----------------|---|
| Merad et al (2022) ²³ | 493 | PPV +/- Phako IOL | Gas, SO | 34% during 1st year, At 28% (12 months) |
| Yang et al (2018) ¹⁶ | 58 | PPV | SO | 36.20% |
| Starr et al (2021) ²⁴ | 1466 | SB, PPV or combined PPV/SB | Air, gas, SO | 9.60% |
| Gebler et al (2022) ²⁵ | 150 | SB, PPV or combined PPV/SB | Gas, SO | 18.70% |
| Gharbiya et al (2022) ²⁶ | 107 | SB or PPV | Gas | 14.95% |
| Chatziralli et al (2019) ²⁷ | 86 | PPV | Gas | 16.3% |

a retrospective study comparing scleral buckling (SB) versus PPV. The results showed that PPV has higher rate of post-operative occurrence of CME compared to SB.²⁶

The occurrence of CME seems to be lower in eyes operated using gas tamponades. Starr et al reported a 9.6% incidence in a retrospective multicenter study examining the Primary Retinal Detachment Outcomes database, including 1466 eyes and in which gases were used in 95.3% of cases. He argued that the lower rates of incidence of CME compared to older studies were due to the primary use of vitrectomy for repair, as opposed to the primary use of scleral buckles in the previous studies.²⁴ However, it is important to note that older studies predominantly used fluorescein angiography for diagnosis, which could lead to an underestimation of the true incidence of CME in these cases. A recent study by Gebler et al, using OCT for diagnostic imaging, included eyes treated primarily with SB (54.2%) or a combination PPV with SB (20.6%). This study reported a higher incidence of CME at 18.7% and identified epiretinal membrane (ERM) and macula-off RRD as potential risk factors.²⁵

Mechanism of Cystoid Macular Edema Development

In the normal physiologic state, free leakage of protein and fluid from macular vasculature is prevented by the blood retinal barrier (BRB).³³ This is categorised into either the inner or the outer BRB. The inner BRB is formed by the tight junctions of retinal blood vessel endothelium, whereas the outer BRB is derived from the retinal pigment epithelium (RPE).³⁴

The macula is susceptible to oedema due to lax interconnecting fibres in Henle's layer³⁵ and relative lack of Müller cells, which support fluid absorption from retinal tissue.³⁶ The specific mechanism of oedema can be categorised into either vasogenic or cytotoxic. Although some retinal vascular conditions primarily cause either one or the other, usually a combination occurs, with vasogenic being the most common pathway (Table 2).

In vasogenic oedemas, the primary defect is in the BRB, resulting in an abnormal accumulation of extracellular fluid.³⁴ In cytotoxic oedemas, the issue is in retinal parenchymatous cells. An insult to these, whether hypoxic, ischaemic or other, causes intracellular fluid accumulation and secondary breakdown of the BRB.³⁷

Both the BRB³⁸ and blood aqueous barrier (BAB)³⁹ have been shown to break down in rhegmatogenous retinal detachment (RRD). BRB breakdown itself causes the release of inflammatory mediators and pre-disposes the retina to vasogenic oedema.⁴⁰

Furthermore, the vitreous concentration of pro-inflammatory mediators such as Vascular Endothelial Growth Factor (VEGF)⁴¹ and multiple other cytokines⁴² are raised in eyes with RRD. These cause further disruption of the inner BRB, tight junction dysfunction, permeability and leukocyte migration, resulting in vasogenic oedema.

Following surgery for RRD, CME is predominantly thought to be secondary to postoperative subclinical intraocular inflammation.⁴⁰ Studies have demonstrated the pro-inflammatory effect of vitrectomy.^{43,44} SB also alters the BRB and induces inflammation.⁴⁵ Cryotherapy, a common adjunctive treatment, works by causing inflammation and BRB breakdown with consequent scarring for the necessary effect around a retinal break.⁴⁶ However, this association has not been demonstrated. On the other hand, pneumatic retinopexy (PnR) is less invasive and inflammatory than vitrectomy or scleral buckling⁴⁷ and therefore associated with less post-operative CME.^{48,49}

Table 2 Mechanism of Macular Oedema Development

| Mechanism | Description |
|--------------------|---|
| Vasogenic | BRB breakdown causing extracellular fluid accumulation |
| Cytotoxic | Intracellular fluid accumulation due to cellular insult |
| Inflammation | Post-surgical inflammation causing BRB breakdown |
| VEGF and Cytokines | Elevated levels causing further BRB disruption |

Overall, these pro-inflammatory surgical factors compound BRB breakdown, resulting in intraretinal capillary serous exudation mainly between the outer plexiform and inner nuclear layers.⁴⁰ Elevated prostaglandin levels also likely play a major role in postoperative CME.^{50,51}

The postsurgical inflammation theory is also supported by the fact treatments for post-RRD surgery CME are mainly anti-inflammatory. Commonly, either non-steroidal anti-inflammatory drugs (NSAIDs)⁵⁰ and/or steroids^{52,53} are used.

Other less substantiated theories of post-RRD surgery CME are in relation to loss of cellular function from apoptosis secondary to RRD⁵⁴ or secondary to Müller cell dysfunction.⁵⁵ Changes in Müller cell morphology and pathologic damage following retinal detachment and re-attachment may cause cytotoxic oedema as they swell.⁴⁰

Risk Factors

Many studies have identified risk factors for CME development following RRD surgery (see Table 3). Most recently, a large multi-institutional study of 1466 primary RRD surgeries found the biggest risk factors for postoperative CME were recurrent RRD, pre-existing PVR, older age and cataract surgery following RRD repair.²⁴ Of these surgeries, 13.1% were undertaken by primary SB, 50.6% by PPV and 36.3% with primary combined PPV/SB. Notably, this study excluded PnR. Another large study of 1042 patients treated with PPV for RRD,²³ showed similar findings in relation to identifying PVR and post-vitreotomy cataract surgery as risk factors for CME. Similarly, a recent retrospective study, including 708 eyes, found that factors such as prior intraocular surgery, presence of an ERM, number of retinal redetachment surgeries, and PPV surgery were associated with a higher risk of developing CME.⁵⁶

Recurrent RRD

Two large studies of more than 1000 patients each found that a greater number of surgeries increase the risk of postoperative CME.²³ Single surgery leads to a lower number of post-RRD surgery CME in both phakic (OR 0.42,

Table 3 Risk Factors Identified

| Study | Risk Factors Identified | Significance (P-value) |
|--|--|------------------------|
| Starr et al (2021) ²⁴ | Single surgery success (Recurrent RRD) | <i>P</i> <0.0001 |
| | Pre-operative PVR | <i>P</i> = 0.0400 |
| | Cataract surgery following primary RRD surgery | <i>P</i> = 0.0001 |
| | Older Age | <i>P</i> = 0.0038 |
| Pole et al (2021) ⁵⁷ | Recurrent RRD | <i>P</i> <0.0001 |
| | Pre-operative PVR | <i>P</i> = 0.09 |
| | Macula-off RRD | <i>P</i> = 0.06 |
| | Retinectomy | <i>P</i> = 0.009 |
| Chatziralli et al (2019) ²⁷ | Pre-operative PVR | <i>P</i> = 0.042 |
| | Macula-off RRD | <i>P</i> = 0.027 |
| | Duration of RRD >1 week | <i>P</i> = 0.012 |
| | Pseudophakia | <i>P</i> = 0.039 |
| Gebler et al (2022) ²⁵ | Epiretinal membrane | <i>P</i> <0.001 |
| | Macula-off RRD | <i>P</i> = 0.044 |

95% CI 0.19–0.92) and pseudophakic eyes (OR 0.22, 95% CI 0.12–0.39).²⁴ Another study of 99 eyes undergoing RRD surgery also found patients with CME underwent greater numbers of surgeries ($P < 0.0001$).^{24,57}

Pre-Operative Proliferative Vitreoretinopathy (PVR)

In the largest study detailing risk factors for CME in this context, pre-operative PVR (OR 1.74, 95% CI 1.03 to 2.95, $p = 0.0400$) was significantly associated with postsurgical CME.²⁴ This is corroborated by other studies^{20,21} assessing postoperative CME rates following PVR detachment surgery, which are much higher. Specifically, PVR-C has been implicated as a major risk factor.^{23,57,58}

Cataract Surgery Following Primary RRD Surgery

In a mixed intervention study, rates of CME following RRD surgery were similar in both pseudophakic (9.0%) and phakic (9.9%) cohorts. Following primary RRD repair, 47.4% (400) of the phakic eyes that underwent cataract surgery had a significantly increased postoperative ME risk (OR 7.28, 95% CI 3.78–14.03, $p = 0.0001$).²⁴ In a study solely on PPV for RRD repair, post-vitreotomy cataract surgery was significantly associated with CME at 12 months (OR, 1.96; 95% CI, 1.06–3.63; $p = 0.03$).²³

Macula-off RRD

Some studies have shown a higher rate of postsurgical ME in macula-off RRD eyes. A higher rate of postsurgical CME eyes (83%) had a macula-off retinal detachment compared with those without CME (44%) in a study of 99 eyes.⁵⁷ In a monocentric retrospective study of 62 consecutive patients, macula-off RRD increased the risk of CME by 4.3 times compared to macula-on RRD regardless of the surgical procedure ($p = 0.04$).⁵⁹ Another study of 150 patients with primary RRD undergoing surgery patients with macula-off RRD had more postsurgical ME (26.5% versus 11.1%, $p = 0.044$).²⁵ In relation to SB, rates of postsurgical CME were also higher in the initially macula-off cohort.⁶⁰

Comparing two larger studies, one found no statistically significant difference in postsurgical CME dependent on pre-operative macula status.²⁴ In multivariate analysis of another, eyes with macula-off status were at higher risk of postsurgical CME (OR, 1.80; 95% CI, 1.02–3.28; $p = 0.048$). This also matches with the significant finding of worse initial BCVA as a risk factor for CME.²³

Extensive RRD

In patients with more extensive RRD (defined as macular detachment plus RD of more than three clock hours before surgery), more frequent CME has been reported.⁶⁰ Other results also suggest that the greater the extent of RRD, the greater the risk of CME by 1.43 times.²³

Silicone Oil (SO) Tamponade

In a Korean study of 58 eyes treated with PPV and SO for RRD, 36.2% of patients exhibited postsurgical CME.¹⁶ This high rate supports SO as a risk factor for postsurgical CME. In fact, SO tamponade was found to be a statistically significant risk factor (OR, 2.84; 95% CI, 1.57–5.13; $p < 0.001$)²³ in a large study. In another study of 99 eyes, 64% of patients with postsurgical CME had SO tamponade, compared to only 5% of those without CME.⁵⁷

Surgical Approach

Different techniques have demonstrated inconsistencies regarding incidence rates of CME. In a large subset analysis of 1466 eyes undergoing primary RRD surgery, PPV and PPV/SB had a lower odds ratio linked with postsurgical CME compared to SB, but this showed no statistic significance; Starr et al argued, however, that the lower incidence rates of CME compared to older studies were due to the primary use of vitrectomy for repair, as opposed to the primary use of scleral buckles in previous studies, where subretinal fluid may have persisted much longer.²⁴ The findings of Gharbiya et al, in a study comparing PPV and SB and including 107 patients, concluded the opposite, with CME higher in the PPV cohort.²⁶ Gebler et al did, instead, also not find any differences between surgical techniques ($p = 0.494$).²⁵ In another

study of 62 eyes affected by RRD who underwent SB (20) or PPV (42), CME occurred in 33.3% of the PPV group regardless of epiretinal membrane formation; no CME cases were identified in the SB group.⁵⁹

In relation to PnR, a study evaluating angiographic CME found presence in 11% of PnR eyes as opposed to 29% of SB eyes at 6 weeks post-operatively ($p = 0.0005$).⁴⁹

Laser Retinopexy

Laser retinopexy has been reported to significantly increase the risk of postsurgical CME in pseudophakic patients undergoing surgery for RRD.⁵⁸ Another study comparing to cryotherapy also found endolaser retinopexy was associated with an increased risk of postoperative CME at 12 months (OR, 3.06; 95% CI, 1.33–7.84; $p = 0.01$).²³

Retinectomy

Rates of retinectomy have also been reported to be significantly higher in the postsurgical CME group (36%) as opposed to those who do not have CME (5%).⁵⁷ This also ties in with macula-off detachment and PVR data.

Other Potential Risk Factors

Age

Some studies have found increasing age to be a risk factor. Controlling for surgical modality (PPV/SB), older age was a statistically significant factor in the development of post-RRD surgery CME (OR 1.03 per year, 95% CI 1.01 to 1.05, $p = 0.0038$).²⁴ A study of 130 eyes undergoing SB also found increasing risk with increasing age.⁶⁰ However, another large study focussed on PPV and a smaller retrospective series⁵⁷ did not find any association between development of postsurgical CME with age.²³

Epiretinal Membrane

In a study of 150 patients with primary RRD undergoing surgery, the risk of postsurgical ME was significantly elevated in patients with ERM (42.9%) versus those without (6.9%).²⁵ However, another large study found no association between ERM and CME.²⁴

Diabetes

Diabetes mellitus was not found to be a risk factor in 2 large studies.^{23,24} In a study of 1466 eyes,³⁰ 172 (11.8%) patients were diabetic (type 1 or 2). The risk of postsurgical CME was not found to be significant (OR, 0.83; 95% CI, 0.47–1.48; $p = 0.5258$).

Treatments

The treatment of CME linked to PPV ranges from waiting to several different agents, mostly with an anti-inflammatory effect (Table 4). These treatment options aim to limit the presence of inflammatory components, which are released from the disruption of the BRB. These mediators cause dilation of vessels, elevated permeability of the capillaries, leukocyte attraction, and finally CME.^{40,61} Post-PPV CME is believed to be more resistant to treatment than post-cataract surgery CME, with around 69% of eyes not responding to medical treatment alone in a recent study.⁷ A distinction can be made for post-RD repair eyes which received SO, as resolution of most cases, which developed after an SO tamponade often occurs spontaneously after SO removal, possibly due to the relieving of both inflammatory and mechanical insults.^{30,62} In case of a chronicization of the edema, more invasive treatment is usually needed.⁷

NSAIDs

The most widespread class of drugs used to treat post-operative CME is Nonsteroidal anti-inflammatory drugs (NSAIDs). Their topical form is considered as a first line. NSAIDs block cyclooxygenase-1 and cyclooxygenase-2 and, thus, prostaglandin. As a result, the ocular tissue penetrance of topical NSAIDs is a treatment of choice when dealing with CME, and they are effective even for chronic postoperative cases.^{70,71} Only a few articles in the literature are centered around CME after RRD, with none reporting about the use of topical NSAID alone. Most of the evidence does, in fact, derive from post-cataract surgery studies. A small retrospective case-control series including 25 cases of

Table 4 Treatment Approaches and Efficacy

| Treatment Type | Study | Sample Size | Success Rate (%) (N) | Comments |
|--|--|-------------|---|---|
| Topical NSAIDs | Pole et al (2021) ⁵⁷ | 25 | 25% (5) | Limited efficacy |
| Intravitreal Triamcinolone | Gao et al (2012) ⁶³ | 2 | 100% (2) | SO filled eyes Recurrence after 2 months in both patients |
| | Alam et al (2016) ⁶⁴ | 39 | Unknown % Significant decrease in mean CFT at 3, 6 and 12 months | VA gain noted at 1 month but not sustained |
| Dexamethasone Implant 0.7mg (DEX-I) | Thanos et al (2018) ⁶⁵ | 17 | 100% (17) | All patients developed recurrence of ME at 3 months requiring retreatment |
| | Chatziralli et al (2021) ²⁷ | 14 | 93% (13) | 12 month follow up |
| | Pole et al (2021) ⁵⁷ | 4 | 0% (0) | Small sample size. No significant change in CST ($P = 0.125$) |
| | Freissinger et al (2020) ⁶⁶ | 15 | 46% (7) | CDVA gain > 1 line |
| | Banerjee et al (2017) ⁶⁷ | 69 | 57.3% (40) | The proportion of eyes with ME in the adjunct group was 42.7%, compared with 67.2% in the control group ($P = 0.004$) |
| Fluocinolone Acetonide (0.19 mg) Implant | Alfaqawi et al (2018) ⁶⁸ | 1 | 100% (1) | Case report, ME-free for 13 months |
| | Motloch et al (2024) ⁶⁹ | 49 | 71.4% (35) | All eyes had received DEX implants beforehand |

CME developing post-RRD-repair surgery showed a resolution of only 25% of cases with a combined topical treatment of NSAID and corticosteroids.⁵⁷ For eyes that have been vitrectomized, the efficacy of topical treatment seems to be usually limited.^{24,57,72} More studies are therefore needed to assess the efficacy of topical NSAID in eyes developing CME after RD repair surgery.

Corticosteroids

Corticosteroids are the most reported treatment in the literature for post-PPV CME and seem to be the most frequently used as well. They effectively minimize inflammation and cellular proliferation, as they also block prostaglandin and leukotriene production, and therefore increase the tightness of the BRB.⁷³

Topical application is not very present in the literature, as no study reported about its use for repaired RRD and CME. It has been, however, demonstrated that, in eyes developing CME after cataract surgery, topical Prednisolone acetate, when used in combination with topical NSAIDs (such as Ketorolac), seems to be more effective than the use of single agents for acute CME.^{40,74}

Periocular and intravitreal injections seem to be more effective for CME treatment compared to systemic steroids but are mostly reserved for cases of CME that do not respond to topical therapy.⁷⁵ Among the intravitreal options, triamcinolone has been considered as possible treatment. Gao et al studied its use in eyes filled with SO as an option for post-operative CME but showed a recurrence of the CME 2 months after administration. In one instance a repeated injection was administered with good result, but the sample was limited to 2 patients.⁶³ Alam et al evaluated the outcomes of intravitreal triamcinolone acetonide for chronic ME after PPV in a retrospective study, and found that it was

effective in reducing CME, with, however, only a short-term VA improvement reported.⁶⁴ Some experimental studies have, however, shown a decrease in the vitreous half-life of different drugs after PPV, and intravitreal triamcinolone acetonide is more rapidly cleared in vitrectomized eyes.^{76,77}

Another major option is the intravitreal injection of a dexamethasone implant (DEX-I) which has a 25-fold higher anti-inflammatory potency than cortisol.^{76,78} Dexamethasone has a short half-life and its utility has previously been limited by this, hence the need for a slow-release implant such as DEX-I.⁷⁹ The efficacy of dexamethasone is furthermore enhanced by its high hydrophilicity, allowing for higher vitreous concentrations compared to other corticosteroids.⁸⁰ It is considered to have similar results between non-vitrectomized and vitrectomized eyes in decreasing central retinal thickness and improving visual acuity.⁸¹ The implant slowly releases dexamethasone, gradually degrading into water and carbon dioxide, up to a complete degradation at almost six months post-insertion. This has also shown to be effective in chronic post RD repair surgery CME.⁶⁵ A recent retrospective study including 86 eyes post-vitrectomy for RD repair, of which 14 experiencing postoperative CME and been treated with DEX-I, showed that these achieved a 71% resolution rate with a single injection, and showed a significant improvement in best-corrected visual acuity (BCVA) after one year.²⁷ Its long-term efficacy has also been proven despite recurrence, indicating that repeated intravitreal injections may be necessary.^{57,66}

Two large retrospective multicenter studies (EPISODIC 1 and 2) with 150 patients in total and assessing the effectiveness of intravitreal dexamethasone implants for treating postsurgical CME demonstrated functional and anatomical improvements, but reported poorer outcomes in the postoperative CME group due to RRD compared to the post-cataract surgery group.^{82,83} They postulated that in cases of vitrectomy for RD or ERM peeling, the presence of an underlying macular disease represented a poor prognosis factor of functional effectiveness. The studies did, however, mostly include eyes, which developed CME after cataract surgery (82% and 58% of all eyes) and included only 9 patients who developed CME after an RD repair surgery.

The efficacy of DEX-I in post-RD repair eyes was further corroborated by a 2-year, large, multicenter, prospective, randomized, clinical trial investigating the clinical efficacy of DEX-I in cases of RRD with PVR grade C, showing a greater reduction in CME in patients treated with DEX-I at 6 months compared to the placebo group, although no difference in primary anatomic success rate was observed.⁶⁷

Finally, The ILUvien study investigated the safety and efficacy of an additional corticosteroid, namely a long-acting 0.19 mg fluocinolone acetonide implant, in treating patients with refractory CME post-RD repair surgery. This included 49 patients and demonstrated that the implant improved BCVA and reduced the CRT of the eyes involved.⁶⁹ This was corroborated by a case report, in which a patient, unresponsive to prior interventions with intravitreal triamcinolone and DEX-I, was shown to be CME-free for a duration of 13-month follow-up after receiving the fluocinolone acetonide implant.⁶⁸

Others

Agents such as carbonic anhydrase inhibitors and intravitreal anti-VEGF have been tested and considered for the treatment of post-operative pseudophakic CME. However, there is no evidence to support the effective use of these treatments for the treatment of CME following retinal RRD surgery.

Conclusions

CME is a significant complication following RRD repair surgery, affecting visual recovery and overall patient outcome. With a complex pathogenesis and factors involved in its development, it remains a challenge for vitreoretinal surgeons.

Treatment approaches include topical NSAIDs and corticosteroids, but this evidence is extrapolated from CME after cataract surgery and we lack strong evidence of their role in CME after RRD repair. Periocular and intravitreal corticosteroids, such as triamcinolone and dexamethasone implants, have shown more promise in the treatment of persistent CME. Recently, also Fluocinolone Acetonide implants demonstrated encouraging results, as pointed out in the Iluvien study. However, the management of persistent CME remains challenging and often requires repeated interventions.

Further studies are essential to better understand the mechanisms underlying CME and to develop more effective treatment strategies. For example, looking into other biomarkers of subclinical postoperative inflammation and their association with CME. Inconsistencies in findings highlight the need for more research on the etiology of post-operative CME.

Evaluating current therapies is crucial for assessing their efficacy, especially where there remain large gaps in the literature (eg fluocinolone). Clinical trials for therapies targeting novel pathways such as IL-6 in relation to other inflammatory causes of macular oedema are underway and their application to patients with CME after RRD repair surgery may significantly improve patient outcomes.⁸⁴

Disclosure

The authors report no conflicts of interest in this work.

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