

Dry Eye and Ocular Surface Disease

Cataract surgery in patients with ocular surface disease:
An update in clinical diagnosis and treatment

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Abstract

In this article we review essentials of diagnosis and management of ocular surface disease in patients who undergo cataract surgery. It is clearly shown that dry eye disease worsens following the cataract surgery in patients with prior history of ocular surface disease, Also new cases of dry eye might appear. Current strategies for the timely diagnosis and proper management of dry eye syndrome in the face of cataract surgery patients are mainly emphasized. To achieve the best outcome in cataract surgery, a healthy ocular surface is crucial. While ocular surface preparation is indispensable in patients with established ocular surface disease, it is also helpful in those with minimal signs or symptoms of surface disease. The current approach begins with early diagnosis and drastic management of ocular surface disease before cataract surgery using a stepwise regimen customized to each patient and disease severity. These measures are continued throughout and after the surgery.

Keywords: Cataract surgery, Ocular surface disease, Dry eye, Blepharitis

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<http://dx.doi.org/10.1016/j.sjopt.2014.06.013>

Introduction

Several risk factors have been proposed for dry eye syndrome; among them older age, female gender, diabetes and high blood pressure are known for quite some time. In general ocular surface disease is more common in the elderly^{1,2} and since age-related cataract comprises most of cataract surgeries, the identification and management of ocular surface disease is therefore imperative in majority of patients undergoing cataract surgery. According to long-term population-based studies the incidence rates of dry eye among individuals between ages 43 and 86 years at 5 and 10 years of follow-up are 13.3% and 21.6% respectively.^{3,4}

It has also been shown that both incidence and severity of dry eye symptoms increase even further after cataract surgery.⁵ In particular, the reduction in tear meniscus height and tear break up time⁶ and squamous metaplasia in conjunctival impression cytology⁷ is documented after

phacoemulsification. To assess dry eye and meibomian gland dysfunction after cataract surgery, Han et al.⁸ followed 48 patients after phacoemulsification. The ocular symptoms got worse at 1 month and 3 months postoperatively. Moreover lid margin abnormal examination was significantly increased and TBUT decreased postoperatively. Yet, meibography score, SPK, lower tear meniscus height, depth, and area and ST did not change significantly 1 or 3 months after cataract surgery.

The exacerbation of ocular surface disease after cataract surgery is possibly multifactorial: In one hand transection of the corneal nerves and damage to corneal epithelium from exposure to microscopic light and intense irrigation of the tear film during operation and on the other, elevation of inflammatory factors in the tear film due to ocular surface irritation and use of topical anesthesia during surgery in addition to preservative containing topical eye drops administered after surgery.⁹

Received 9 May 2014; accepted 30 June 2014; available online 4 July 2014.

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Peer review under responsibility
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Furthermore patients with somewhat more severe ocular surface disease are also at higher risk of post-operative complications such as infections and corneal melts. Consequently, an assertive approach in the management of the ocular surface disease is imperative in many cataract surgery patients. This article reviews the latest approaches for the diagnosis and management of ocular surface disease in the setting of cataract surgery.

Identification of patients with ocular surface disease

Detection of ocular surface disease prior to cataract surgery provides an opportunity to improve the surface health before proceeding with surgery. History constitutes a crucial element in the diagnosis of patients with dry eyes or "dysfunctional tear syndrome".¹⁰ Besides grittiness or discomfort, blurry vision that is worsened by visual activity, may sometimes be ignored as a symptom of dry eye and could be falsely attributed to the cataract symptoms.¹¹ Fluctuating vision either before or after cataract surgery is a sign of tear film insufficiency in most patients. Similarly, history of systemic collagen vascular diseases, arthritis or dry mouth provides important clues for the associated ocular surface diseases. Clinical examination may be helpful in finding further clues. Debris in the tear film, a low tear meniscus height, lid margin abnormalities, reduced meibomian gland expression and conjunctival inflammation are examples of such findings.

The most commonly performed tests include Schirmer's test (ST), tear film break-up time (TBUT), and ocular surface staining. Interestingly, despite their central role in detection and grading the severity of surface disease, clinical findings and diagnostic tests are only weakly associated with patient symptoms in ocular surface disease.¹² It is suggested to perform ST without anesthesia with the eyes closed for 2 or 5 min.¹³ ST is a practical test to detect patients with moderate to severe aqueous tear deficiency. An abnormal TBUT is similarly suggestive of an inadequate tear film and is a valuable diagnostic test when looking for ocular surface disease pre-operatively.

Ocular surface staining with fluorescein is a widely used diagnostic modality to assess the severity of the dry eyes. Rose Bengal staining can detect mucous deficiency and is more sensitive than fluorescein in detecting early signs of tear film insufficiency. To identify patients with high risk of developing dry eye signs and symptoms after phacoemulsification. Patients are examined after one hour from instillation of dilating and anesthetic drops. Any punctate keratopathy warns problems in maintaining a healthy epithelial surface after surgery.¹⁴ Neurotrophic corneal disease is relatively common especially in diabetic patients and is a frequent cause of chronic surface disease. While a neurotrophic patient's complaints of the typical dry eye symptoms are minimal, they are specifically at higher risk for ocular surface complications following cataract surgery. Corneal sensation can be tested using a cotton wisp to identify patients with neurotrophic keratopathy.¹⁵ Jiang et al. have used a new method called Noninvasive Keratograph assessment of tear film break-up time which demonstrates a color-coded tear break-up map, that might enable surgeons to more efficiently assess TBUT preoperatively; however, there is no data showing the efficacy of using such technology in the reduction of dry eye after cataract surgery.¹⁶

Optimizing ocular surface prior to the surgery

A cataract surgery candidate who has poorly controlled ocular surface disease, surgery could typically wait until the surface can be optimized. Delphi approach to treatment recommendations for DED was published in 2006.¹⁷

The management of dry eye commonly begins with artificial tears. Artificial tear is shown to alleviate the symptoms, improve vision as well as dry eye signs (TBUT) in the majority of cataract surgery patients.¹⁸

Topical steroids and immunoregulatory agents are the main choices in moderate to severe dry eye currently in use. Numerous studies have shown the efficacy of topical corticosteroids in treatment of dry eyes.¹⁹ The most beneficial effect of steroids is the rapid onset of action and making them very handy in circumstances that immediate response is intended. In a randomized, double-masked, placebo-controlled study in keratoconjunctivitis sicca patients, loteprednol etabonate ophthalmic suspension 0.5%-treated group had significantly better outcomes than vehicle-treated group after 2 weeks of therapy.²⁰

Cyclosporine's popularity is due to the lack of steroid induced side effects for a long-term use. Although, in order to reach therapeutic levels several weeks of treatment are necessary and for an unknown reason some patients do not benefit this topical medication even with a long-term use.²¹ The mechanism of action of cyclosporine in tear production increase is not fully understood. The increase in the number of conjunctival goblet cells has been shown²²; in addition, immunomodulatory effects of the medication reduce inflammation in most cases. Many studies²³⁻²⁶ have reported the beneficial effects of topical cyclosporine therapy twice daily for at least 6 months in improvement of signs and symptoms of dry eye disease.

Donnenfeld et al.²⁵ showed that cyclosporine therapy improves visual quality after multifocal intraocular lens implantation signifying its beneficial effect on tear-film quality. Decreasing the dosage of topical 0.05% cyclosporine to once daily for at least a year, may have equal effects in dry eye syndrome.²⁶

Given that the inflammation is increased significantly after cataract surgery, it is crucially important to suppress the inflammation pre-operatively.

In patients with significant aqueous deficiency, punctal occlusion might be considered. This modality of treatment is preferably performed after controlling the ocular surface inflammation. Combination of punctal occlusion and cyclosporine is shown to improve ST scores, rose Bengal staining, and reduction in overall artificial tear use compared to either treatments alone.^{†,27}

Management of lid disease is necessary for the best surgical outcomes. Blepharitis is the most frequent cause of cataract surgery cancellation²⁸ since it seems to be a primary risk factor for endophthalmitis.²⁹

The basic step in pre-operative care in patients with lid margin disease is a prolonged commitment to eyelid hygiene. Topical antibiotics such as topical azithromycin are choice in unresponsive patients.³⁰ In severe blepharitis or in the presence of complications such as phlyctenules or severe

† Roberts CW, Carniglia PE, Brazzo BG, Comparison of topical cyclosporine, punctal occlusion, and a combination for the treatment of dry eye. *Cornea* 2007;26:805-809.

conjunctivitis, topical antibiotic-steroid combinations can be used for short periods of time. Systemic doxycycline or minocycline, are the last resort for refractory cases most of whom have significant meibomian gland disease or ocular rosacea.³¹ Tetracyclines improve the symptoms and TBUT and are typically started at least one month before cataract surgery. Increasing intake of Omega-3 fatty acids³² may also have anti-inflammatory effects and are shown to decrease signs and symptoms of dry eye and may also be beneficial in the management of lid disease.³³

Intra-operative measures to minimize surface damage

The ocular surface is prone to damage from dryness during the surgery as well as preservative containing eye drops. Inordinate instillation and wrong use of preservative containing eye drops are significant factors that lead to the development of dry eye after phacoemulsification and corneal toxicity.⁸

Frequent irrigations with BSS or the use of viscous eye lubricants or viscoelastics can minimize the desiccating stress to the surface.³⁴

The surgical incision may affect the ocular surface after cataract surgery.³⁵ Even small incision cataract wounds may create localized damage to the corneal nerves with subsequent reduced corneal sensation.

As shown in a prospective study, the use of aspirating speculum was found to worsen dry eye-related parameters, such as conjunctival staining, TBUT, conjunctivochalasis grades, and OSDI, during the early postoperative period. Though these parameters returned to baseline at 1 month after the operation.³⁶

In a recently published article about the incidence and pattern of dry eyes post cataract surgery, Kasetsuwan et al. suggested that using light filters, decreasing exposure time, proper irrigation, and soft manipulation of the ocular surface tissue may reduce the complications after surgery.³⁷

Post-operative management to optimize the result of cataract surgery

After cataract surgery the signs and symptoms of ocular surface disease typically worsen.

Dry eye symptoms can develop instantly after phacoemulsification. The severity can peak on day seven but both symptoms and signs may ameliorate over time.³⁷ Prolonged use of eye drops may be an important contributing factor. Consequently, in patients with surface disease it is preferred to stop or taper medications when no longer needed. Topical NSAIDs such as nepafenac, ketorolac and diclofenac have been reported to cause corneal melting mainly in the presence of epithelial breakdown.^{38,39} These complications are more likely to occur in patients with significant ocular surface disease such as Sjogren's syndrome. The concomitant use of topical steroids with NSAIDs may reduce this complication however, it does not completely prevent it. Therefore, in patients with severe ocular surface disease it is wise to minimize or even avoid the use of topical NSAIDs especially as a single agent. In a recent paper, using 0.05% cyclosporine twice daily, Chung et al. showed a significant increase in TBUT and ST-I in patients after cataract surgery while these

indices were shown to be abnormal postoperatively.⁴⁰ Some prefer to pretreat patients using topical steroid for few months prior to starting cyclosporine to decrease discomfort.⁴¹

Another remarkable complication is sterile corneal melts which has been reported in patients with immune mediated ocular surface diseases such as Sjogren's syndrome, graft versus host disease, and Stevens-Johnson syndrome.^{42,43} Optimization of the ocular surface prior to cataract surgery is imperative in these patients. While topical steroids are cautiously used in patients with an unstable surface, systemic immunosuppression may be indicated to overpower inflammation in the setting of systemic disease. Cataract surgery in patients with ocular mucous membrane pemphigoid (MMP) requires controlling the disease for a minimum of one year. Systemic steroids are highly recommended prior to cataract surgery in these patients.

In conclusion, given that cataract surgery is a surface damaging event, it is important to consider ocular surface in patients pre-operatively. It has clearly been shown to worsen ocular surface disease at least temporarily. Ocular surface preparation is beneficial not only in patients with established ocular surface disease, but also in those with minimal signs or symptoms of surface disease. Currently, there is more interest among the cataract surgeons to further improve the outcomes of surgery by aggressively treating the ocular surface before and after operation. This is especially important in patients with moderate to severe ocular surface diseases which are at increased risk for complications, most notably corneal melting, in the post-operative period.

Financial disclosure

None.

Conflicts of interest

The authors declared that there is no conflict of interest.

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