back to contents

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Abstract

Cataract surgery has become one of the commonest and safest procedures to be performed in ophthalmology departments across the UK. Optometrists and other health care professionals have become increasingly involved in post-operative care and it is essential that they are able to recognise and to respond to the rare complications resulting from this surgical procedure. Corneal oedema, raised intraocular pressure, corneal abrasion, wound leak, suture complications, iris prolapse, incarcerated vitreous, severe anterior uveitis and displacement of the intraocular lens may occur as early complications. Cystoid macular oedema, endophthalmitis, retinal detachment, posterior capsule opacification and unsatisfactory refractive error may arise as later complications. This article reviews the nature and appearance of each of these complications.

Keywords

Cataract surgery, co-management, complications

Introduction

As we embark upon the 21st century, cataract surgery has become one of the most frequently performed procedures in ophthalmology departments across the United Kingdom.[1]. Improved surgical techniques have meant that it has also become one of the safest and most successful of ophthalmic procedures.

However, the number of patients requiring cataract extraction has often exceeded the surgical capacity, and the dual factors of an increasing elderly population (10.6% increase in people aged over 60 from 1999 to 2009)[2] and patients presenting for surgery at an earlier stage, mean that this problem is set to get worse.

In recent years, optometry, both within the Hospital Eye Service and in primary care, has become more involved in the co-management of cataract patients, both pre and post-operatively. This extended role has been actively promoted by the recent Government initiative 'Action on Cataracts', which has sought to address the problem of long waiting times. Shorter recovery times and fewer complications mean that optometrists are well placed to provide the post-operative aftercare for uncomplicated cases, improving the convenience to the patient and relieving the burden placed on the ophthalmic outpatient clinic. This article will briefly discuss the options for managing post-operative cataract care, and outline the main clinical complications that may occur.

The patient journey

There has been much debate recently about the ideal patient journey', from their awareness of impaired vision to the completed treatment episode. For day case patients, it is common practice to undertake a first day post-operative review, a one week review and a final check, including refraction, at three to four weeks. However, the best time intervals at which to see patients post-operatively has not been systematically evaluated. Some regard the first day post-op review as unnecessary for uncomplicated cases[1,2], provided that patients have adequate information regarding post-operative symptoms and easy access to the hospital should they experience difficulties. In addition, wider implementation of flexible roles across NHS organisations has meant that much of the post-operative care of uncomplicated cases is being carried out by hospital optometrists, primary care optometrists, nurse practitioners or GPs.[2] These practices are advocated as 'ideal' by the 'Action on Cataracts' initiative, since they enhance the convenience to patients and reduce their visits to hospital. However, when a wider range of staff are involved, it is essential that clinical protocols are established and adhered to.

The remainder of this article deals with post-operative cataract complications divided according to whether they primarily occur within the first 48 hours after surgery or beyond.

Complications within 48 hours of surgery

The National Cataract Survey 1997/8 found that around 23% of all patients are likely to experience a surgically related complication within 48 hours of surgery, ranging from minor to potentially sight-threatening events.[3]

Corneal oedema

Probably the commonest early complication is corneal oedema, often accompanied by folds in Decemet's membrane. The oedema can vary in severity from mild to severe, with a corresponding effect on the visual acuity (Figure 1). Prolonged phacoemulsification or trauma to the corneal endothelium by instruments, lens fragments, forcible flow of irrigation fluids or IOL insertion may be the cause of the oedema.[4,5]

Patients report hazy or misty vision, "like looking through ground glass", but generally experience no or only mild discomfort. They may feel disappointment or concern about their level of acuity. However, in the majority of cases, even marked corneal oedema resolves within the first week, and the patient can be reassured.

The presence of pre-existing corneal abnormalities (e.g. Fuch's endothelial dystrophy) may result in oedema which is severe and persisting[4] (Figure 2). Treatment in these cases may include intensified anti-inflammatory therapy, and it is only in exceptional cases (less than 1%[5,6]) that the endothelial decompensation is such that the oedema does not eventually resolve. Severe cases, however, may require penetrating keratoplasty. Patients with a preoperative abnormal endothelial pattern should be warned of this risk prior to surgery.

Raised intraocular pressure

The intraocular pressure (IOP) can be expected to rise sharply immediately following cataract surgery. At the first day post-operative examination, IOP should already be reducing to normal levels, and any reading under 30 mmHg is acceptable. Viscoelastic substances retained in the anterior chamber at the time of surgery or pre-existing glaucoma are common causes of high IOP. Intervention is required in approximately 8% of patients.[1,3] The incidence of troublesome raised IOP post-operatively may be minimised by a prophylactic course of acetazolamide for patients with co-existing glaucoma, as these cases have a greater risk of damage to an already compromised optic nerve head. Any pre-existing glaucoma therapy should be resumed as soon as the eye shield is removed.

A suggested regime for the treatment of post-operative raised IOP is outlined in Table 1. The use of a Patient Group Direction[7] within an NHS Trust enables acetazolamide to be administered or supplied by named professional staff other than medics, where the post-operative care has been delegated to them. However, where the IOP does not respond to acetazolamide, the surgeon may perform paracentesis, a technique by which a small amount of aqueous humour is released through the cornea by a needle.

IOP	Treatment	Follow-up
< 30 mmHg	none	See in 1 week
30 - 35 mmHg	PoM acetazolamide 500mg stat	See in 1 week
>35mmHg	PoM acetazolamide 500mg stat plus PoM acetazolamide 250mg qds for 48 hours	Recheck IOP 1 hour after the stat dose: IOP reducing? Yes - see in 1 week No - refer to surgeon for paracentesis

Table 1. Suggested regime for the treatment of raised IOP at day one post-operatively

Corneal abrasion

Patients presenting at one day post-operatively with a painful, watery eye may have a corneal abrasion from intra-operative trauma. The incidence is rare but is easily detectable from well-defined corneal staining. This condition generally resolves within a few days, but ocular comfort will be enhanced in the short-term by insertion of a bandage contact lens.

Wound leak and suture complications

Leakage from the wound will occur following inadequate closure of the incision, and is not uncommonly seen in large incision surgery. However, this complication has become rare with the advent of self-sealing small incision surgery.

Detection of wound leak is by performing the Seidel test. After instillation of fluorescein and examination of the wound under blue light, escaping aqueous will be seen diluting the fluorescein at the site of leakage.

Very small leaks may seal spontaneously, although the precaution of inserting a bandage contact lens for a week may be taken. This approach becomes more necessary for marked leakage, where there is a risk of hypotony, serious post-operative infection or abnormal wound healing. Marked leakage may also need re-suturing.

The sutures themselves will cause discomfort to the patient if the knots are not buried or if they are too tight. However, little can be done at this stage until the wound has healed after which the sutures may then be removed. Extreme cases of poor suturing may require re-suturing. Inadequately buried sutures and suture removal increase the risk of post-operative endophthalmitis.[8]

Iris prolapse or incarceration of vitreous in the wound

eliminate incarceration of vitreous in the wound. In either event, excision of the trapped tissue is essential to minimise the risk of chronic anterior uveitis, defective wound healing, cystoid macular oedema and endophthalmitis.

Anterior chamber abnormalities

First day post-operative examination must ensure that the anterior chamber is properly re-formed. A collapsed anterior chamber requires immediate referral back to the surgeon for remedial surgery.

Uveitis and adverse reactions to corticosteroids

Cells in the anterior chamber are expected post surgically, and topical corticosteroids will have been given as a matter of course. 5.6% of patients may have more advanced uveitis[1,3]. This inflammation may be exacerbated by retained lens material, which occurs in 1.1% of cases.[1,3] If necessary, the corticosteroid starting dosage of four times daily can be increased to six with more gradual reductions under close supervision.

Some patients will respond to the corticosteroid therapy with a raise in IOP. If this increase is evident after one week, the steroids should be tailed-off more rapidly, providing that the cellular activity in the anterior chamber has reduced to acceptable levels. The patient will need to be reviewed to ensure normalisation of IOP and no recurrence of inflammation.

A typical allergic response to the anti-inflammatory drops may be seen in some patients, including peri-orbital swelling and redness, chemosis, hyperaemia and watering. Often the reaction is to Neomycin, where this is combined with a steroid, and the problem can be overcome by exchanging the drops for ones that only contain the steroid. Alternatively, steroids in the form of minims may be prescribed when a reaction to a preservative is suspected.

Displaced intraocular lens (IOL)

Within the first 24 hours of surgery, dilation or partial dilation of the pupil is likely to persist following the mydriasis of the day before. This facilitates examination of IOL position (Figure 3). If the IOL is malpositioned and not sufficiently centred on the pupil, disturbing aberrations or edge glare may result (Figure 4). Remedial surgery will correct this if it cannot be tolerated. Trauma, eye rubbing or capsular contraction may be causes of subsequent IOL displacement.[4]

Total dislocation of the IOL into the vitreous may follow intraoperative complications such as a capsular split. (It may also occur later as a rare complication of Nd:YAG laser capsulotomy.) The presence of the IOL in the vitreous cavity increases the risk of cystoid macular oedema (CMO), but this risk must be weighed against the risk of retinal detachment if the IOL is removed. If the eye settles despite the presence of the IOL in the vitreous, it may be left. A secondary AC-IOL can then be considered (Figure 5).

Longer term complications of cataract surgery

Cystoid macular oedema

Cystoid macular oedema is an accumulation of fluid in the outer plexiform and inner nuclear layers of the retina, centred on the fovea. The incidence of CMO following phacoemulsification cataract extraction is unknown, but 15 to 30% of extra-capsular extractions show angiographic evidence of CMO. Of these, less than 2% suffer visual deficit.[4,5,9,10,11] CMO should be suspected in post-operative cataract patients with reduced visual acuity and no other obvious cause. Without the aid of fluorescein angiography, detection of mild CMO is made by the experienced observer using biomicroscopy. Loss of the foveal depression, thickening of the retina and multiple fluid-filled microcysts at the fovea may be seen. Many patients spontaneously improve (75% within 6 months[4,9]), but if the CMO persists beyond 12 months, the microcysts will have coalesced into large cystic spaces with subsequent formation of a lamellar macular hole, causing permanent damage to central vision.[5,11,12]

The exact cause of CMO is a topic of debate. Vitreous traction, breakdown of the blood-aqueous and blood-retinal barriers, and intraocular inflammation are all possibilities.[4,5,13] Patients with diabetes mellitus are more at risk. Medical treatment may include corticosteroids administered topically, orally or by periocular posterior sub-Tenon's injection, topical and oral nonsteroidal agents, hyperbaric oxygen and oral acetazolamide.[5,14]

Endophthalmitis

Infectious post-operative endophthalmitis is a devastating complication that is most feared by ophthalmic surgeons. It may occur at any stage from within two days to a few months of surgery. It occurs in 0.03 to 0.13% of extracapsular extraction or phacoemulsification and IOL implantation cases, and 0.4% of secondary lens implantation cases,[5,6,8] although the risk has decreased with improvements in surgical technique and wound closure. The infection is caused by various organisms, the most common being *Staphylococcus epidermidis*.[5] These may arise from the patient's own ocular surface and adnexa in blepharitis, conjunctivitis, canaliculitis or dacryocystitis, contaminated solutions or instruments, or the environment or personnel within the operating theatre. Prolonged surgery (more than 60 minutes), vitreous loss and diabetes mellitus are risk factors.

Early recognition and treatment are the key to a successful outcome, although about 50% of cases will result in a blind eye. Clinical signs and symptoms may include pain, marked visual loss, hypopyon, corneal oedema, corneal infiltrate, vitreous inflammation, retinitis, chemosis, conjunctival injection and lid oedema (Figure 6). Other conditions can mimic infectious endophthalmitis, such as severe anterior uveitis, often associated with retained lens material, and toxic reactions to irrigating fluids or the IOL. For a positive diagnosis of endophthalmitis, culture samples from both the aqueous and vitreous are needed, although organisms grow better from vitreous specimens because the anterior chamber more effectively clears the bacteria.

Treatment includes intravitreal antibiotics, with possible further administration of antibiotics by periocular injection, topical and/or systemic therapy. Steroid therapy may be used concurrently. Vitrectomy may be performed, producing better penetration of the antibiotics, although this increases the risk of retinal detachment.[5,15]

Retinal detachment

Approximately 0.1 to 0.2% of patients will experience a retinal detachment within the first three months of uncomplicated cataract surgery.[1,3] Up to 2% may go on to have a detachment in the future.[5] The risk increases following posterior capsulotomy. Other risk factors are retained lens material, vitreous loss, severe myopia, lattice degeneration and trauma.[5,16] As with any retinal detachment, proper management and early detection will result in better visual prognosis.[5]

Posterior capsule opacification

Remnant or regenerated lens epithelial cells or fibres migrate centrally to opacify the posterior capsule, resulting in reduced visual acuity (Figure 7). This opacification is reported to occur in 5 to 50% of adult patients, and nearly 100% of paediatric patients.[5,17,18] The average time that posterior capsular opacification occurs is 26 months post-operatively, with the time ranging from three months to four years.[5] Acrylic IOLs are thought to reduce the incidence as compared to PMMA IOLs (see companion article in this issue on IOL design), as are other factors such as atraumatic surgical technique, thorough removal of cortical lens material and incorporation of capsular bag fixation.[5]

Treatment of visually significant posterior capsular opacification is by Nd:YAG capsulotomy (Figure 8). This procedure may cause pitting of the IOL. Other complications are rare, but include an enhanced risk of retinal detachment, transient rise in IOP, CMO, IOL dislocation in plate haptic lenses, and vitreous prolapse into the anterior chamber.

Unsatisfactory refractive error

In a recent USA review of medico-legal claims following cataract surgery, the single largest group of claims involved insertion of the wrong powered IOL.[19] The commonest factors leading to these claims were incorrectly labelled IOLs, the wrong IOL being handed to the surgeon in theatre or errors in biometry. The result is an unsatisfactory refractive outcome, which may be a source of great disappointment to the patient, even in the presence of good visual acuity. Extreme post-operative refractive surprises have been reduced through enhanced theatre checking procedures, and improved biometry techniques with modern IOL calculation formulae. It is rare that the patient will return to the surgeon for exchange of the IOL, but where this is necessary, the surgery should be completed as close to the primary surgery as possible, to minimise complications.

Conclusion

Serious complications from cataract surgery are rare with modern surgical techniques. There is an increasing role opportunities for non-medics to become involved in routine post-operative cataract care. However, along with this opportunity comes responsibility, and this article has sought to update and inform the reader of the main complications, both minor and major, that may occur, and the appropriate actions to be taken should they do so.

back to top

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