

# Cataract surgery after intravitreal injection of triamcinolone acetonide

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## Abstract

**Purpose** To report the clinical outcome of patients undergoing cataract surgery after one or repeated intravitreal injections of triamcinolone acetonide as treatment of intraocular neovascular or oedematous diseases.

**Methods** The interventional clinical case series study included all patients ( $n = 22$ ) who presented with cataract which had progressed after a single or repeated intravitreal injection of 25 mg of triamcinolone acetonide as treatment of exudative age-related macular degeneration ( $n = 18$ ) or diffuse diabetic macular oedema ( $n = 4$ ). Duration of the follow-up period was  $3.76 \pm 4.99$  months. With topical anaesthesia, the patients underwent standard cataract surgery including clear cornea incision, phakoemulsification and aspiration of the lens nucleus and cortex, and implantation of a foldable posterior chamber lens. The main outcome measures were frequencies of capsular rupture, vitreous loss, postoperative infectious endophthalmitis, secondary cataract, and decentration of the intraocular lens, visual acuity and intraocular pressure.

**Results** Intraoperative dialysis of the lens zonules occurred in one (4.5%) eye and resulted in a loss of vitreous. Secondary cataract leading to Nd:YAG laser capsulotomy was observed in one (4.5%) eye. An optically significant decentration of the IOL or infectious endophthalmitis was not encountered in any patient. Visual acuity increased from  $0.11 \pm 0.10$  to  $0.13 \pm 0.94$  during the follow-up. Within 1 week after surgery, intraocular pressure was in the normal range in all the eyes.

**Conclusions** Cataract surgery after single or repeated intravitreal injection of 25 mg of triamcinolone acetonide does not harbour a

markedly elevated frequency or a markedly changed profile of surgical complications.

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**Keywords:** age-related macular degeneration; cataract; diabetic macular oedema; intraocular pressure; triamcinolone acetonide

## Introduction

Intraocular neovascular, proliferative or oedematous diseases represent an important factor in threatening vision and, sometimes, leading to severe consequences for the eye. Recently, intravitreal injections of triamcinolone acetonide have increasingly been used as a treatment for these diseases such as exudative age-related macular degeneration,<sup>1–8</sup> diffuse diabetic macular oedema,<sup>6–11</sup> central retinal vein occlusion,<sup>12,13</sup> persistent pseudophakic cystoid macular oedema, proliferative diabetic retinopathy,<sup>14</sup> proliferative vitreoretinopathy,<sup>15</sup> iris neovascularisation,<sup>16</sup> chronic preperipheral ocular hypotony,<sup>17</sup> chronic uveitis,<sup>18–21</sup> and neovascular glaucoma.<sup>22</sup> Complications and side-effects of the intravitreal injection of triamcinolone acetonide include secondary ocular hypertension developing in about 50% of the eyes injected and leading to high intraocular pressure up to 60 mmHg with the need for antiglaucomatous filtering surgery in about 1% of the eyes;<sup>23</sup> infectious endophthalmitis in less than 1% of the eyes, if the injection was performed under sterile criteria in the operation room; and, because of the cataractogenic effect of steroids, a cataract that has eventually to undergo surgery.<sup>8</sup> Since the megadosage of steroids injected into the eye may change the internal structures of the eye, and as a result may increase or change the spectrum of surgical complications, the purpose of the present study

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was to evaluate the frequency and profile of complications of standard cataract surgery following an intravitreal injection of triamcinolone acetonide.

### Patients and methods

The prospective clinical interventional cases series studies included all the eyes ( $n = 22$ ; 10 right eyes; 22 patients; 14 women) that underwent a standard surgery for progressive cataract occurring after a single or repeated intravitreal injection of 25 mg of triamcinolone acetonide. The intravitreal injection had been performed as treatment of exudative age-related macular degeneration ( $n = 22$ )<sup>7,8</sup> or diffuse diabetic macular oedema ( $n = 4$ ).<sup>9,11</sup> The injection had been carried out 10.5 ± 4.2 months (median, 9.1 months; range, 5.4–22.4 months) prior to cataract surgery. At the time of the intravitreal injection of triamcinolone acetonide, the lens was usually not quite clear, however, there was no reason to combine the intravitreal injection of triamcinolone with cataract surgery. In total, 20 (90.9%) eyes had received a single injection of triamcinolone acetonide, and two (9.1%) eyes two injections after 7 or 9 months after the first injection. All patients had been fully informed about the experimental character of the intravitreal injection of triamcinolone acetonide, and had signed an informed consent. The Ethics Committee of the University had approved the study following the tenets of the Declaration of Helsinki. The mean age of the patients was 74.3 ± 5.7 years (median, 75.4 years; range, 62.8–83.8 years). Refractive error ranged between -4.75 and +5.9 dioptres (mean ± SD: +0.87 ± 2.53 dioptres; median, +0.88 dioptres). The mean intraocular pressure was 16.6 ± 4.2 mmHg (median, 16 mmHg), and mean preoperative visual acuity 0.11 ± 0.10 (median, 0.08; range, 0.01–0.40). In all eyes included in the study, the opacity of the lens was reduced as not to permit ophthalmoscopic visibility of the fundus. The degree of cataract was not systematically graded.

Under topical anaesthesia, the cataract surgery was performed in a standardised manner including two 1-mm wide paralimbal paracenteses at the 9 o'clock and 3 o'clock position, a limbal clear cornea incision at the 12 o'clock position, an injection of a viscoelastic substance into the anterior chamber, capsulorrhexis, hydrodelineation, hydrodissection, and phakoemulsification of the lens nucleus and aspiration of the lens cortex, refilling of the anterior chamber and the lens capsular bag with the viscoelastic substance, widening of the limbal incision to about 3.5 mm, implantation of a foldable intraocular lens (three-piece Acrysof<sup>®</sup>, Alcon Laboratories, Forth Worth, Texas; diameter of the optical part: 6.5 mm) into the lens capsular bag, aspiration of the viscoelastic substance out

of the anterior chamber, and injection of Ringer's solution through a paracentesis into the anterior chamber to normalise the intraocular pressure. All interventions were performed by a single surgeon (JB) experienced in cataract surgery. Postoperative treatment consisted of gentamycin eye drops administered three times a day for 1 week after surgery, a mydriatic ointment for the first postoperative night, and prednisolone acetate eye drops five times a day for 1 week postoperatively.

Postoperatively, all patients were re-examined during the first week after surgery, and roughly in monthly intervals after that. The postoperative examination included determining visual acuity, tonometry, slit-lamp biomicroscopy including assessment of the degree of intraocular inflammation, and fundus examination. The mean duration of the follow-up period ranged 3.76 ± 4.99 months (median, 1.22 months; range, 3 days to 15.10 months).

### Results

Visual acuity increased from 0.11 ± 0.10 (median, 0.08; range, 0.01–0.40) to 0.13 ± 0.94 (range, 0.04–0.40). The increase in visual acuity was marginally significant ( $P = 0.08$ ; Wilcoxon test). Comparing the visual acuity determined at the end of the follow-up with the preoperative visual acuity measurements, an increase in visual acuity was found in 11 eyes (50%), and a decrease of visual acuity defined as a loss of at least one line was observed in three eyes (13.6%). Reasons for postoperatively decreased visual acuity were the underlying diseases which primarily had led to the intravitreal injection of triamcinolone acetonide.

Intraoperatively, a dialysis of the lens zonules was seen in one (4.5%) eye resulting in a prolapse of vitreous into the anterior chamber. This eye did not differ in any specific systemic or ocular factor from the other eyes included in the study. There was no major risk factor predisposing the eye to intraoperative lens capsule rupture. Other intraocular complications did not develop. Duration of surgery ranged between 7–15 min.

At the first postoperative day, intraocular pressure was higher than 21 mmHg in eight (36.4%) eyes. Highest recorded intraocular pressure at the first postoperative day was 40 mmHg, probably due to remnants of the viscoelastic substance in the anterior chamber. In all the eyes with postoperatively increased intraocular pressure, intraocular pressure was controlled by topical antiglaucomatous medication within 1 week after surgery, and subsequently remained in the normal range without any further medication. During the entire follow-up, postoperative complications such as infectious endophthalmitis, rhegmatogenous retinal detachment, wound leakage, an unusually high corneal

astigmatism (>1.5 dioptres), or other unusual corneal wound-healing problems were not observed in any of the patients included in the study. None of the patients reported a marked postoperative pain nor had asked for an analgetic therapy for more than the first postoperative night. In none of the patients was, a persisting corneal endothelial decompensation with subsequent pseudophakic bullous keratopathy observed. Postoperative intraocular inflammation, as assessed by slit-lamp biomicroscopy, was less than Tyndall ++ in all the eyes. A decentration of the intraocular lens, requiring an additional surgery to relocate the intraocular lens, did not occur during the follow-up. A YAG-laser capsulotomy due to secondary cataract was performed in one eye (4.5%). This eye did not differ in any specific systemic or ocular factor from the other eyes included in the study. The type of opacification was a mixture of a posterior capsular plaque, which was present at the end of cataract surgery, and a fibrous posterior capsule opacification acquired postoperatively. In the remaining 21 (95.6%) eyes, the posterior lens capsule remained transparent during the follow-up.

During an additional follow-up period of 4 months after inclusion of the last patient into the study, none of the patients presented with late postoperative complications such as rhegmatogenous retinal detachment, low-grade infectious endophthalmitis, dislocation of the intraocular lens, or increase in intraocular pressure.

## Conclusions

The development and progression of cataract is a typical side-effect of a therapy including corticosteroids. As treatment for ocular diseases, the corticosteroids have been applied topically as drops, locally as subconjunctival or subtenon injections, and systemically as oral medication or intravenous injection or infusion. Based on experimental studies as well as on clinical observations of patients who accidentally received an intraocular injection of corticosteroids, Machemer and co-workers<sup>24-26</sup> introduced the possibility of intravitreal injections of corticosteroids as a new pharmacodynamic route for drug delivery. Since soluble cortisone is washed out of the eye within 1-2 days after a single intravitreal injection,<sup>27</sup> Machemer suggested to use the crystalline form of cortisone which, depending on the amount injected, provides an intraocularly available cortisone for a considerably longer period of time than after a single injection of soluble cortisone.<sup>28,29</sup> Consequently, recent studies suggested that a single intraocular injection of triamcinolone acetonide as a crystalline form of corticosteroids may be feasible as an adjunctive treatment for long-standing macular oedema of various

aetiologies, proliferative diabetic retinopathy, uveitis, and exudative age-related macular degeneration.<sup>1-22</sup> Similar to topical or systemic application of corticosteroids, the most frequent side effects of an intravitreal injection of crystalline corticosteroids are secondary ocular hypertension and the development of cataract which eventually has to be operated on.

The results of the present study suggest that cataract surgery after single or repeated intravitreal injections of 25 mg of triamcinolone acetonide does not show a markedly elevated frequency or a markedly changed profile of surgical complications. It holds true for intraoperative complications such as lens capsular rupture and dialysis of lens zonules, as well as for postoperative complications such as postoperative infectious endophthalmitis, decentration of the intraocular lens, rhegmatogenous retinal detachment, and corneal wound healing problems like a prolonged leakage from the clear cornea incision site, a partial wound dehiscence, or increased corneal astigmatism. The results of the present study are in agreement with previous safety and toxicity investigations, which did not detect a negative effect of intravitreal corticosteroids on intraocular structures.<sup>30-32</sup> Consequently, the results of the present study may suggest that a single, or repeated, intravitreal injection of 25 mg of triamcinolone acetonide is not associated with a profoundly increased risk of intraoperative and postoperative complications of cataract surgery performed some months after the injection.

In conclusion, the development or progression of cataract as side effect after an intravitreal injection of triamcinolone acetonide applied in eyes with oedematous, proliferative or neovascular diseases may not be a major contraindication against an intravitreal application of triamcinolone acetonide. Cataract developing months to years after the injection can be treated by surgery, the complications of which may be comparable with the complications occurring after cataract surgery performed in eyes without a preceding intraocular injection of 25 mg of triamcinolone acetonide.

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