Archives of
Ophtalmological Research

Original Article

DOI: 10.51271/AOR-0016

Dexamethasone implantation causing iatrogenic lens injury: a review of literature with case series

Ali Dal[1], Murat Erdağ[2], Mehmet Canleblebici[3], Mehmet Balbaba[2], Hakan Yıldırım[2]

[1]Department of Ophthalmology, Faculty of Medicine, Mustafa Kemal University, Hatay, Turkiye
[2]Department of Ophthalmology, Faculty of Medicine, Fırat University, Elazığ, Turkiye
[3]Department of Ophthalmology, Kayseri State Hospital, Kayseri, Turkiye

Received: 25/08/2024 ◆ Accepted: 06/09/2024 ◆ Published: 23/10/2024

Cite this article: Dal A, Erdağ M, Canleblebici M, Balbaba M, Yıldırım H. Dexamethasone implantation causing iatrogenic lens injury: a review of literature with case series. *Arch Ophthalmol Res*. 2024;1(4):56-59.

Corresponding Author: Murat Erdağ, mderdag@gmail.com

ABSTRACT

Aims: In this study, three cases of iatrogenic lens injuries during Dexamethasone (DXM) implantation will be discussed, and current approaches will be reviewed with the literature.

Methods: Three patients with iatrogenic lens injury during DXM implantation were evaluated retrospectively.

Results: The two patients underwent DXM implantation for cystoid macular edema with central retinal vein occlusion and one patient for EALES disease. The surgical intervention was performed in all three patients in conjunction with cataract surgery. Intraocular lenses are implanted into the sulcus in all patients. The DXM could be directed to the vitreous in two patients, while the other patient underwent anterior vitrectomy and DXM explanation. Anti-vascular endothelial growth factor was injected in the patient who could not implant DXM. The lens was stable in all patients in postoperative controls. There was a decrease in macular thickness at follow-up.

Conclusion: The dexamethasone implant is a slow-release tablet for macular edema due to retinal vein occlusion, diabetic retinopathy and non-infectious uveitis. Lens injury during dexamethasone implantation is a rare complication. In our series, the implant occluded the visual axis and most of it was in the lens, managed with cataract surgery. If possible, DXM should be directed to the vitreous; if not, treatment modalities should be specificized on a patient-by-patient basis.

Keywords: Dexametasone implantation, Iatrogenic lens injury, iatrogenic cataract

INTRODUCTION

Dexamethasone implant (DXM) (Ozurdex® Allergan Inc, Irvine, CA, USA) is a rod-shaped, slow-release tablet containing 700µg of DXM. It is administered with a 22 gauge needle for macular edema due to retinal vein occlusion, diabetic retinopathy and non-infectious uveitis.[1,2] To avoid systemic side effects of corticosteroids, such drugs can be administered intravitreally. However, the short half-life of intravitreally administered corticosteroids requires frequent intraocular injections. To overcome this problem, intravitreal sustained-release dosage forms have been developed.

In the ZERO study of DXM implant, complications such as glaucoma and cataract endophthalmitis were reported, but crystalline lens injury was not reported.[3] There are rare case reports of crystalline lens injuries during implant injection.[4-6] This may be due to inexperience of the surgeon, surgical technique or the patient during the procedure.[7] Complications arising from the implant itself, such as fracture or displacement of the DXM implant into the anterior chamber, can also occur.[4,8]

When intralenticular DXM complications develop, some studies recommend follow-up, while others recommend immediate cataract surgery.[5,9] An alternative approach is a conservative approach in which phacoemulsification is not performed immediately unless there is a change in macular edema and worsening of visual acuity.[10] In this case series, we aimed to evaluate the approach to the patient with lens injury during DXM implantation and to discuss the complication management with patient-specific approaches in the light of the literature.

METHODS

The preoperative and postoperative findings of three patients who developed crystalline lens damage after intravitreal DXM implantation and underwent surgical treatment were retrospectively analyzed. In addition, intraoperative approaches were evaluated. Approaches in the surgical stages were discussed in detail with alternative orientations. A case series study, we do not have ethical commitee report. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

RESULTS

Case 1

A 62-year-old man was admitted to our clinic with blurred vision. One month ago, DXM implantation was performed in his left eye due to macular edema secondary to retinal vein occlusion. He had no systemic disease except hypertension which was controlled with medication. On ophthalmologic examination, best corrected visual acuity (BCVA) was 0.9 and 0.1 in the right and left eyes, respectively, according to the Snellen chart. Intraocular pressure was 14 mmHg in the right eye and 16 mmHg in the left eye. Anterior segment examination revealed grade 1 nuclear sclerosis in the right eye and dexamethasone implant in the left eye, which pierced the posterior capsule at the 2 o'clock level, extended to the anterior capsule and formed a sheen in the posterior capsule (Figure 1). Fundus examination revealed diffuse retinal hemorrhage in 4 quadrants of the left eye and cellophane maculopathy onset in the right and left fundus. Central macular thickness (CMT) was 289 micrometers (μm) in the right eye and 453 μm in the left eye.

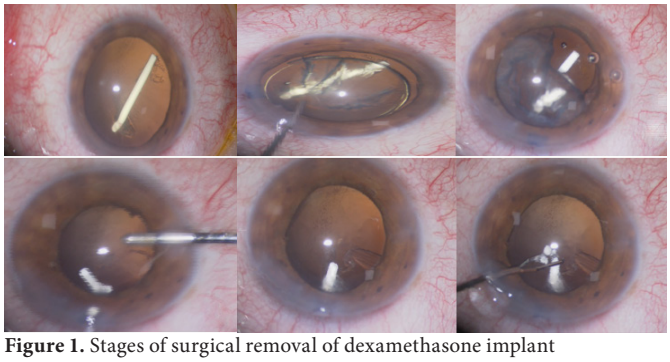

Figure 1. Stages of surgical removal of dexamethasone implant

Surgery was decided because of the implant occlusion of the optic axis and lens opacification. Hydrodelineation was performed in a controlled manner during surgery. The parameters of the phacoemulsification device were set as bottle height 60 cm water, phaco power 20%, aspiration power 250 mmHg. After the phacoemulsification procedure was completed, the implant fragments were cleaned with the help of irrigation/aspiration and the remaining residual fragments carefully maneuvered through the opening in the posterior capsule into the vitreous with the help of microforceps. It was observed that vitreous was not in the anterior chamber and the anterior hyaloid was intact. A 3-piece intraocular lens (IOL) was implanted in the sulcus and optical capture was performed. Postoperative follow-up showed that the IOL was stable and centralized. At the 1st month follow-up visit, the left eye BCVA was 0.5 and no change in CMT was observed with 13 mmHg IOP.

Case 2

The DXM implantation was recommended in a 47-year-old male patient with EALES disease for his right eye because macular edema persisted despite previous anti-vascular endthothelial growth factor (VEGF) treatment. After implantation, the lens was penetreted with DXM. The BCVAs were measured as 0.3 and 0.9 in the right and left eyes, respectively, according to the Snellen easel. Intraocular pressures were 14 mmHg in the right eye and 12 mmHg in the left eye. In the anterior segment examination, the anterior capsule extended to the anterior capsule by piercing the posterior capsule at 2-3 o'clock in the right eye and occluded the axis. The anterior segment examination of the left eye was normal. The fundus examination revealed diffuse retinal hemorrhage and panretinal photocoagulation scars in 4 quadrants in the right fundus, while the left eye was normal. Central macular thickness (CMT) was 630 μm in the right eye and 270 μm in the left eye.

In this case, hydrodelineation was performed in a controlled manner during surgery with gloden ring sign and similar phaco parameters were used as in the previous case. Afterwards, residual implant fragments were removed with a 23-gauge ocutome and anterior vitrectomy was performed with low cutting speed and some fragments of DXM were carefully maneuvered into the vitreous during the procedure. A 3-piece IOL was implanted to the sulcus (Figure 2). Perioperative anti-VEGF injection was performed due to macular edema. Postoperative visual acuity of the right eye was 0.5 and CMT was 453 μm at the 1st postoperative month with 13 mmHg IOP.

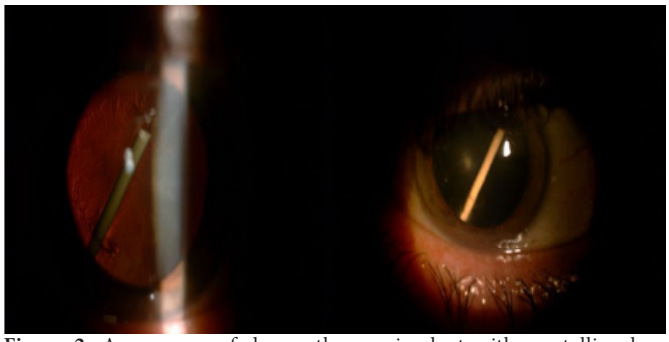

Figure 2. Appearance of dexamethasone implant with crystalline lens insertion on slit lamp

Case 3

A 61-year-old man was recommended DXM implantation for macular edema due to central retinal vein occlusion. During implantation in the left eye, it was observed that the implant penetrated the lens at 2-9 o'clock. (Figure 3) BCVA was 0.8 in the right eye and 0.1 in the left eye. The patient had bilateral nuclear sclerosis. Fundus examination of the left eye was unremarkable while diffuse retinal hemorrhages were observed in 4 quadrants in the left eye. Preoperative macular thickness in the left eye was 443 μm.

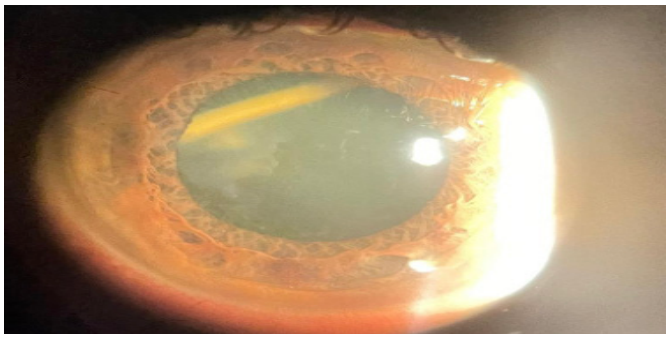

Figure 3. Dexamethasone implant lodged in the superonasal part of the lens

Cataract surgery was performed with the settings mentioned above. In this patient, the anterior hyaloid was intact and the lens was directed to the vitreous because the hole in the posterior capsule did not enlarge during the case. The IOL was implanted to the sulcus. At the 1st month post operative control, BCVA was 0.2 and the lens was stable and centralized and IOP was 14 mmHg. The control macular thickness was decreased to 317 μm

DISCUSSION

To avoid the systemic side effects of corticosteroids, such drugs can be administered intravitreally but require frequent injections due to the short half-life of corticosteroids. To overcome this, intravitreal sustained-release dosage forms have been developed.[11] Since the DXM implant is administered with a large 22 gauge syringe compared to the 28 or 30 gauge needles used for anti-VEGF therapy, there is relatively high compression of the eyeball during the procedure, which can lead to complications.[7]

In previous studies, the incidence of crystalline lens injury during implant injection was reported as 0.009%.[12] When intralenticular dexamethasone complications develop, some studies recommend follow-up, while others recommend immediate phacoemulsification for cataract.[5,9] If there is no significant increase in macular edema and no worsening of visual acuity, it is recommended that phacoemulsification is not performed immediately.[10] Patients with a conservative approach should be closely monitored for elevated IOP and endothelial toxicity. Cases with intralenticular implantation have been reported up to 12-20 months without cataract development.[7,13] Başkan et al.[14] reported that the dexamethasone implant, which is completely inside the lens, may not have a therapeutic effect, while Çiloğlu et al.[15] reported that there was no increase in macular edema in their case, they followed intralenticular dexamethasone until the 6th month and planned surgery upon the patient's complaint.

Patients who develop clinically significant cataract formation, sudden IOP increase or corneal decompensation after complications may require emergency surgery.[16] After phacoemulsification and IOL implantation, the implant can be repositioned or directed into the vitreous cavity[9] However, in this approach, implant fragments sent into the vitreous cavity may pass into the anterior segment due to the lack of integrity of the posterior capsule and may result in endothelial toxicity. Sometimes in patients who have undergone cataract or pars plana vitrectomy surgery and IOL implantation, the implant may pass into the anterior chamber even though the posterior capsule is intact.[17] Some authors have reported that the dexamethasone implant, which passes into the anterior chamber and is called 'traveling implant', can be positioned and sent to the posterior vitreous.[18] Caution is required if implants are to be used in patients with scleral fixation IOLs or zonule weakness due to aphakia, posterior capsule rupture. Alternative routes such as subtenon steroid injection should be preferred.[19]

Surgery was planned in our all cases because the implant occluded the optic axis and caused lens opacification. Another condition that should be evaluated before deciding on surgery is the size of the releasing part of the implant in the vitreous. In our cases, we thought that the drug may not reach the effective dose in the vitreous because the majority of the dexamethasone implant was in the lens.[14] In addition to topical anesthesia, subconjunctival, peribulbar or retrobulbar anesthesia should also be considered as alternatives considering that the operation time may be prolonged. As in our two cases, the anterior hyaloid can remain intact and the IOL can be implanted into the pulpus by an experienced surgeon without the need for anterior vitrectomy. This may provide advantages such as less complications such as Irvine-gass syndrome that may develop later.

The DXM implant should be directed to the vitreous in these cases if possible. This is advantageous for controlling inflammation and macular edema, as the drug is expensive. As in one of our cases, if the implant cannot be repositioned to the vitreous, alternative therapies such as anti-VEGF should be considered. The important points of the aproach for lens injury with DXM implantation is summarized with Table.

Table. Important points to be considered in cases of lens damage with DXM implant

Implant damage should be carefully evaluated.
The extent of posterior capsule damage and the presence of zonular damage should be well evaluated.
Preoperative visual acuity, the level of iatrogenic cataract, whether the visual axis is clear, the age of the patient, the condition of the lens opacification and how much of the implant is in the lens should be evaluated and cataract surgery should be planned.
Stronger anesthesia such as sub-tenon, retrobulbar or general anesthesia should be chosen.
Since there is a posterior capsule tear during surgery, hydro-delineation should be performed, and hydro-dissection should be avoided unless necessary.
Low bottle height, low phacoemulsification energy, frequent intervention with dispersive viscoelastic should be preferred and an experienced surgeon should manage the case.
The posterior capsule tear should not be widened and the anterior hyaloid should be kept intact, and if possible, the implant should be directed towards the vitreous.
If the implant cannot be saved, alternative treatment methods such as anti-VEGF should be considered.
Anterior vitrectomy can be applied when necessary.
If possible, the surgeon should consider IOL implantation in the sulcus.
If the IOL cannot be implanted in the implanted sulcus, secondary IOL implantation can be considered with different techniques.
Keeping the complications at a minimum level in these patients is important to reduce the effect of postoperative Irvine gass syndrome on macular edema.
Postoperative follow-ups should be careful in terms of complications such as IOP elevation, lens dislocation, posterior capsular opacification, increased macular edema, and endophthalmitis.

DXM: Dexamethasone implant, VEGF: Anti-vascular endthothelial growth factor, IOL: Intraocular lens

Limitations

Our study has limitations due to the small number of cases. However, these cases, even if sporadic, should be reported and future meta-analyses or reviews will provide a better understanding of the management of these cases.

CONCLUSION

In patients with lens damage during DXM implant administration, the amount of release may be inadequate with the part of the implant that remains outside the lens, depending on the size of the amount that enters the lens. These patients can be implanted with an IOL lens with careful and cautious cataract surgery. If possible, the implant should be directed into the vitreous. If the implant cannot be guided, alternative treatment methods should be considered.

ETHICAL DECLARATIONS

Ethics Committee Approval

A case series study, we do not have ethical commitee report.

Informed Consent

The written informed consents were obtained from the patients and their family for publication of this study and accompanying images.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Pacella F, Ferraresi AF, Turchetti P, et al. Intravitreal injection of Ozurdex (®) implant in patients with persistent diabetic macular edema, with six-month follow-up. *Ophthalmol Eye Dis.* 2016;8:11-16.
2. Lowder C, Belfort Jr R, Lightman S, et al. Dexamethasone intravitreal implant for noninfectious intermediate or posterior uveitis. *Arch Ophthalmol.* 2011;129(5):545-553.
3. Schmitz K, Maier M, Clemens CR, et al. Zuverlässigkeit und Sicherheit von intravitrealen Ozurdex-injektionen. Die ZERO-studie. *Ophthalmologe.* 2014;111(1):44-52. doi:10.1007/s00347-012-2737-2
4. Agrawal R, Fernandez-Sanz G, Bala S, et al. Desegmentation of Ozurdex implant in vitreous cavity: report of two cases. *Br J Ophthalmol.* 2014;98(7):961-963.
5. Poornachandra B, Kumar VBM, Jayadev C, et al. Immortal Ozurdex: a 10-month follow-up of an intralenticular implant. *Indian J Ophthalmol.* 2017;65(3):255-257.
6. Coca-Robinot J, Casco-Silva B, Armad Maresca F, et al. Accidental injection of dexamethasone intravitreal implant (Ozurdex) into the crystalline lens. *Eur J Ophthalmol.* 2014;24(4):633-666.
7. Regan K, Blake CR, Lukowski ZL, et al. Intralenticular Ozurdex- one year later. *Case Rep Ophthalmol.* 2017;8(3):590-594.
8. Khurana RN, Appa SN, McCannel CA, et al. Dexamethasone implant anterior chamber migration: risk factors, complications, and management strategies. *Ophthalmology.* 2014; 121(1):67-71.
9. Munteanu M, Rosca C. Repositioning and follow-up of intralenticular dexamethasone implant. *J Cataract Refract Surg.* 2013;39(8):1271-1274.
10. Sekeroglu MA, Anayol MA, Koc F et al. Intralenticular sustained-release dexamethasone implant: is it still effective on macular edema. *Case Rep Ophthalmol.* 2016;7(1):85-89.
11. Costello MA, Liu J, Wang Y, et al. Reverse engineering the Ozurdex dexamethasone intravitreal implant. *Int J Pharm.* 2023;634:122625.
12. Meyer CH, Rodrigues EB, Michels S, et al. Incidence of damage to the crystalline lens during intravitreal injections. *J Ocul Pharmacol Ther.* 2010;26(5):491-495.
13. Valverde-Megias A, Hernandez-Ruiz S, Cifuentes-Canorea P, et al. Intralenticular Ozurdex implant: what to do and how. *J Fr Ophthalmol.* 2018;41(4):149-150.
14. Baskan B, Cıcek A, Gulhan A, Gundogan M, Goktas S. Ozurdex completely located inside a crystallized lens-results of 14 months. *Am J Ophthalmol Case Rep.* 2016;4:38-40.
15. Çiloğlu E, İnan P. Intralenticular dexamethasone: a case report. *J Retina Vitreous.* 2021;30(2).
16. Fasce F, Battaglia PM, Knutsson KA, et al. Accidental injection of dexamethasone intravitreal implant in the crystalline lens. *Acta Ophthalmol.* 2014;92(4):330-331.
17. Kocak N, Ozturk T, Karahan E, Kaynak S. Anterior migration of dexamethasone implant in a pseudophakic patient with intact posterior capsule. *Indian J Ophthalmol.* 2014;62(11):1086-1088.
18. Srinivasan P, Jayadev C Shetty R. The nomadic Ozurdex®: anterior migration of the dexamethasone implant and back!. *Oman J Ophthalmol.* 2017;10(2):109-111.
19. Kumar A, Ambiya V, Kapoor G, Arora A. Wandering Ozurdex in eyes with scleral fixated intraocular lens and its management: a report of two cases. *J Curr Ophthalmol.* 2019;31(3):345-348.