

Unexpected Intrastromal Insertion of Square-Edged Intraocular Lens during Routine Cataract Surgery

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Abstract

Purpose: This case highlighted an important although uncommon complication of wound assisted intraocular lens insertion whereby the corneal lamellae were dissected and the intraocular lens is injected into the corneal stroma.

Observations: Wound construction, cartridge design, square-edged lens design and wound assisted delivery of the intraocular lens appeared to be contributory factors to this complication. There were minimal long-term sequelae in this case. There have been three similar cases reported in the literature previously.

Conclusions and importance: Corneal implantation of intraocular lenses is a potential complication of cataract surgery with contributing factors from wound construction, lens edge and cartridge design as well as wound-assisted delivery. Awareness of this complication may reduce the incidence of future cases.

Keywords: Intraocular lens, Insertion, Intrastromal, Intracorneal, Phacoemulsification, Complication

Case report

A 70 year old female suffering Alzheimer's disease was referred for routine left phacoemulsification and intraocular lens implantation. Examination revealed a left nuclear sclerotic cataract and an otherwise unremarkable anterior segment with best corrected visual acuity of 6/60 in the left eye. Fundal examination was normal.

The patient underwent routine left phacoemulsification and attempted intraocular lens (IOL) insertion under sub-Tenon's anaesthetic with an experienced senior surgeon. A 2.2mm keratome was used to make a temporal clear-corneal stepped incision angled 15 degrees to the iris plane. Phacoemulsification of the cataract was without complication. During wound assisted insertion of the square-edged Alcon AcrySof SN6AT2 23.0D IOL it was noted to have been inadvertently injected into the corneal mid-stroma. IOL delivery was performed manually with the Monarch II system using a D cartridge with no depth guard, placed bevel down beneath the wound margin approximately 0.5mm into the wound tunnel. The lens remained folded and was subsequently removed with Kelman-McPherson forceps. Minimal viscoelastic had inadvertently entered the dissected IOL tract. A second incision parallel to the iris plane, passing more posteriorly at the limbus beneath the original incision was used to inject a second Acrysof SN6AT2 23.0D IOL. It was delivered at a steeper angle with the tip of the injector cartridge visualised in the anterior chamber. The implant was successfully placed in the capsular bag. The remainder of the procedure went without complication. At day 1 post-operative vision in the left eye was 6/60 with significant corneal stromal oedema (Figure 1).

Best corrected visual acuity had recovered to 6/18 in the left eye by 3 months with only a trace amount of residual stromal oedema remaining. OCT of the anterior segment showed a barely detectable plane through which the lens had cleaved the corneal mid-stroma. Best corrected visual acuity at a 6 month follow up was 3/60 in both eyes. Left eye refraction post operatively was -0.25/-0.75x106. The visual potential in the left eye was limited thought to be related to progression of her Alzheimer's disease [1,2] (Figure 2).

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Figure 1: (a) Intraoperative clinical photograph demonstrating intrastromal implantation of the intraocular lens. (b) Post removal of the lens a visible tract remains.

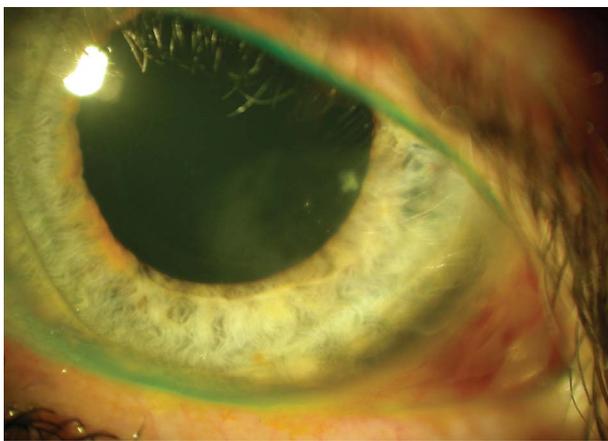


Figure 2: Anterior segment photograph at 3 months post-procedure. Mild stromal haze is visible where the lamellae dissection occurred.

Discussion

There have only been three other reported cases of iatrogenic intrastromal lens implantation during cataract surgery [3-5]. These cases had similar resolution of corneal oedema with satisfactory final visual acuity of 6/6 attained in two cases with the third case achieving 6/9.

Intrastromal insertion of the lens occurs when the force generated by the IOL edge overcomes the cohesive forces between the stromal lamellae, allowing lamella dissection and creating a false lens passage. Centrally the cornea contains approximately 200 layered lamellae which are produced by collagen fibrils embedded in a hydrated matrix of proteoglycans [6]. Proteoglycan complexes create interlamellar adhesion by binding collagen fibrils at specific axial sites along the fibrils [6,7]. The lamellae are extensively interwoven in the anterior and mid-stroma centrally and this interlacing extends to the posterior stroma in the peripheral cornea [6]. The clear corneal incision made during cataract surgery alters the structural integrity and biomechanical properties of the cornea by cutting through these interwoven lamellae [8]. The increase in obliquely oriented lamellae in the periphery increases the interlamellar adhesive strength compared to the centrally located lamellae [7]. It is hypothesised that these interweaving lamellae act as anchoring fibres which tear instead of separate, thereby contributing their tensile strength to the overall adhesion forces between lamellae [7].

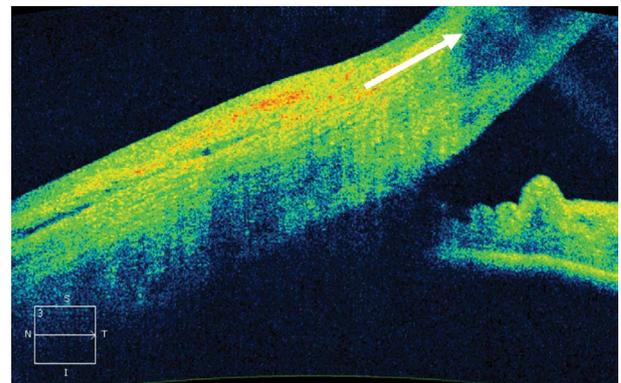


Figure 3: Anterior Segment OCT LE demonstrating a relatively anterior path of the IOL dissection tract through anterior corneal stroma (white arrow).

Two of the three previously reported cases of IOL implantation state the lens type used (Alcon Acrysof SN60AT 24.0D and Tecnis ZCB00 16.0D) with the third case only demonstrating an intraoperative photograph where a single piece foldable IOL can be seen [3-5]. The two known cases used a sharp edge lens design with corresponding injector systems and all cases used wound-assistance with the IOL delivery [3-5]. Apart from corneal dissection, iatrogenic injuries to the cornea from IOL insertion include Descemet's membrane tears or detachment [5]. It is unclear what role lens edge design contributes to these complications but we postulate that sharper edge designs confer a higher risk of dissection through corneal lamellae. Ocular risk factors previously considered include small, tight or stepped wounds, disease which impairs the view through the cornea to visualise the injector tip and any factors leading to lengthened, flattened entry through the wounds, such as shallow anterior chambers [3,5]. Delivery cartridges not equipped with a depth guard to limit how far the nozzle advances in the wound may allow inadvertent stretching and deepening of the incision as well as splitting of the nozzle tip [9]. Other operative factors including small, sharp injector tips, insufficient anterior chamber viscoelastic and wound-assisted IOL delivery may result in premature insertion into the stromal lamellae [5].

This case highlights that intrastromal insertion of an IOL is a possible complication of using a wound-assisted square-edged lens design injector system. Conservative management with active surveillance in this and previous cases have all resulted in reversal of post-operative corneal oedema with minimal long-term sequelae. Surgeons should consider how wound construction, cartridge design and injection technique may be modified to avoid this potential complication of cataract surgery (Figure 3).

Patient Consent

Written consent to publish potentially identifying information, such as details or the case and photographs, was obtained from the patient's legal guardian.

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Conflicts of Interest

The following authors have no financial disclosures BDM, SOH

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship

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