


# Case Report: Implantable Collamer Lens for Keratoconus with Splinter Cataract

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**Background:** Implantable collamer lens (ICL) could be an effective and safe treatment option for patient with keratoconus. The presence of cataract is considered a relative contraindication to the use of ICL. In this case report, we describe the outcomes of ICL implantation in an eye with keratoconus and splinter cortical cataract sparing the visual axis.

**Case Report:** Thirty-six-year-old female patient diagnosed with keratoconus was followed in the outpatient department and sought to be independent of glasses in the right eye. Upon examination she was found to have bilateral splinter cortical cataract not involving the visual axis. She had the best spectacle corrected visual acuity of 20/30; she underwent uneventful implantation of ICL in the right eye with an uncorrected visual acuity of 20/30 post-operatively with no progression of the cataract during the follow-up period.

**Conclusion:** The patient achieved a stable uncorrected visual acuity of 20/30 with no cataract progression after 18 months. Splinter cataract remains stable over time, thus it should not be considered as a contraindication for the implantation of ICL in patients with keratoconus.

**Keywords:** Cataract, Keratoconus

## Background

Keratoconus, a progressive ectatic disorder of the cornea, causes thinning and conical protrusion, leading to significant visual distortion.<sup>1</sup> Traditionally managed with glasses, rigid gas-permeable contact lenses, or corneal cross-linking to halt progression, alternative solutions are often required for cases unresponsive to these methods. Implantable Collamer Lenses (ICLs) represent a valuable option in such scenarios.<sup>2</sup> ICLs, placed between the iris and the crystalline lens, provide a reversible and cornea-preserving approach to correcting a broad range of refractive errors. This method is particularly advantageous for keratoconus patients who are contact lens intolerant or unsuitable for keratoplasty, as it offers significant visual improvement with a low complication rate.

Splinter cortical cataracts, often associated with frequent eye rubbing in keratoconic patients, present a unique challenge in management.<sup>3</sup> Eye rubbing, a known risk factor for keratoconus progression, generates mechanical stress and oxidative damage that may contribute to cataract development. While the presence of cataracts has traditionally been considered a contraindication for ICL implantation,<sup>4</sup> selective cases—such as cataracts sparing the visual axis—may still benefit from this approach.

Alternative treatments for keratoconus with coexisting cataracts, such as keratoplasty or cataract extraction with intraocular lens implantation, involve surgical interventions that may be unsuitable for young or visually active patients due to increased surgical risks or limited visual outcomes. In contrast, ICL implantation provides an effective option by maintaining corneal integrity and offering rapid, reversible refractive correction.

This case report describes the successful implantation of an ICL in an eye with keratoconus and a splinter cortical cataract sparing the visual axis. The case highlights the stability of the splinter cataract, the absence of significant progression over the follow-up period, and the patient's improved quality of life due to independence from glasses and restored functional vision. Furthermore, this report emphasizes the need for long-term monitoring to address potential late-onset complications in similar cases. Ethical approval was obtained from the Research and Ethics Committee at King Khaled Eye Specialist Hospital, and written informed consent was provided by the patient for publication of the case details and accompanying images.

## Case Report

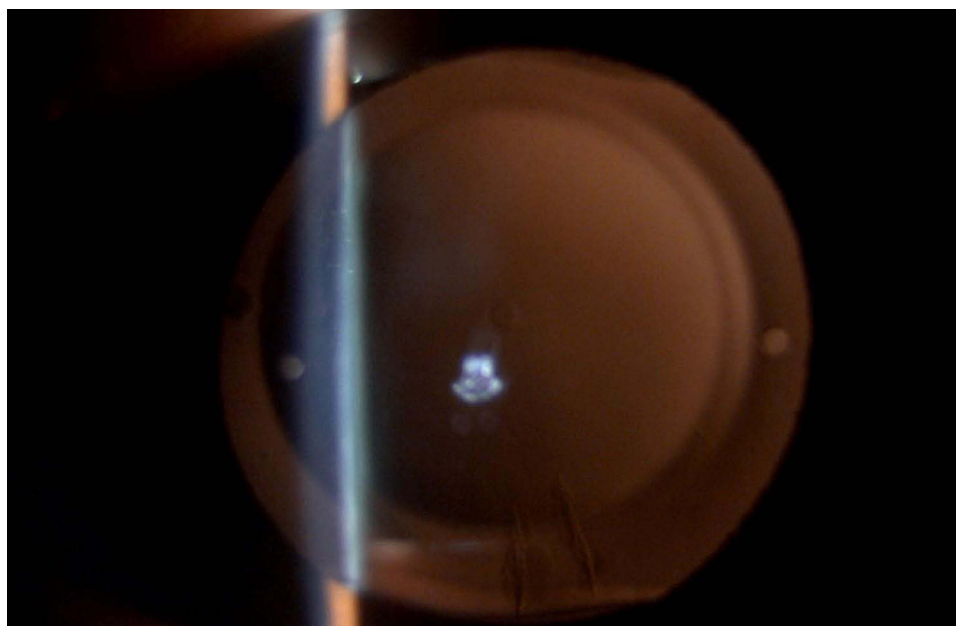
This was a 36-year-old female patient diagnosed with keratoconus, she was medically fit with no prior history of ocular surgeries or trauma, denies smoking and steroid use. However, she admits to frequent and vigorous eye rubbing. Upon examination, the patient had an uncorrected visual acuity (UCVA) of 20/70 in the right eye and 20/200 in the left eye. She had a normal intraocular pressure, and slit-lamp examination was unremarkable apart from bilateral splinter-shaped cortical cataract sparing the visual axis (Figure 1). Splinter-shaped cataracts were noted pre-operatively in both eyes, however, slit-lamp photographs were taken post-operatively. (Figure 1) Fundus examination was normal. Based on Krumeich classification of keratoconus,<sup>1</sup> she had stage III keratoconus in the right eye and stage IV in the left eye. Patient had a best spectacle-corrected visual acuity (BSCVA) of 20/30 in the right eye with  $-6.50$  sph  $-4.50$  cyl at 25 and 20/80 in the left eye with  $-7.00$  sph  $-6.00$  cyl at 20. The left eye was fitted with hard contact lens and found to have a visual acuity of 20/25. Patient underwent uneventful lamellar keratoplasty (LKP) in the left eye and had an uncorrected visual acuity of 20/40 and BSCVA of 20/25 with minimal refractive error at the last follow-up visit 10 years post LKP, and the splinter cortical cataract remained stable with no progression. She underwent implantation of implantable collamer lens (ICL) in the right eye with UCVA of 20/30 post-operatively. At 18-months post-op visit the patient maintained her uncorrected and best corrected visual acuity with no progression in the cataract morphology.

## Discussion

The effectiveness of ICL in managing keratoconus has been documented, with studies indicating satisfactory visual outcomes and stability in refractive correction.<sup>2</sup> However, the concomitant presence of a cortical cataract presents additional challenges, as cataract development could be accelerated post-ICL implantation, potentially impacting visual acuity and necessitating further surgical intervention.

The risk of cataractogenesis post-ICL is well documented, with a positive correlation with patient age and a negative correlation with anterior chamber depth (ACD).<sup>4</sup> This highlights the importance of a thorough preoperative assessment to gauge the likelihood of cataract progression. Surgical planning for such patients requires meticulous consideration, balancing the complexities of inserting ICLs in eyes with keratoconus against the risks of cataract surgery. The literature suggests that younger patients may encounter fewer cataract-related complications post-ICL implantation due to the correlation between age, cataract formation, and anterior chamber depth (ACD).<sup>4,5</sup> Long-term outcomes and vigilant follow-up are crucial for monitoring cataract progression.

Anterior subcapsular cataract is a well-documented complication following ICL implantation.<sup>6,7</sup> However, the outcomes of ICL implantation in eyes with pre-existing non-visually significant cataract are not well documented in the literature.



**Figure 1** Slit-lamp photography with retroillumination of the left crystalline lens with splinter cortical cataract.

Splinter cortical cataract is a novel finding reported in a case series of 16 eyes with keratoconus and vigorous eye rubbing.<sup>3</sup> The exact morphology of the cataract was reported to be splinter shaped cortical cataract in the inferotemporal quadrant of the crystalline lens similar to what the reported patient had. The authors of the case series postulated that the pathophysiology of the reported cataract is due to eye rubbing, which was present in all reported eyes, however cause-effect relationship could not be clearly established.<sup>3</sup> It was also reported that it is visually insignificant as it spares the visual axis therefore cataract surgery is not warranted.<sup>3</sup> This is further confirmed by the long-term follow-up of this case report as the splinter cataract did not progress for 10-years following LKP in the left eye and 18-months following ICL implantation of the left eye and the patient maintained adequate uncorrected and best corrected visual acuity in both eyes.

## Conclusion

In conclusion, the findings of this report suggest that the presence of a splinter cataract is stable and does not progress significantly over time, thus it should not be considered as a contraindication for the implantation of an Implantable Collamer Lens (ICL) in patients with keratoconus. The stability of the splinter cataract implies that it should not interfere with the ICL's performance or the visual outcomes of keratoconus patients. Prospective studies with large sample size and longer follow-up period are recommended to further confirm this finding.

## Name of Department and Institution Where Work Was Done

Anterior Segment Division, King Khaled Eye Specialist Hospital.

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## Disclosure

The authors report no conflicts of interest in this work.

## References

1. Gore DM, Shortt AJ, Allan BD. New clinical pathways for keratoconus. *Eye*. 2013;27:329–339. doi:10.1038/EYE.2012.257
2. Fairaq R, Almutlak M, Almazyad E, et al. Outcomes and complications of implantable collamer lens for mild to advance keratoconus. *Int Ophthalmol*. 2021;41:2609–2618. doi:10.1007/S10792-021-01820-2
3. Kirat O, Ahad MA, Alhilali S, et al. Splinter Cataract in Patients with Keratoconus and Frequent Eye Rubbing: a Novel Finding. *Am J Case Rep*. 2023;24. doi:10.12659/AJCR.939082
4. V. GH, LeClair BM, Jabo B, et al. Incidence of implantable Collamer lens-induced cataract. *Can J Ophthalmol*. 2018;53:518–522. doi:10.1016/J.JCJO.2017.11.018
5. Zhang H, Gong R, Zhang X, et al. Analysis of perioperative problems related to intraocular Implantable Collamer Lens (ICL) implantation. *Int Ophthalmol*. 2022;42(11):3625–3641. doi:10.1007/S10792-022-02355-W
6. Packer M. Meta-analysis and review: effectiveness, safety, and central port design of the intraocular collamer lens. *Clin Ophthalmol*. 2016;10:1059–1077. doi:10.2147/OPHTH.S111620
7. Hayakawa H, Kamiya K, Ando W, et al. Etiology and outcomes of current posterior chamber phakic intraocular lens extraction. *Scientific Re*. 2020;10(1):1–7. doi:10.1038/s41598-020-78661-z

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