

# **“Intraocular Polyimide IOL Haptic Breakage Long-Term Postoperatively”**

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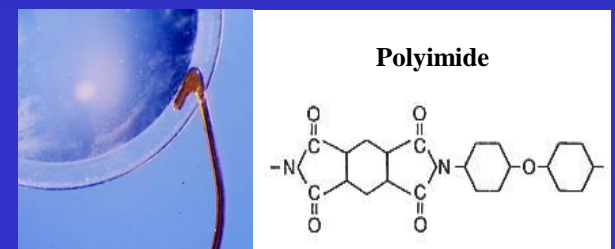
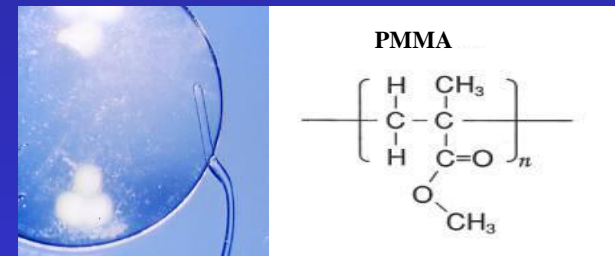
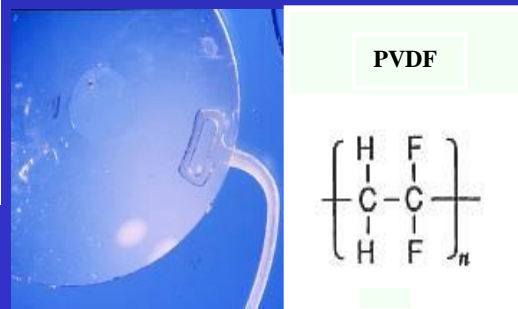
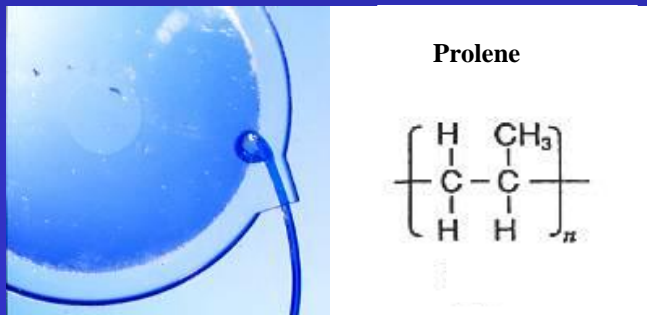
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# Background

•A variety of materials has been used in the manufacture of intraocular lens (IOL) loops in multipiece-IOLs, including polyamide (nylon), polypropylene (Prolene), polyvinylidene fluoride (PVDF), poly(methyl methacrylate) (PMMA), and polyimide (Elastimide). Research assessing their biocompatibility has been conducted, and results have affected their use in IOL manufacture.<sup>1</sup> For example, it has been well-documented that nylon loops can degrade over time.<sup>2-5</sup>



# Background/Objective

- The Staar polyimide IOL (Staar Surgical Co.) is a 3-piece silicone IOL with modified C-loop polyimide haptics with a 10-degree angulation; different models with different optic diameters and overall lengths are available.
- Polyimide is considered safe to use in implantable devices, with insignificant levels of cytotoxicity and hemolysis.<sup>6</sup> However, few studies have examined its long-term biocompatibility, and no peer-reviewed publication has addressed this issue regarding the intraocular environment.

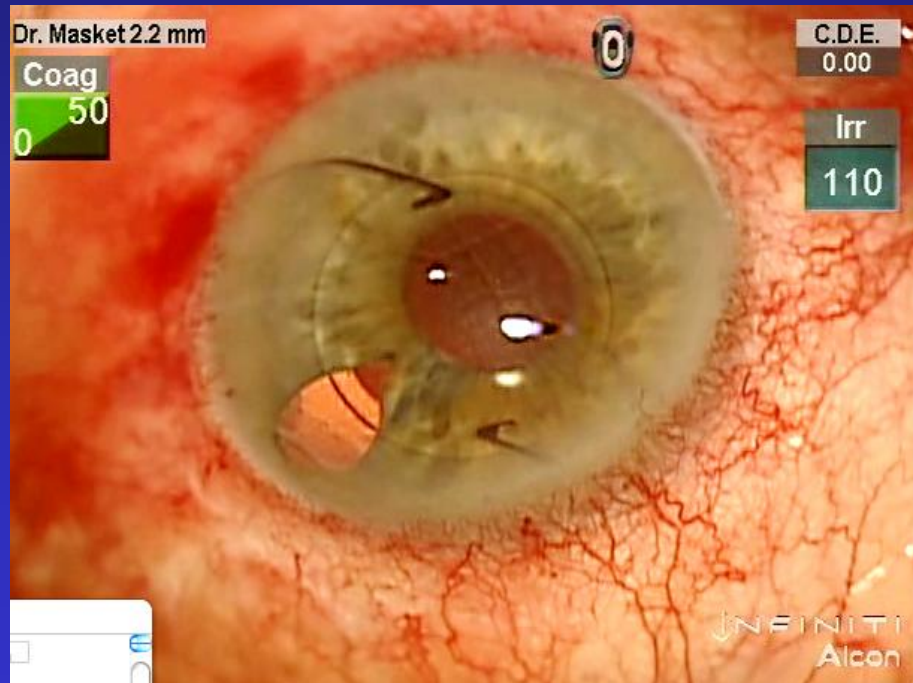
*The aim of this study was to describe 2 cases of intraocular breakage of polyimide haptics many years after IOL implantation.<sup>7</sup>*



# Case 1

- September 2008: an 86-year-old man was referred to one of us (S.M.) with decreased vision in OS. 12 years earlier, cataract surgery with implantation of a Staar 3-piece silicone posterior chamber IOL had been performed in that eye. The IOL was originally fixated in the anterior chamber after intraoperative posterior capsule rupture.
- The patient was noted to have significant pseudophakic bullous keratopathy and a large temporal iridectomy in OS. Vision was reduced to counting fingers. Additionally, the IOL in this eye was vaulted anteriorly within the anterior chamber.

# Case 1



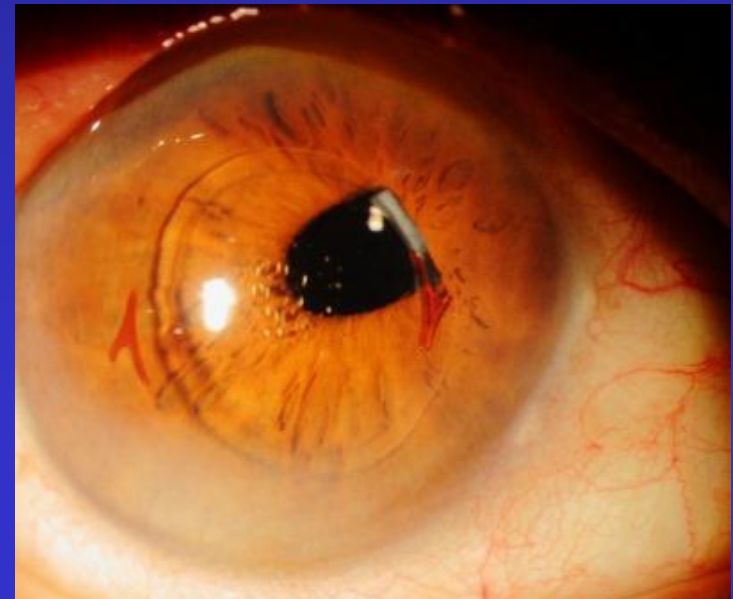
- The IOL was eventually explanted and exchanged. During explantation, 1 haptic was noted to break into multiple pieces with only slight manipulation but all pieces were removed successfully.

## Case 2

- 1998: uneventful phacoemulsification with in-the-bag Staar AQ2010V (serial number 2378116; +22.0 diopters) was performed in OD of an 80-year-old man.
- February 19, 2013: the patient presented to one of us (A.C.) with complaints of decreased vision in OS for 7 days. Both eyes were fully dilated for complete exam.
- Fundoscopy revealed several hemorrhages in the optic nerve head in OS, and slit lamp exam revealed 3+ nuclear sclerosis. OD was unremarkable, with the 3-piece silicone IOL in the bag. The IOL optic showed evidence of neodymium:YAG laser pits, and a large posterior capsulotomy was noticed.

## Case 2

- The patient returned the following day with new complaints of sudden decrease in vision in OD, with uncorrected distance visual acuity dropping from 20/30 to 20/50. Slit lamp OD showed that the IOL optic was now sitting in front of the iris in the anterior chamber. The temporal IOL haptic was broken at the optic–haptic junction.
- The IOL was subsequently explanted and exchanged. However, the broken piece of the temporal haptic was left in place, as it was found to be buried within the bag.



# Laboratorial Analyses

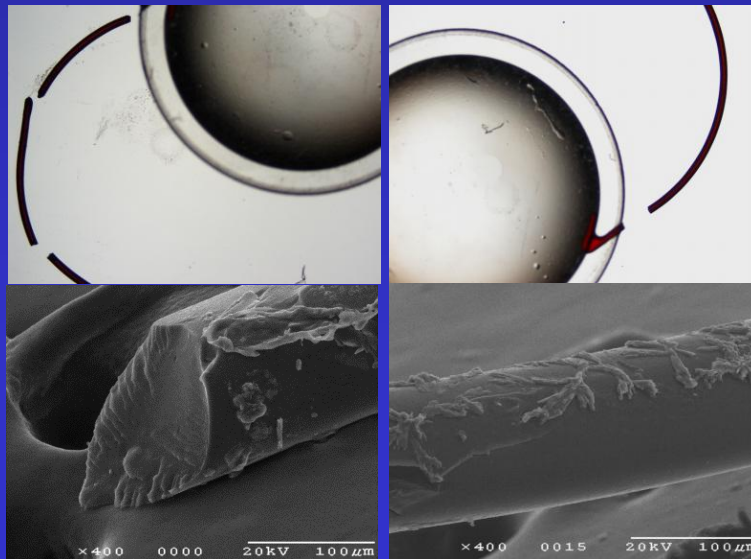
- Both IOLs were sent to the Intermountain Ocular Research Center. Gross and light microscopic examinations were performed with photodocumentation.
- Scanning electron microscopy (SEM) was also performed. The IOLs and corresponding broken loops were air dried in an open vial, mounted on a stub with a carbon adhesive tab, and sputter-coated with a thin layer of gold. Imaging was performed at 15 and 20 kV using a S-2460N Hitachi SEM (Hitachi, Ltd.).
- Minimal manipulation of the lenses with forceps to place them on glass slides for microscopy caused further haptic breakage in both loops of each IOL. The loops were very brittle and appeared to have lost their elastic properties.



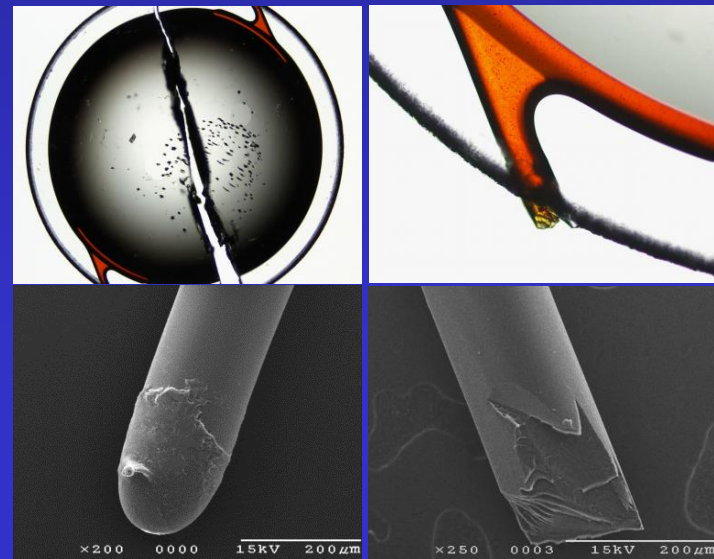
# Laboratorial Analyses

- The IOLs had jagged breaks at the optic–haptic junction, close to the insertion points of the loops into the optic, and at other sites. Under SEM, the broken edges of the haptics appeared asymmetrical, with no particular pattern of breakage. The surface of the loops was smooth and regular, with deposits that appeared to correspond to protein and salts. No obvious degradation was found on the loops.

Case 1



Case 2



# Discussion/Conclusions

- Typically, IOL loops maintain their shape through a combination of rigidity and loop memory. This allows the haptics to bend and re-expand without breaking during IOL insertion into the bag. A haptic that has become brittle will lose both its rigidity and memory.<sup>1</sup>
- Polyimide loops are basically composed of 60% to 80% carbon, 10% to 20% oxygen, and 2% to 5% nitrogen, producing advancing contact angles in the hydrophobic range (80 to 100 degrees).<sup>6</sup>
- There is no study describing any degradation of polyimide loops.

# Discussion/Conclusions

- In our 2 cases there were no signs of degradation under SEM.<sup>7</sup> It is not known whether the fixation of the first IOL in the anterior chamber accelerated the process leading to brittle loops. Pharmacological mydriasis may have triggered IOL movement with rupture of brittle haptics in case 2.
- To our knowledge, this is the first report describing loss of elasticity of polyimide loops leading to breakage and associated clinical consequences.<sup>7</sup> Further studies are necessary to ascertain long-term biostability of polyimide haptics.

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