

Scattered Blue Deposits After Cataract Surgery

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CASE PRESENTATION

A healthy 77-year-old woman undergoes uncomplicated phacoemulsification on her right eye. A venturi pump system with reusable tubing and phaco tips is used for the case. On postoperative day 1, the patient complains of new floaters. Her UCVA is 20/25, and the IOP measures 14 mm Hg. The pertinent findings include minimal corneal edema and scattered blue deposits in the corneal incision, iris, ante-

rior chamber, and anterior vitreous (Figures 1 and 2). The IOL is centered in the capsular bag. The anterior capsulorhexis is continuous, and the posterior capsule is intact (Figure 3). The rest of the examination is unremarkable. What are these deposits, why are they present in both the anterior and posterior chambers, and what would be your approach?



Figure 1. Blue deposits in the anterior chamber.



Figure 2. Blue deposits in the clear corneal incision.

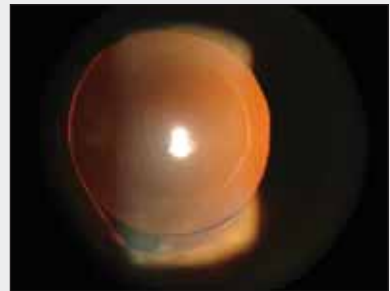


Figure 3. Retro-illumination shows intact anterior and posterior capsules.

LAMA AL-ASWAD, MD

This is an interesting case. It is hard to figure out what the deposits are. Are they organic? They appear not to be, especially since they have a different texture from the retained cortical material at 6 o'clock (Figure 3).

If inorganic, might they have arisen from the reusable venturi tubing, an inappropriate cleaning solution or technique, or a breakdown in the tubing, the filters, the rubber stopper, a surgical instrument, or the phaco tip or sleeve if they were poorly manufactured or over-used? Could the source be a medication or solution used in the irrigation bottle or injected intracamerally? Another potential cause is lint from the surgical tray or drape that could have entered the eye. The presence of these deposits in the anterior vitreous can be

explained by a degree of zonular dehiscence that allowed the irrigating solution to enter the posterior chamber.

As far as management, the surgeon has two options: to monitor the patient or to wash out the anterior chamber. I would recommend observing the patient for worsening inflammation, corneal decompensation, or elevations in IOP. It would also be important to determine if this problem occurred in other cases for which the machine and tubing were used and to investigate the properties of the medications that were administered during the surgery. In addition to examining the venturi phaco system, tubing, and instruments, I would recommend researching how the reusable tubing was cleaned.

LAURA K. GREEN, MD

The first thought that comes to my mind is blue dye. Trypan blue is the only FDA-approved blue ophthalmic dye, so I wonder if it were used in this case. When a surgeon stains the capsule, the corneal endothelium and clear corneal incision can become stained, as can the iris. Just as anterior chamber cells can “leak” into the vitreous around and through the zonules, so can any small, fine, particulate matter, which would explain the blue vitreous deposits.

It is unusual, however, to see blue deposits after phacoemulsification. Normally, there has been enough irrigation to fully remove any trace of trypan blue. I therefore wonder if the reusable venturi tubing line regurgitated fluid. The other possibility is that the wrong blue dye was used. Methylene blue is reportedly toxic to the anterior segment, and its blue vials can be mistaken for trypan blue. There are no signs of toxic anterior segment syndrome (TASS) at this time, but I would increase the dosing of steroids to every 2 hours and observe the patient closely.

S. ANNA KAO, MD

I am wondering if the surgeon used trypan blue during the case. In my experience with this dye, residual blue particles are sometimes visible at the site of the corneal incision on day 1. The staining typically disappears by the 1-week postoperative visit. Blue particles are present in the anterior chamber and anterior vitreous face, however, despite an intact posterior capsule. One plausible explanation is that the reflux mechanism on the venturi system forced a small amount of cortical material onto the vitreous surface. I have found that this phenomenon is more likely to occur when the I/A tip is located close to the posterior capsular surface. My guess is that the reflux pushes the material through the zonular space. It is unlikely that blue particles would remain in the anterior chamber at the end of case, however, because cataract surgeons routinely irrigate the anterior chamber with balanced salt solution, either when removing viscoelastic or hydrating the corneal incision.

Another possible source of the blue deposits is intracameral medication. Some surgeons routinely inject either antibiotics or steroids during the cataract procedure. The blue particles may be evidence of the injected substance. An injection into the sulcus (advocated by some ophthalmologists for select high-risk diabetic patients) could have left the blue material in the anterior vitreous space.

If the blue particles are the result of an unintended intracameral injection, a careful investigation of all of the surgical equipment should identify the source. From

time to time, surgical lint is observable in the anterior chamber during the immediate postoperative slit-lamp examination. The amount and extent of the blue deposits in this case, however, are awfully impressive for the ophthalmologist not to have noticed them at the time of surgery.

In terms of managing the blue material, if there is no evidence of TASS, I would carefully observe the patient rather than intervene surgically. The presentation is not consistent with TASS: the IOP is not elevated, and there is no significant corneal edema accompanied by other anterior chamber inflammatory signs. A washout of the anterior chamber might be warranted if the patient’s clinical course quickly worsened. Close monitoring of her IOP and inflammatory signs would be crucial.

NICK MAMALIS, MD

The small blue deposits are widely scattered from the corneal wound to the anterior chamber and iris, and some small deposits seem to be located in front of and behind the IOL. It appears that small bits of material showered into the anterior chamber during the cataract surgery. It is interesting that this blue material is visible in the anterior vitreous. This location is difficult to explain if the capsule is intact, unless the material somehow flowed through the zonules and into the anterior vitreous. The material may be located on the posterior capsule behind the IOL.

Metallic material can sometimes enter the eye during cataract surgery from a stressed phaco tip or the hub of the I/A tip. Intriguingly, these deposits do not seem to be metallic but have a plastic appearance to them. It is possible that small bits of blue plastic broke off from the irrigating sleeve surrounding either the phaco or the I/A tip. Another potential source of plastic material that has gained access to the eye is the injector cartridge for the IOL. These cartridges are often clear plastic rather than blue, but they have been shown to react to the stress of placing an IOL with linear fractures, which could lead to material’s breaking off. There have also been reports of a rubber-like material in the eye from the stopper used in the irrigating bottle of balanced salt solution, but this material is usually black rather than blue.

A foreign plastic material would likely be inert in the anterior segment of the eye and probably would not cause postoperative inflammation. For this reason, it is probably not necessary to irrigate this material from the eye unless some form of anterior segment inflammation occurs.

SUZANN PERSHING, MD

On postoperative day 1, contamination would lead my differential diagnosis. Although infection is always at

the top of my mind when I am evaluating patients after uncomplicated surgery, this would be an extremely atypical presentation. Endogenous deposits (presumably present preoperatively) usually fall into recognized patterns not seen here.

An analysis of the source requires a carefully systematic approach. Were any other cases performed on the same day that had similar findings? Was anything atypical about the surgical routine? Did the surgeon load the IOL him- or herself?

Possible sources of the deposits include reusable tubing and tips/sleeves, irrigating fluid, or lint from the surgical drapes. Particles in the anterior vitreous do not exclude intraoperative contamination; with vigorous phaco fluid dynamics, it is not unheard of to see a tiny cataract fragment behind an intact posterior capsule or to find a small strand of vitreous slipping through zonules into the anterior chamber despite an undamaged bag. A small particle could easily follow the same course. Contamination here might have occurred upon the IOL's implantation; subsequent high-flow irrigation and aspiration to remove viscoelastic could have sent particles into the anterior vitreous. For prevention, it is important to rinse IOLs with balanced salt solution before loading and to load them on a plastic surface.

Should the particles be removed? I would expect them to provoke minimal inflammation. One could wash out the wound and possibly the anterior chamber as well, but I would leave the anterior vitreous particles. If the patient is 77 years old, her vitreous is probably liquefied, and the particles should settle. I would follow her symptoms and watch carefully for endophthalmitis.

RICHARD TIPPERMAN, MD

In the current case, I would assume that the blue particulate matter represents some type of foreign inorganic material. Given the history of reusable tubing, it is likely that the deposits represent material from the tubing or the irrigating sleeve with which the surgeon has inadvertently seeded the anterior and posterior segments.

Inasmuch as this surgery appears to have been uncomplicated, the blue particulate matter present in the posterior segment is likely the result of occult zonal incompetence. This weakness would have allowed the particles to travel from the anterior segment to the posterior segment. Richard Mackool, MD, has described this phenomenon as the mechanism for infusion misdirection syndrome.¹

At present, the patient's vision is excellent, and overall, her eye appears relatively quiet. I would therefore favor careful clinical observation rather than any intervention's approach. Although it is possible that the patient's

acute development of floaters is related to the blue particulate matter, it is much more likely related to normal postoperative changes.

In the unlikely event that the patient develops more inflammation, the surgeon can increase the topical steroids. The remote specter of TASS should at least be considered but is unlikely to occur if the eye is this quiet on postoperative day 1. ■

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1. Mackool RJ, Sirota M. Infusion misdirection syndrome. *J Cataract Refract Surg.* 1993;19(5):671-672.