

# The “Sandwich Technique” for Iris-fixated Phakic Intraocular Lens Implantation

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## ABSTRACT

**PURPOSE:** To describe a new technique of implantation of the Artisan/Verisyse phakic intraocular lens (PIOL).

**METHODS:** After PIOL insertion into the anterior chamber, a bolus of a high viscosity ophthalmic viscosurgical device (OVD) is placed over the optic, separating it widely from the endothelium.

**RESULTS:** The technique decreases the chance of endothelial damage during enclavation.

**CONCLUSIONS:** A bolus of a high viscosity OVD placed on the anterior surface of the Artisan/Verisyse PIOL may make enclavation safer. [*J Refract Surg.* 2006;22:96-98.]

**T**he iris-fixated lens represents an alternative to corneal reshaping procedures such as relaxing incisions, LASIK, or photorefractive keratectomy in the correction of myopia, hyperopia, and astigmatism.

In 1986, Worst and Fechner modified the existing iris-fixated lens into a negative biconcave lens, which was changed into a convex-concave shape in 1991 to increase its safety. Since then, it has been successfully implanted as the Worst myopia claw lens and its name changed to Artisan (Ophtec, Groningen, The Netherlands) in 1998.<sup>1,2</sup> It is also distributed by Advanced Medical Optics Inc (AMO, Santa Ana, Calif) under the name Verisyse and has recently received Food and Drug Administration approval.

Endothelial cell loss associated with the surgical procedure is a major concern with this type of phakic intraocular lens (PIOL). In a 4-year follow-up study of patients implanted with an iris-fixated IOL, Menezo et al<sup>3</sup> found a slight, progressive cell loss after IOL implantation. However, the morphometric changes recovered and were close to preoperative levels at 2 years postoperative, suggesting that endothelial damage occurred primarily during the surgical procedure. Therefore, intraoperative endothelial manipulation should be minimized.

Shallowing of the anterior chamber should be prevented strictly during the PIOL enclavation maneuver. However, fixation forceps shallow the anterior chamber depth due to the outflow of ophthalmic viscoelastic devices (OVDs) from the primary incision. Krumeich et al<sup>4</sup> recommended suturing of the primary incision before IOL positioning in the eye to maintain a closed system. In addition, a Krumeich-Koch “spreader” (F.A. Geuder, Heidelberg, Germany) can be used to maintain a stable fixation of the PIOL in the anterior seg-

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ment. However, temporary sutures are time-intensive and the spreader may damage the IOL haptics.

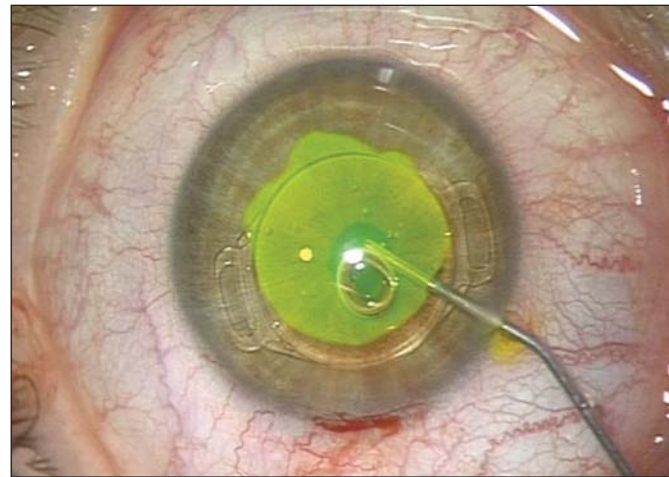
Therefore, an advanced technique is required to maintain a deep anterior chamber and to protect the endothelium from PIOL contact during the enclavation maneuver. For this purpose, we developed the following new implantation technique.

### SURGICAL TECHNIQUE

Before surgery, miotic drops (pilocarpine 1% to 2%) are administered to facilitate the iris for lens fixation, reduce the risk of crystalline lens touch during implantation, and ensure centration of the PIOL.

General systemic anesthesia is preferred. Two paracenteses are performed at 10 and 2 o'clock. Miochol-E (Novartis, Basel, Switzerland) is injected into the anterior chamber to flatten the anterior side of the iris. A medium viscosity solution is brought into the eye via the paracenteses. Attention should be paid to placing the OVD first in the inferior peripheral chamber and then in the nasal and temporal peripheral regions to ensure aqueous fluid flow. Primary incision size and location depends on the IOL model: when implanting the toric model, which is only available in polymethylmethacrylate, a 5.3-mm modified sclerocorneal frown-incision for the 5-mm optic model (6.2 to 6.5 mm for the 6.0-mm optic) is made at the 12 o'clock position. When implanting the foldable spherical model (Artiflex [Ophtec] or Veriflex [AMO]), a superior 3.2- to 3.5-mm clear corneal incision is performed.

After performing the primary incision, a cohesive medium viscous hyaluronic acid-based OVD is instilled to deepen the anterior chamber. We prefer Healon (AMO, Santa Ana, Calif) because it is a pure, pH-balanced,<sup>5</sup> iso-osmolar OVD with low endotoxin content.<sup>6</sup> Ophthalmic viscoelastic devices containing hydroxypropylmethyl-cellulose or chondroitin sulfate are not recommended.<sup>7</sup> The PIOL is implanted into the anterior chamber and placed into the location where enclavation is intended. After this maneuver, a high viscosity OVD, such as Healon GV or Healon 5, is placed on the top of the IOL optic before performing the enclavation (Fig). Thus, the high viscosity OVD is sandwiched on both sides by the medium viscosity OVD. Healon 5 possesses the highest zero shear viscosity at rest of all OVDs, a great space-maintaining capability, and a long relaxation time.<sup>7</sup> Therefore, it is most effective in maintaining a deep anterior chamber, preventing anterior chamber collapse and minor OVD loss through the primary incision, and preventing endothelial touch by the PIOL. Under Healon 5 protection, a safe and sufficient distance to the endothelium is achieved so that the enclavation maneuver can now



**Figure.** Healon 5, stained with 2% fluorescein sodium for better visualization, is placed on the top of the PIOL optic before performing enclavation of the Artisan/Verisyse lens.

be performed. All OVD material is removed by flushing and irrigation with balanced salt solution in front of the IOL at the end of the procedure.<sup>7,8</sup>

We do not use simultaneous irrigation/aspiration because variations in anterior chamber depth may cause stress on the zonules.

### DISCUSSION

Ophthalmic viscoelastic devices can help minimize endothelial damage during the enclavation process of the Artisan/Verisyse PIOL. Since the introduction of OVDs, anterior segment surgery has become less associated with intraoperative complications. By maintaining a deep anterior chamber space, protecting the endothelium, and facilitating IOL implantation, OVDs have contributed to the success of anterior segment surgery.<sup>9</sup>

In current iris-fixated lens implantation, a 5.2- to 5.5-mm-wide incision is necessary. We present the sandwich technique combining a high-viscosity OVD with a viscoadaptive viscoelastic substance. This is analogous to Arshinoff's "soft-shell" technique in which he combines a low-viscosity viscoelastic with a high-viscosity viscoelastic to maximize their advantages.<sup>10</sup> For maximum maintenance of the anterior chamber, a high-viscosity OVD is needed. The higher the zero shear viscosity, the better the maintenance. As for endothelial protection, the OVD should have high viscosity and elasticity at rest. Dick et al<sup>9</sup> demonstrated that Healon 5 has a significantly higher zero shear viscosity than Healon and Healon GV and a longer relaxation time. This indicates that Healon 5 is the most effective OVD in terms of creating and maintaining a deep anterior chamber to facilitate safe surgical maneuver. We have successfully applied

this technique in over 50 cases of phakic iris-fixated lens implantation. We experienced no instances of intraoperative anterior-chamber flattening and no intraocular pressure (IOP) spikes (values >25 mmHg) immediately postoperative. In addition, no intraoperative endothelial cell loss above standards (2% to 8%) was observed.

To prevent high spikes of IOP after the use of Healon 5, avoid overfilling the anterior chamber, do not inject the OVD into the angle, and place the Healon 5 in one single injection directly on the anterior surface of the PIOL optic only so that the bolus can be removed easily.

An open unsutured wound during IOL enclavation decreases control of the PIOL in the anterior chamber and increases the chance of endothelial damage. Currently, placement of temporary sutures to create a closed system represents a favorable option to prevent anterior chamber shallowing. However, this option is time-intensive, as the sutures have to be placed and then removed. Therefore, we believe our sandwich technique represents a good alternative to temporary sutures, because it maintains a safe distance between the PIOL and the endothelium, minimizing endothelial cell damage.

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