

Ophthalmology Times

oculoplastics special report

Aluminum oxide orbital implant has better biocompatibility

By **LYNDA CHARTERS**

Reviewed by David Jordan, MD

OTTAWA, ONTARIO—A bioceramic orbital implant made of aluminum oxide represents a new generation of porous implants, because it does not dissolve in body fluids and does not release soluble components. In addition, a protein coating that forms immediately after insertion prevents the implant from being recognized as a foreign body.

“Use of this implant makes a significant clinical difference in patients because the eye sockets are quieter than with previous implants, even after 24 months of follow-up,” said David Jordan, MD, professor of ophthalmology, University of Ottawa Eye Institute, Ottawa, Ontario.

The aluminum oxide implant (Alumina, FCI, Issy-Les-Moulineaux, France) is the newest in a long series of materials used in the eye socket following enucleation and evisceration. The oldest implant materials, such as glass, gold, silver, cork, and assorted metals, had various problems associated with their use.

More recently, polymethylmethacrylate, which was well tolerated without many associated problems, became the standard orbital implant. This was later followed by the hydroxyapatite implant (Bio-Eye, Integrated Orbital Implants Inc., San Diego, CA); the material was formed during a high-temperature patented

process in which the chemical makeup of ocean coral was changed from calcium carbonate to calcium phosphate.

“Hydroxyapatite is recognized by the human body as a similar substance. This was a big breakthrough, considering that the body responds to the implantation of plastic by building a fibrous barrier around it. In addition, hydroxyapatite is porous, which allows the body to grow into it and prevents migration of the implant,” Dr. Jordan explained in an interview with *Ophthalmology Times*.

Another advantage of porous implants is that at about 6 months after implantation, a hole can be drilled into the material and a peg

inserted, which allows the eye socket implant to be fastened to the overlying artificial eye. A synthetic version of the hydroxyapatite implant also became available in the 1990s (FCI, Issy-Les-Moulineaux, France).

Advanced technology

The advent of the bioceramic orbital implant advanced the technology a step further.

“This implant looks almost identical to the Bio-Eye implant, in that both are round and have multiple holes. When it is inserted into the eye socket, the tissue grows into it and the implant can be pegged at a later date,” Dr.

Figure 1A



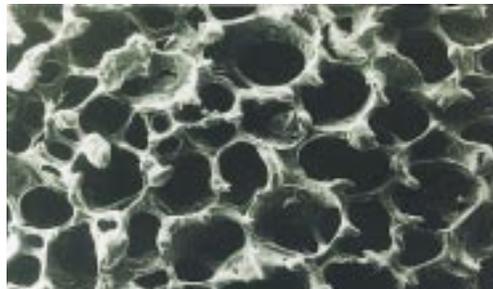
The bioceramic orbital implant is made of aluminum oxide.

Figure 1B



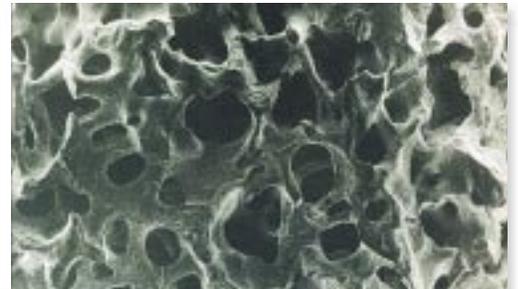
The Bio-Eye implant is made of hydroxyapatite.

Figure 2A



A scanning electron microscopic view of the bioceramic implant.

Figure 2B



A scanning electron microscopic view of the hydroxyapatite implant.

Jordan noted.

“However, in addition to being less expensive than the Bio-Eye implant, the body responds better to aluminum oxide. The tissues grow on aluminum oxide better than on hydroxyapatite, indicating that the material is more biocompatible with human tissue,” he said.

“The patient’s protein that coats the aluminum oxide implant allows it to be immunologically camouflaged and more bioinert compared with hydroxyapatite. Both materials are biocompatible, but I favor the one that causes the least reaction when implanted,” Dr. Jordan continued.

A quieter response

After having implanted 150 Bio-Eye implants, 150 synthetic hydroxyapatite implants, and 85 aluminum oxide implants, Dr. Jordan said that the eye sockets in which the aluminum oxide implants were used are quieter than the sockets with the other types of implants. He has implanted more aluminum oxide implants than any other oculoplastic specialist worldwide.

“After follow-up times up to 24 months after implantation, it appears the body’s tissues seem to prefer aluminum oxide over hydroxyapatite. Over the long term, this may make a difference,” he said.

“In addition, the aluminum oxide implant is less expensive than the hydroxyapatite implant (\$400 compared with \$600), slightly stronger than the synthetic hydroxyapatite implant, and equally as strong as the original hydroxyapatite implant,” Dr. Jordan said.

Few complications are associated with implantation of the aluminum oxide implant. In the 85 patients who have received the implant thus far, there have been no cases of implant exposure, historically the primary

Figure 3A



The bioceramic implant in a patient looking straight ahead.

Figure 3B



The same patient gazing left.

Figure 3C



The same patient gazing right.

Figure 3D



The same patient gazing up. (Photos courtesy of David Jordan, MD)

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problem postoperatively. There have also been no cases of conjunctival thinning, pain, pyogenic granulomas, discharge, or infection.

An identical technique is used to implant both the aluminum oxide and the hydroxyapatite implants. First, the eye is removed and the muscles are isolated. The implant is wrapped in either donor sclera, donor fascia, or an absorbable mesh and inserted, the muscles are hooked to the implant, and the tissue is then sewn over.

Dr. Jordan has no proprietary interest in this technology. The aluminum oxide implant was approved by the FDA on April 22, 2000, for use in the United States and approved for use in Canada on April 13, 2001.

For more information about the implant, contact FCI Ophthalmics, of Marshfield Hills, MA, at info@fci-ophthalmics.com. ♠

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