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Porous Hydroxyapatite in Orbital Reconstructive Surgery: Radiologic Recognition

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Summary: The authors describe two patients in whom porous hydroxyapatite was used in orbital surgery, and demonstrate the postoperative CT appearance of this material, ie, an irregular-shaped, calcified, extraconal mass.

Index terms: Orbits, computed tomography; Surgery, reconstructive

Interpore porous hydroxyapatite (Interpore International, Irvine, CA) is a bone graft substitute derived from specific marine corals. Interconnected porosity of this material mimics the microstructure of bone, providing a scaffold for connective tissue and bone ingrowth. The utility of this material in orthognathic and maxillofacial surgery has been recently presented in nonradiologic literature (1–4). Herein we describe the computed tomographic (CT) appearance of this prosthetic material in two patients with orbital reconstructive surgery.

Case 1

A 65-year-old woman underwent enucleation of the left globe for choroidal melanoma in April 1988, with no evidence of extrabulbar extension at surgery. Resulting enophthalmos was treated 3 months later with subperiosteal placement of Interpore porous hydroxyapatite along the lateral left orbital wall. The patient returned in August 1988 with periorbital soft-tissue swelling, and was referred for CT examination.

Postcontrast axial orbital CT scan at the mid-orbit level revealed a prosthetic left globe, and an ovoid densely calcified extraconal mass along the lateral left orbital wall (Fig. 1A), which was the porous hydroxyapatite prosthetic material. Uniform, enhancing pre-septal soft-tissue swelling was demonstrated at the mid and lower orbit level with a lobulated mildly enhancing intraconal soft-tissue mass within the lower orbit (Fig. 1B), which at biopsy was recurrent melanoma.

Case 2

A 5-year-old boy with complete blindness and bilateral retinal detachments resulting from retrolental fibroplasia presented in July 1986 for treatment of bilateral enophthalmos. Methylmethacrylate without barium was placed along the medial right and the superior left orbital walls during separate surgeries in 1986 and 1987. Interpore calcium hydroxyapatite crystals were placed subperiosteally along the medial left orbital wall in 1988. The patient was referred for CT examination in 1990 for evaluation of possible periorbital swelling.

Noncontrast axial orbital CT scans demonstrated an ovoid, noncalcified, hyperdense, extraconal mass along the medial right orbital wall displacing the medial rectus (Figs. 2A and 2B). This corresponds to cranioplast prosthetic material. A densely calcified extraconal lesion along the left lamina papyracea similarly displaces the adjacent medial rectus, and represents calcium hydroxyapatite prosthetic crystals. Bilateral marked coarse intraocular calcification and microphthalmia (Figs. 2A and 2B) are consistent with the history of retrolental fibroplasia.

Discussion

Interpore porous hydroxyapatite is a nonresorbable, biocompatible implant material derived from reef building coral of the *Poritidae* family (1). The 190–230 micron interconnected pores of Interpore 200 mimic the microstructure of bone. In vivo studies, including biopsy follow-up, have histologically documented bone and soft-tissue ingrowth within subperiosteal implantations of porous hydroxyapatite (1–3). Porous hydroxyapatite is well tolerated as a bone graft substitute with absence of acute or chronic inflammatory cells at biopsy, and few instances of postoperative infection. Advantages over autogenous bone grafting include absence of donor site morbidity and lack of unpredictable resorption and remodeling. While surgical applications of this prosthetic

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Fig. 1. Patient 1: Axial postcontrast CT through the mid (A) and lower orbit (B) demonstrates a prosthetic left globe (P), and densely calcified extraconal porous hydroxyapatite prosthetic material along the lateral left orbital wall (arrows). A lobulated enhancing intraconal inferior orbital mass (asterisk) was biopsy-proven to be recurrent melanoma.

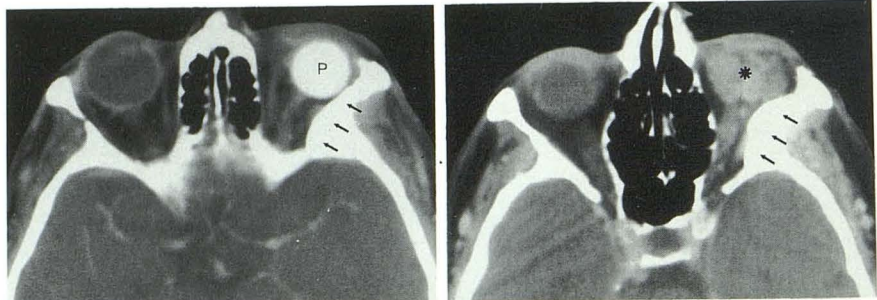
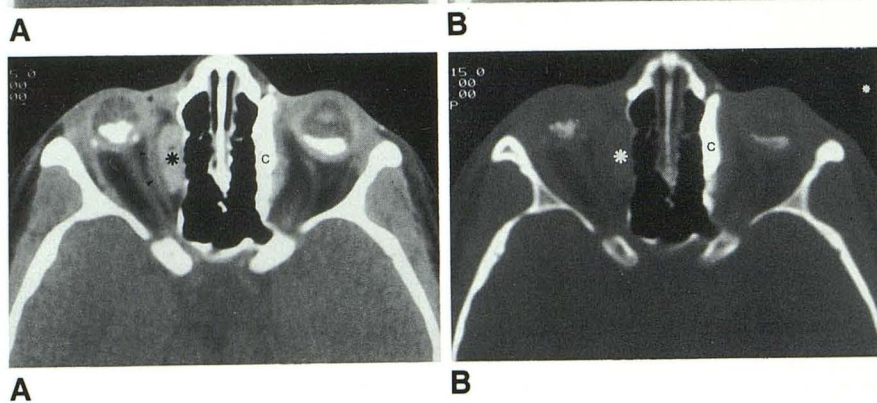


Fig. 2 Patient 2: Noncontrast axial orbital CT soft tissue (A) and bone windows (B) of a 5-year-old boy with history of retrolental fibroplasia. Bilateral orbital reconstructive surgeries were performed for treatment of secondary enophthalmos. Cranio-plast prosthetic material along the medial right orbital wall (asterisk) appears as a non-calcified ovoid hyperdense mass, displacing the adjacent medial rectus muscle (arrowheads) and improving the patient's enophthalmos. Densely calcified extraconal calcium hydroxyapatite prosthetic crystals are present along the left lamina papyracea (C).



material have been published in the orthodontic and maxillofacial literature, this is, to our knowledge, the first report of this material's radiographic appearance in the radiologic literature.

In both our patients, Interpore porous hydroxyapatite appeared on CT as an irregular calcified extraconal mass. On bone windows, its density appears equivalent to the contiguous cortical bone. There was secondary displacement of the overlying extraconal muscles, with no intraconal direct extension or inflammatory change beyond the immediate postoperative period. In a patient with history of prior orbital surgery, a calcified subperiosteal hematoma might have a similar appearance. If a history of orbital prosthetic implantation is not provided, care should be taken to avoid confusing porous hydroxyapatite with

fibrous dysplasia, Paget's disease, primary bone tumor (giant cell tumor, chondrosarcoma, osteosarcoma), blastic metastasis (prostate, treated breast cancer), or hyperostosis secondary to meningioma.

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