

CASE REPORT

An Innovative Modified Orbital Implant in Enucleated Eyes for Postoperative Functionality and Cosmesis

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ABSTRACT

Orbital implants replace the volume lost by enucleated eye, impart motility to the prosthesis, and maintain cosmetic symmetry with the fellow eye. They include nonintegrated, synthetic semi-integrated, integrated, bio-integrated, and biogenic varieties. The much favored hydroxyapatite (bio-integrated) implant, due to its rough surface, needs to be wrapped in donor sclera or other wrapping materials (like polyglactin-910 mesh, polytetrafluoroethylene sheet, etc.) to which the muscles could be directly sutured. Cost factor of such wrappings is often prohibitive that add to the expense of such implants.

Purpose: To highlight monofilament polypropylene surgical mesh commonly used for herniorrhaphy as an alternative implant wrapping for achieving augmented implant volume and enabling easier extraocular muscle attachment in postenucleation reconstruction of artificial eye.

Materials and methods: Following enucleation of a nonfunctional eye in a patient who met with a road traffic accident, a 14 mm hydroxyapatite ball was used to replace the globe. The ball was wrapped with a monofilament polypropylene surgical mesh used in herniorrhaphy and sutured. The patient achieved a satisfactory cosmesis and movements of the implant for different gazes. No ocular discomfort or implant extrusion was reported following 6 months of follow-up.

Conclusion: Monofilament polypropylene mesh can be used safely as an orbital implant wrapping, economizing the implant cost.

Keywords: Hydroxyapatite, Implant wrappings, Orbital implants.

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INTRODUCTION

Following enucleation or evisceration, there is a reduction in the volume of the orbital contents, which needs to be

replaced by an orbital implant. A prosthetic eye without an implant causes stretching of the lower lid under its weight and has poor motility. Thus, an orbital implant is inserted for achieving satisfactory prosthetic motility and better cosmetic results. The implant can be inserted at the time of surgery (enucleation or evisceration) or later.

CASE REPORT

A 30-year-old male presented to our hospital with complaints of protrusion of right eye, loss of vision, and severe pain in the same eye following a road traffic accident 3 days before the time of presentation. Loss of vision was sudden in onset associated with severe pain along with two episodes of vomiting. There was no history of loss of consciousness or bleeding from the ear. The patient was referred to us from a local hospital following first aid that included repair of a right temporal laceration.

On local examination, sutures were present over the right temporal and zygomatic region. Globe was proptosed with absent extraocular movements. Periorbital edema and ecchymosis were present in both the lids of the right eye with marked subconjunctival hemorrhage, the posterior margins of which could not be assessed. Cornea was dry and lusterless following exposure keratopathy. Anterior chamber was shallow. Pupil was dilated and fixed (Figs 1A and B). Visual acuity: Oculus dexter – PL negative; oculus sinister – 6/6.

On general and systemic examination, abrasions were present over the right knee with mild pain. No other significant abnormality was detected. Routine blood investigations were carried out and polymorphs (83%), total leukocyte count (16,400/mm³), and erythrocyte sedimentation rate (18 mm in first hour) were slightly raised. Noncontrast computed tomography (NCCT) head showed fracture of lateral wall of right orbit, right zygomatic arch, and right lamina papyracea with abnormal attenuation in retroconal region. The NCCT orbit (Fig. 1C) showed findings of:

- Soft tissue swelling involving preseptal and retrobulbar region on right side with proptosis.
- Multiple fractures involving right zygomatic arch, right nasal bone and septum, right maxillary sinus wall with air fluid level in right maxillary sinus, and suggestion of avulsion of the globe.

Conservative option being ruled out, enucleation was performed under general anesthesia due to the painful,

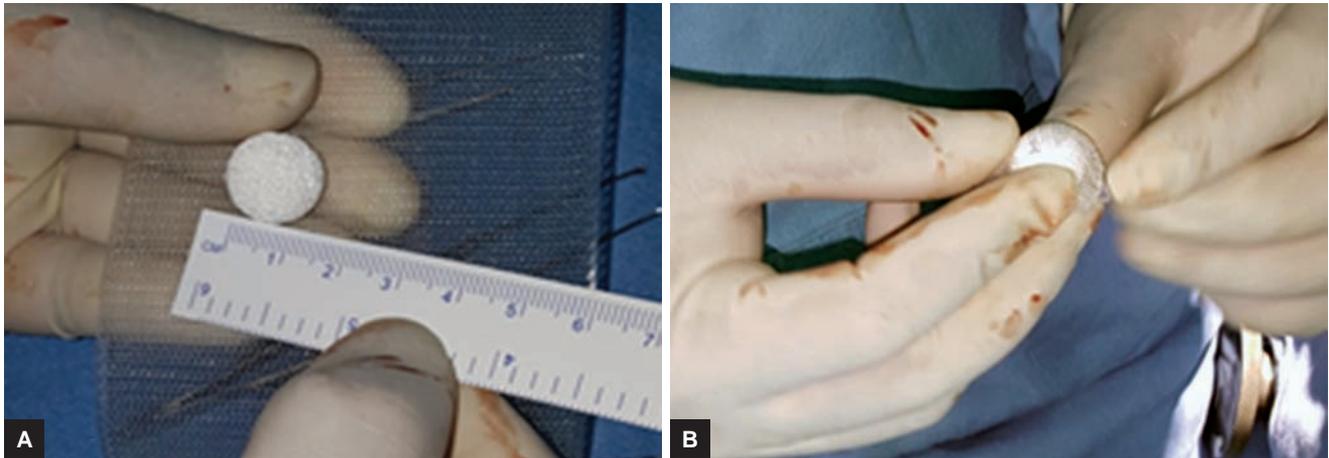
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Figs 1A to C: (A and B) Presentation of the patient; and (C) NCCT orbit showing multiple fractures



Figs 2A and B: Wrapping of the implant with prolene mesh



Figs 3A to C: (A) Placing the implant in the socket; (B) suturing the extraocular muscles to the mesh; and (C) closing the socket

nonfunctional status of the eye with nil visual prognosis. A 14 mm hydroxyapatite ball was used to replace the globe (Fig. 2A). The ball was wrapped with a monofilament polypropylene surgical mesh used in herniorrhaphy and sutured with 5-0 Vicryl (Fig. 2B). The wrapped implant was placed in normal saline for 5 minutes to loosen the stiffened fibers of the mesh. Implant was placed in the socket thereafter under the cover of tenons (Fig. 3A). The free ends of tendons of the recti and oblique muscles were sutured on the wrap at preordained markings (Fig. 3B). The tenons and conjunctival layers were sutured subsequently in vertical and horizontal fashion using 5-0 Vicryl and silk sutures respectively (Fig. 3C).

Postoperative recovery was uneventful with subsidence of edema within 48 hours. Satisfactory movements of the implant were achieved for different gazes (Figs 4A and B). No ocular discomfort or implant extrusion was reported, following 6 months of follow-up (Fig. 4C).

DISCUSSION

There are various types of orbital implants available: Nonintegrated or solid implants [polymethyl methacrylate (PMMA), silicone], semi-integrated implants (Allen implant), integrated or porous implants (Cutler's implant), bio-integrated implants (hydroxyapatite, porous polyethylene), and biogenic implants (cancellous bone).



Figs 4A to C: (A) Postoperative day 1; (B) postoperative day 7; and (C) after 6 months

Nonintegrated implants do not allow integration with orbital structures or prosthesis; PMMA and silicone spheres are the commonest nonintegrated implants used today.¹ There is a recent trend of wrapping a PMMA or silicone implant in donor sclera and attaching the extraocular muscles to the sclera to provide better implant centering and prosthesis motility.²

Hydroxyapatite, a complex calcium-phosphate salt, is a component of human bone. The porous hydroxyapatite implant allows fibrovascular ingrowth into it and gets incorporated into the orbital tissue, minimizing the chance of displacement and extrusion as well as providing better motility. Because of its rough surface, the implant needs to be wrapped in donor sclera or other materials.

Motility peg insertion provides an indirect attachment of the orbital implant to the prosthesis, enhancing prosthesis motility.³ Pegging of hydroxyapatite implant can sometimes be performed as early as 6 months after initial surgery in patients desirous of having a better prosthesis motility, pending confirmation of vascularization.⁴ Pegging may, however, increase the risk of implant exposure and infection.⁵

Implant exposure seems to be a major complication with hydroxyapatite implant (1–15%).⁶ The results vary vastly due to variations in surgical procedure. Proper implant size and meticulous wound closure minimize the risk of implant exposure.

Proper implant size is important. An implant that provides about 65 to 70% of volume replacement is ideal, the remaining 30 to 35% being contributed by the prosthesis. A recent trend is to use the axial length of the fellow eye (axial length in mm² = implant diameter in mm) to choose the implant size.⁷

The advantages of implant wrapping include: Providing an additional barrier with reduced risk of implant exposure, enabling easy attachment of extraocular muscles providing better prosthesis motility, entailing a smooth external surface making the process of implant

insertion easier, and helping in volume enhancement by adding 1 to 1.5 mm in the implant diameter.⁸

Most popular wrapping material is the donor sclera. Others include donor-processed pericardium and fascia lata. Popular synthetic wrapping materials are polyglactin-910 mesh, poly-tetrafluoroethylene sheet,⁹ etc. The use of these synthetic wrapping materials significantly raises the cost of surgery.

Present work had tried a monofilament polypropylene surgical mesh as an alternative implant wrapping material, which is used in herniorrhaphy procedures, with satisfactory postoperative results. Key advantages were easy availability of the mesh and minimizing the cost of the implant.

CONCLUSION

In surgeries involving orbital implants, a monofilament polypropylene mesh can be used safely as an alternative to other synthetic orbital implant wrapping material. In addition to the advantage of using a biointegrated implant, the newly tried wrapping material economizes the implant procedure.

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