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Two-stage procedure for management of large exposure defects of hydroxyapatite orbital implant

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PURPOSE. *To report the results of a newly devised two-stage surgical technique for management of large hydroxyapatite exposure defects.*
METHODS. *Eight patients with exposed hydroxyapatite orbital implant were treated in two stages. The exposed hydroxyapatite anterior surface was burred down and the defect was directly closed 3 to 13 months after the primary procedure. Then a mucous membrane or dermis-fat graft was added for socket reconstruction.*
RESULTS. *Trauma was the primary cause of enucleation in all patients. Hydroxyapatite exposures occurred 1 to 2 weeks after implantation. Mean defect size was 15 mm in the greatest dimension (range 10–21 mm). Socket reconstruction was done in seven patients with mucous membrane graft and in one patient with dermis fat graft 3 to 13 months after direct repair of the defects. All eight patients maintained closure of the defects during a mean follow-up of 13 months (range 9–19 months).*
CONCLUSIONS. *Management of hydroxyapatite exposures, especially those with large defects, can be difficult. Based on our experience, optimal results can be obtained after direct closure of the defect under minimal tension at the expense of foreshortening the fornices after which the socket can be reconstructed with a mucous membrane or dermis fat graft as a secondary procedure. (Eur J Ophthalmol 2003; 13: 789-93)*

KEY WORDS. *Hydroxyapatite implant, Orbital implants, Hydroxyapatite exposure*

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INTRODUCTION

Hydroxyapatite (HA), coral-derived calcium phosphate, has received considerable attention as a new material for integrated orbital implants since 1985 (1). Early clinical studies reported an absence of exposure with these integrated implants (2, 3). With the increasing use of these implants, complications including exposure have become more apparent to orbital surgeons. Despite several reports on different treatment options of HA exposure (4-10), management of these cases can be extremely difficult. The problem is more with large defects where the conjunctiva may be relatively deficient. In these cases, hard palate, mucosal grafts, or dermis fat grafts have been recommended (4, 5). However, anterior melting and recurrence of the exposure has been observed (4).

In this article, we report our experience with a newly devised two-stage technique for treatment of large

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HA exposure defects. The technique consists of burring down the exposed anterior surface with direct closure of the defect, followed by adding a mucous membrane or dermis fat graft for reconstruction of the sockets.

MATERIALS AND METHODS

Over a 20-month period, all patients referred with large exposed HA implants (≥10 mm) were treated by the authors as described below.

Surgical Technique

Conjunctiva and Tenon tissue were trimmed and freshened around the bare area and undermined for 360°. The coral surface was ground down with a drill burr to make it less convex and slightly smoother to facilitate reapproximation of surrounding tissues (Fig. 1). Tenon capsule was brought together with closely spaced interrupted 5-0 Vicryl sutures, and the conjunctiva was closed with closely spaced bites of continuous 6-0 Vicryl sutures. The fornices were inadequate to hold the conformer. The patients were followed up for 3 to 13 months after direct closure of the defects. Thereafter, socket reconstruction was done. For socket reconstruction, a transverse incision was placed centrally across the conjunctiva. Conjunctiva was undermined and spread until a large conformer could be inserted easily and the eyelids closed over it (Fig. 2). Tenon was left intact over the implant. In all cases except one (Case 2), the bared Tenon capsule was covered with oral mucosa and sutured to the surrounding conjunctiva with a continuous 6-0 Vicryl suture. In Case 2, the created defect was covered with a thin dermis fat graft. Then the upper and/or lower fornices were formed by three 4-0 Vicryl fornix-forming sutures placed through the full thickness of the lid (Fig. 3). A conformer was placed and temporary tarsorrhaphy was performed.

RESULTS

Eight patients with large exposure defect were managed successfully (Tab. I). Trauma was the primary cause of enucleation in all cases. HA was implanted

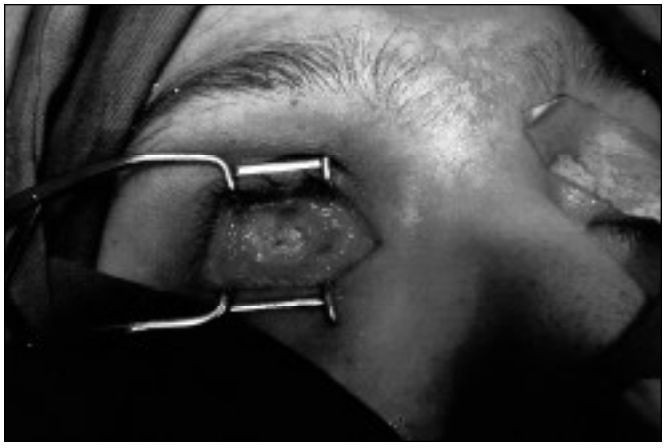

Fig. 1 - *Exposed coral implant becomes less convex and smoother after being ground down.*

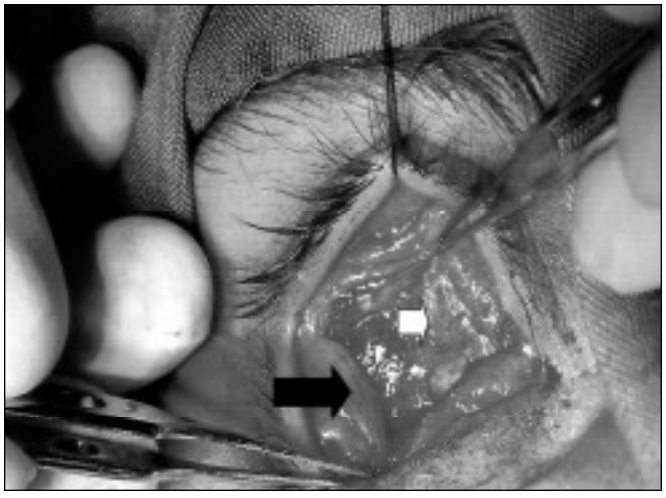

Fig. 2 - *Conjunctiva is undermined and spread away (black arrow). Intact well-vascularized Tenon capsule is visible (white arrow).*

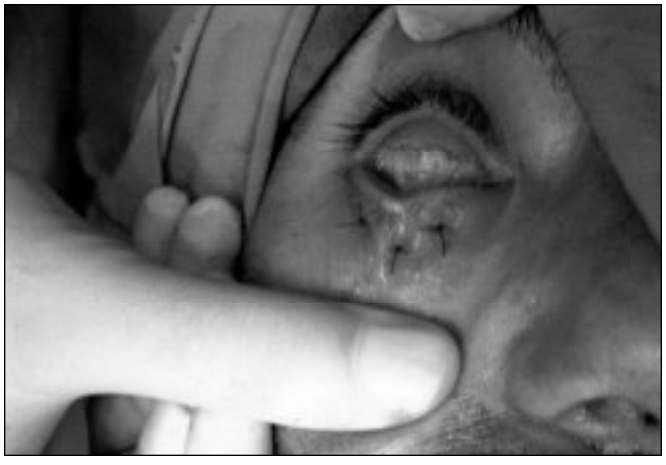

Fig. 3 - *The defect is covered with oral mucosa. Three fornix-forming sutures are placed in the lower fornix.*

TABLE I - SUMMARY OF THE PATIENTS

Case no.	Age (yr)/sex	Type of surgery	Time to exposure (wk)	Size of defect (mm)	Prior procedures	Time (mo) between primary and secondary repair	Socket reconstruction	Total follow-up time (mo) after direct repair
1	50/M	Primary implantation	1	14x16	(1) Simple repair (2) AMT (3) MMG	6	MMG	9.5
2	26/M	Secondary implantation	2	17x15	None	5	DFG	18
3	23/F	Secondary implantation	5	15x15	(1) Simple repair (2) MMG	8	MMG	19
4	11/M	Primary implantation	3	20x21	None	13	MMG	16
5	36/M	Secondary implantation	12	11x8	(1) AMT	3	MMG	11
6	24/F	Secondary implantation	5	10x8	None	6	MMG	13
7	26/M	Primary implantation	3	20x15	None	6	MMG	9
8	34/M	Primary implantation	4	7x11	None	6	MMG	8

AMT = Amniotic membrane transplantation; MMG = Mucous membrane graft; DFG = Dermis fat graft

primarily in four patients and was placed as a secondary implant in others. Exposure took place 1 to 12 weeks after HA implantation. There was no clinical evidence for infection when tissue breakdown occurred. No predisposing factors for exposure, such as multiple surgeries, antimetabolite or radiation therapy, or systemic diseases, were noted.

The defect size ranged from 10 to 21 mm (largest dimension), with an average of 15 mm. In three cases there was at least one earlier failed attempt for closure (Cases 1, 3, and 5). All patients who were referred to us had had multiple surgical procedures to manage the exposure.

Two patients had failed Tenon-conjunctival advancement (Cases 1 and 3). Two patients had failed mucous membrane graft (cases 1, 3), and two patients had failed amniotic membrane transplantation (Cases 1 and 5).

Direct repair of the defects was successful in all patients. The average follow-up after the first stage of the operation was 6.5 months (range 3–13 months). Socket reconstruction (stage two) was also successful in all patients (Fig. 4). No re-exposure or other complications were encountered during the average follow-up period of 13 months (range 9–19 months) after direct repair. The donor site healed uneventfully in all patients.

DISCUSSION

HA orbital implants have become increasingly popular in the management of the anophthalmic socket owing to improved prosthesis motility and superior cosmesis (3, 11). In 1992, Goldberg and associates reported six cases of exposed HA implants (11). Since then, many reports of exposure have surfaced, giving rates ranging from 1.6% to as high as 21.6% (7). The reported reasons for exposure include lack of vascular ingrowth (12), inflammatory reaction of the overlying tissues (12, 13), poor surgical technique, antimetabolite or radiation therapy, systemic diseases such as diabetes mellitus, multiple previous operations (6), infection (7), and too early or poorly fitting prosthesis (5, 7, 9). In our cases, poor surgical technique seems to be the most important factor in unusually large exposure defects. HA implantation was done in most cases by surgeons, not oculoplastics subspecialists.

A number of procedures have been advocated to handle porous implant exposure, including hard palate, dermis fat graft (4), burring down the surface of the HA implant and direct closure (5), simple closure, scleral patch graft, bipedicle conjunctival flap (6), temporalis fascia graft (7), Müller muscle flap (8),

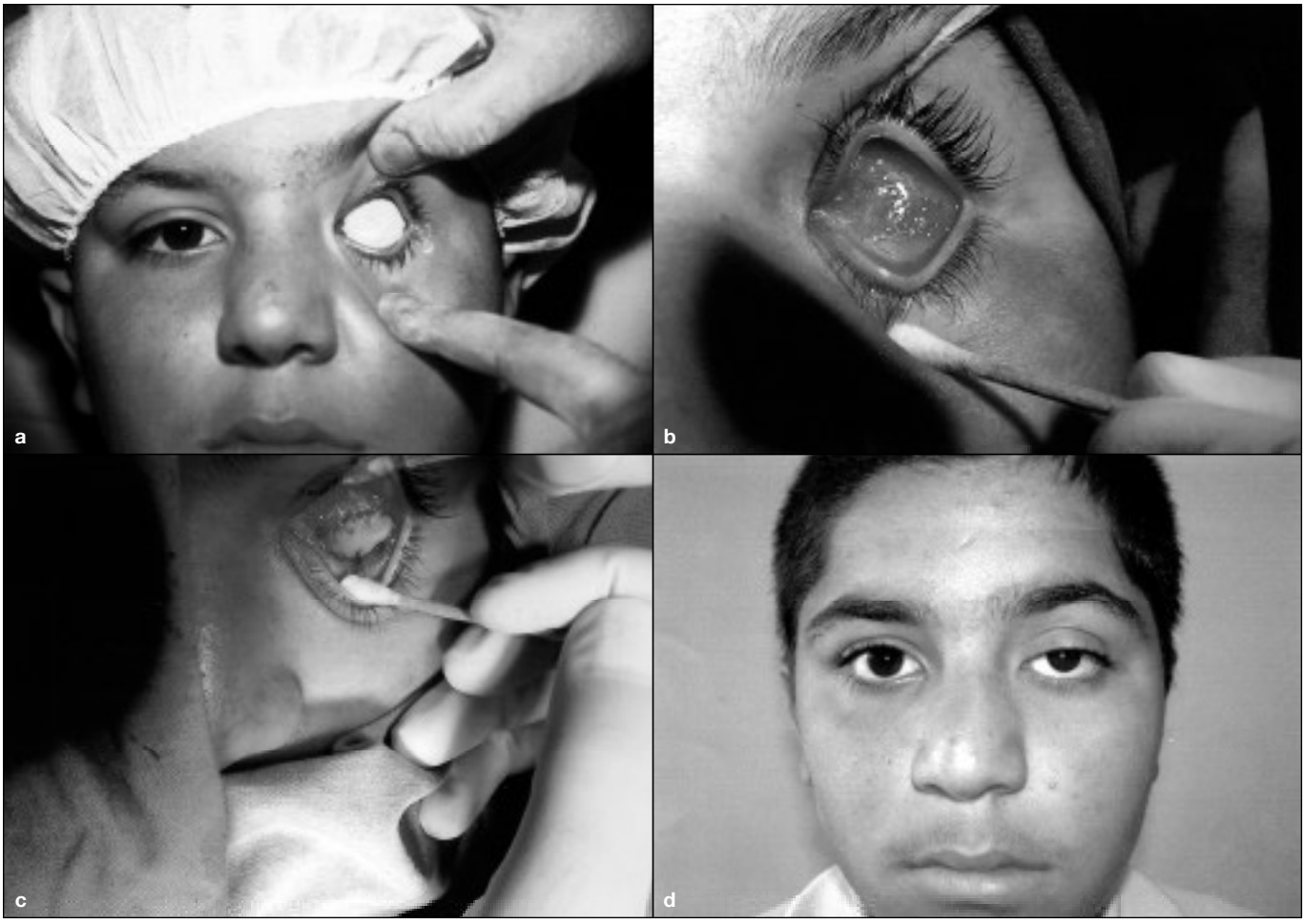

Fig. 4 - *Case 4.* **a)** *An 11-year-old patient presented with 20x21 mm exposure defect 3 weeks after primary implantation.* **b)** *Thirteen months after direct repair.* **c)** *Socket reconstruction with mucous membrane graft.* **d)** *Two weeks after socket reconstruction, prosthesis is in place.*

tarsal patch flap (9), and two-stage pedicled conjunctival flap from the lower lid (10). Most of the above techniques have been described to repair small to medium (<10 mm) exposure defects. Our technique was performed to treat patients with large exposure defects (≥10 mm).

In this report, eight patients with large exposure defects were managed successfully. Previous reports (4, 5) have recommended hard palate, mucosal graft, or dermis fat graft for treatment of large defects to prevent fornix foreshortening. However, in many cases, the above procedures have resulted in anterior melting and recurrence of exposure (4). This should not be considered unexpected because a good recipient bed is the prerequisite for successful taking of the free graft. Factors that may adversely influence the chance of free graft survival are a large defect, an avascular underlying HA, and coarse irritative HA spicules. In addition, as mentioned by Oestreicher (5), it is extremely important that the tissues brought over the top of the anterior surface to effect closure have adequate blood supply of their own to prevent their breakdown.

We believe the surrounding Tenon and conjunctiva with rich vascular supply is the most appropriate tissue for covering exposed HA. In case of exposed coral implants, one should refresh the edges of the surrounding conjunctiva, dissect in the sub-Tenon space, extensively mobilize the tissues, and close the wound with minimal tension. In this stage the surgeon should not

fear the foreshortening of the fornices because this can be corrected in the second stage of the operation, as described above. In our series, socket reconstruction was done 3 to 13 months after direct repair of the defect. This follow-up period was considered sufficient to determine the efficacy of direct closure as most implant exposures become clinically apparent within 3 months of surgery (12, 13).

At surgery, the coral should be burred down. This has at least two advantages. Some of the abrasive spicules are eliminated (7) and convexity of the surface is lessened; the latter provides easier closure of the wound. After successful primary repair, the anterior avascular area within the HA implant will slowly fill with fibrovascular tissue. This process takes several months, after which the socket is ready for reconstruction of the foreshortened fornices with a mucous membrane or dermis fat graft on a well-vascularized bed.

This two-stage procedure was successful in all patients. At the time of the most recent follow-up, all the patients treated with this approach are doing well with adequate vascular tissue coverage of the HA implant and the fornices were adequate to hold prosthesis. We recommend consideration of this technique when presented with exposures of HA implant, especially those with large defects in the absence of clinical signs of infection.

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