Surgical coverage of exposed hydroxyapatite implant with retroauricular myoperiosteal graft

S L Liao, S C S Kao, J H S Tseng, L L-K Lin

Background: With the increasing use of hydroxyapatite orbital implants, the complication of exposure has become apparent to oculoplastic surgeons. Many kinds of patch grafts, such as sclera, dermis, and hard palate mucosa, have been used to cover exposed hydroxyapatite implants with inconsistent results. In this study, the authors use a newly developed technique, autogenous retroauricular myoperiosteal graft, and the results are reported.

Methods: A piece of retroauricular muscle together with its underlying periosteum was carefully harvested. This myoperiosteal graft was patched to the debrided hydroxyapatite exposure area with the periosteal surface facing outward. The margin of periosteal surface was secured with conjunctiva and left uncovered for the surrounding conjunctiva to epithelialise.

Results: Nine eyes with hydroxyapatite exposure more than 3 mm were managed with autogenous retroauricular myoperiosteal grafts. Seven cases were successfully treated with single graft surgery. The other two cases needed an additional graft surgery, and there was no re-exposure noted thereafter. Five patients received a successful insertion of the motility peg. All nine patients have been fitted with prosthesis with reasonable motility. There were no complication noted during more than 1 year of follow up.

Conclusion: The thick composite nature of the myoperiosteal graft provides a durable and vascularised coverage for exposed hydroxyapatite implants. This technique offers an encouraging alternative for the management of exposed hydroxyapatite implants.

See end of article for authors’ affiliations

Correspondence to: Shu-Lang Liao, MD, Department of Ophthalmology, National Taiwan University Hospital, 7, Chung-Shan South Road, Taipei, Taiwan; lang89@ha.mc.ntu.edu.tw

Accepted for publication 28 March 2004

EXTENDED REPORT

Surgical coverage of exposed hydroxyapatite implant with retroauricular myoperiosteal graft

S L Liao, S C S Kao, J H S Tseng, L L-K Lin

Background: With the increasing use of hydroxyapatite orbital implants, the complication of exposure has become apparent to oculoplastic surgeons. Many kinds of patch grafts, such as sclera, dermis, and hard palate mucosa, have been used to cover exposed hydroxyapatite implants with inconsistent results. In this study, the authors use a newly developed technique, autogenous retroauricular myoperiosteal graft, and the results are reported.

Methods: A piece of retroauricular muscle together with its underlying periosteum was carefully harvested. This myoperiosteal graft was patched to the debrided hydroxyapatite exposure area with the periosteal surface facing outward. The margin of periosteal surface was secured with conjunctiva and left uncovered for the surrounding conjunctiva to epithelialise.

Results: Nine eyes with hydroxyapatite exposure more than 3 mm were managed with autogenous retroauricular myoperiosteal grafts. Seven cases were successfully treated with single graft surgery. The other two cases needed an additional graft surgery, and there was no re-exposure noted thereafter. Five patients received a successful insertion of the motility peg. All nine patients have been fitted with prosthesis with reasonable motility. There were no complication noted during more than 1 year of follow up.

Conclusion: The thick composite nature of the myoperiosteal graft provides a durable and vascularised coverage for exposed hydroxyapatite implants. This technique offers an encouraging alternative for the management of exposed hydroxyapatite implants.
auricular muscle (fig 2A). The size was calipered and the donor area was marked. A scalpel with a No 10 blade was used to incise through the muscle and periosteum layers vertically down to the bony part. The composite graft was harvested with a periosteum elevator, to free the periosteum from the temporal bone. Since the intact posterior auricular muscle tensed on the temporal bone before harvest, the freed graft shrank and became thicker. The composite components of the graft, periosteum, and muscle are shown in figure 2B. The subcutaneous layer of the donor site was closed with 4-0 Dexon interrupted sutures, and the skin wound with 6-0 Nylon continuous sutures.

**Myoperiosteal graft application**

The myoperiosteal graft was applied to the recipient bed, with the periosteum surface outward and the muscle layer facing the recipient bed (fig 2C). The graft should be flush tight both on the bed and along the border. The margin of the periosteum layer was secured to the recipient sclera if available or to the Tenon capsule underlying the exposed conjunctiva with 5-0 Dexon interrupted sutures (fig 3). The central area of the periosteum was left bare for conjunctival epithelialisation (fig 2D). In this way, the risk of fornix loss could be avoided, especially in those cases of exposure with fibrotic contracture of conjunctival sac. Antibiotic ointment was applied and transparent conformer was inserted.

### RESULTS

Nine eyes with an implant exposure area more than 3 mm were managed with autogenous retroauricular myoperiosteal

**Table 1** Summary of cases

<table>
<thead>
<tr>
<th>Case no</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Diagnosis</th>
<th>Procedure</th>
<th>Apparent tissue defect</th>
<th>Time to defect after surgery</th>
<th>Duration of exposure</th>
<th>Re-exposure after graft</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>42</td>
<td>M</td>
<td>Ocular melanoma</td>
<td>Enucleation 20 mm</td>
<td>4×5 mm</td>
<td>3 weeks</td>
<td>3 months</td>
<td>No</td>
<td>Exposure resolution, peg inserted</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>M</td>
<td>Trauma, phthisis globe</td>
<td>Enucleation 20 mm</td>
<td>5×6 mm</td>
<td>1 month</td>
<td>3 weeks</td>
<td>No</td>
<td>Exposure resolution, peg inserted</td>
</tr>
<tr>
<td>3</td>
<td>31</td>
<td>M</td>
<td>Trauma, disorganised globe</td>
<td>Retinoblastoma</td>
<td>Enucleation 20 mm</td>
<td>3×3 mm</td>
<td>1 month</td>
<td>6 months*</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>F</td>
<td>Trauma, phthisis globe</td>
<td>Enucleation 18 mm</td>
<td>4×4 mm</td>
<td>3 months</td>
<td>3 months</td>
<td>Yes 1×2 mm</td>
<td>Myoperiosteal re-graft, exposure resolution</td>
</tr>
<tr>
<td>5</td>
<td>28</td>
<td>F</td>
<td>Trauma, phthisis globe</td>
<td>Enucleation 20 mm</td>
<td>6×15 mm</td>
<td>3 months</td>
<td>2 weeks</td>
<td>Yes 3×2 mm</td>
<td>Myoperiosteal re-graft, exposure resolution</td>
</tr>
<tr>
<td>6</td>
<td>39</td>
<td>F</td>
<td>Endophthalmitis</td>
<td>Evisceration 20 mm</td>
<td>4×8 mm</td>
<td>3 weeks</td>
<td>2 weeks</td>
<td>No</td>
<td>Exposure resolution, peg inserted</td>
</tr>
<tr>
<td>7</td>
<td>33</td>
<td>M</td>
<td>Trauma, disorganised globe</td>
<td>Evisceration 20 mm</td>
<td>5×6 mm</td>
<td>6 weeks</td>
<td>3 months†</td>
<td>No</td>
<td>Exposure resolution</td>
</tr>
<tr>
<td>8</td>
<td>29</td>
<td>F</td>
<td>Trauma, disorganised globe</td>
<td>Evisceration 20 mm</td>
<td>6×8 mm</td>
<td>2 months</td>
<td>7 weeks</td>
<td>No</td>
<td>Exposure resolution, peg inserted</td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>M</td>
<td>Trauma, disorganised globe</td>
<td>Evisceration 20 mm</td>
<td>11×16 mm</td>
<td>3 weeks</td>
<td>5 months‡</td>
<td>No</td>
<td>Exposure resolution</td>
</tr>
</tbody>
</table>

*Referred patient with a failed sclera patch graft.
†Sympathetic ophthalmia with long term steroid use.
‡Referred patient with failed sclera patch graft and dermis fat graft.

---

Figure 1 (A) Hydroxyapatite implant exposure measured 11×16 mm. (B) The margin of the fibrotic conjunctiva and Tenon’s capsule around the exposed area were carefully lifted up. (C) The implant was burred down on the area of exposure. (D) The recipient bed was well prepared.

Figure 2 (A) A curvilinear skin incision was made at the retroauricular area and blunt dissection was performed to expose the posterior auricular muscle. (B) The myoperiosteal graft was harvested. (C) The myoperiosteal graft was applied to the recipient bed, with the periosteum surface outward and the muscle layer facing the recipient bed. (D) A conjunctival flap was advanced over the margin of the periosteum and the central area was left bare for epithelialisation.

---

www.bjophthalmol.com
grafts. The duration between implantation and occurrence of exposure ranged from 3 weeks to 3 months. The area of exposure measured from $3 \times 3 \text{mm}^2$ to $11 \times 16 \text{mm}^2$. The duration of exposure ranged from 3 weeks to 6 months before treatment with the current method (table 1).

Seven of these nine patients received one myoperiosteal graft only (fig 4), while two patients needed additional surgery (case 4 and 5). In case 5, the myoperiosteal graft had maintained coverage for 3 months, before re-exposure was noted. The area of exposure had shrunk significantly to $3 \times 2 \text{mm}^2$ after myoperiosteal graft compared to the original area of $6 \times 15 \text{mm}^2$. In the other case (case 4), re-exposure was noted 7 weeks after myoperiosteal graft. The area of re-exposure was $1 \times 2 \text{mm}^2$ compared to an initial area of $4 \times 4 \text{mm}^2$ (table 1). Regrafts provided complete resolution.

All patients have been followed up more than 1 year after their last surgery. Five patients received further insertion of a motility peg. No infection or extrusion of the implants were observed during the follow up period. Deep fornices were maintained in all patients except one with mildly contracted fornices (case 6), which had existed before her primary surgery. The cosmesis and motility of prosthesis were good in all patients (fig 5).

**DISCUSSION**

Porous hydroxyapatite has been successfully used as an orbital implant in enucleation, evisceration, and as secondary implant since 1985.12–16 The benefits of using this implant is its extensive porous system permitting fibrovascularisation ingrowths, which decrease the risk of implant extrusion and infection.21 In addition, with drilling and peg insertion, this implant can be directly coupled to the prosthesis, allowing a wide range of prosthetic movement, especially fine darting eye movements commonly seen during conversational speech. These movements impart a more lifelike quality to the prosthetic eye. However, with increasing use of hydroxyapatite implant, complications such as tissue breakdown, conjunctival dehiscence, and implant exposure are becoming more apparent to oculoplastic surgeons.4–13

Several causes of hydroxyapatite implant exposure had been proposed, including using too large an implant, tension on the wound, excessive inflammation related to hydroxyapatite material itself,9,18 spicules on the hydroxyapatite implant surface,5 pressure from the prosthesis to the conjunctival surface,5 or inadequate vascularisation of the implant.5 They can be prevented by appropriate surgical technique and implant size, covering the implant with the wrapped materials, attempting to accelerate vascularisation and vaulting of the prosthesis.

Small conjunctival defects ($<3 \text{mm}$) can be managed by observation and vaulting of the prosthesis.12 Larger implant exposures ($>3 \text{mm}$) required a more elaborate approach. Helveston was the first to report the use of human banked sclera patch in 1969.11 In their long term follow up report, there was a 55% success rate.7 The use of banked sclera as a patch has some drawbacks, as it may melt if vascular supply is insufficient. It may potentially contain infectious agents. As a homologous material, it may generate more inflammation than autologous tissue.

Fascia lata or temporalis fascia can be an autologous patch graft for the management of hydroxyapatite exposure.12 They
have a sturdy fibrous tissue thick enough to cover the irregular, speculated surface of the implant. In another technique, a dermis fat graft is proposed as a covering for the exposed hydroxyapatite implant. The technique suggested eliminating a portion of the exposed implant by burring it down or rongeuring it away before placing the dermis fat graft.

In general, a favoured graft for the implant exposure should have both an abundant vascular network for the ready establishment of perfusion, and a tough collagenous layer to resist melting in the early phase of hypoperfusion. In this study, we use the retroauricular myoperiosteal graft as a patch graft. Before placement of the myoperiosteal graft, we eliminated a portion of exposed implant by burring down the non-vascularised coral to establish an abundant vascular bed. We believe the burring procedure is important for the successful management of the hydroxyapatite implant exposure.

In chronic exposure, the porous spaces of hydroxyapatite may harbour infectious pathogens and cause infection or abscess of orbital implants. Jordan et al reported two cases of abscessed hydroxyapatite orbital implants. They recommended that patients with conjunctival dehiscence postoperatively should be closely observed for infection because organisms may gain access through this portal of entry. Patients with chronic medical diseases or long term steroid use may have a predisposition to infection after implant exposure. In our series, infection of the orbital implant should be considered in the differential diagnosis of hydroxyapatite implant exposure for a patient with sympathetic ophthalmia with long term steroid use (case 7). In the other two cases with regraft (cases 4 and 5), incomplete debridement of infected hydroxyapatite implant might have been partially responsible for the recurrence of implant exposure. Additional debridement of infected implants with re-application of myoperiosteal grafts led to complete resolution. We think that a severe infection or abscess within the exposed implant might require extensive removal or even complete removal of the implant. Smaller or subtotal abscesses within the implant is more likely treatable utilising the debridement, irrigation, and reconstruction of the anterior surface with autogenous grafts. Without complete debridement, the fibrovascular ingrowth would be hindered by chronic infection in these dead spaces, with graft sloughing as a result.

Several advantages have been achieved by this technique. Some of the abrasive spicules are eliminated, as well as some of the non-vascularised coral, and burring down the implant creates sufficient space for the placement of the myoperiosteal graft and the proper adjustment of the prosthetic eye. In addition, retroauricular myoperiosteal graft is a sturdy fibrous tissue accompanying the additional muscular layer. The sturdy periosteal surface, which is more durable for melting, should be faced outward; the muscular layer placed inward provides a better cushion for the underlying speculated surface of the implant, as well as having a little volume effect. Care must be taken to place the myoperiosteal graft flush tight on the recipient bed and the margin of the graft should be secured to the recipient sclera if available or to the Tenon capsule underlying the exposed conjunctiva. In cases 4 and 5, the first graft was not flush tight on the recipient bed. This failure in technique might have been partially responsible for the central melting of the first graft.

In conclusion, retroauricular myoperiosteal graft as a patch graft has several advantages. The procedure is easy to do and may be performed in the same surgical field. As it is an autologous graft, there will be less immunological reaction—that is, it is more resistant to melt. There is no risk of disease transmission. It is a sturdy fibrous tissue accompanying a muscular layer, which can serve as a better cushion by providing an additional muscle layer, as well as providing a layer of peristeum tougher than other grafts such as donor sclera or dermis fat. Because of its accessibility and low donor site morbidity, the retroauricular myoperiosteal graft can be offered as one of the options for robust autogenous tissue in reconstructing the ocular surface following exposed orbital implant.

Authors’ affiliations
S L Liao, J H S Tseng, L L-K Lin, Department of Ophthalmology, National Taiwan University Hospital, Taipei, Taiwan
S C S Kuo, Department of Ophthalmology, Hsin Chu Provincial Hospital, Taipei, Taiwan

All authors have no financial interest in the materials described in this paper

This paper had been presented in the 21st annual meeting of European Society of Ophthalmic Plastic and Reconstractive Surgery in Gothenburg, Sweden, 2003.

REFERENCES
Surgical coverage of exposed hydroxyapatite implant with retroauricular myoperiosteal graft

S L Liao, S C S Kao, J H S Tseng and L L-K Lin

Br J Ophthalmol 2005 89: 92-95
doi: 10.1136/bjo.2003.038778

Updated information and services can be found at:
http://bjo.bmj.com/content/89/1/92

These include:

References
This article cites 20 articles, 1 of which you can access for free at:
http://bjo.bmj.com/content/89/1/92#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/