Cadaver bone as orbital implant

R. K. BANSAL

From the Department of Ophthalmology, University of Nigeria Teaching Hospital, Enugu, Nigeria

Orbital implants are used to provide a mobile ball for a prosthesis to pivot on and also to prevent bony deformity of the orbital wall. Various types have been tried. Acrylic, now most commonly used, is a comparatively biologically inert substance and if proper care is taken to maintain asepsis, to achieve correct anatomical placement, and to bury the implant in a reasonably thick layer of tissue the chances of extrusion are less. But late pressure necrosis of the tissue over the implant by the artificial eye is not uncommon. Therefore individually moulded prostheses are usually required (Reed, 1964).

Synthetic polyvinyl sponge (Pearlman, 1958) does not migrate easily, as it gets organized with the host tissue, but it is more susceptible to infection. Moreover, its removal is tedious and difficult. Spaeth (1941) recommended the use of Guist's carbonized cancellous bone spheres for orbital implants, and Molteno, Van Rensberg, Van Rooyen, and Ancker (1973) have used kiel bone, an antigen-free cancellous calf bone, with good results. All other materials like glass, fat, rubber, wire, silk, fascia lata, donor sclera, and others have been condemned and are no longer used.

This paper reports a trial of cadaver bone as a buried orbital implant.

Patients and methods

The patients were selected from those coming to the outpatient department with an indication for enucleation. Fifty-four patients whose ages ranged from 8 to 54 years were operated on. The indications for enucleation were as follows: blunt injury to eye 28 cases, recent perforating injury seven cases, absolute glaucoma 15 cases, and atrophic bulbi four cases. Any infection was medically treated before operation.

Cadaver flat ribs were obtained from the university department of anatomy. The bone was thoroughly cleaned. Various sizes of implants were cut with a bone cutter. The grooves were made by saw on four sides to accommodate the recti (Fig. 1). The implants were sterilized before use by autoclaving.

OPERATIVE TECHNIQUE

Under general anaesthesia the eye ball was exposed with the help of an eye speculum. The conjunctiva and

Tenon's capsule were cut along the limbus and retracted. Each rectus was caught on a strabismus hook and a 3/0 chromic catgut suture applied near the insertion. The muscle was then detached near the insertion and clipped on to the towel with artery forceps. The inferior oblique and superior oblique were sutured to the lower margin of the lateral rectus and superior rectus respectively by 3/0 chromic catgut to prevent the migration of the implant towards the floor of the orbit. The optic nerve was crushed by artery forceps and cut. The eyeball was prolapsed out and all its attachments cut.

The four recti were pulled out and a bed for the implant prepared by achieving as much haemostasis as possible by hot sponging. An implant of the correct size was selected and placed in the floor of orbit. The four recti were placed in their respective grooves (Fig. 2). They were pulled tight and the opposite recti sutured over the implant with 3/0 chromic catgut. The four recti were then united by another 3/0 chromic catgut suture (Fig. 3). Tenon's capsule was sutured vertically by 4/0 chromic catgut with interrupted sutures. The conjunctiva was stitched by continuous 6/0 black silk suture. Soframycin eye ointment was inserted and a pad and crepe bandage applied.

The first dressing was done after 48 hours and was followed by routine daily dressings of soframycin eye ointment. Systemic antibiotics were used only when necessary. The conjunctival suture was removed after six days. Artificial eyes were fitted as soon as possible, usually after three to four weeks.

Results

Out of 54 cases with a follow-up of six months to three years only two implants were extruded. One was extruded within five days of operation. This was because the patient had a lacerated eyeball and possibly some infection. The other extrusion, after one year, was in a young girl who had a very tight artificial eye which she wore even during the night.

FIG. 1 Cadaver bone implants of various sizes

FIG. 2 *Implant placed in floor of orbit after stretching of recti*

The resulting ulceration of the conjunctiva and infection was not controlled in time. In all other cases there was some initial postoperative oedema which subsided in three to four days. In long-term follow-up the conjunctiva was seen to be adherent and uniformly thinned out. Radiologically no change was seen in the radiodensity of the implant

after three years (Fig. 4). The implants moved fully and freely.

Discussion

The results of bone implant, compared with acrylic or polyvinyl sponge implants, have been very encouraging. Moreover, cadaver bone is easily

FIG. 3 *Four recti sutured over implant*

available and costs the patient nothing. Different sizes of implant can be prepared in advance and the appropriate one chosen at operation. There was no case of exposure of the implant, as reported by Molteno and others (1973), probably because Tenon's capsule and conjunctiva were sutured in two different layers at right-angles to each other. Similarly, in no case did the implant seem to migrate towards the floor. The purpose of suturing the inferior oblique muscle to the lower margin of the lateral rectus and the superior oblique to the superior rectus was to prevent this (Stallard, 1965).

A longer follow-up is needed to know the ultimate fate of the implants, but to date there is no radiological evidence of atrophy or shrinkage. Muscles should get a better anchorage on a bone implant because of its rough surface compared with an acrylic or silicone implant.

Summary

Fifty-four cases of cadaver bone orbital implant are described. The results were encouraging. Cadaver bone implant is easily available and can be prepared in various sizes to fit the individual patient.

I thank Mrs P. Gupta, of the Department of Anatomy, for helping me to prepare the bone implants and Mr A. J. Brooks, Head of Department of Medical Illustration, for the photographs.

References

- MOLTENO, A. C. B., VAN RENSBERG, J. H. J., VAN ROOYEN, B., and ANCKER, E. (1973) *Brit. J. Ophthalm.*, **57**, 615
 PEARLMAN, M. D. (1958) *Ibid.*, **36**, 1756
 REED, H. (1964) In 'Modern Ophthalmology', ed. A. Sorsby, vol. 4, p. 934. Butterworths, London
 SPAETH, E. B. (1941) 'The Principles and Practice of Ophthalmic Surgery', 2nd ed., p. 126. Lea Febiger, Philadelphia
 STALLARD, H. B. (1965) In 'Eye Surgery', 4th ed., p. 845. Wright, Bristol

FIG. 4 Radiological appearance of implant after 3 years