Diced cartilage grafts to correct enophthalmos

D. J. COSTER¹ AND J. E. K. GALBRAITH²

From the ¹Department of Clinical Ophthalmology, Moorfields Eye Hospital, City Road, London, and the

²Royal Melbourne Hospital, Victoria, Australia

SUMMARY A technique is described using diced cartilage grafts to correct the volume deficit which is responsible for many of the unsatisfactory cosmetic features following enucleation.

Cosmetic defects following enucleation and evisceration are distressingly common. In severe cases 4 elements contribute to the abnormal appearance: enophthalmos, deepening of the superior sulcus, ptosis, and lower lid laxity. All except the lower lid laxity can be attributed to the loss of volume of intraorbital contents that follows removal of the globe. The purpose of this paper is to describe a technique for introducing diced cartilage chips into the orbit to correct the deformities resulting from loss of intraorbital tissues.

Methods

The principle of the procedure is to increase the volume of the orbital tissues by introducing costal cartilage.

REMOVAL OF COSTAL CARTILAGE

An incision 10 cm long is made along the costal margin, the medial end of the incision being 2.5 cm from the midline. The incision is made through the skin, subcutaneous tissue, and deep fascia, and the rectus abdominis muscle is retracted medially to expose the lower costal cartilages.

An incision is made in the perichondrium of the central cartilage, usually the sixth, and elevated from its anterior and posterior surface. Care must be taken when working behind the cartilage not to penetrate the pleura. The costal cartilage is removed by cutting it at each end with a rib cutter. A piece of costal cartilage 5 cm in length is usually sufficient. The perichondrial sheath is sutured with 4-0 plain catgut, and the wound is closed in layers.

INSERTION OF THE GRAFT

An incision is made along the central third of the

inferior orbital margin. The periosteum is incised and elevated off the floor back to the apex of the orbit. A small-bore cannula with internal trochar (as used for tapping fluid from the chest or peritoneal cavity) is passed along the orbital floor to the apex of the orbit and then pushed up through the periosteum. The cartilage is then diced to allow its introduction into the orbit through the cannula, the trochar being used to push the cartilage through the cannula. The artificial eye is left in place for the procedure, and enough cartilage is introduced to overcorrect the deformity slightly. The periosteum is sutured with plain catgut, and the orbicularis sutured as a second layer and the skin closed with a subcuticular monofilament nylon suture. A firm bandage is applied to minimise postoperative oedema.

Results

We have performed this operation without complication on 8 patients with cosmetic deformity following enucleation, and the results are satisfactory in all cases. The improved appearance has been maintained without any observable absorptions of the implant over the follow-up period, which is 8 years in 2 of the cases.

Discussion

The major advantages of this technique over the more commonly employed methods are due to the use of a diced cartilage autograft rather than the widely practised techniques involving implantation of synthetic materials (Sugar and Forestner, 1946; Vannas, 1958; Hill and Radford, 1965; Hill, 1967; Shannon, 1967; Smith *et al.*, 1967) or grafts of bone or fascia (Devoe, 1945; Cutler, 1946; Vannas, 1946; Gordon Cole, 1967) or large pieces of cartilage, which are liable to resorb.

Synthetic materials excite an inflammatory

Address for reprints: Mr D. J. Coster, FRCS, Department of Clinical Ophthalmology, Moorfields Eye Hospital, City Road, London EC1V 2PD

response (Ben-Hur, 1967) and have a tendency to migrate (Iliff, 1967). Of the various materials employed for orbital prostheses injectable silicone is probably the most satisfactory (Soll, 1971) but is not without its complications.

Cartilage has considerable advantage over bone. Unlike bone grafts, cartilage grafts survive equally well whether in contact with like tissue (cartilage) or some other tissue such as fat, muscle, or fascia (Peer, 1954). Functional stresses seem important for the survival of autogenous bone grafts but are unimportant for cartilage grafts, which survive and usually maintain their bulk regardless of function.

Histological examination of diced cartilage grafts (Peer, 1939, 1943) after transplantation shows that the spaces between the cartilage are at first occupied by haematoma that organises. The cartilage chips rest against each other, separated by a small area of connective tissue, and contraction is minimal. Diced grafts thus occupy a larger space than the solid rib cartilage from which they are derived. Histological sections show the survival of chondrocytes within normal matrix and general absence of connective tissue invasion and absorption.

The use of costal cartilage has the obvious advantage that it is easily obtained in quantities adequate for the procedure, and can be diced easily for introduction through the cannula.

The small incision in the inferior orbital margin can be easily hidden in a skin fold, and the subperiosteal route along the orbital floor provides easy access to the orbital apex, the periosteum healing back on to the bone of the orbital floor and sealing the tract made by the trochar and cannula. Migration of cartilage fragments has not been a problem. Using a trochar and cannula ensures that cartilage is diced to such a small size that the fragments are unlikely to resorb. There is the additional advantage that the cannula can be left in situ for the entire procedure, avoiding the need for repeated instrumentation when introducing fragments and avoiding the need for retraction of tissues which is traumatic and results in oedema and distortion.

This technique can be used only on patients who have an enophthalmic prosthesis or blind eye. Because of the obvious danger to structures in the

apex of the orbit it is a technique which cannot be employed when the orbit contains an eye with useful vision.

References

- Ben-Hur, N. (1967). Local and systemic reactions of dimethylpolysiloxane injection in mice. *Proceedings of the Second International Symposium on Plastic and Reconstructive Surgery of the Eye and Adnexa*, pp. 454-457. Edited by B. Smith and J. M. Converse. Mosby: St. Louis.
- Cutler, N. L. (1946). Fascia-lata transplant for retro-tarsal atrophy of the upper lid following enucleation. *American Journal of Ophthalmology*, **29**, 176-179.
- Devoe, A. A. (1945). Experiences with the surgery of the anophthalmic orbit. *American Journal of Ophthalmology*, **28**, 1246-1351.
- Gordon Cole, J. (1967). Correction of enophthalmos with bone and fascia lata grafts. *Proceedings of the Second International Symposium on Plastic and Reconstructive Surgery of the Eye and Adnexa*, pp. 450-453. Edited by B. Smith and J. M. Converse. Mosby: St. Louis.
- Hill, J. C. (1967). Enophthalmos: foreign injections. *Proceedings of the Second International Symposium on Plastic and Reconstructive Surgery of the Eye and Adnexa*, pp. 439-445. Edited by B. Smith and J. M. Converse. Mosby: St. Louis.
- Hill, J. C., and Radford, C. J. (1965). Treatment of advancing enophthalmos in the ocular prosthetic patient. *American Journal of Ophthalmology*, **60**, 487-492.
- Iliff, C. E. (1967). The extruded implant. *Archives of Ophthalmology*, **78**, 742-744.
- Peer, L. A. (1954). Cartilage grafting. *British Journal of Plastic Surgery*, **7**, 250-262.
- Peer, L. A. (1939). The fate of living and dead cartilage transplanted in humans. *Surgery, Gynecology and Obstetrics*, **68**, 603-610.
- Peer, L. A. (1943). Diced cartilage grafts. *Archives of Otolaryngology*, **38**, 156-165.
- Shannon, G. M. (1967). Enophthalmos: foreign injections. *Proceedings of the Second International Symposium on Plastic and Reconstructive Surgery of the Eye and Adnexa*, pp. 446-450. Edited by B. Smith and J. M. Converse. Mosby: St. Louis.
- Smith, B., Obear, M., and Leone, C. R. (1967). The connection of enophthalmos associated with enophthalmos by glass bead implantation. *American Journal of Ophthalmology*, **64**, 1088-1093.
- Soll, D. B. (1971). Correction of the superior lid sulcus with subperiosteal implants. *Archives of Ophthalmology*, **85**, 188-190.
- Sugar, H. S., and Forestner, H. J. (1946). Methacrylate resin implant for sunken upper lid following enucleation. *American Journal of Ophthalmology*, **29**, 933-1000.
- Vannas, M. (1946). The use of rib cartilage for the correction of cosmetic defects caused by enucleation. *Acta Ophthalmologica*, **24**, 225-238.
- Vannas, S. (1958). A method for correction of the retracted upper eye lid. *Acta Ophthalmologica*, **36**, 444-454.