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Four-Petal Evisceration: A New Technique

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Purpose: To describe a new evisceration technique that allows the use of large orbital implants and closure without tension on the wound.

Methods: Interventional prospective study. The technique involves quadrisectioning the sclera and placement of a large orbital implant. The sclera is sutured in 2 layers covering the implant.

Results: A total of 73 eyes underwent surgery. The implants were 22 mm in 11 eyes (15%), 20 mm in 60 eyes (82.2%), and 18 mm in 2 eyes (2.8%). Thirty-one eyes (42%) were phthisical with small scleral cavities. There was 1 case of postoperative mild superior sulcus deficiency and no cases of extrusion of the implant.

Conclusions: The 4-petal evisceration is technically easy to perform and provides excellent results with few complications. It allows the use of orbital implants of any desired size.

Orbital implant extrusion and anophthalmic socket syndrome are 2 major risks of evisceration surgery.[1,2] The main cause of implant extrusion is excessive tension on the wound. Several evisceration techniques have been described to lessen the tension on the wound and consist mainly of posterior sclerotomies.[3–10] Anophthalmic socket syndrome primarily results from loss of orbital volume. Sclerotomies have been used to expand the sclera, which allows placement of large orbital implants.[3,5–9]

We report the results of the evisceration technique we previously described[11] that allows both the insertion of large orbital implants and double-layer closure of the sclera. The technique can be used in microphthalmic or phthisical eyes.

METHODS

Surgical Technique. Under retrobulbar anesthesia and intravenous sedation, a eyelid speculum is placed between the eyelids. A 360-degree conjunctival peritomy is performed with Wescott scissors. A blunt sub-Tenon dissection with Stevens scissors is performed to expose the retrobulbar area. The cornea with 1 mm of adjacent limbus is removed and the contents of the eye are removed, leaving no choroidal tissue. Four 3/0 silk sutures are placed between the rectus muscle insertions and the limbus to serve as traction sutures and to maintain the proper position of the rectus muscles. Four sclerotomies are performed from the limbus, between the rectus muscle insertions, to the optic nerve. The optic nerve is cut at its insertion point in the posterior sclera. The 4 sclerotomies reach one another to form 4 separate scleral petals, each containing 1 rectus muscle insertion (Figs. 1, 2, and 3). The orbital implant is placed inside the 4 petals using an implant injector (Fig. 4). The 4 petals are brought anterior to the implant. Because the petals are independent from each other and from the optic nerve, the sclera can cover any size of implant without tension, even in phthisical or microphthalmic globes. The vertical petals are sutured to each other in front of the implant using a continuous 5/0 reabsorbable suture (Fig. 5). The horizontal petals are sutured in the same way over the vertical petals (Fig. 6). Conjunctiva and Tenon capsule are both sutured independently with a resorbable 6/0 continuous horizontal suture. An ocular conformer is placed at the end of the surgery.

RESULTS

Seventy-three eyes of 71 patients were eviscerated between 1999 and 2006 using the described technique. Thirty-two (45%) patients were men and 39 (55%) were women; the mean patient age was 61 years (range, 7–92 years). In all cases, an orbital implant was used. Sixty-five eyes received a biointegratable porous polyethylene implant; no perforation of the implant for peg placement was performed. Eight eyes received a nonbiointegratable silicone implant. The implants were 3 mm smaller than the axial length of the contralateral eye (22 mm in 11 eyes [15%], 20 mm in 60 eyes [82.2%], and 18 mm in 2 bilateral microphthalmic eyes [2.8%]). The indications for evisceration were blind painful eyes (n = 28; 38.3%), blind cosmetically unacceptable eyes (n = 41; 56.2%), and traumatic ruptured globes (n = 4; 5.5%). The distribution by etiology was complicated vitreoretinal surgery (n = 11; 15%), terminal glaucoma (n = 20; 28%), post-traumatic phthisis bulbi (n = 31;

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FIG. 1. The sclera is quadrisected in independent petals, each containing 1 rectus muscle.

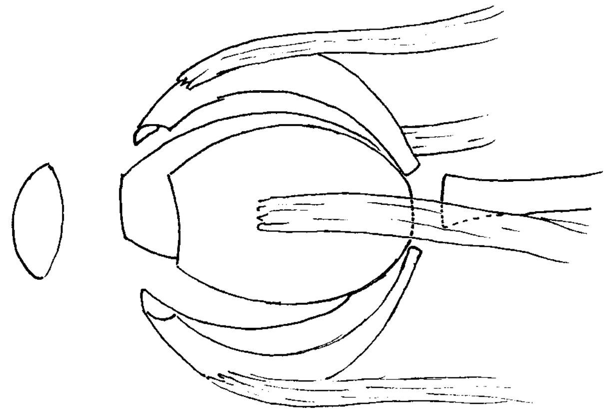

FIG. 3. Lateral view of Figure 2.

42%), acute ocular trauma (n = 3; 4%), and complicated anterior segment surgery (n = 8; 11%).

During postoperative follow-up (mean, 43 months; range, 6.3–81 months), there were no cases of implant exposure or migration, contraction of the socket, or sympathetic ophthalmia. The complications that developed were mild-to-moderate chemosis and eyelid swelling (n = 73; 100%), conjunctival cysts (n = 2; 2.73%), and mild superior sulcus deficiency (n = 1; 1.3%). The volume of the anophthalmic socket remained adequate in all cases. The cosmetic results were acceptable for all patients, except for 1 patient with mild superior sulcus deficiency.

DISCUSSION

Orbital implants were first used by Mules[12] in 1884 and Frost[13] in 1887 to restore orbital volume. Perry[14] first used biointegratable implants in enucleated or eviscerated eyes. Several materials have been used, mainly divided in biointegratable (hydroxyapatite, Medpor) or non-biointegratable (polymethylmethacrylate, silicone) types. Various surgical techniques have been described to place larger orbital implants in eviscerated globes with fewer complications and better cosmetic results.

One of the most frequent postoperative complications of an anophthalmic socket is anophthalmic socket syndrome,[2] which is caused primarily by volume loss and is generally treated by increasing the external prosthesis volume, with negative results.

Orbital implants are used in both evisceration and enucleation procedures.[15–17] We prefer evisceration over enucleation because with evisceration, the orbital anatomy (including the muscular insertions), volume, and

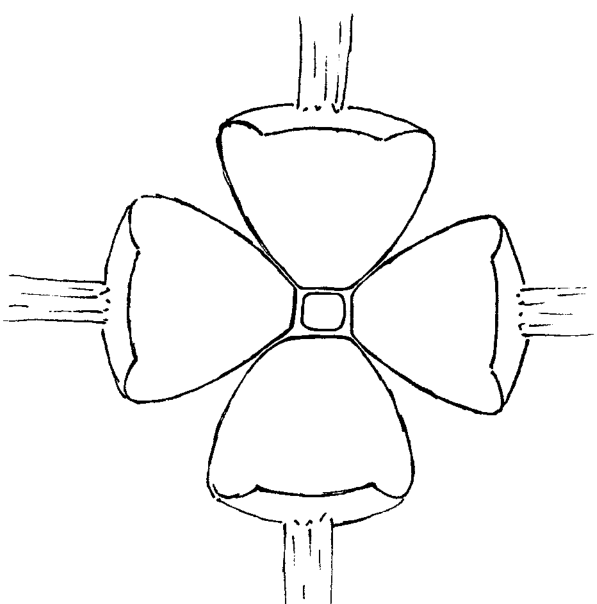

FIG. 2. Front view of the 4 independent scleral fragments, each attached to a rectus muscle. The 4 petals are sectioned from the optic nerve.

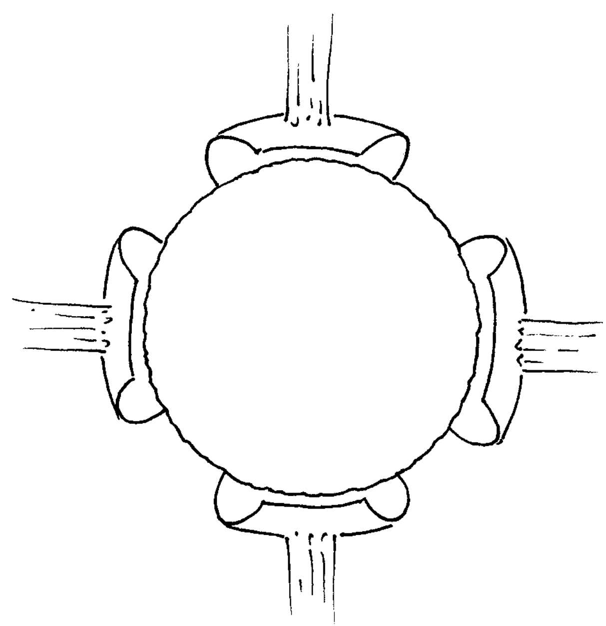

FIG. 4. The orbital implant is placed inside the 4 petals.

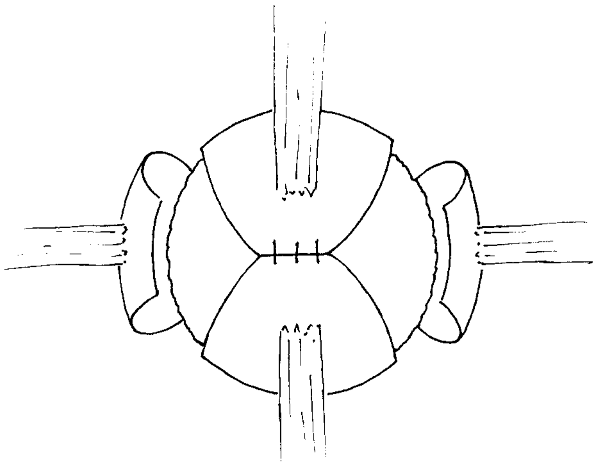

FIG. 5. The vertical petals are sutured first over the implant. The posterior sclerotomies allow the petals to be brought in front of a large implant.

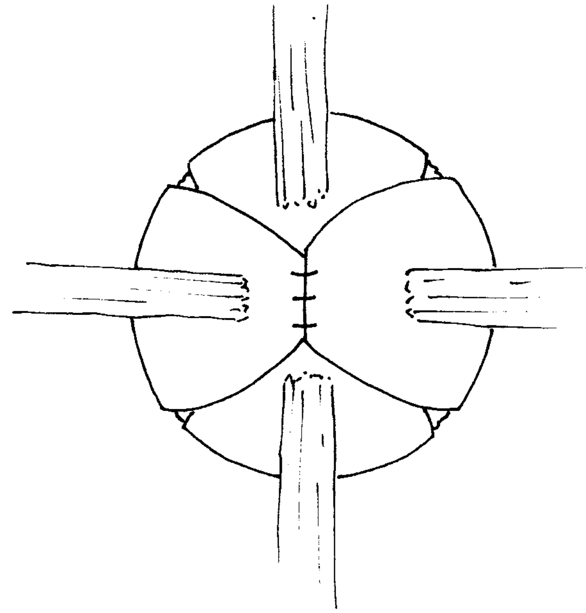

FIG. 6. The horizontal petals are sutured over the vertical petals. This order of suturing allows 3 different perpendicular planes (vertical petals, horizontal petals, and Tenon capsule).

socket motility are better preserved, leading to superior cosmetic and functional results.[18]

External prosthesis usually are 1.5 mm in sagittal depth, so the best cosmetic results with evisceration are achieved when the orbital implant measures 3 mm less than the axial length of the fellow eye.[19] Considering that eyes that undergo evisceration frequently have small scleral cavities because of phthisis bulbi, usually it is impossible to place an orbital implant greater than 16 mm in a cornea-off evisceration with an overlapped or edge-to-edge scleral closure without a sclerotomy. We always use implants approximately 3 mm less than the biometric measurement of the contralateral eye.

Extrusion of the orbital implant is a major complication of the anophthalmic cavity, produced by erosion of the overlying tissues. Exposure of the implant can lead to implant infection, which usually makes removal of the implant mandatory. Extrusion has been reported in 0% to 22% of eviscerations.[1,2] The main risk factors are inadequate surgical technique, covering of the implant with high tension, and persistent conjunctival inflammation. Duong et al.[20] reported that an inappropriately large implant predisposes to its exposure. We believe that exposure is not caused by the implant size, but by the tension of a large implant in a microphthalmic or phthisical scleral cavity. We used large implants with our technique and had no cases of exposure, probably because of the low tension resulting from the complete posterior sclerotomies and the double anterior scleral layer.

The evisceration technique has undergone several modifications with the goals of achieving a lower rate of exposure and allowing colonization of the biointegratable implant by the receptor tissue. Fibrovascular ingrowth in the implant begins at the sclerotomies.[21,22] Stephenson[3] performed meridional and equatorial sclerotomies to expand the tissue, allowing coverage of large implants without tension. Ainbinder et al.[23] performed posterior sclerotomies to facilitate colonization of the implant. Lee et al.[4] reported no exposure of the implants when the scleral window was left and covered by the rectus muscles. The modification of Kostick and Linberg[5] included relaxing incisions and posterior sclerotomies, so a large sphere could be accommodated without tension on the wound. Yang et al.[6] quadrisectioned the sclera between the rectus muscle insertions, without releasing it from the optic nerve; the authors sutured the sclerotomies in the same layer, and no cases of exposure or migration of the implants developed. Long et al.[7] reported a transscleral evisceration technique in which the posterior sclera is opened and an unwrapped orbital implant is placed behind it in the intraconal orbital fat. The scleral openings are closed in 2 layers, the posterior sclera is sutured vertically, and the anterior sclera is sutured horizontally. The investigators reported 1 case of superior sulcus deformity and no cases of implant extrusion. Massry and Holds[8] performed 2 full-thickness sclerotomies from the anterior limbus incision to the optic nerve in the inferonasal and superotemporal quadrants to create 2 scleral flaps. The 2 flaps then are brought in front of the implant allowing the use of large implants. Doung et al.[20] reported good results with enucleation with evisceration on the table, avoiding extraction of any other autogenous tissues to cover the implant or the risk of using heterologous or artificial materials. This technique permitted the use of large implants in phthisical eyes. By placing the posterior pole of the patient sclera in front of the implant, the investigators decreased the risk of exposure. Madill and Maclean[9] also reported good results with a low complication rate with this technique. Morel et al.[24] described a modified technique similar to the one we reported by limiting the sclerotomies to the equator of the eye. We think it is faster to complete the same sclerotomy to the optic nerve than perform an additional equatorial sclerotomy. Choung et al.[10] developed another evisceration technique in which the implant is placed retrosclerally after sectioning the optic nerve. The implant then is covered by 3 scleral layers: first the posterior pole and then 4 partial scleral flaps are made by radial incisions from the limbus between the rectus muscles, then they are sutured overlapping the horizontal and vertical flaps. Our technique also manages the use of large implants with 2 instead of 3 overlying layers. In addition, the procedure is less complicated, because the radial sclerotomies extend directly to the optic nerve.

Our technique is similar to the one reported by Massry and Holds.[8] It consists of scleral sectioning from the limbus to the optic nerve, with release of the sclera from it. This allows placing large implants while suturing the wound without tension. The authors reported overlapping both scleral flaps anteriorly to avoid exposure. Our technique also allows covering the implant with a double scleral layer, giving the implant an additional layer of protection against erosion and exposure. Massry and Holds also argued that it is important to close the sclera at the equator to avoid posterior migration of nonbiointegratable implants. We usually use biointegratable implants to prevent possible posterior migration of the implant due to opening of the posterior sclera. In cavities with a nonbiointegratable implant, no cases of posterior implant migration occurred. Because the fibrovascular ingrowth in the implant begins at the sclerotomies, we found no disadvantage to performing an extra sclerotomy. Massry and Holds also changed the position of the rectus muscles, although they did not report any deficiency in socket motility. Our technique preserves the positions of all the muscles, giving the socket more natural motility.

Evisceration performed with our technique is technically easy, quick, and provides excellent and reproducible results. It allows the use of orbital implants of the desired size, usually 3 mm less than the axial length of the contralateral eye, and restores the desired orbital volume, including that in phthisical eyes. The results are similar with both biointegratable and nonbiointegratable materials. The double scleral layer also provides additional protection to avoid implant exposure.

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