Dissertation on

# EVALUATION OF A MODIFIED EVISCERATION TECHNIQUE INVOLVING TRANS-SCLERAL QUADRISECTION AND PMMA IMPLANTATION IN NON-INFECTED BLIND EYES

Submitted in partial fullfillment of requirements of

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# CERTIFICATE

This is to certify that the dissertation entitled **"EVALUATION OF A MODIFIED EVISCERATION TECHNIQUE INVOLVING TRANS-SCLERAL QUADRISECTION AND PMMA IMPLANTATION IN NON-INFECTED BLIND EYES"** submitted by Dr. S. VISWESWARAN, in partial fulfillment for the award of the degree of Master of Surgery in Ophthalmology by the Tamilnadu Dr. M.G.R. Medical University, Chennai is a bonafide record of the work done by him in the Regional Institute of Ophthalmology, Government Ophthalmic Hospital, Egmore, Chennai, during the academic year 2008-2011.

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# CONTENTS

# EVALUATION OF A MODIFIED EVISCERATION TECHNIQUE INVOLVING TRANS-SCLERAL QUADRISECTION AND PMMA IMPLANTATION IN NON-INFECTED BLIND EYES

# HISTORY

References to ocular surgical procedures predate 2000 BC (before the common era). Sumerian law limited what a practitioner could charge for successful eye operations; for those procedures deemed unsuccessful, the penalty was amputation of the surgeon's hands. In the mid 16th century[1], extirpation of the eye was described. The disfiguring procedure was more akin to a subtotal exenteration, including removal of portions of the conjunctiva, extraocular muscles, and orbital fascia. The patient could not be fitted with an ocular prosthesis[2]. In the mid 1800s, O'Ferral and Bonnet developed a more accepted technique, which involved transecting the extraocular muscles at their scleral insertions and preserving Tenon's capsule. Their description is most consistent with enucleation as we know it today.

The first description of an evisceration is credited to Beer in 1817. While he was performing a glaucoma procedure, the eye experienced an expulsive hemorrhage and Beer removed the ocular contents. In 1874, Noyes published his experience in removing the contents of severely infected eyes and it is he who is credited with first using evisceration as a routine procedure.

In 1884, Mules placed a glass sphere[3] into an eviscerated scleral shell, initiating the search for the perfect implant. The early implants were hollow glass spheres and had unacceptably high extrusion rates. Throughout the early part of the 20th century, numerous implant materials were investigated, including gold, silver, vitallium (a cobalt–chromium alloy), platinum, aluminum, cartilage, bone, fat, fascia lata, sponge, wool, rubber, silk, catgut, peat, agar, asbestos, cork, ivory, paraffin and cellulose.

Concerns about the simple spheres' tendency to migrate, incomplete translation of socket motility to the prosthesis[4] and inadequate volume replacement led to the development of several unique implants. Shape and texture modifications sought to isolate the extraocular muscles to their respective quadrants to limit implant migration. Anterior implant projections (Figure 1), some with exposed coupling pegs[5], were engineered to create a direct linkage with the prosthesis and maximize motility. Several implants met the goal of improved prosthesis motility but at the expense of unacceptably high exposure and extrusion rates. Others developed donor sclera[6] covering techniques (Figure 2) for the acrylic and silicone spheres, historically the best tolerated of any implant design, allowing the muscles to be

sutured to the implant. The latter technique remains an acceptable adjunct to enucleation surgery today, with the same acrylic and silicone spheres acceptable as evisceration implants.

Since the early to mid 1990s, porous implants[7] (hydroxyapatite and porous polyethylene) (Figures 3, 4) have become the choice for many surgeons. The interconnecting porous channels (Figure 5) allow fibrovascular ingrowth throughout the implant. This ingrowth (Figure 6) stabilizes the implant position and limits migration. After the implant has completely fibrovascularized, it may be drilled and an anterior projecting coupling peg placed. Although early results of the pegging process have been promising, recent reports of complications are emerging. The long-term prognosis for drilling of implants and placing of pegs is not yet known.

# PREOPERATIVE PLANNING

## Decision to Remove the Eye

The psychological effect of losing an eye may present greater difficulties for the patient than the physical disability. The preoperative time spent addressing eye removal, as well as discussing life after losing an eye, will reap benefits in postoperative recovery and acceptance.

Photographs of other anophthalmic patients are useful as the prospective patient tries to understand the process. It may be helpful to facilitate a meeting between the patient facing eye removal and one who has completed the process. Psychiatric referral[8] is appropriate for patients who manifest increased difficulty coping with the loss.

## Preoperative Counseling

It is vitally important that the patient be prepared for surgery and the rehabilitation to follow. Pain is variable in the immediate postoperative period and patients should be assured that appropriate medication will be provided. The patient must be prepared to wear a conformer for 5 to 7 weeks until the socket is ready to be fitted with a

prosthesis. In addition, the patient must understand that the fitting process may require several appointments over as many weeks.

**Goals of Rehabilitating the Anophthalmic Socket**

Communication between the ophthalmologist and the ocularist is integral to a good outcome. The ophthalmologist must select an implant of appropriate volume to allow for optimal prosthetic size. Too small an implant necessitates an inappropriately large prosthesis to fill the orbital volume and this may limit motility and transmit excess weight to the lower eyelid. Over time, the excess weight will result in laxity of the lower eyelid with a resultant asymmetric appearance. On the other hand, too large an implant limits the ocularist's ability to fashion a prosthesis with simulated anterior chamber depth without imparting a proptotic appearance to the orbit.

The ocularist can modify the prosthesis to adjust lid position, correct for a shortened conjunctival culde-sac and improve motility. The posterior surface of the prosthesis can be vaulted in cases of conjunctival irritation or breakdown. Patients who elect to undergo implant pegging to maximize prosthetic motility rely on the ophthalmologist and the ocularist to coordinate their care. The ocularist

can provide a prosthetic template to assist the ophthalmologist in peg placement and centration. Following the peg placement, the ocularist will modify the implant to allow implant–prosthetic coupling[9].

Eye removal and socket rehabilitation are not procedures to relegate to minimally supervised junior residents. This is the primary procedure that will determine long-term success and promote rapid patient rehabilitation. Less than-optimal surgical technique can lead to subsequent procedures to address implant exposure, implant extrusion (Figure 7), implant migration, socket contraction, chronic pain and lid malposition (Figure 8). The same impeccable attention that the ophthalmologist commits to microsurgical ocular procedures is essential for surgery of the anophthalmic socket. Preservation of conjunctiva, implant placement and sizing, anatomical reinsertion of extraocular muscles, and tension-free wound closure are integral to a successful outcome.

**Decision to Enucleate or Eviscerate**

The patient needs to understand the available options and to participate in the choice between *enucleation* (removal of the globe and a segment of the anterior optic nerve) and *evisceration* (removal of

the ocular contents with preservation of the sclera and in some cases, the cornea). The ophthalmologist must guide the patient to the most appropriate procedure if absolute indications or contraindications exist. Some patients may take comfort in evisceration and equate the retention of the scleral shell to keeping the eye. Conversely, the appropriately selected evisceration candidate may find the minimal risk of sympathetic ophthalmia[10] to be unacceptable and elect for enucleation.

Although a consensus does not exist, most authors agree that penetrating trauma[11] increases the risk of sympathetic ophthalmia and is a contraindication to evisceration. For ocular trauma that leads to loss of useful vision, enucleation removes the uveal tissue implicated in inciting inflammation in the sympathizing eye[12].

Otherwise-untreatable intraocular malignancies and cases that require histopathological review for assessment of the tumor margins dictate enucleation[13]. In addition, a small, phthisical eye may preclude adequate volume replacement following evisceration.

On the other hand, in cases of endophthalmitis, evisceration offers a relative barrier to posterior spread of the infection. Evisceration may impart less disruption to the orbital tissues, does not require disinsertion of the rectus muscles, and may enhance cosmesis. In cases appropriate for either procedure, the surgeon should pursue the technique that allows for the most consistent results in his or her hands.

# ENUCLEATION

Enucleation involves removing both the globe and a segment of the anterior optic nerve, with care taken to preserve the conjunctiva, Tenon's capsule and the extraocular muscles.

The indications for enucleation[14] include severe trauma, intraocular tumors and cases at risk for sympathetic ophthalmia. In the setting of eye injury secondary to war wounds, enucleation is more commonly the procedure of choice. It is these severe wounds with uveal prolapse that are at greater risk for sympathetic ophthalmia and early removal of the inciting eye minimizes this risk. The presence of a known or suspected ocular tumor that is untreatable by other means dictates enucleation over evisceration. In a blind, painful eye with opaque media, enucleation is the better choice and precludes the possibility of eviscerating an occult tumor.

Enucleation surgery[15] is best performed under general anesthesia but, with a cooperative patient, can successfully be undertaken with a retrobulbar anesthetic block alone. An epinephrine-containing retrobulbar block is a recommended adjunct to general anesthesia. Lidocaine with epinephrine is injected into the perilimbal bulbar conjunctiva to promote hemostasis, and the fluid wave assists in dissecting the conjunctiva and Tenon's capsule from the limbal sclera.

## SURGICAL GOALS OF ENUCLEATION AND EVISCERATION

- To achieve a centrally placed inert implant with adequate anterior coverage.
- To achieve appropriate volume replacement in the orbit.
- To maintain deep fornices and eyelid support for the placement of a prosthesis.
- To provide symmetry with the contralateral orbit.
- To allow for maximum socket motility, with translation of forces to the prosthesis.

# PROCEDURE OF ENUCLEATION

Curved tenotomy or Westcott scissors are used to perform a 360° limbal peritomy. In an effort to preserve the greatest amount of conjunctiva for closure, the tips of the scissors are used to elevate Tenon's capsule and the conjunctiva toward the corneal limbus before cutting.

Curved Steven's scissors are then placed into the oblique quadrants and slid posteriorly along the sclera. The tips are spread and withdrawn to separate Tenon's capsule from the sclera. The check ligaments are then identified by pulling the conjunctiva and Tenon's capsule away from the rectus muscles and the anterior fibers are cut to better expose the insertion. Muscle hooks are passed in a serial fashion under the muscle to isolate and elevate it. As the toe of the hook emerges from under the muscle, it will be covered by a thin film of Tenon's capsule; a small snip in this tissue is necessary to complete the pass. A second muscle hook is passed through this track and the muscle insertion is presented for traction suture placement. A double-armed 6-0 Vicryl (polyglactin) suture with spatulated needles is passed through the muscle parallel to and 3 to 5 mm from the muscle insertion. A locking bite is secured at each pole of the muscle. The

muscle is disinserted from its attachment to the sclera using Westcott or tenotomy scissors. This procedure is repeated for each of the four rectus muscles.

When transecting the medial and lateral rectus, it is advisable to leave a small segment of tendon on the globe so that a traction suture can be attached to the eye. A 4-0 silk suture is whip-stitched through both tendon stumps to make manipulation of the eye easier. This step facilitates oblique muscle identification and allows for controlled anterior traction as the optic nerve is later transected.

Rotating the eye inferiorly and medially allows for identification of the superior oblique tendon in the superolateral quadrant. The tendon is isolated with a muscle hook and transected at its scleral attachment. Next, the eye is rotated superiorly and medially to identify the inferior oblique muscle, which is transected free from its insertion near the macula. Using silk traction sutures, the eye can be rotated about its primary axis to assess freedom of movement. Limitations to rotation suggest an incomplete rectus or oblique muscle disinsertion. Next, the eye is torted laterally and curved enucleation scissors are inserted into the medial orbital space. The tips of the scissors are used

to locate the optic nerve by strumming it from above and below. The blades of the scissors are then spread to span the nerve.

While applying anterior traction to the globe, the scissors are slid posteriorly and the optic nerve is transected. An attempt is made to take at least a 4-mm segment of nerve with the globe. The eye is removed from the socket and any residual soft-tissue attachments are transected. Packing material is then placed into the socket for several minutes to control bleeding.

Sizing spheres may be used to determine an appropriate implant size. The implant should provide adequate volume replacement and when properly positioned should allow for a tension-free anterior closure of Tenon's capsule and conjunctiva[16].

The most frequently used implant across the world is porous polyethylene, of size 20 mm. The implant is placed into the socket using a sphere introducer. If an introducer is not available, forceps are used in a hand-over-hand fashion to pull Tenon's capsule up and over the implant.

Next, the extraocular muscles are attached to the implant. Each needle of the double-armed suture, preplaced in the rectus muscles, is

passed through the porous polyethylene implant. The needle tip is placed into a surface pore and a shallow pass is made through the surface material of the implant. As these sutures are pulled tight and secured, the muscle becomes firmly attached to the implant in a position slightly anterior to the original anatomical placement. This positioning helps cover the anterior aspect of the implant and protects against its exposure.

Each of the four rectus muscles is reattached in this fashion. Tenon's capsule is draped anteriorly to ensure that it will cover the implant without tension across the wound. This layer is crucial and several layers of interrupted 6-0 Vicryl sutures are used to close it. Care is taken to avoid trapping the conjunctiva, which will predispose to the development of inclusion cysts. Finally, a running 7-0 Vicryl suture closes the conjunctiva. The suture only approximates the conjunctival edges and does not add strength to the closure. Sterile antibiotic ointment and a plastic conformer are then placed behind the eyelids into the interpalpebral forniceal space. The largest conformer that allows for closure of the eyelids should be used. A pressure patch is applied over the closed eyelids for 48 hours.

## EVISCERATION

The evisceration process removes the ocular contents but preserves the sclera and in some cases, the cornea. The goals of evisceration and enucleation are the same. Although no firm consensus exists on the indications for evisceration, most experts agree that a patient with a blind, painful eye without risk of intraocular malignancy[17] is a good candidate. Additionally, eyes lost to endophthalmitis may be best treated with evisceration.

Evisceration (Figures 9-15) is best performed under general anesthesia supplemented with a retrobulbar block but may also be performed with local retrobulbar anesthesia alone. The conjunctiva is injected with an epinephrine-containing local anesthetic mixture before the procedure. As described above for enucleation, a limbal peritomy is performed. The conjunctiva and Tenon's capsule are elevated off the sclera back to the insertions of the rectus muscle. A partial-thickness incision is made around the corneal limbus and scissors are used to excise the corneal button. A cornea-sparing technique has also been described. An evisceration spoon is placed into the eye to scoop out the intraocular contents. The dissection plane is just internal to the sclera, and the entire uveal tract, vitreous, lens, and anterior ocular structures

are removed. Sterile, cotton-tipped applicators soaked with absolute alcohol solution are used to treat the internal aspect of the sclera, minimizing the potential for viable uveal tissue remnants.

Small, radial incisions are made in the oblique quadrants of the sclera so that sizing spheres can be placed into the scleral shell. Care is taken to select an implant that will minimize any anterior traction on the scleral closure. An insertion device can be used to place the implant into the scleral shell and forceps can be used to further position the implant and ensure that it is adequately seated. If the sclera does not easily close over the implant, then posterior radial incisions may be made in the scleral shell to allow the implant to be placed deeper.

A 4-0 nonabsorbable suture (eg, Mersilene) is then used to close the sclera over the implant. Tenon’s capsule and the conjunctiva are now closed in separate overlying layers. A conformer is placed behind the eyelids and a pressure patch is applied for 48 hours.

**IMPLANTS**

The most suitable options[18] at present include (*a*) solid spheres, (*b*) autogenous dermis fat grafts (Figure 16) and (*c*) porous implants.

The solid spherical implants, either acrylic (polymethylmethacrylate) or silicone, are well tolerated, have low extrusion rates and are inexpensive. Their disadvantages include a tendency to migrate within the orbit and decreased motility. However, by wrapping the implant in donor sclera and reattaching the extraocular muscles, it may be possible to minimize both of these complications.

The autogenous dermis fat graft is readily available in all settings and the implanted tissue can augment the lining of a contracted socket. Disadvantages include decreased motility, unpredictable resorption and increased operative time. Although it may not be the primary implant of choice, harvesting and implanting the dermis fat graft are procedures that ophthalmologists should be prepared to perform.

The graft is harvested from an area midway between the anterior superior iliac spine and the ipsilateral buttock. The area is injected with local anesthetic. A 20-mm circle is drawn and incised to a depth of

approximately 20 mm or just above the underlying muscular fascia. Before removing this cylindrical core of tissue, the epidermis is sharply excised or abraded from the dermis and discarded. The dermis-covered fat plug is then separated from its deep attachments and transferred to the recipient orbit. The donor site is converted into an ellipse and closed primarily. The dermis fat graft is inserted into the orbit. The tagged extraocular muscles are drawn up and sutured in correct anatomical position to the edge of the dermis cap. Tenon's capsule and the conjunctiva can now be positioned over the edge of the dermis graft and sutured into position. By minimizing the overlap at this junction, maximal socket surface area is maintained. The bare dermis will epithelialize under the conformer.

The porous implants are the ones most commonly used today. Both hydroxyapatite and porous polyethylene have interconnecting pores that provide a passive latticework for fibrovascular ingrowth. This ingrowth helps stabilize the implant position within the muscle cone and provides the implant with access to the patient's immune system. After fibrovascular ingrowth is complete, an optional pegging procedure may be considered, in which the prosthesis is directly coupled to the implant, allowing complete translation of socket

motility. Many patients, however, are satisfied with the motility of the uncoupled prosthesis and decline to risk the potential complications associated with the pegging procedure. These complications include chronic discharge, peg extrusion and implant exposure.

Hydroxyapatite implants must be wrapped prior to placement. Donor sclera (Figure 17), readily available from eye banks, is commonly used for this purpose. The wrap covers the abrasive surface of the implant, decreasing the risk of conjunctival breakdown and providing a scaffold to which the extraocular muscles are reattached. Four small windows are cut in the sclera to accept each of the four rectus muscles. The windows are positioned to approximate the anatomical insertion of the extraocular muscles. Each of the double-armed Vicryl suture needles is passed through the anterior edge of the scleral window. Securing these sutures pulls the muscle into the window and into contact with the hydroxyapatite implant. This provides the anterior implant with a source for fibrovascularization. Several windows may be cut in the posterior aspect of the implant wrap to accelerate the ingrowth there.

Porous polyethylene implants have a smooth surface and may be placed without a wrap. The material is also softer, and the suture

needles used to attach the extraocular muscles can be passed through the surface of the implant. The curved needle engages the implant in a surface pore at a shallow angle. With steady force, the needle is passed forward and the natural curve of the needle returns it to the implant surface.

## POSTOPERATIVE CARE

The use of systemic antibiotics should be dictated by the potential for infection. Routine enucleation or evisceration with minimal risk of infection need not be covered with antibiotics.

The pressure patch is applied following surgery to preclude orbital hematoma formation. It also serves to maintain the conformer in position under the eyelids, ensuring the preservation of deep superior and inferior fornices. The patch is removed 48 hours after surgery unless discharge or patient complaints of increasing orbital pain warrant earlier removal to allow inspection of the socket. Following removal of the pressure patch, the patient is instructed to instil an ophthalmic antibacterial ointment into the interpalpebral fissure twice daily for 7 days.

The conformer is first removed 1 week following surgery, and a careful inspection of the socket is performed. The conjunctival suture line is surveyed for breakdown and areas of implant exposure. Any indication of infection warrants aggressive management, including culture and appropriate antibiotics. The patient is next seen 5 to 6 weeks following surgery. At that time, the conjunctiva should be pink

and free of edema. The superior and inferior forniceal spaces should be deep and there should be no evidence of implant exposure. The patient is now ready for referral to the ocularist for socket evaluation and prosthesis fitting.

Most patients who receive porous implants are satisfied with the translation of socket movement to the prosthesis without pursuing direct coupling. The ocularist should be consulted before the option of implant pegging is entertained. Changes to the posterior prosthesis—in addition to overall size modifications—may provide satisfactory improvement in motility. If the patient still desires increased motility and a disparity between socket and prosthesis movement can be seen, then pegging can be considered 6 to 12 months after implant placement. The time delay is necessary to ensure adequate implant vascularization. Magnetic Resonance Imaging with gadolinium contrast medium may be useful in assessing vascularity of the implant.

Pegging systems exist for both the hydroxyapatite and the porous polyethylene implants. Each system involves the placement of a post (ie, a peg) into the central implant (Figure 18) along a line paralleling what would be the visual axis. A template prepared by the ocularist can assist the surgeon in achieving proper centration. A small

portion of the post protrudes above the conjunctival tissues and engages a corresponding indentation on the posterior surface of the prosthesis. In addition to the potential for improved motility, such coupling may serve to distribute a portion of the weight of the prosthetic to the implant, effectively unweighting the lower eyelid. This may, over time, minimize lower-eyelid sag. Although impressive results are possible following prosthesis–implant coupling, the patient must be prepared to accept the potential complications of the procedure. Long-term effects of pegging are not known, but early problems include exposure, extrusion, and socket discharge.

# COMPLICATIONS

## Blepharoptosis

Either true or pseudoblepharoptosis[18] may follow eye removal. True blepharoptosis can be a result of aponeurotic dehiscence, levator palpebrae muscle injury, or damage to the innervation of the levator palpebrae. These complications may result from the initial trauma or the surgical procedure used to remove the eye. Careful preoperative assessment is necessary to document a preexisting problem. Enucleation surgery, by virtue of visitation to the retrobulbar space, has higher potential for damage to the levator palpebrae muscle or the orbital branches of the third cranial nerve. Pseudoblepharoptosis can be associated with inadequate volume replacement or the shape of the prosthetic. An ideal implant replaces most of the globe volume, leaving only enough room for an adequately sized prosthesis. Too small an implant can create enophthalmos, and the lack of anterior projection changes the geometry of the levator palpebrae complex. The ocularist can increase the vertical height of the prosthesis or build up its superior margin—within the limits of acceptable weight and volume—to help correct eyelid position. Too large a prosthesis, though, can decrease motility and create lower-eyelid malposition.

**Lower-Eyelid Malposition and Laxity**

Both minimizing prosthetic size and coupling the implant to the prosthesis decrease the amount of weight that the lower eyelid must support. Over time, though, it is not uncommon for the lower eyelid to yield to gravitational forces and a lower-eyelid- tightening procedure might be necessary. If recurrences of lower-eyelid malposition secondary to a large prosthetic occur, it may be necessary to replace the orbital implant with one of greater volume. The increased volume of the implant allows the ocularist to fit a smaller prosthesis.

**Enophthalmos**

As noted above, enophthalmos is usually related to inadequate volume replacement at the time of enucleation or evisceration. In cases of trauma, with concurrent damage to the bony orbital walls, spherical implants alone may be insufficient for volume replacement. Orbital fracture repair may be necessary to achieve satisfactory results.

**Socket Contracture**

One of the more difficult complications to manage is contracture of the socket and the associated foreshortening of the fornices. Depending on the degree of contracture, the patient may be unable to

wear a prosthesis and surgical expansion often requires tissue grafting to the mucosa-lined socket. In removing the eye, every effort should be made to preserve Tenon's capsule and the conjunctiva. Preserving these structures can be challenging in serious ocular injuries and may necessitate primary dermis fat grafting if insufficient tissue is available. Following either enucleation or evisceration, a conformer of the largest possible size should be placed into the palpebral fornices as a socket maintainer. Patients should be instructed on how to replace the conformer should it dislodge and the potential consequences of not wearing one for prolonged periods.

**Implant Exposure**

Tension on the closure of Tenon's capsule and conjunctiva may predispose to wound breakdown and exposure of the implant . A rough implant surface (eg, uncovered hydroxyapatite spheres) has also been associated with anterior implant exposure and extrusion. Small, stable defects of the conjunctiva may be observed. Progressive areas of exposure or those associated with infection require intervention. In some cases, the anterior projection of the porous implant may be reduced, allowing for a tension-free closure of Tenon's capsule and conjunctiva. An electric burr is used to remove portions of the anterior implant both to reduce its projection and to expose.

# SUMMARY

Early care must be definitive, with every possible attempt made to preserve vision. In the event that this is not possible, the ophthalmologist must be prepared to remove the affected eye. A careful decision of evisceration or enucleation should be made depending on the indication. In planning, the ophthalmic surgeon must identify those essential supplies necessary to provide optimum care. Space and weight allowances will limit gear selection. A single implant that is suitable for both enucleation and evisceration is ideal. Additionally, an implant that allows direct attachment of the extraocular muscles will save on the necessity to stock a wrapping material such as donor sclera. A selection of 12-mm, 14-mm and 16-mm implants in the Indian population should be adequate. The advantages of stabilization and access to the immune system warrant consideration of porous implants. The ophthalmologist should also ensure that an adequate supply of socket conformers is available, as the freshly operated socket will contract without one. After a period of six weeks the patient should be fitted with a suitable prosthesis, provided the socket is healthy and adequate in volume.

# AIM OF THE STUDY

To evaluate a modified evisceration technique employing trans-scleral quadrisection and implantation in non-infected blind eyes.

# MATERIALS AND METHODS

30 patients with non-infected blind eyes who came to RIOGOH between June 2009 and November 2010

## DESIGN

A prospective interventional case study

## INCLUSION CRITERIA

Painful blind eyes due to anterior staphyloma (Figure 19), end-stage glaucoma (Figure 20), phthisis bulbi.

## EXCLUSION CRITERIA

Endophthalmitis, panophthalmitis, intraocular malignancies, trauma.

# INVESTIGATIONS

A thorough slit-lamp examination followed by B-scan ultrasonography was done to rule out intra-ocular malignancy. In doubtful cases, corneal smears or vitreous samples were taken and culture-positive cases were excluded from the study. A routine blood test including a complete haemogram, blood sugar, bleeding and clotting time was done. Blood pressure was checked all patients and was gotten under control prior to surgery. Adequate pre-operative counselling about the procedure, its necessity and outcome of surgery was given. Subsequently, the patients were posted for surgery after obtaining informed consent.

## PROCEDURE (Figures 21-26)

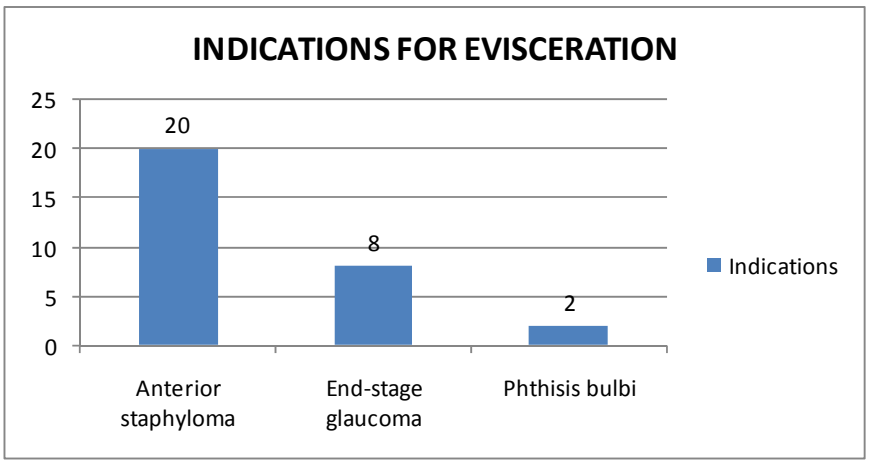
A four quadrant peribulbar block was given with 10 ml lignocaine mixed with 0.1 ml adrenaline. The patient was painted and draped once the block was taken. After placing the lid speculum, 360 degrees conjunctival peritomy was done at the limbus followed by excision of the corneal button. All intraocular contents were scooped with an evisceration spoon until bleeding stopped completely and plain sclera was seen. Subsequently, four vertical incisions between each of the four recti muscles, i.e, at 1,5,7,11 clock hours were made upto 5 mm away from the optic disc ,thus cutting the sclera into four petals. A 16 mm PMMA implant was placed inside (except for the phthisical eyes ,for which a 12 mm implant was used) and the vertical petals were sutured first with 4-0 prolene. Then, horizontal petals were sutured similarly, followed by the conjunctiva which was secured by continuous 4-0 prolene sutures. Proper wash with antibiotic and saline was given, conformer was placed and bandage was applied.

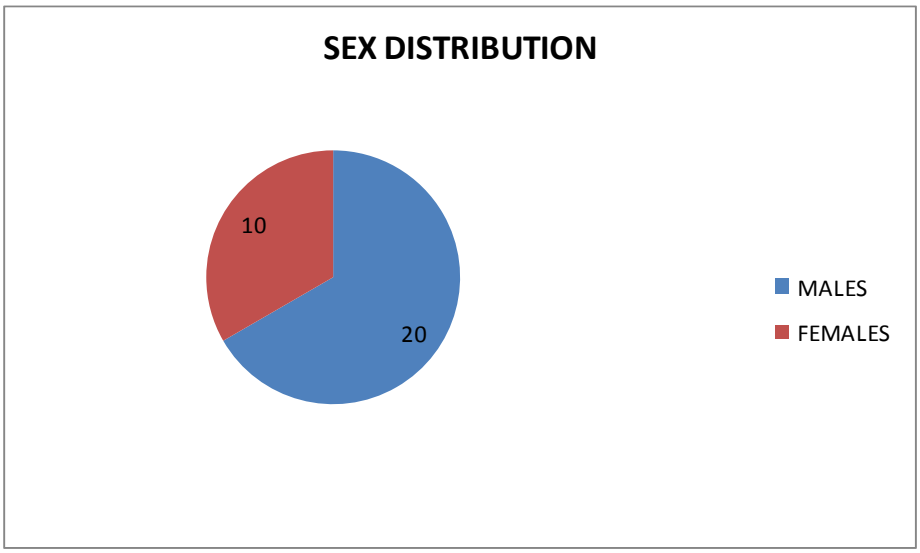
# POST-OPERATIVE CARE

The patient was treated with systemic and topical antibiotics post-operatively. The conformer was removed after 5 days, the patients were prescribed antibiotic ointment on discharge and followed-up every week in the first month (Figures 27 & 28) every fortnightly in the second and once a month for the next four months. A plastic shell was placed at the end of 6 weeks to provide adequate cosmesis (Figures 29 & 30).

# OBSERVATION AND ANALYSIS

30 patients were included in the study, whose ages ranged from 14 to 65 years. 20 patients were males and 10 were females.

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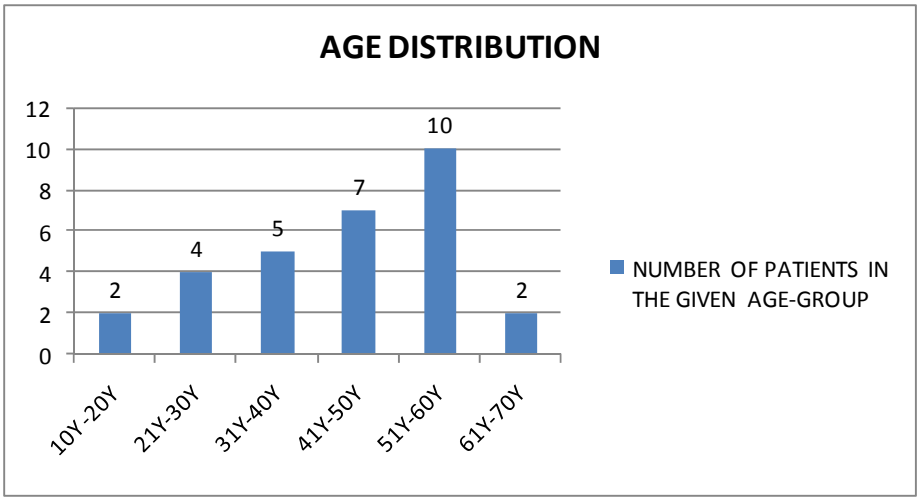
FEMALES


AGE DISTRIBUTION
12
10
8
6
4
2
0
2
4
5
7
10
2
10Y-20Y
21Y-30Y
31Y-40Y
41Y-50Y
51Y-60Y
61Y-70Y
NUMBER OF PATIENTS IN THE GIVEN AGE-GROUP

## COMPLICATIONS

| Parameter assessed | Number | Percentage |
|---|---|---|
| Conjunctival dehiscence | 0 | 0% |
| Extrusion of implant | 0 | 0% |
| Infection | 2 | 6.67 % |
| Enophthalmos | 0 | 0% |
| Poor motility | 2 | 6.67% |
| Poor cosmesis | 1 | 3.33% |

# RESULTS

Out of 30 non-infectious cases, 20 (66.7%) had anterior staphyloma,8 (26.7%) had absolute glaucoma and 2 (6.6%) had phthisis bulbi with uveal prolapse. Post-operatively, 2 (6.67%) patients had infection by Staphylococcus aureus, 2 (6.67%) patients had poor motility of prosthesis and 1 (3.33%) had a poor cosmetic outcome. Rest of the patients had a good cosmetic appearance after placement of shell, with good motility and no enophthalmos.The success rate of this technique is high but no comparison can be made with other similar studies as no data is available.

# DISCUSSION

Eye removal surgery runs contrary to ophthalmologists' interest in preservation of vision. When circumstances necessitate, the ophthalmic surgeon must be prepared to intervene and provide the best result possible.

Evisceration is the removal of the ocular contents with preservation of the sclera and in some cases, the cornea. Some patients may take comfort in evisceration and equate the retention of the scleral shell to keeping the eye. It is the initial surgery that defines a successful outcome or, conversely, commits the patient to future surgical management of complications arising from an inadequate repair. Less-than-optimal surgical technique can lead to subsequent procedures to address complications. In this regard, trans-scleral quadrisection improves the final outcome of surgery and reduces complication rates.

Also, the solid spherical implants, either acrylic (polymethylmethacrylate) or silicone, are well tolerated, have low extrusion rates and are inexpensive. They come at a rate of Rs.150,

which is easily affordable by poor patients. Their disadvantages include a tendency to migrate within the orbit and decreased motility.

An ideal implant, in this case, PMMA, replaces most of the globe volume, leaving only enough room for an adequately sized prosthesis. Too large an implant (18 mm) limits the ability to fashion a prosthesis without imparting a proptotic appearance to the orbit. Too small an implant (14 mm) can create enophthalmos. Enophthalmos is usually related to inadequate volume replacement at the time of enucleation or evisceration.

Tension on the closure of Tenon's capsule and conjunctiva may predispose to wound breakdown and exposure of the implant. A rough implant surface (Eg, uncovered hydroxyapatite spheres) has also been associated with anterior implant exposure and extrusion. Correct technique of suturing with 4 – 0 prolene and the smooth surface of PMMA implant reduce the risk of extrusion.

Also, injudicious use of antibiotics encourages the emergence of resistant bacterial strains and contaminated instruments or gloves in the surgical field increase the risk of infection.

Finally, ophthalmologists must be prepared to recognize the psychosocial issues associated with eye removal and to treat when necessary. Therefore, attention to the final cosmetic outcome is indispensable and no surgery is complete in this context if devoid of patient satisfaction.

Hence, keeping the above mentioned considerations in mind, this technique works in terms of easy technique with a low learning curve, reduced rates of enophthalmos, extrusion of implant and post-operative infection.Above all, the motility of the prosthesis and overall cosmetic outlook are excellent.

# CONCLUSION

Trans-scleral quadrisection technique of evisceration is excellent in non-infected eyes, especially in terms of lower complication rate, good cosmesis and patient satisfaction. PMMA implant is ideal with respect to this study as it is very cheap, easily available and requires no special technique of placement in the socket.

# PROFORMA

**SERIAL NO.** **OP/IP NO.**

**NAME AND ADDRESS**

**AGE/SEX**

**OCCUPATION**

**SLIT-LAMP EXAMINATION**

**INVESTIGATIONS**

HAEMOGLOBIN

TOTAL BLOOD COUNT

DIFFERENTIAL BLOOD COUNT

ERYTHROCYTE SEDIMENTATION RATE

BLEEDING TIME

CLOTTING TIME

BLOOD SUGAR

BLOOD PRESSURE

CORNEAL AND CONJUNCTIVAL SMEAR AND CULTURE

VITREOUS CULTURE

B-SCAN

**INDICATION FOR EVISCERATION**

**COMPLICATIONS**

**POST-OPERATIVE FOLLOW-UP**

FIRST MONTH

DAY 1,

FIRST WEEK, SECOND WEEK,

THIRD WEEK, FOURTH WEEK

SECOND MONTH

SECOND WEEK, FOURTH WEEK

THIRD MONTH

FOURTH MONTH

FIFTH MONTH

SIXTH MONTH

**OUT COME**

# MASTER CHART

| S.NO. | NAME | AGE/SEX | OCC | EYE | IND | COMP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | I.E | D | IN | E | PM | PC |
| 1 | VINOTH KUMAR | 28/M | TYPIST | L | AS | - | - | - | - | - | - |
| 2 | BEEBI JAAN | 60/F | HW | R | AS | - | - | - | - | - | - |
| 3 | KALAIVANI | 14/F | STU | R | AS | - | - | - | - | - | - |
| 4 | SUBHASH | 17/M | STU | L | AS | - | - | - | - | - | - |
| 5 | ANAND | 22/M | STU | L | PH | - | - | - | - | - | + |
| 6 | SULOCHANA | 43/F | HW | R | AG | - | - | - | - | - | - |
| 7 | MURUGESAN | 48/M | LAB | R | AS | - | - | - | - | - | - |
| 8 | CHINNAPPAN | 39/M | LAB | R | AG | - | - | - | - | - | - |
| 9 | PASUPATHY | 50/M | TAILOR | L | AG | - | - | - | - | - | - |
| 10 | RAMALINGAM | 38/M | TEACHER | R | AS | - | - | + | - | + | - |
| 11 | RAVI | 52/M | LAB | R | AS | - | - | - | - | - | - |
| 12 | VASANTHA | 52/F | HW | R | AG | - | - | - | - | - | - |
| 13 | RADHA | 58/F | HW | R | AS | - | - | - | - | - | - |
| 14 | ANNAMALAI | 28/M | LAB | R | AS | - | - | - | - | - | - |
| 15 | KARTHICK | 26/M | SK | L | PH | - | - | - | - | + | - |

| S.NO. | NAME | AGE/SEX | OCC | EYE | IND | COMP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | I.E | D | IN | E | PM | PC |
| 16 | PARVATHY | 46/F | SERVANT | R | AG | - | - | - | - | - | - |
| 17 | KAMAKSHI | 53/F | HW | L | AS | - | - | - | - | - | - |
| 18 | RAJA | 58/M | LAB | L | AG | - | - | - | - | - | - |
| 19 | THANGAPPAN | 31/M | LAB | R | AS | - | - | + | - | - | - |
| 20 | SREENIVASAN | 48/M | ENG | R | AS | - | - | - | - | - | - |
| 21 | PALANI | 63/M | LAB | R | AS | - | - | - | - | - | - |
| 22 | CHITTIBABU | 65/M | BEGGAR | L | AG | - | - | - | - | - | - |
| 23 | MANIKANDAN | 46/M | FARMER | R | AS | - | - | - | - | - | - |
| 24 | MAGESH | 36/M | SK | L | AS | - | - | - | - | - | - |
| 25 | GOVINDAN | 58/M | FARMER | R | AG | - | - | - | - | - | - |
| 26 | SARASWATHY | 54/F | HW | L | AS | - | - | - | - | - | - |
| 27 | BABYAMMAL | 55/F | HW | L | AS | - | - | - | - | - | - |
| 28 | PRAKASH | 45/M | FARMER | R | AS | - | - | - | - | - | - |
| 29 | AROCKIASAMY | 38/M | FARMER | L | AS | - | - | - | - | - | - |
| 30 | SARALA | 52/F | HW | R | AS | - | - | - | - | - | - |

# KEY TO MASTER CHART

| ABBREVIATION | EXPANSION |
|---|---|
| S.NO. | Serial Number |
| M/F | Male/Female |
| OCC | Occupation |
| IND | Indication |
| COMP | Complication |
| I.E. | Implant Extrusion |
| D | Dehiscence of Wound |
| IN | Infection |
| E | Enophthalmos |
| PM | Poor Motility |
| PC | Poor Cosmesis |
| HW | Housewife |
| LAB | Labourer |
| STU | Student |
| ENG | Engineer |
| SK | Shop Keeper |
| R/L | Right/Left |
| AG | Absolute Glaucoma |
| AS | Anterior Staphyloma |
| PH | Phthisis Bulbi |

# BIBLIOGRAPHY


1. Luce CM. A short history of enucleation. *Int Ophthalmol Clin* 1970;10:681-687.

2. Meltzer MA. Complications of enucleation and evisceration: prevention and treatment. *Int Ophthalmol Clin* 1992;32:213-233.

3. Kronish JW, Gonnering RS, Dortzbach RK, et al. The pathophysiology of the anophthalmic socket. Analysis of orbital fat. *Ophthal Plast Reconstr Surg* 1990;6:88-95.

4. Soll DB. The anophthalmic socket. *Ophthalmology* 1982;89:407-423.

5. Nunery WR, Heltzler KJ. Improved prosthetic motility following enucleation. *Ophthalmology* 1983;90:1110-1115.

6. Bosniak SL. Reconstruction of the anophthalmic socket: state of the art. *Adv Ophthalmol Plast Reconstr Surg* 1988;7:313-348.

7. Spivey BE. Enucleation: a remaining challenge. *Aust J Ophthalmol* 1980;8:69-74.

8. Noyes W. *Treatise on diseases of the eye.* New York: Wood Publishing, 1881:189.

9. Perry AC. Integrated orbital implants. *Adv Ophthalmic Plast Reconstr Surg* 1990;8:75-81.

10. Mules PH. Evisceration of the eye and its relation to the bacterial theory of origin of sympathetic disease. *Trans Ophthalmol Soc UK* 1885;5:200.

11. Soll DB. Evolution and current concepts in the surgical treatment of the anaophthalmic orbit. *Ophthal Plast Reconstr Surg* 1986;2:163-171.

12. Brackup AB, Carter KD, Nerad JA, et al. Long-term follow-up of severely injured eyes following globe rupture. *Ophthal Plast Reconstr Surg* 1991;7:194-197.

13. Woog JJ, Angrist RC, White WL, Dortzbach RK. Enucleation, evisceration and exenteration. In: Dortzbach RK, ed. *Ophthalmic plastic surgey: prevention and management of complications.* New York: Raven, 1994:251-268.

14. Bayliss H. Shorr N, Tanenbaum M, McCord CD Jr. The anophthalmic socket: evaluation and management of surgical problems. In: McCord CD, Tanenbaum M, eds. *Oculoplastic surgery*. 2nd ed. New York: Raven, 1987:425-449.

15. Callahan MA, Callahan A. *Ophthalmic plastic and orbital surgey*. Birmingham, AL: Aesculapius, 1979:42-54.

16. Goldberg RA, Holds JB, Ebrahimpour J. Exposed hydroxyapatite orbital implants. *Ophthalmology* 1992;99:831-836.

17. Munzenreider JE, Gragoudas ES, Seddon JM, et al. Conservative treatment of uveal melanoma: probability of eye retention after proton treatment. *Int J Radiat Oncol Biol Phys* 1988:15:553-558.

18. Kennedy RE. The effect of early enucleation on the orbit in animals and humans. *Am J Ophthalmol* 1965;60:277-306.

# LIST OF SURGERIES PERFORMED

| Sl. No. | Name | Age/Sex | IP/OP No. | Eye | Diagnosis | Surgery |
|---|---|---|---|---|---|---|
| 1. | Kasthuri | 61/F | 493210 | L | Mature Cataract | ECCE with PCIOL |
| 2. | Aisha | 55/F | 493912 | R | Death due to burns | Enucleation and excision of corneal button |
| 3. | Sengottayan | 72/M | 514123 | R | Pterygium | Excision |
| 4. | Thannagi | 64/F | 522121 | L | Chronic Dacryocystitis | DCT |
| 5. | Narasimhan | 59/M | 527643 | R | Pterygium | Excision with autograft |
| 6. | Rajagopal | 33/M | 6739 | R | Chalazion | Excision |
| 7. | Veeralakshmi | 42/F | 8132 | L | Upper Lid tear | Reconstruction |
| 8. | Noyonika | 28/F | 8136 | R | Lower Lid tear | Reconstruction |
| 9. | Thamizh | 69/F | 553946 | R | Chronic Dacryocystitis | DCT |
| 10. | Yogeswari | 19/F | 8842 | L | Pterygium | Excision with amniotic graft |
| 11. | Rajalakshmi | 49/F | 554329 | R | Endophthalmitis | Evisceration |
| 12. | Sami | 71/M | 571869 | L | Immature cataract | SICS with PCIOL |
| 13. | Venugopal | 61/M | 580042 | R | Pterygium | Excision with rotation flap |
| 14. | Radha | 38/F | 9116 | L | Lacrimal Abscess | I & D |
| 15. | Renuka | 64/F | 583264 | R | Anterior Staphyloma | Evisceration with PMMA implant |
| 16. | Valasamma | 67/F | 592743 | R | Chronic Dacryocystitis | External DCR |

| Sl. No. | Name | Age/Sex | IP/OP No. | Eye | Diagnosis | Surgery |
|---|---|---|---|---|---|---|
| 17. | Nagesh | 47/M | 598615 | R | Endophthalmitis | Intra-vitreal injection |
| 18. | Veerasamy | 70/M | 599123 | L | Lagophthalmos | Tarsorrhaphy |
| 19. | Subburayudu | 55/M | 600428 | L | Perforated corneal ulcer | TKP |
| 20. | Lakshminarayanan | 50/M | 612149 | R | Perforated corneal ulcer | Hooding |
| 21. | Robin | 40/M | 659423 | R | Chronic Dacryocystitis with fistula | External DCR with Fistulectomy |
| 22. | Ammaiyappan | 70/M | 660212 | L | Neovascular glaucoma | Cyclocryo-therapy |
| 23. | Rajesh | 57/M | 661430 | R | POAG | Combined surgery |
| 24. | Pughazhendhi | 72/M | 672456 | L | Neovascular glaucoma | Combined surgery |
| 25. | Murugan | 69/M | 679913 | R | Panophthalmitis | AC wash |
| 26. | Chinnanayaki | 74/F | 712462 | R | Globe rupture | Wound exploration and repair |

**FIGURE 1** **Different types of pegs used for coupling implant to the prosthesis**

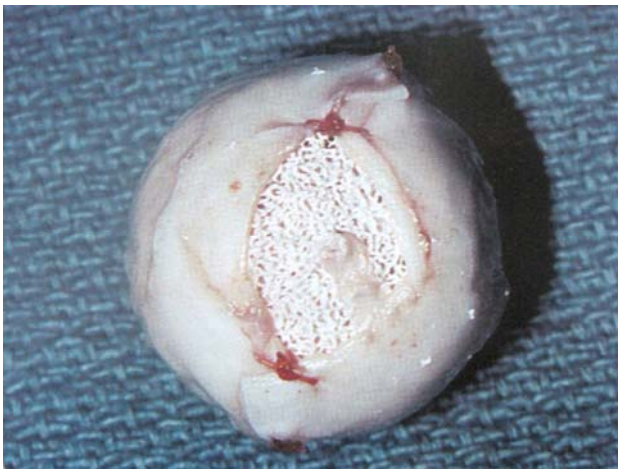


**FIGURE 2** **Hydroxyapatite implant wrapped in donor sclera**

**FIGURE 3 Hydroxyapatite implants**

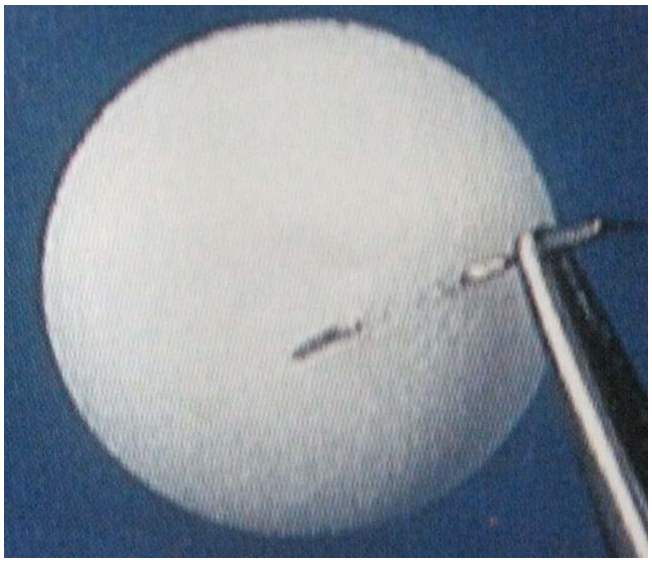


**FIGURE 4 Porous Polyethylene implant with suture needle for the attachment of extra-ocular muscles**

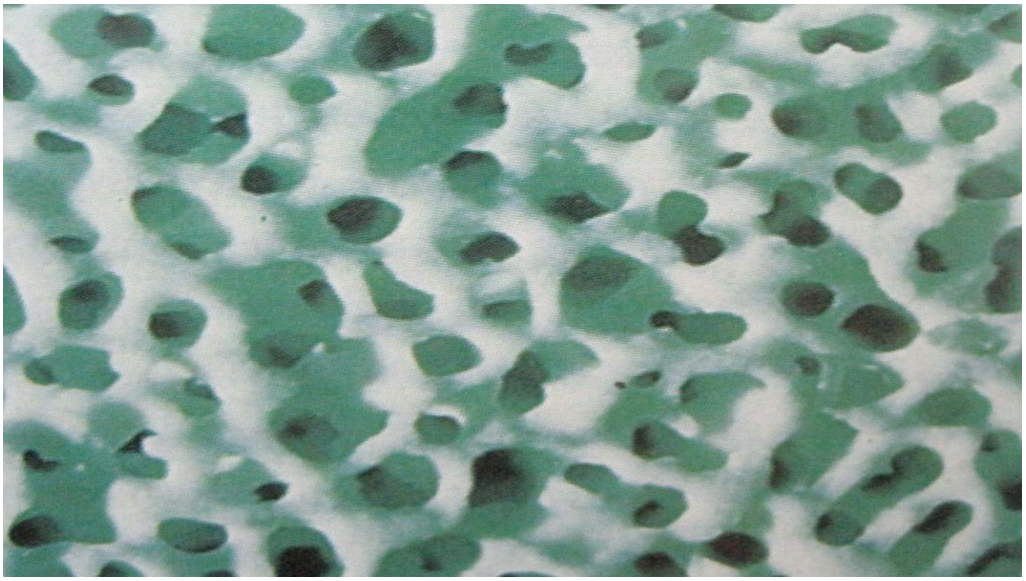


**FIGURE 5** **Interconnecting channels in porous polyethylene implant**

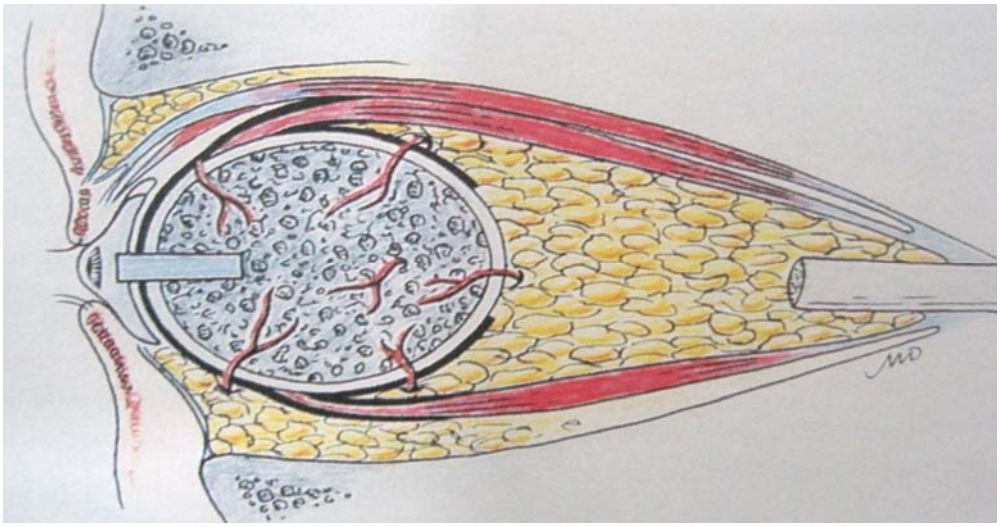


**FIGURE 6** **Fibrous ingrowth into a porous polyethylene implant**

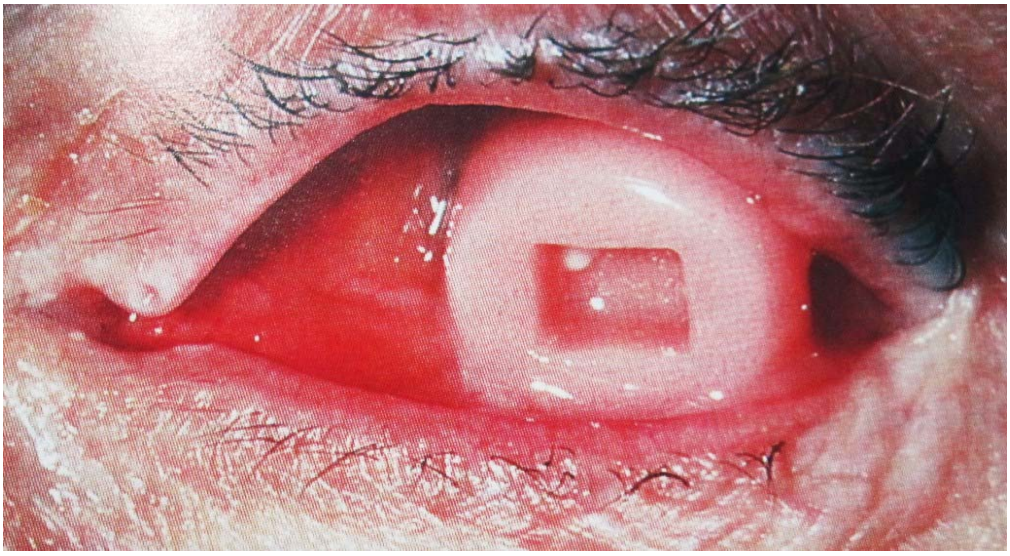


**FIGURE 7** **Implant extrusion**

**FIGURE 8** **Upper lid entropion with lash ptosis and lower lid ectropion due to improper placement of prothesis in the left eye**

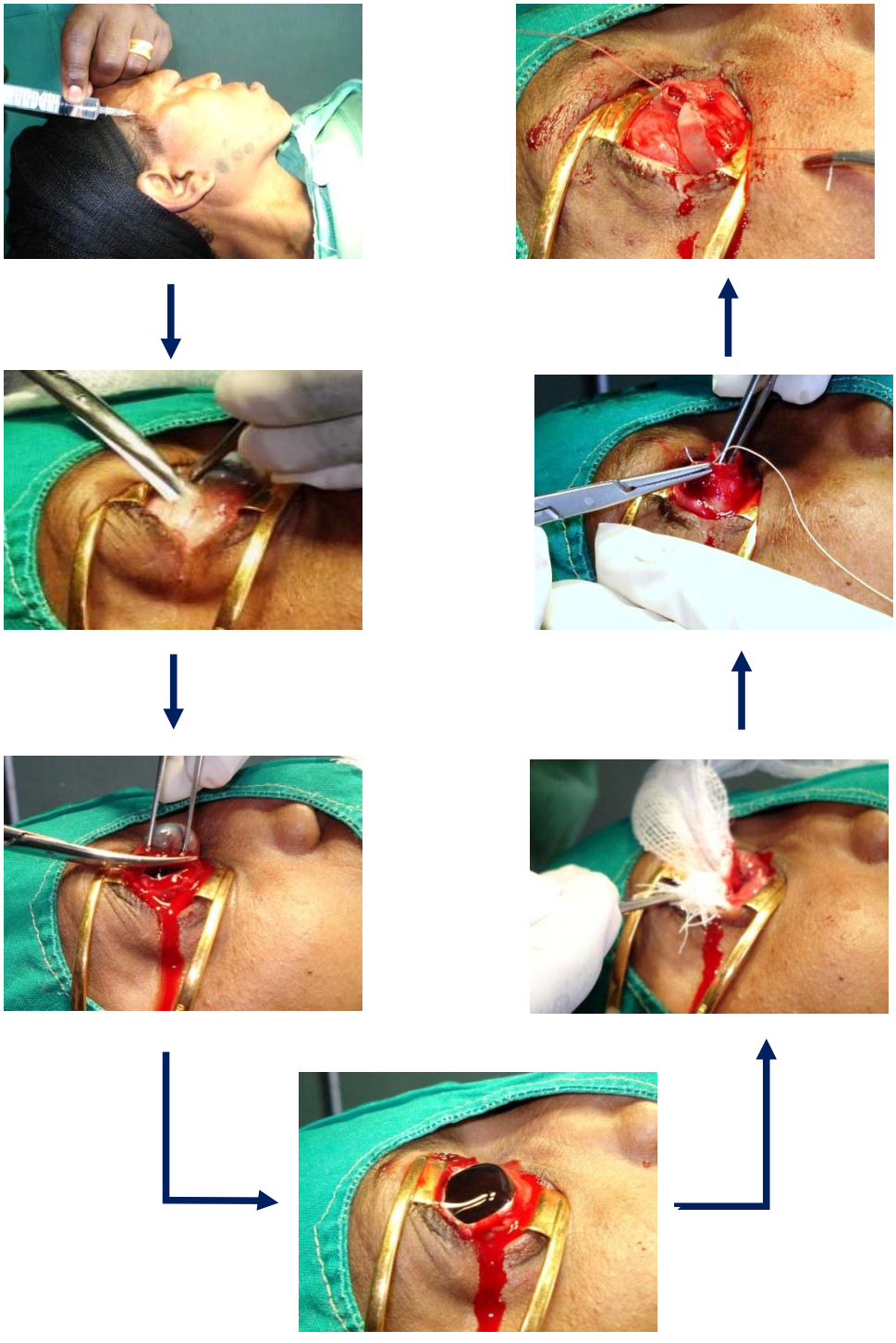


**FIGURE 9 – 15  Procedure of evisceration**

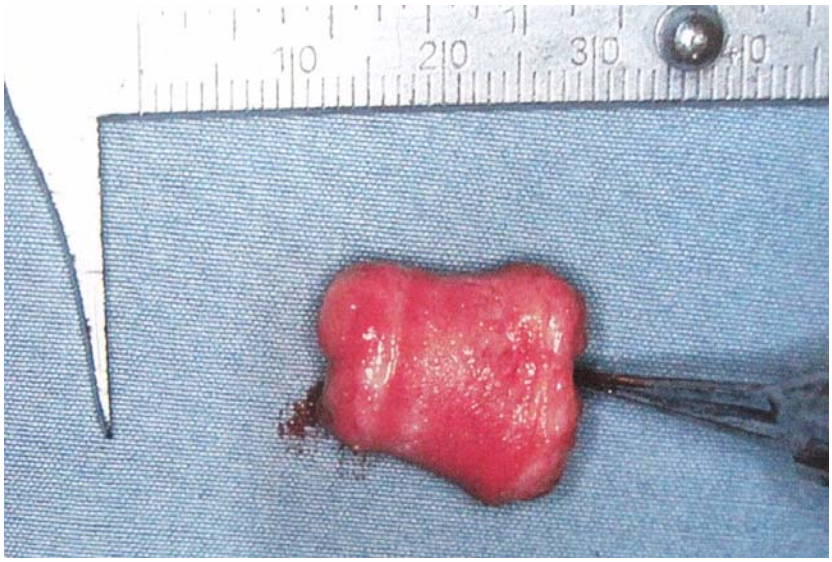



**FIGURE 16** **Dermis fat graft**

**FIGURE 17** **Scleral – covered hydroxyapatite implant with open posterior aspect for enhanced vascularization and four windows of sclera excised for attachment of recti**

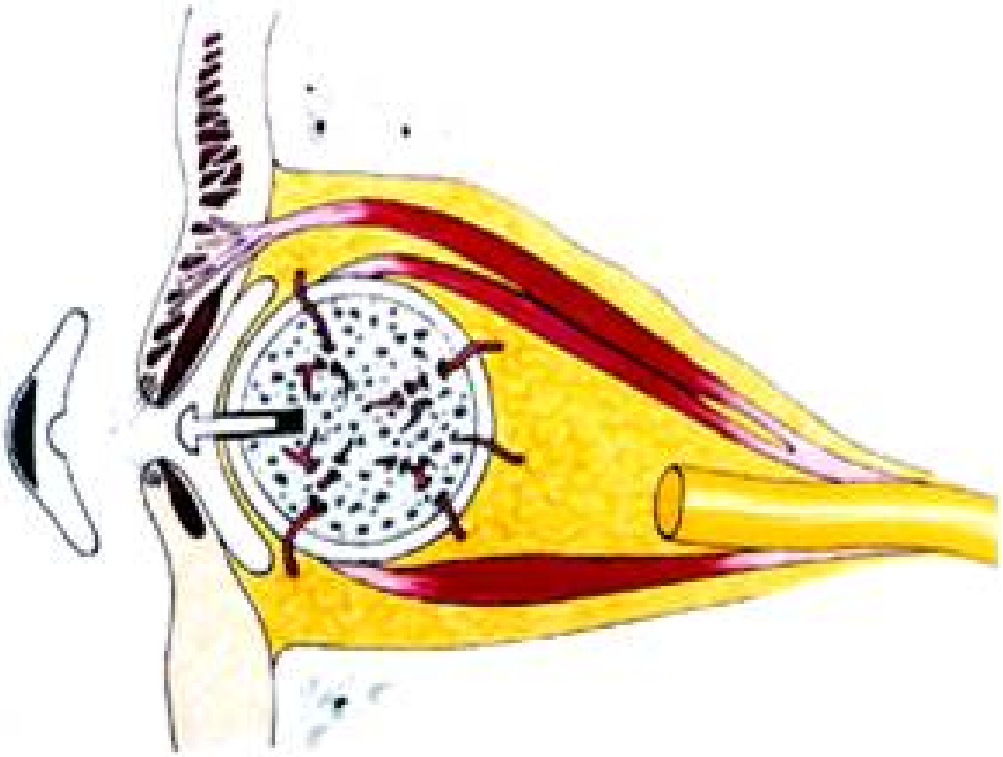


**FIGURE 18 Pegging of central implant**

**FIGURE 19 Anterior staphyloma**

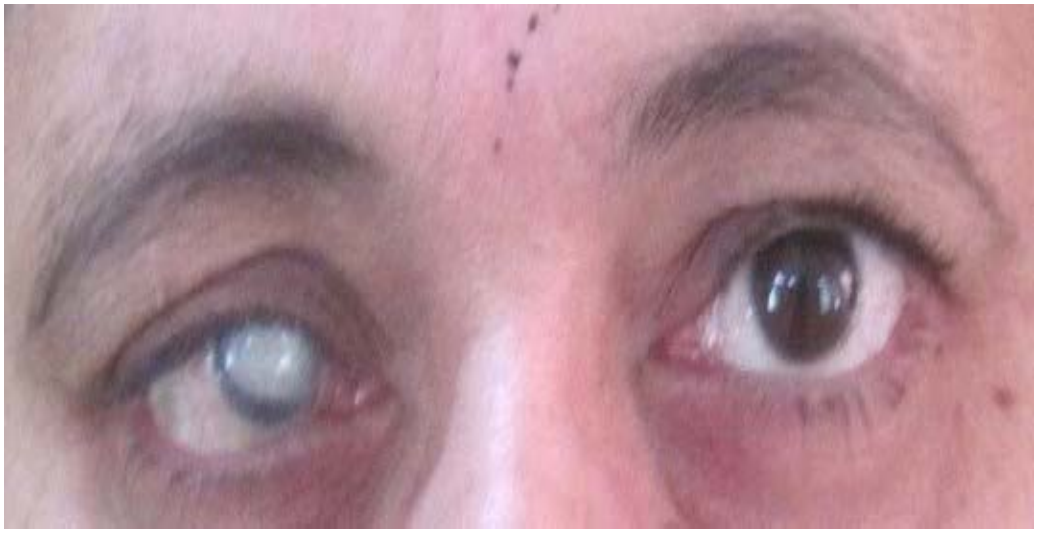


**FIGURE 20 Absolute glaucoma**

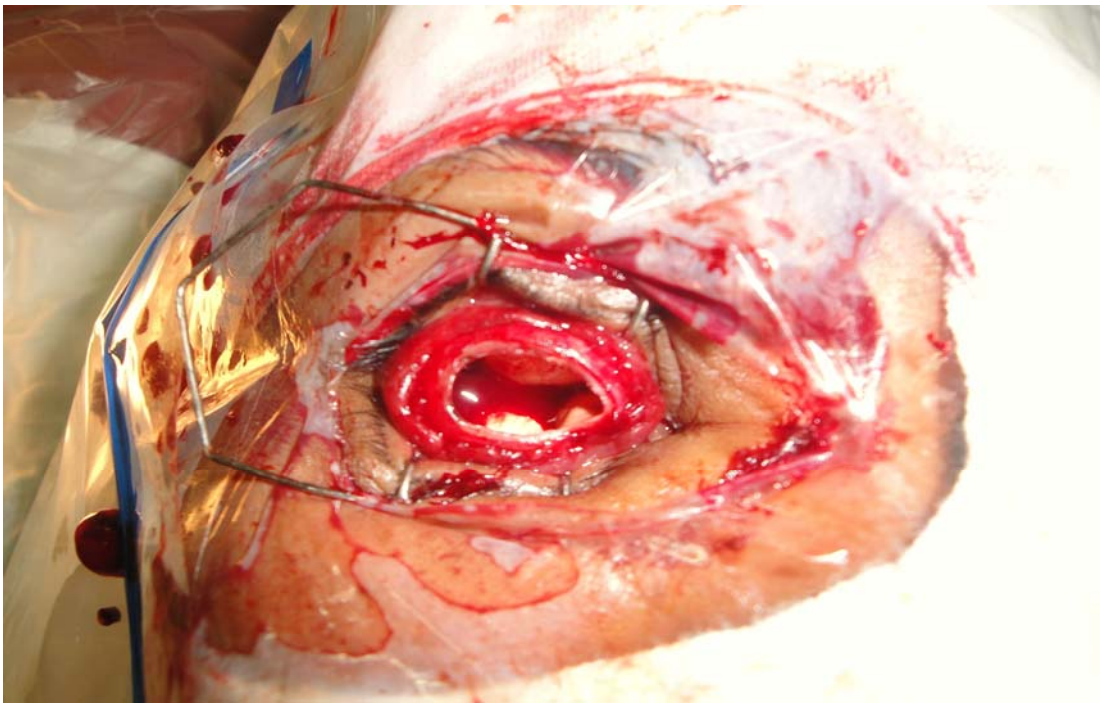


**FIGURE 21** **Bare sclera after intra-ocular contents are scooped out**

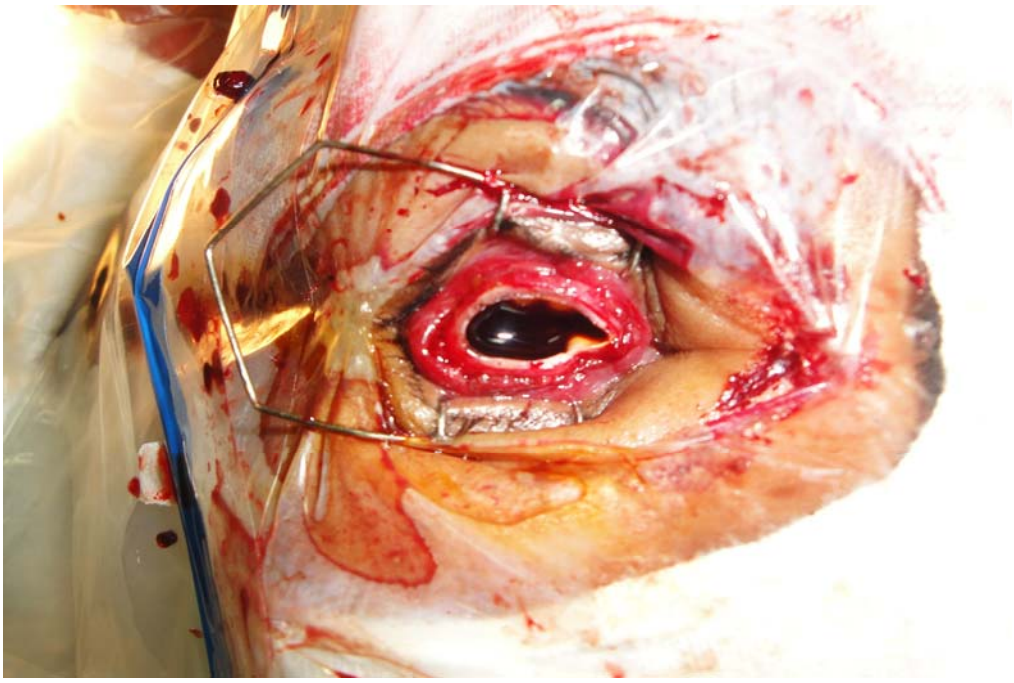


**FIGURE 22** **Intra-ocular cavity washed with Povidone iodine solution**

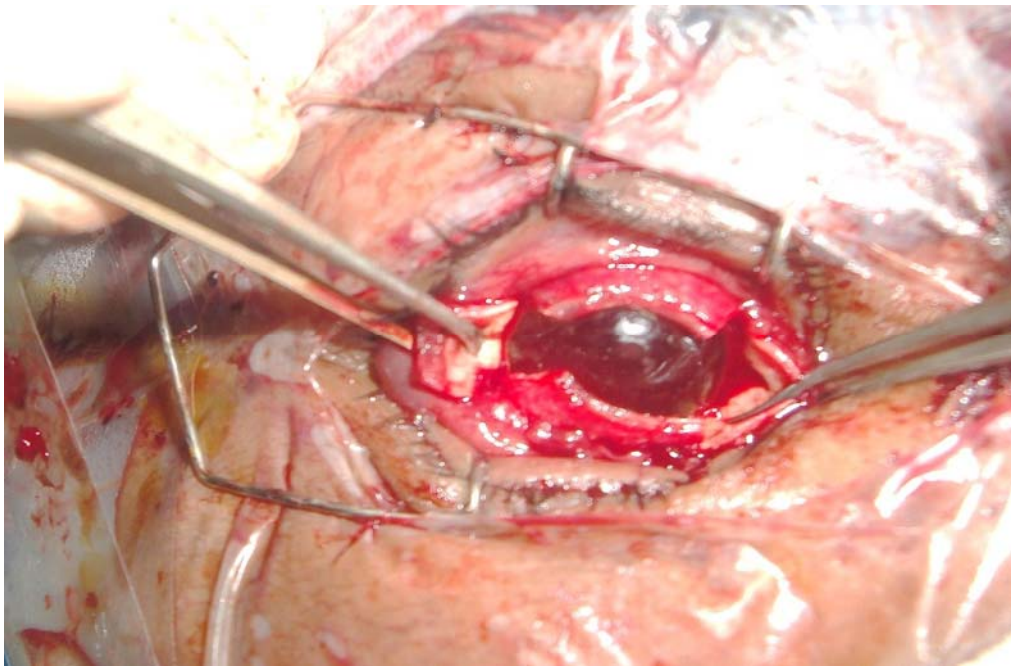


**FIGURE 23** **16 mm PMMA implant placed in the intra – ocular cavity after the sclera is transected into four petals**

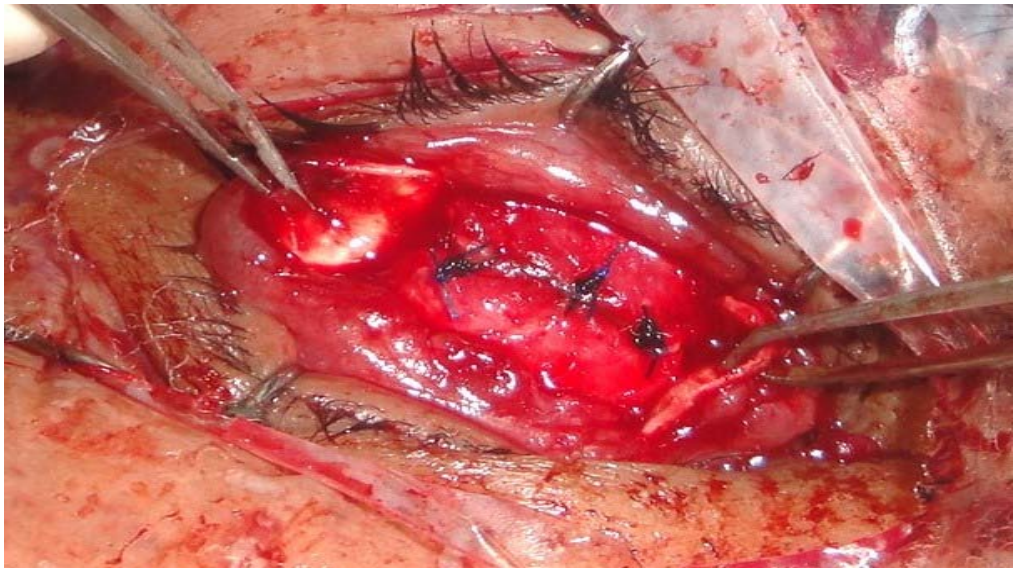


**FIGURE 24** **Petals sutured with 4 - 0 Prolene along the vertical meridian**

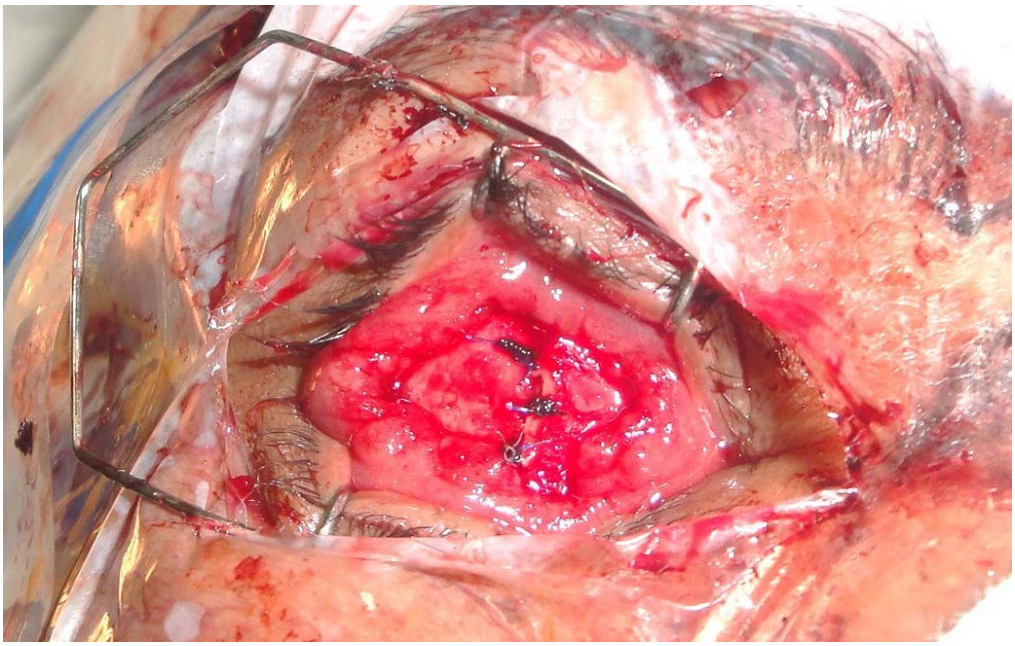


**FIGURE 25 Petals sutured along the horizontal meridian**

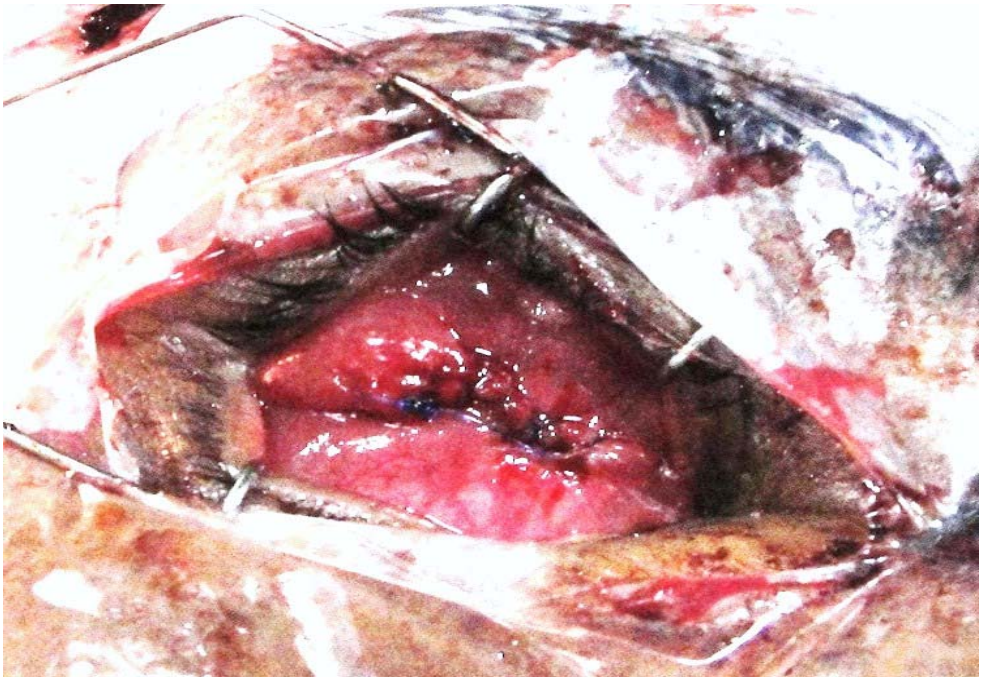
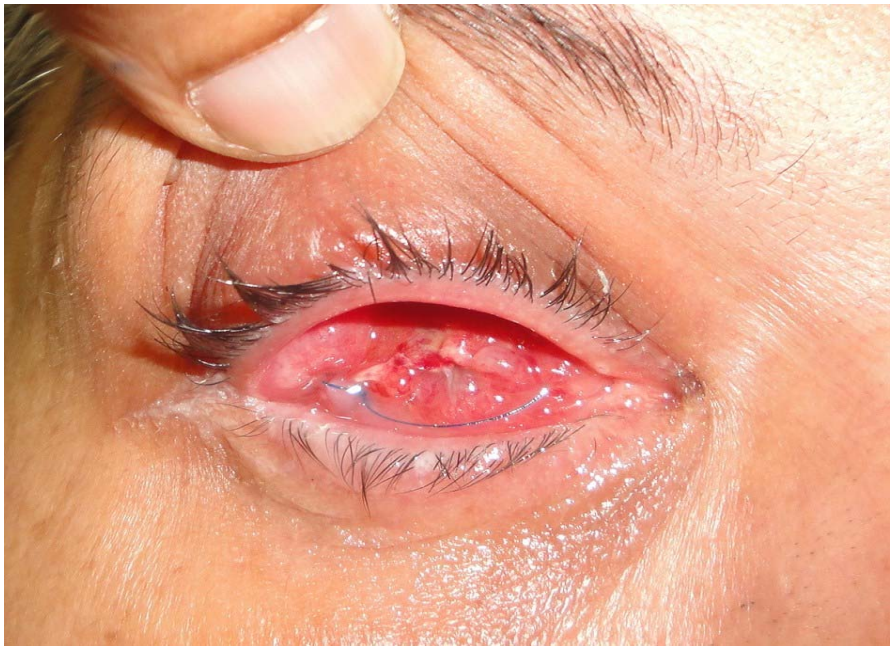
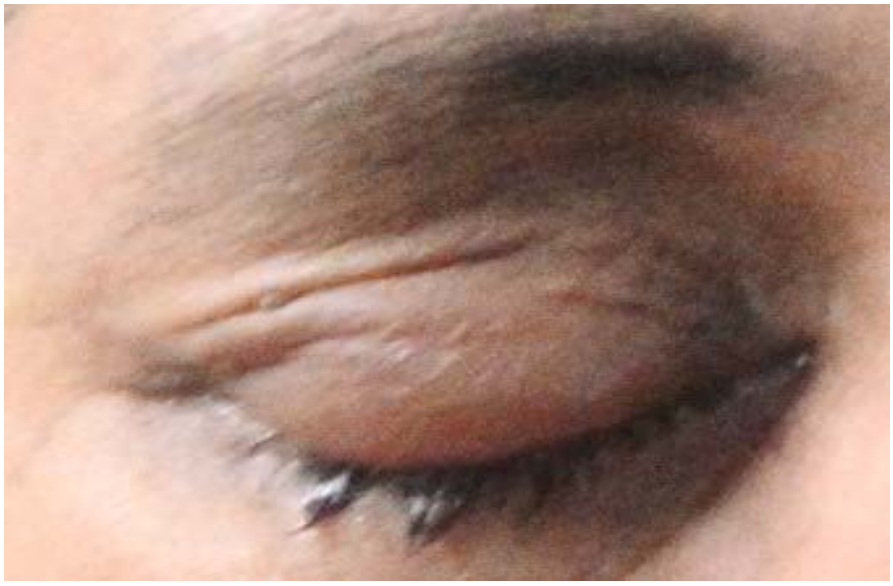


**FIGURE 26 Conjunctiva closed with continuous sutures**





**FIGURES 27 & 28 Right eye seen one week after evisceration**

**FIGURE 29** **Left eye seen six weeks after surgery, prior to the placement of prosthesis**

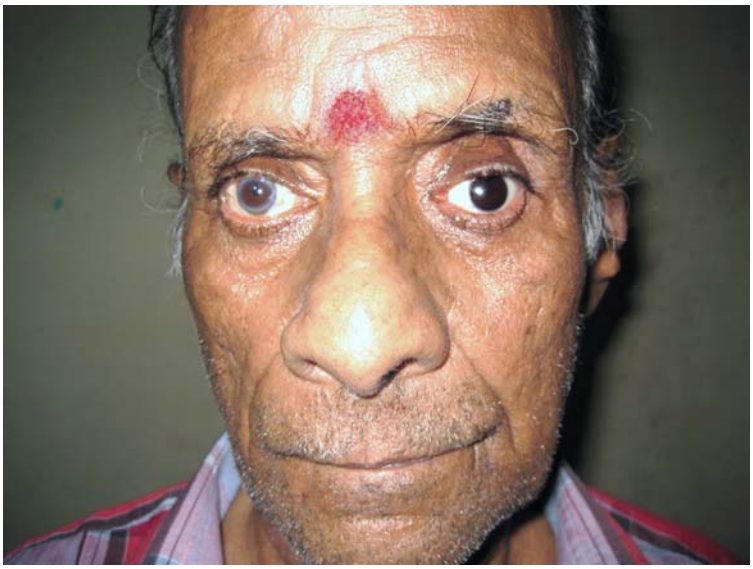


**FIGURE 30** **Left eye seen six weeks after surgery, after the placement of prosthesis**