Repair of orbital implant exposure using Müller’s muscle flap

Intérêt des lambeaux de muscle de Müller dans le traitement chirurgical des expositions de bille des cavités anophtalmes

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Summary
Introduction. — The purpose of this study is to analyse the 2-stage Müller’s muscle flap technique for the treatment of orbital implant exposure and its results.
Materials and methods. — This retrospective study reviewed all patients undergoing surgery using this technique in our university hospital over a 14-year period (1999–2012) in terms of success (no re-exposure of the implant) or failure.
Results. — Nineteen patients were managed using this 2-stage procedure. Orbital implant exposure occurred 94.4 months (2–240) after implantation. The success rate was 68.4% (13/19) and failure rate 31.6% (6/19). Risk factors for exposure were enucleation for melanoma followed by radiation therapy, acrylic implant, and early exposure probably due to excessive suture tension.
Discussion. — Implant exposure is the most common complication after evisceration, enucleation or socket surgery. Several techniques to repair exposures have been described. Two-stage Müller’s muscle flap is an interesting option, especially for patients presenting defects larger than 4 mm² and without previous radiation therapy treatment.
Conclusion. — The two-stage Müller’s muscle flap procedure allows for an autologous vascularized pedicle flap from the ipsilateral upper eyelid. It is a reliable technique with a success rate of 68% in our study.
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Introduction

Implant exposure is one of the most frequent complications after evisceration, enucleation or secondary socket reconstruction when implants are used. Hydroxyapatite orbital implant is reported to have lower rates of complications than the other devices of orbital implants: 0 to 22% of exposures [1—3]. Exposed non-porous implants often extrude. Exposed porous implants have been reported to spontaneously heal but may require a surgical treatment for persistent and large exposures. Risks factors of exposure include superficial placement of the implant, lack of suture, too tight sutures of the Tenon fascia and conjunctiva, infection, antimetabolite use or radiation therapy [4].

In this study, we report our experience with a two-stage technique of Müller muscle and conjunctival flap for the treatment of orbital implant exposure defects, as first described by Rosen in 1998 [5]. Another quite similar technique was described by Martin in 1999 [6]. Potential risk factors of failure were also analysed.

Materials and methods

In this retrospective study, nineteen patients with acquired anophthalmic socket presenting with an exposure of the orbital implant were included. They were operated on between March 1999 and September 2012. Operations were carried out by three oculoplastic surgeons. A two-stage surgical technique was used.

The first stage was performed under general anesthesia. The margins of the conjunctiva and Tenon’s capsule around the exposed area were freshened and lifted, in order to prepare a healthy and vascularized recipient bed (Fig. 1).

Then the implant was drilled or burred down on the exposed area with a continuous irrigation, in order to wash out necrotic tissues and to make the implant surface less convex (Fig. 2). Usually the exposed implant was vascularized till the depth of the sphere. The total area of exposed implant was measured to determine the Müller muscle flap’s size. Two 3.0 silk traction sutures were placed through the central upper eyelid margin and the superior eyelid was everted over a Desmarres retractor. The upper tarsal border was identified. The required area of conjunctiva and Müller muscle to fill the defect was measured and marked. Using Vannas scissors and blunt dissection, the conjunctival and Müller muscle flap was dissected off the upper tarsal border. During Müller muscle dissection, care was taken to preserve the levator aponeurosis (Fig. 3). Hemostasis was obtained with...
cautious monopolar cautery. The flap with anterio-superior hinge was undermined superiorly. This flap was placed over the exposed implant, inverted in order to place the Müller muscle surface faces the exposure and the conjunctival surface faces anteriorly. The margins were sutured using 6.0 fast-absorbing interrupted stitches (Fig. 4).
Müller muscle flap (success/failure rates)

![Success or failure rates of Müller muscle flaps.](image)

Figure 8. Success or failure rates of Müller muscle flaps.

Data retrospectively referred were: age, sex, date of enucleation or evisceration, reason for surgery, type of orbital implant, time between surgery and orbital implant exposure, date of Müller muscle flap, time between surgery and section of the flap, second surgery or not, duration of the follow-up, success and failure at the end of the follow-up.

The surgery was judged successful when a new prosthesis could be implanted without further ball exposure. Failure of the surgery was defined as a re-exposure of the implant and necessity of second surgery.

**Results**

Nineteen patients were managed using this two-stage procedure (13 women, 6 males). Medium age was 57.5 years (9 to 90). The average follow-up was 41 months (3 to 163). Sixteen patients had undergone an evisceration and three patients an enucleation (1 for retinoblastoma, 2 for melanomas). All of them had been implanted primarily with hydroxyapatite (HA) implants, except one with an acrylic implant. Trauma was the primary cause of surgery. Orbital implant exposure happened 94.4 months (2 to 240 months) after implantation. The average period between the first stage (Müller muscle flap) and the second stage (section of the flap) was 39.9 days (33 to 62 days).

Success rate was 68.4% (13 patients) and the failure rate was 31.6% (6 patients) who needed second surgery (Fig. 8). Second surgical procedures were: 2 one-stage implant ablations followed by dermis fat graft, 3 two-stages implant ablations followed by dermis fat graft because of an infection of the recipient bed, and 1 temporalis fascia graft (Table 1). The average length between failure of Müller muscle flap and second surgery was 27.2 months (3 to 69 months).

Predisposing factors for exposure were noticed among patients with failed Müller muscle flaps: 2 had undergone an enucleation for melanoma followed by radiation therapy, 1 patient had an acrylic non-porous implant (evisceration in 1991). One patient presented an early exposure probably due to too tight sutures. The remaining 2 patients did not present risk factors for exposure (Table 2).

Among patients with successful Müller muscle flaps, no re-exposure or other complications were encountered during the follow-up. Some of them underwent another socket surgery: for Post-Enucleation Socket Syndrome (PESS) in 2 patients (1 Coleman procedure and 1 orbital hydrogel implants injection) and for conjunctival retraction in 1 patient (amnion membrane graft).

Every patient was fitted with a prosthetic device successfully (Figs. 9 and 10).

**Discussion**

Implant exposure is the most common complication after evisceration, enucleation or socket surgery, with a superior rate for acrylic or silicone implants than for hydroxyapatite implants.
Hydroxyapatite implants [7]. Preventive care should be carried out to avoid this complication. The appropriate size of the implant should be assessed before implantation using sizers of various diameters. Moreover, closing Tenon capsule and conjunctiva over the implant should be realized without tension [1—3].

Sometimes, spontaneous healing of a small orbital implant exposure is observed, but observation is recommended only with areas less than 4 mm² [8,9]. But simple observation or direct conjunctival closure are ineffective in most cases [6,10].

Previously described procedures for treatment of exposed orbital implants include: ablation of the implant and dermis fat graft: one or two-stage procedure in case of infection [11], simultaneous secondary implant and dermis fat graft [12], temporalis fascia graft [13], frontal perios- teum graft [14], tarsal patch flap [15], amniotic membrane graft [16], retroauricular myoperiosteal graft [17] or biosynthetic material patch graft as described by Enduragen [18].

The two-stage Müller muscle flap technique is an interesting alternative, allowing an autogenous local vascularized pedicle flap from the homolateral upper eyelid.

The main disadvantage of this technique is the requirement of two surgical steps for the patient.

Moreover, Müller muscle flaps present the theoretical risk of ptosis, fornix shortening, upper eyelid retraction or hemorragies. None of our patients experienced these complications.

The main risk of this technique is a failure of final coverage or persistent infection, especially in cases of poor cicatrization risk factors: acrylic implants,ocular cancer therapies. Acrylic orbital non-porous implants often extrude (8,9%), with large exposures, migrate (16,1%) or become infected (7%) [19], also Müller muscle flap does not seem to be the appropriate technique to treat these complications. In cases of ocular cancer therapies, the vascularization is compromised and the bed recipient is not effective to receive a Müller muscle flap [20,21]. For these cases, ablation of the implant and autogenous dermis fat graft seems to be a better alternative [22].

### Conclusion

Two-stage Müller muscle flap is a reliable technique, with a success rate above 68%, allowing preservation of the implants and easy equipment with a new prosthesis.

We recommend consideration of this technique for the treatment of porous orbital implant exposures, especially those greater than 4 mm², in the absence of previous orbital radiotherapy or fornix damage. Nevertheless, removal of the orbital implant and replacement with dermis fat graft is required in cases of chronic inflammation or infection, non-porous implant, conjunctival shortage or previous orbital radiotherapy.

### Disclosure of interest

The authors declare that they have no conflict of interest concerning this article.

### References