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CASE REPORT
Reconstructive

Eyelid Reanimation with Free Platysma Graft: Final Stage of Reconstruction after Gunshot Wound to Face

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Summary: Patients with gunshot wounds to the face have massive soft tissue and bony damage from projectile and blast injuries. They often require multiple, staged reconstructive surgeries with cross-facial nerve grafting and free muscle flap for re-establishment of facial expression. Injury to or total loss of the facial nerve and branches can result in loss of function of the orbicularis oculi muscle, which leads to the loss of protective mechanisms of eyelid function and blink reflex. The purpose of this article is to provide a literature review and discussion of eyelid reanimation after facial paralysis and to discuss our surgical technique with free platysma muscle grafts of the eyelid. The patient is a 45-year-old man with a history of a gunshot wound to the right face. He underwent multiple reconstructive surgeries in the past, and in preparation for eyelid reanimation, he underwent a cross-facial nerve graft from the left temporal branch to the right eyelid. At initial postoperative evaluation, the patient was able to close his right eye with minimal lagophthalmos, and at 3-month follow-up, he exhibited stronger blinking reflex. This case demonstrates that a free platysma graft with direct neurotization with cross-facial nerve graft fascicles can be utilized for restoration of spontaneous eyelid animation. However, there may be failure of neurotization and inability of the spontaneous blink reflex to be present. Despite these limitations, we still recommend the utilization of free platysma graft to provide upper eyelid reanimation through cross-facial nerve graft. *(Plast Reconstr Surg Glob Open 2022;10:e4372; doi: 10.1097/GOX.0000000000004372; Published online 10 June 2022.)*

Patients with a gunshot wound (GSW) to the face will have massive soft tissue and bony damage from projectile and blast injury. They will often need multiple, staged reconstructive surgeries, including restoration of the bony framework, mandible and facial reanimation with cross-facial nerve grafting, and free muscle flap for re-establishment of facial expression. Injury to or total loss of the facial nerve and branches can result in loss of function of the orbicularis oculi muscle, which leads to the loss of protective mechanisms of eyelid function and spontaneous blink reflex. This inability to close the eye can cause increased corneal exposure, increasing the risk of corneal abrasions, epiphora, and possible loss of vision.[1,2] Static and dynamic procedures can be used to restore the function of the eyelid and protect the globe from further injury. Previous studies have shown that muscles that are not reinnervated by 2 years after injury will undergo permanent atrophy, requiring replacement of new muscle due to lost motor units.[3,4] Dynamic surgery for reconstruction of the orbicularis oculi muscle and blink reflex using cross-facial nerve grafting, neurotized free muscle flap, or muscle transfers have been described.[1] The purpose of this article is to provide a discussion of eyelid reanimation after facial paralysis and to describe our surgical technique for staged blink reconstruction with free platysma muscle graft of upper and lower eyelids in a patient with history of GSW.

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CASE REPORT

The patient is a 45-year-old man with a history of GSW to right face. He underwent multiple reconstructive

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surgeries in the past, including stabilization with soft tissue reconstruction, right mandibular reconstruction with osteocutaneous fibula flap, right-sided facial reanimation with cross-facial nerve graft with median antebrachial cutaneous nerve, and gracilis flap. The patient exhibited good Bell's phenomena and the ability of partial closure of the right eye with mastication; however, he continued to have symptoms of dry eye and epiphora. In preparation for eyelid reanimation for improvement of synchronous blink, 3 years after the initial injury, he underwent a second cross-facial nerve graft with right sural nerve coaptation with the left temporal branch for right eyelid reconstruction. The right sural nerve graft was harvested with distal "Y" branching point for upper and lower eyelids. A preauricular facelift incision was utilized to create a subcutaneous flap. Nerve monitoring was used to identify the left temporal nerve branch, and subcuticular tunneling was created overlying the left eyebrow and glabella to the right upper and lower eyelids (Fig. 1). Nine months after nerve grafting, the patient had adequate Tinel's sign and was taken back to the operating room for the second stage of the restoration of eyelid reanimation with free platysma graft and direct neurotization. Incisions were made on the right upper and lower eyelids, and a skin flap was undermined with identification of the previously placed cross-facial nerve grafts. The fascicular dissection was performed on upper and lower nerve grafts. The platysma muscle graft was harvested from the left neck with approximate size of 5 × 2 cm. The free platysma muscle was split inset along the upper and lower tarsal plates with Monocryl sutures with minimal tension with no overlap on the medial canthus. Laterally, the muscle remained intact to maintain circular orientation. The fascicular neurotization to the platysma was performed with 11-0 Nylon to muscles fibers (Fig. 2). The eyelid skin incisions were closed with 5-0 Prolene sutures, and tarsorrhaphy was placed.

At the initial postoperative evaluation and removal of the frost stitch, the patient had the ability to close his right eye with minimal lagophthalmos. On continued follow-up and after surgical swelling decreased, he had continued improvement of spontaneous blinking of the right eyelid with 1–2 mm of lagophthalmos. At the 3-month follow-up, he exhibited stronger blinking reflex and no symptoms of dry eye or further irritation. At the 1-year follow-up, the patient had great spontaneous blink of his reconstructed right upper and lower eyelids and minimal lagophthalmos. (**See Video [online]**, which displays the follow-up after completion of facial reconstruction and eyelid reanimation. This video is at 1-year follow-up after right-sided blink

Fig. 1. Intraoperative image of the planned subcutaneous course of the harvested sural nerve graft and distal branch point for upper and lower eyelid reconstruction. A preauricular facelift incision was utilized for creation of subcutaneous flap and identification of the left temporal nerve branches for coaptation of cross-facial nerve graft.

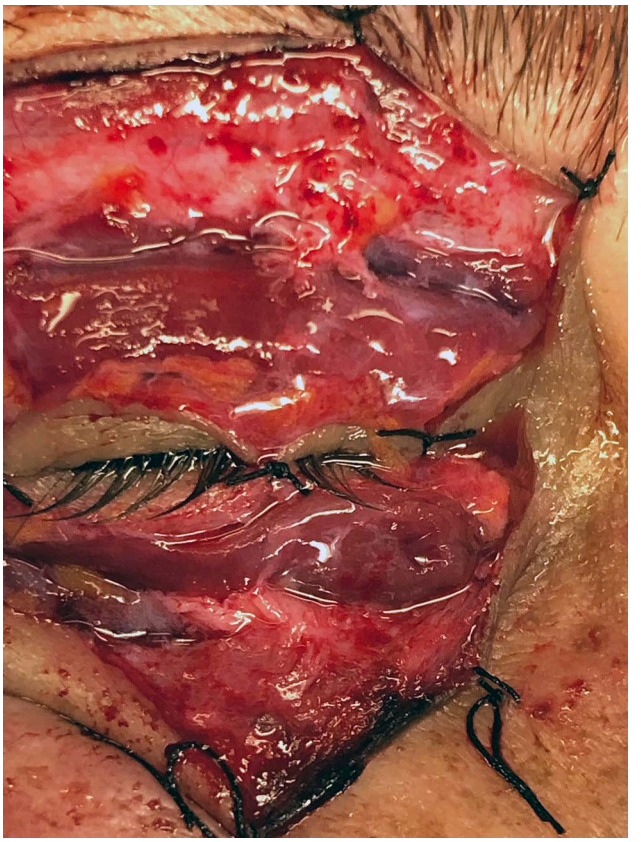

Fig. 2. Intraoperative image of the superior and inferior eyelid reconstruction with inset to tarsal plate and direct neurotization of platysma graft. A total of six fascicles sutured to platysma graft in the upper eyelid and four fascicles sutured to the lower eyelid.

restoration with direct neurotization of free platysma graft showing synchronized blinking.) Although the strength of the restored eyelid was stronger compared with previous follow-up examinations, it was weaker compared with the normal left eyelid forced blink strength. He was no longer using any type of eye drop for previous dry eye symptoms (Fig. 3). Further reconstruction for soft tissue augmentation and contouring with fat grafting to right midface was offered but declined as the patient was very pleased with his reconstruction and blink restoration. Although further follow-up would be beneficial to observe the long-term results of the eyelid reconstruction and blink restoration, the patient died from an unexpected myocardial infarction before the next scheduled appointment.

DISCUSSION

Restoration of the eyelid function is an important aspect of facial reconstruction after injury. There are many techniques, such as gold weight implantation and temporalis transfer, that can be utilized for static and dynamic restoration of the blink reflex with goals to restore proper eyelid position and function for protection of the globe. However, individuals who have undergone gold weight implantation often complain of incomplete normalization of visual acuity along with a disrupted tear film and eye irritation.[5] Similarly, the temporalis transfer is popular but has several shortcomings: eyelid closure during chewing or teeth clenching and lack of spontaneous blinking reflex.[4,6,7]

Although the idea of utilizing a free platysma graft came about in 1984 by Lee and Terzis, the platysma was not used until 2004.[1,8] Guelinckx[8] determined that the use of a platysma transfer in blink restoration is a feasible method to restore eye closure due to the similar embryological origin of the orbicularis oculi and the platysma. The use of cross-facial nerve grafting with gracilis free flap for midface reanimation and staged platysma free flap has been utilized by microvascular surgeons for blink restoration,[8,9] but may be limited due to the orientation of neurovascular bundles.[10] A previous study by Biglioli et al[4] also demonstrated successful neurotization of free platysma for upper eyelid blink restoration. However, there have been no applications of the current technique utilized in patients after GSW to the face. Nassif et al[3] demonstrated good spontaneous blinking after direct neurotization of platysma graft in 53% of patients in case series. The technique described by Nassif et al and our technique are similar in utilization of the sural nerve graft, timing of

Fig. 3. Pre- and postoperative photographs. A, patient is s/p facial reconstruction with osteocutaneous fibula graft, cross-facial nerve graft with median antebrachial cutaneous nerve, and midface reanimation with gracilis flap, preoperative photograph before platysma graft and direct neurotization. B, The postoperative photograph is taken at 1-year follow-up after facial reconstruction with open reduction internal fixation of orbital and midface fractures, mandible reconstruction with free osteocutaneous fibula flap, right-sided midface reanimation with gracilis flap, and staged blink restoration with cross facial nerve graft and free platysma graft with direct neurotization. The postoperative image demonstrates symmetrical blink restoration, and there is mild lagophthalmos present.

staged reconstruction, harvest of the platysma graft, and inset with platysma at tarsus with no overlap at the medial canthus while maintaining continuity of the platysma at the lateral canthus. Nassif et al[3] utilized incisions at lateral orbit and nasolabial folds with coaptation with contralateral zygomatic nerve branches with subcutaneous course above the eyebrow and superior lip. In contrast, we preferred a preauricular incision and facial flap for better exposure of the facial nerves and to limit scarring on the face. The course of our nerve graft and branches was above the eyebrow and glabella to the contralateral eyelids. Although other flaps could have been utilized, this patient had a history of multiple free flap surgeries for prior facial reconstruction. We believe that this technique should be utilized in a subset of patients who have a limited number of free flaps that can be harvested.

Furthermore, restoring upper eyelid reanimation with a free platysma graft has several shortcomings. Primarily, there may be failure of neurotization, leading to lack of spontaneous blink reflex or lid malposition. This could potentially cause more globe complications and require additional invasive surgical procedures. Despite these limitations, we still recommend the utilization of eyelid reanimation through cross-facial nerve graft and direct neurotization of free platysma graft in the appropriate patient population.

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PATIENT CONSENT STATEMENT

The patient provided written consent for the use of his image.

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