



# Replantation of Avulsed Eyelid Followed by Use of Bioengineered Dermal Substitute

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## Introduction

In the United States, 4.5 to 4.7 million dog bite injuries are reported per year.<sup>1</sup> Injuries involving the lacrimal system after dog bite are commonly encountered in oculoplastic practices ranging from 20-36%.<sup>1</sup> Bratton et al. reported an 8% medial canthal avulsion rate in their retrospective review of 1,989 children with facial dog bites.<sup>1</sup> However, per literature review, only one case of total eyelid avulsion secondary to dog bite has been reported so far.<sup>3</sup> We report a case of a young girl with full thickness upper eyelid avulsion which was repaired in a timely manner with replantation of avulsed eyelid tissue followed by use of a dermal regeneration substitute. Consent for publication of the case and clinical images were obtained from the patient, and the report adheres to HIPAA compliance and to the principles set forth in the Declaration of Helsinki.

## Case Description

An 18-year-old female presented after being bitten by her dog approximately one hour prior to arrival. Upon examination, she was noted to have a full thickness avulsion of her central right upper eyelid measuring 25 mm x 15 mm (Figure 1A). There were no other signs of ocular injury, and her remaining ocular exam was unremarkable. The avulsed piece of eyelid tissue accompanied the patient and did not look dark or dusky (Figure 1B).



Figure 1. A) Full thickness avulsion of central upper eyelid; B) Avulsed piece of eyelid tissue (with fake eyelashes).

Eyelid reconstruction was performed within 2 hours of her presentation by meticulous replantation of the avulsed eyelid piece with layered closure using 6-0 vicryl and 6-0 plain gut suture (Figure 2A). Postoperatively, she was started on oral antibiotics and ophthalmic antibiotic ointment. Two weeks postoperatively, the skin of the grafted eyelid was slightly dusky in color and necrotic at the superior edge (Figure 2B). Orbicularis muscle and posterior lamella appeared to be well perfused and healing appropriately. It was decided to debride the necrotic skin and place a bioengineered dermal substitute (Integra® Dermal Regeneration Template [DRT], Integra Life Sciences, Plainsboro, NJ). The necrotic wound edges were freshened, and Integra was secured in place with interrupted 6-0 vicryl sutures. Three weeks after the initial placement, the silicone layer was removed, and the wound bed appeared healthy and vascularized. Six months postoperatively, the patient had an excellent eyelid contour and symmetry without lagophthalmos. The central upper lid was missing lashes (Figure 2C).



Figure 2. A) Immediate postoperative appearance after replantation; B) Skin of grafted eyelid slightly dusky and necrotic at superior edge (2 weeks postoperatively); C) Eyelid after Integra (Integra LifeSciences, Plainsboro, New Jersey) placement.

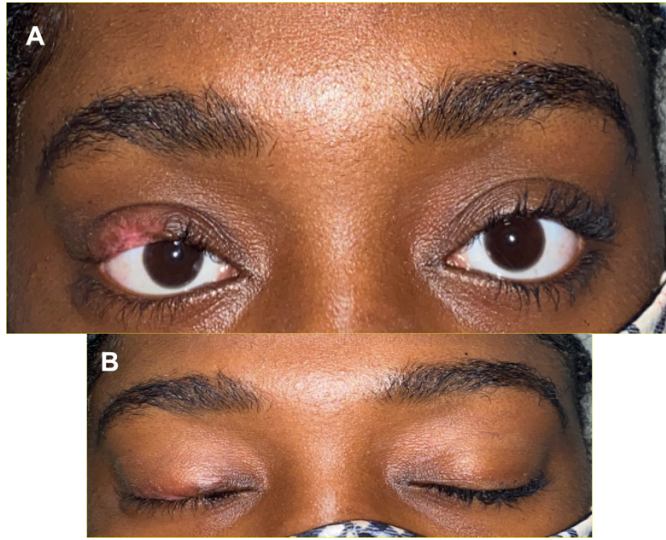


Figure 3. A) Postoperative appearance 6 months after Integra (Integra LifeSciences, Plainsboro, New Jersey) placement with excellent cosmesis; B) Full eyelid closure without lagophthalmos.

## Discussion

By definition, avulsion of tissue or an organ refers to tearing away or forcible separation. Literature on replantation of avulsed eyelid tissue is sparse with only 2 cases of eyelid avulsion reported in the literature to date. Yeatts et al. reported replantation of an avulsed lower eyelid 8 months after motor vehicle injury. In their patient, the avulsed eyelid was lodged onto temporalis fascia in a fistulous tract. The avulsed piece was retrieved and replanted to its original anatomic location resulting in a good outcome. The authors did not comment on the length of postoperative follow up.<sup>2</sup>

In a second case by Soueid et al., a 22-year old female patient had upper lid avulsion after a dog bite. Microsurgical reimplantation with microvascular anastomosis was performed, and the patient was followed for 5 months with clinical improvement. The last postoperative photo showed mild to moderate ptosis of upper lid, and the authors did not comment on lagophthalmos.<sup>3</sup> In their experimental study on rabbit eyelids, Goldberg et al. demonstrated that eyelid tissue stored in a cold (4°C) and moist environment (and not immersed in saline) with reattachment delayed no longer than 6 hours has resulted in minimal postoperative degeneration of tissue.<sup>4</sup> Similarly, by preserving the tissue in McCarey-Kaufman medium (MK) the reattachment can be delayed up to 24 hours.<sup>4</sup>

Integra® is a bilayer consisting of an inner layer of bovine collagen cross-linked with glycosaminoglycans and an outer layer of silicone.<sup>5,6</sup> The inner layer provides a scaffold for vascular and dermal growth, while the outer silicone layer prevents wound desiccation and protects the regenerating dermis.<sup>5,6</sup> The package insert recommends removing the silicone sheet at 2 weeks. Recently, Integra has shown good results when used in periocular injuries with extensive tissue loss before placement of an autograft (skin graft). Scar contracture has been reported after the use of this skin substitute in the periocular region, resulting in lagophthalmos and exposure keratopathy. We left the silicone sheet in place for 3 weeks as the regenerating dermis still had an active granulation tissue appearance 2 weeks postoperatively. Our patient did not show any evidence of skin contracture and her wound healed nicely without a need for skin grafting at her 6 month follow up appointment. We believe that keeping the silicone sheet in place for 3 weeks may have helped to keep the wound moist to allow for complete dermal regeneration and thus prevented scarring and contracture.

Full thickness eyelid replantation can be considered if surgical intervention is possible within a reasonable time frame after injury and the tissue appears healthy. Good aesthetic outcomes and eyelid functionality can be achieved with eyelid replantation. Bioengineered skin substitutes are a viable option for skin grafts if needed to replace the anterior lamella after replantation procedures. This may be particularly useful in young patients who are not ideal candidates for rotational flaps given less tissue distensibility and their propensity for excessive scarring. When using bioengineered skin substitute such as Integra for eyelid repairs, clinical judgement on the timing for silicone sheet removal may be important for optimal outcomes. It is crucial to follow these patients closely to prevent the delay in treating the wound contracture, subsequent lagophthalmos, and sight threatening corneal exposure.

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### **Statement of Ethics and Informed Patient Consent**

This case report adheres to patient confidentiality and ethical principles in accordance with the guidelines of the Declaration of Helsinki and relevant local regulations. Written consent was obtained from the patient for the publication of this case report.

### **Conflict of Interest Statement**

The authors declare no conflicts of interest related to this topic.

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