

Eye Lid Reconstruction Following Extensive Ulcerated Tumour Excision in Two Dogs

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Abstract

This paper describes successful surgical management of eye lid tumour excision with reconstruction of eye lids in two dogs that were presented to the Veterinary Teaching Hospital, School of Veterinary Medicine, Trinidad. One was an eleven-year-old mixed breed dog presented with a large ulcerated soft tissue mass involving the lower lateral eyelid that was confirmed as mast cell tumour. The other was a ten-year-old Pitbull with a 3 cm darkly pigmented haemorrhagic mass in the lower eyelid, confirmed as melanoma. Following surgical removal of the mass, the eyelid was reconstructed with a lip-to – lid transposition in both dogs. While the flap was successfully received in the mixed breed, it devitalized and failed in the Pitbull. Revision surgery to reconstruct lower eyelid defect with a local transposition flap and an oral mucosal graft for conjunctival mucosal lining wTas carried out, successfully. In conclusions lip-to-lid flap and local transposition flaps with oral mucosal graft are effective and viable alternative surgical techniques for the reconstruction of eyelid defects following excision of extensive tumours.

Keywords: Buccal Mucosal Flap, Dogs, Eye Lid Tumours, Lip-to Lid Flap, Reconstruction

Introduction

Eye lid defects resulting from trauma, congenital agenesis and excision of neoplasms can result in severe adnexal and corneal diseases as well as functionally and cosmetically unacceptable outcome (Pellicane *et al*, 1994). Many techniques have been described for reconstruction of eyelid defects. These include single stage techniques such as mucocutaneous subdermal plexus flap (lip to lid) (Pavletic *et al*, 1982) ; and rotating pedicle flap (Schmidt *et al*, 2005). Techniques involving two- stages like sliding skin flap with a tarsoconjunctival graft (Gelatt and Blogg, 1969), bucket handle technique (Gwin, 1980) and cross lid flap (Munger and Gourley, 1981) have also been described. Pena and Garcia (1999) have described a technique of substitution of the palpebral conjunctiva with a free oral mucosal graft.

Since fine needle aspiration and cytology was suggestive of mast cell tumour in one dog and melanoma in the other, we decided to perform a full thickness eye lid resection with the surgical margins recommended by Simpson *et al.* (2004) and reconstruction. The surgical procedures were performed with an aim of providing a conjunctival lining for the lid after tumour excision of the tumour in addition to the skin coverage. In case of failed lip to lid flaps, oral mucosal graft for conjunctival lining with a local cutaneous transposition is a viable surgical option.

Case Description

Case 1

An eleven- year- old mixed breed dog was referred with a non-pigmented raised 2cm soft tissue mass in the lateral to mid- lower right eyelid. The mass had been present for the past six months and was increasing in size. A complete blood count and serum biochemistry was done 24hours prior to surgery and the results showed all parameters within normal limits.



Figure 1: Eye lid mass- mixed breed

Case 2

This was a 6-year-old male Pitbull and had a 3cm mass in the left lower eye lid. The mass was excised by a practitioner repeatedly four times at 3 months' interval before being referred to the teaching hospital.



Figure 2: Eyelid mass- Pitbull

All the blood and biochemical parameters were within the normal range. Thoracic radiographs and abdominal ultrasound were done in both dogs and the findings were unremarkable. For both dogs, a decision was made to do a full thickness resection of the eye lid along with the mass and perform a lip to lid graft. Both the dogs were premedicated with morphine at 0.5mg/Kg and midazolam 0.25mg/kg intravenously. Anaesthesia was induced with propofol at 4mg/Kg body weight 'till effect' and maintained with 2% Isoflurane in oxygen.

Surgical Technique

The procedure of the lip to lid flap was done as per the guidelines of Pavletic (2010). A full thickness resection of two thirds of the right lower eyelid along with the tumour mass was performed. The lip to lid flap was then elevated by making a full thickness incision, 2cm in width and 1.5cm in length, through the upper lip approximately 1cm from the commissure. This initial incision was made at 45° to the lip margin.

The oral mucosa was split at a level equaling the length and width of the conjunctival defect. Following this, the elevation of the graft was continued with the cutaneous pedicle. The flap elevated was just sufficient to have appropriate length for the transfer without excessive tension to the lower eyelid. A bridge incision was then made from the base of the flap to connect the donor and recipient beds. Throughout the surgery bleeding was stopped with diathermy and digital pressure. The graft was fixed using simple interrupted sutures in two layers - 4/0 polyglactin 910 for the conjunctiva to the oral mucosa, and 4/0 Prolene for the cutaneous layer. The rest of the flap over the bridging incision was closed using 4/0 Prolene in a simple interrupted pattern. The donor site defect was closed in two layers; the oral mucosa with 3/0 polyglactin 910 and the skin with 3/0 prolene. The healing was uneventful in the mixed breed and the sutures were removed on the 10th day. In the Pitbull, the flap turned black on the 3rd day and peeled off from the recipient bed on the 4th day.



Figure 3: Lip to Lid – Immediate post op



Figure 4: Failed lip to lid flap with evidence of necrosis of graft

A revision surgery was performed with a local cutaneous transposition flap and an oral mucosal graft for conjunctival lining. The failed lip to lid flap and necrotic tissues were removed and thoroughly debrided until the entire wound and the edges appeared fresh.



Figure 5: Elevation of local flap



Figure 6: Oral mucosal graft in place

A rectangular flap was elevated at 90 degrees' angle with one border adjacent to the wound. The length of the flap corresponded to the distance between the pivotal point and most distal point of the defect. The flap was elevated with the underlying subcutaneous tissue to preserve the subdermal plexus. The flap was then rotated 90 degrees transposed over the eyelid defect and sutured in place with 3/0 prolene. Oral mucosa slightly larger than the eyelid defect was harvested from the inner side of the upper lip. The graft was trimmed to leave only the mucosa and submucosa. After washing it with saline, the graft was placed over the conjunctival defect and sutured under tension using 5/0 polyglactin 910 as suggested by Van der Meulen (1982). The flap was successfully received and 100% 'take' of the oral mucosal graft was observed by day 10.



Figure 7: Successful 'take' of the local flap and oral mucosal graft – 10th post op day

Post-operative management in both dogs included daily wound powder (Negasunt®-Bayer) and Amoxicillin-Clavulanate tablets at a dose of 15mg/kg BID for seven days. Pain was managed with meloxicam (Mobic®) at a dose rate of 0.1mg/kg once daily for 3days. An Elizabethan-collar was placed until the sutures were removed. In the Pitbull and additional course of Amoxicillin- Clavulanate tablets was administered for 5 days following second surgery.

Discussion

The lip to lid flap is a mucocutaneous subdermal plexus flap and a simple one stage procedure suitable for lower eyelid defects. The central muscular layer of the lip to lid flap gives a more normal thickness and a natural rigidity as an eyelid substitute. The wide mucocutaneous junction and hairless lip margin serves as a natural buffer zone between the cornea and the hairy skin (Pavletic *et al.*, 1982). Although it is a subdermal plexus flap, its high success rate is probably the result of contributions from angularis oris artery (Geraldine, 2012). This procedure has been successfully adopted in cats with a satisfactory functional and cosmetic outcome by Hunt (2006). With a slight modification of this procedure, complete lip commissure has been transposed successfully in cats for the repair of eye lid coloboma (Whittaker *et al.*, 2010). A lip to lid flap was initially planned for both the dogs due to the size of the mass and the difficulty of having conjunctiva to line the graft.

The procedure of the lip to lid flap was done as per the guidelines of Pavletic (2010). Adequate care was exercised to assure atraumatic surgical technique. The graft shifting angle was approximately 40° and the length of the flap was elevated just to aid in tension free transposition at the recipient site. It is important that the width to length ratio for the pedicle should not be lower than 1:3 (Lew *et al.*, 2010). In the mixed breed 1:3 of this ratio was adequate to achieve a tension free closure of the defect. But in the Pitbull a lengthier flap was necessary to close the defect and the width to length ratio was close to 1:4 which could have been the reason for flap failure. However, within the skin of the head there is a high perfusion pressure in the subcutaneous vascular nodes and therefore the width to length ratio may be increased to 1:4. (Borodic and Townsend, 1994). The blood supply to the oral mucosa is from numerous arterial and venous anastomoses between the cutaneous subdermal plexus and the submucosal capillary network. In addition to a good technique, successful engraftment depends on the proper vascularization, solid adhesion of the flap to the recipient bed. Subdermal plexus flap survives by a network of unnamed blood vessels which run in the subcutaneous fatty and areolar tissue on the deep face of the dermis and where there is a cutaneous muscle, the subdermal plexus lies both superficial and deep of it (Pavletic, 2010). Therefore, it is important that the flap be separated with these layers (Lew *et al.*, 2010). Though axial pattern flaps carry a direct cutaneous artery the number of sites where these can be elevated is limited (Stiles *et al.*, 2003). Jacobi *et al.* (2008) successfully performed a superficial temporal artery axial pattern flap with nictitans in a dog to reconstruct the medial eyelids.

Though a one-step procedure this was not done in the present cases, as the lesions were on the lateral border. A proper elevation of the flap with the underlying subcutaneous tissue, maintaining adequate width and length ratio and atraumatic surgical technique are necessary for a flap survival. Experimental evidence suggests that the perfusion decreases to 10% and 40% of normal after initial elevation of single and bipedicle flaps respectively (Geraldine, 2012). There is also vasospasm that occurs resulting in transient decline in circulation (Pavletic, 2003). Flap necrosis can occur when the metabolic requirement of the skin exceeds the capacity of subdermal plexus perfusion. This may be due to insufficient number of blood vessels, damage to the plexus during flap creation, thrombosis of the plexus and decreased oxygenation from haemodynamic and vascular compromise (Geraldine, 2012). As there was no infection and self-trauma, we assume that the any of the above-mentioned adverse changes might be the reason for the initial failure of the lip to lid flap in the Pitbull.

Free oral mucosa and nasal mucosa have been successfully used as conjunctival substitute (Pena and Garcia, 1999). These mucosal grafts are transplanted onto a local pedicle graft and the flap is replaced on the donor site. The resulting composite flap is re-elevated and transferred to the recipient site after 4-7 days following resection of the eye lid mass (Pavletic, 2010). This necessitates a two-step procedure. Since there was an open wound due to the lip to lid flap failure in the Pitbull, the authors decided to do a local transposition flap and a free mucosal graft as a single stage procedure. The one -step free oral mucosal graft for replacement of membrane nictitans have been described in dogs (Kuhns, 1977). Whitehouse and Francis (1988) have done a similar procedure in 15 human patients with successful outcome. The good “take” of the mucosal graft in the present case could be due to the angiogenesis caused by contact with living tissue at the surgical margin. In addition, tears are richly oxygenated and thus contribute to oxygen delivery to the superficial corneal layer. This mechanism could be one potential factor allowing for survival of the grafted mucosa (Yamamoto *et al.*, 2017). The graft must be sutured to the recipient bed with tension so as to create a good contact between the graft and the skin for angiogenesis (Van der Meulen, 1982). We first transposed a cutaneous pedicle flap over the eyelid after removal of the failed lip to lid flap and necrotic tissue. Care was taken to elevate the flap carefully so that it had a smooth, uniform and flat dermis side to seat the buccal mucosa with a good contact. The pedicle flap was sutured to the defect followed by the free graft transfer. The buccal mucosa was sutured under tension as suggested by Van der Meulen (1982). The post-operative healing was incident free and the mucosal graft was “taken” very well. A good functional and cosmetic outcome were achieved by this revision procedure after a failed lip to lid flap in the Pitbull.

Cutaneous mass cell tumours comprise 7-20% of the neoplasms in older dogs (Bostock 1973). There is not sex predilection but Boxers, Boston terriers and Labrador Retrievers seem to be predisposed (Nielsen and Cole, 1958). The treatment of choice for solitary mast cell tumours remains surgical excision with margins of 2cm laterally and one fascial depth plane (Simpson *et al.*, 2004). Melanomas arising from the uvea are considered as the most common primary intra ocular tumours in dogs (Yi *et al.*, 2006). Most of the eyelid melanomas are reported to be benign. (Grahm and Sandmeyer, 2010). The recommended surgical margins were found adhered and viable to in both the dogs and there was no recurrence of tumour over a 6 month follow up period. In these cases, the blink reflex was also not disrupted since this is mainly produced by the upper eyelid and the orbicularis oculi muscle. Also, the direction of hair growth was away from the cornea and the hairless lip margin were beneficial in protecting the cornea.

Conclusion

Lip- to- lid flap and local transposition flap with oral mucosal graft providing a good conjunctival lining are effective and viable alternative surgical technique for reconstruction of eyelid defects following excision of extensive tumours.

Conflict of Interests

There is no conflict of interest.

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