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Ophthalmic Surgery Mini Series

Session 1: The surgical approach to eyelid disease

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The surgical approach to eyelid disease

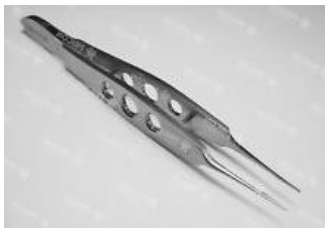
1. What surgical instruments should I keep in my ‘eyelid kit’?

There are some basic staples that I would have in my ‘eyelid kit’. These include:

Ribbon scissors

Steven’s tenotomy scissors

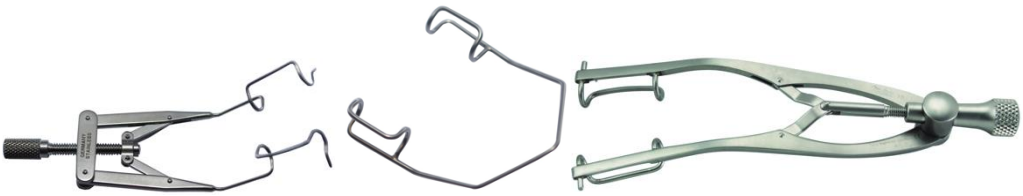
Range of small & fine rat tooth (Bishop Harmon) forceps – 0.5mm, 0.2mm, and 0.12mm



Derf’s needle holders

Microneedle holders

Speculum (good idea to have both small and large sizes, types: surgeon preference)



(Jaeger lid plate)

Chalazion clamp

Bennett’s cilia forceps

Nettleship punctum dilator

Buster™ pillow (Kruuse) and pump (vacu-support)

‘Eye kits’ are generally abused in practice – whenever a small instrument is wanted for a procedure they get raided, and subsequently they may get used inappropriately and damaged. If ocular surgery is your thing, my advice is to be territorial about your kits! Care of any eye kit will extend its life: timely rinsing of blood, hair, and tissue debris, followed by disinfection individually on rubber/silicone finger mats to keep them separated (particularly in the ultrasonic cleaner, where jangling together will damage the delicate instruments). They are best stored in a tray pack with individual instruments separated on silicone finger mats to protect them (not bundled together in a cloth drape).

I am a fan of good lighting in theatre, and this is particularly important if you use surgical loupes, where it is essential. Surgical loupes cannot be recommended highly enough. They take some getting used to, but will really improve your closure accuracy and results.

If you are new to loupes, start with lower magnification e.g. x 2.5, and practice using them on all surgeries (castrates, spays, lump removals, as well as your ocular surgeries) as this will get you to adapt more quickly.

2. Surgical preparation and positioning
co-author: James Gasson (AHT theatre manager)

The Buster™ pillow (supplied by Kruuse) is a vacuum pillow that can be used to position the patient's head and stabilise it for surgery. It is crucial you do not apply towel clamps to this pillow, or perforate it with any surgical instruments, as you will render it useless. Punctures can be repaired using a bicycle puncture repair kit. Inflate the pillow and place it in a bowl of water to identify the puncture site (with a stream of bubbles).

Sternal or lateral positioning is my preference for eyelid surgeries. I favour dorsal recumbency for intraocular and conjunctival surgeries (this includes dermoid (choriostoma) removals that involve the cornea, and aberrant lash surgeries).

When it comes to surgical site preparation, the most significant source of contamination is from the patient's own microbial flora. Bacteriological sampling from the healthy conjunctival sac commonly yields Staphylococcal and Streptococcal species, B. coagulase, E. coli, Corynebacteria, and Pseudomonas aeruginosa. Together with resident flora of the eyelid margins, lash follicles, and periorbital skin, the eye, as a whole, is fairly inaccessible to disinfection. The aim of surgical preparation is to: remove gross dirt and transient organisms, and reduce resident flora to a sub-pathogenic level, whilst exerting the least amount of tissue irritation, and in the shortest amount of time.

For eyelid surgeries clipping is usually limited to the proposed incision site (and margin) due to the delicate and sensitive periorbital adnexa. Poor clipping technique is associated with an increased incidence of surgical wound infections due to: inflammation and micro-lacerations, high rebound population of resident microbes and irritation leading to self-trauma.

The eye should be protected during hair removal by using a sterile water based lubricant e.g. KY™ or Lubrithal™, that traps loose hair and facilitates removal. KY™ is also used as a lubricant in the contralateral eye during bilateral procedures. Clippers should be clean and sharp with no missing or damaged teeth. A No. 40 or No. 50 blade is appropriate for most eyelid surgeries. Narrow blade clippers intended for canine/feline foot grooming can also be useful. KY™ jelly smeared over the area to be clipped lubricates the skin and reduces friction trauma. Skin must be pulled taught and hair clipped against the direction of hair growth using a flat blade (don't be tempted to dig the blades into the skin).

Moist swabs are useful to remove loose surface hairs from the surgical site. Vacuum cleaners should be avoided. A saline flush is used to lift the KY™ jelly from the ocular surface, and remove loose hairs in the process. Dry cellulose (stick) spears or cotton buds (N.B. cotton tipped swabs more likely to shed so are less preferable) are used to remove residual moisture from the conjunctival sac prior to commencing disinfection, if appropriate for the procedure (non-ruptured eye), to avoid unnecessary dilution of the antiseptic.

Antiseptics describe weak disinfectants that are applied to living tissue. The antiseptic should be carefully selected to avoid inadvertent injury. Consequences of inappropriate ocular antiseptics include: chemosis, epithelial oedema, corneal erosion/ulceration and self-trauma due to irritation. Antiseptics must NOT be in a detergent base, commonly known as 'scrubs', but prepared as an aqueous solution. Tinctures or aqueous solutions containing alcohol are also toxic to the ocular surface and MUST be avoided.

A paradoxical relationship between concentration and bactericidal activity has been observed in vitro for povidone-iodine, whereby more dilute solutions exhibit greater antibacterial action compared to stock solutions. Stored dilute solutions of povidone-iodine will decolourise as it degrade into iodides. Iodides have no antibacterial effects. Tap water should not be considered for diluting povidone-iodine.

Tap water is not sterile and is contaminated with numerous impurities capable of reacting with free iodine and thus reducing the amount available for bactericidal activity. Povidone-iodine acts indiscriminately therefore such large amounts of organic debris will reduce the amount of free iodine available for bactericidal activity. Consequently, eyes should be cleansed as far as possible from extraneous matter prior to application of the antiseptic.

Povidone-iodine has a broad range of antibacterial activity and is also effective against fungi and viruses. It has been shown to be sporacidal on prolonged contact (over 15 minutes). With a pH of 3-5 it is well tolerated by corneal epithelium but not endothelium and should NOT be used on a ruptured globe. Experimentally injected eyes demonstrated severe toxicity. Thorough irrigation with saline or balanced salt solution should precede intraocular surgery.

Suggested technique for ocular preparation prior to surgery

- Wear gloves: to minimise patient contamination and to protect self
- Remove mucopurulent discharge and extraneous debris if present
- Clip hair/trim lashes
- Flush with saline to remove KY and loose hair
- Use dry cellulose stick spear to remove excess moisture from conjunctival sac

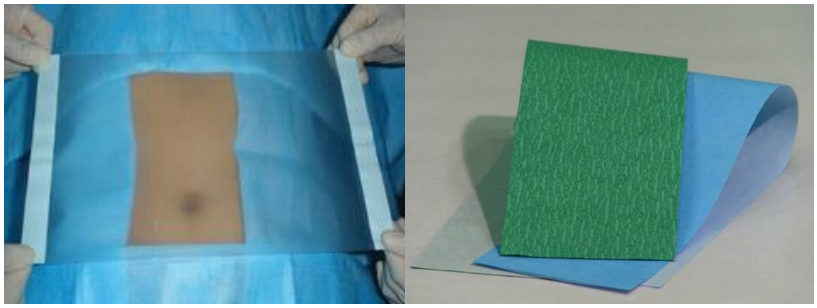
- 15ml of 1:50 PVP-I (0.2%) pulse flushed over ocular surfaces, conjunctival sac and beneath third eyelid using a luer-slip syringe. Dry swabs placed at canthus to collect fluid run off

- Cellulose stick spears impregnated with 1:50 PVP-I used to swab fornices and lid margins
- 5ml of 1:50 PVP-I instilled in eye
- 1:10 (1%) PVP-I impregnated swabs used to cleanse lids and periorbital areas, working in the direction of hair growth to avoid dissemination of loose hairs
- 5ml of saline instilled in eye to remove residual PVP-I

Ruptured globes or those at risk of rupture should not be prepared with a topical antiseptic. A large volume of sterile balanced salt solution (BSS) or Hartmann's solution should be used instead, gently irrigating the ocular surface whilst avoiding any pressure on the globe. Sterile cellulose spears may be used to drag discharge from the eye, taking care not to disturb any fibrin clots plugging the rupture.

Extraocular draping can be achieved using four-quarter drapes, whereby four drapes are laid down to achieve exposure of the surgical site. More commonly, a fenestrated drape is used which is either pre-cut or formed by cutting a hole in a plain drape. Securing the drape to the surgical site presents a further complication. Migration of the drape can result in contamination of the surgical site; drapes must not be repositioned once placed. Towel clamps are traditionally used to secure drapes to the patient. These perforating instruments are traumatic and are associated with a painful stimulus and can distort the surgical field. Once placed, the tips are considered contaminated if subsequently removed for repositioning and should be discarded from the sterile field. Placement through non-sterile areas can lead to localised inflammation and infection.

Adhesive drapes have the advantage of achieving stability without compromising the patient. Most pre-formed adhesive human drapes are unsuitable for veterinary procedures due to anatomical and conformational differences. The most flexible solution is to cut a large hole in a plain non-woven drape that is placed over the eye as a field drape, which is not occlusive. A fenestration of appropriate size to suit the surgical site is cut out of a piece of non- woven disposable adhesive drape tape. This is laid down and secures the field drape to the patient and isolates the surgical site. If the initial hole in the field drape is not large enough, the adhesive properties of the drape tape will be negated. Further drapes are placed to cover the patient as necessary.



3. Trichiasis – dermoids, eyelid agenesis, facial folds, and facial slip

Background: Eyelid anatomy & physiology

The eyelids act to protect the globe and distribute the tears across the cornea. The eyelids also produce components of the tear film (lipid, mucus and aqueous portions). Ordinarily, in animals with a healthy conformation, the eyelids are supported against the ocular surface and slide across it during blinking. The upper eyelid is responsible for 75% of eyelid movement during blinking, rendering it more important functionally when diseased or traumatised.

The eyelids are broadly divided into three layers – the outer haired skin, a middle muscular layer and tarsal plate along with meibomian glands, and the inner palpebral conjunctiva (which ultimately reflects at the fornices on to the globe to become the bulbar conjunctiva, and to cover the third eyelid). There is a small finely haired protruberance at the medial canthus referred to as the caruncle. Occasionally this may be haired or particularly large, and contribute to tear wicking and epiphora.

The eyelids are well vascularised and contain many mast cells, which explains the ample response to trauma seen in eyelids, as well as the rapid healing. The upper eyelid is responsible for the majority of the blink excursion in cats and dogs, which is mediated by the facial (VII) nerve and the orbicularis oculi. The levator palpebrae superioris acts to lift the upper lid and is the only striated muscle to be supplied by the oculomotor (III) nerve. The smooth muscles (Muller's muscle) of the eyelids are innervated by the post-ganglionic sympathetic nerves. Eyelid sensation is provided by the ophthalmic (upper and medial) and maxillary (lateral and lower) branches of the trigeminal (V) nerve.

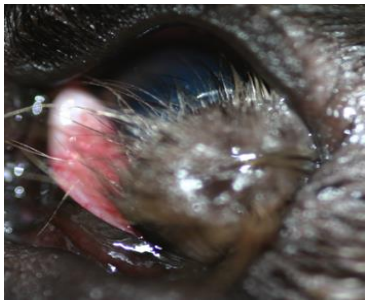
The eyelids contain a number of glands. Along the anterior border (external) of the eyelid the glands of Zeis and Moll are present, and are sebaceous and modified sweat glands respectively. Along the eyelid margin 'grey line' are the opening of the sebaceous meibomian glands (20-40 per eyelid), which produce the lipid portion of the tear film. Within the lining palpebral conjunctiva are numerous goblet cells that produce the mucus component of the tear film. Lastly, the third eyelid has an acinar gland at the base of the third eyelid cartilage that is responsible for approximately one third of the aqueous tear production in cats and dogs.

Trichiasis

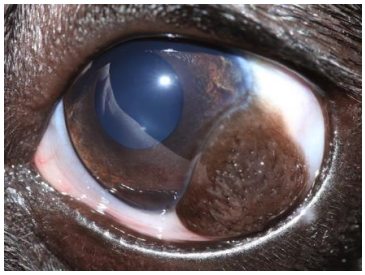
Trichiasis is the misdirection of eyelashes or facial skin onto the corneal surface. It can be encountered in a range of abnormalities including: entropion, nasal fold hair contact, hairy caruncle, senile facial droop entropion, eyelid agenesis and dermoids. Trichiasis may occur secondary to scarring (cicatricial), or eyelid tissue absence (agenesis – see later), which may require more extensive or technically difficult procedures to resolve.

Dermoid (epibulbar dermoid)

Dermoids are masses of non-neoplastic developmental tissue (choristomas) in an abnormal location. They commonly occur at the lateral limbus and may involve the cornea, whilst others may involve the eyelids. They have the appearance of haired skin, frequently sprouting long hairs, which may lie in the tear film. Although congenital, they may be less noticeable in young puppies and kittens, but with growth they may become more obvious and associated with clinical signs (ocular discharge, epiphora). Inheritance of epibulbar dermoids has been postulated in the St Bernard dog, Birman cat, and Burmese cat but epibulbar dermoids have also been encountered in other breeds including German Shepherd dogs, Basset hounds, Bulldogs, Labrador Retrievers, Shih Tzus and domestic shorthaired cats.



Dermoid in a German Shepherd puppy, involving the lateral lower eyelid and conjunctiva. Concurrent scrolled third eyelid cartilage. Image courtesy AHT

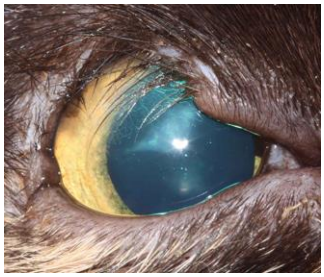


Dermoid in a French bulldog puppy. Image courtesy Langford Vets

Treatment is surgical excision, which is curative if complete. A wedge resection of the eyelid, superficial conjunctivectomy, +/- keratectomy if there is corneal involvement, is sufficient but should be performed with the benefit of magnification (surgical loupes or operating microscope) to ensure complete excision with minimal damage to adjacent normal tissue. Where there is corneal involvement the site of corneal resection will often heal with conjunctivalisation.

Eyelid agenesis (coloboma)

Absence of eyelid tissue can occur, and generally favours the dorsolateral position. It is rare in dogs but can be encountered in cats, where it is often bilateral, and may form part of a syndrome of multiple congenital abnormalities (multiple ocular defects, MOD, including persistent pupillary membranes, retinal dysplasia and cataract). The absence of tissue commonly results in exposure keratitis, and trichiasis, resulting in irritation. Surgical repair is often challenging, and is generally best referred, requiring blepharoplastic procedures to recreate an eyelid and conjunctival lining whilst avoiding a cicatricial entropion.



Eyelid agenesis in a domestic shorthaired cat. Note the corneal vascularisation and trichiasis. Image courtesy AHT

Some of the options for repair include the Mustarde procedure (two stage) and lip to lid procedure (Pavlectic). More recently, subdermal collagen injections have been described, although treatment of trichiasis (in the absence of a normal eyelid margin) is sometimes required in a further procedure (e.g. Stades procedure or cryoepilation of eyelid hair).

Facial folds

Brachycephalic dogs may have excessive facial folds as part of their conformation, the classic being the large nasal fold seen in pugs, bulldogs, and Pekingese amongst other breeds. Excision of all or part of the nasal fold is the standard treatment for nasal fold trichiasis. The Chinese Shar Pei is perhaps the traditional example of excessive facial folds, and these heavy folds may impinge on the eye with entropion. Hotz-Celsus procedures may be required through 360' of the eyelids, whilst in other cases face-lifting procedures (rhytidectomies) may be required to reduce the weight of facial folds on the eyelids).

Facial slip

Facial slip refers to the facial droop seen in some senile dogs, particularly those with heavy brows (e.g. St Bernard, Bloodhound, Cocker spaniel). Senile entropion occurs in aged dogs with brow droop (slipped facial mask) and upper eyelid hairs contact the cornea (trichiasis), or they may rest in the lower conjunctival sac causing conjunctivitis. Treatments for facial slip trichiasis include the Stades' procedure, brow suspension, and rhytidectomies (coronal, Bedford, Blogg, stellate).

4. Entropion – when lids are too tight

Entropion is an in-rolling of the eyelids. Hair contact with the cornea results in discomfort and may cause corneal ulceration. Entropion in dogs is usually a conformational issue and is commonly encountered in the Shar Pei, Bulldog, and Rottweiler amongst other breeds. The Shar Pei entropion can be particularly severe with 360' in-rolling of the eyelids.

Entropion may occur when there is excessive periocular skin or insufficient support of the eyelid margin, so it is important to assess the patient carefully – do they have entropion with normal lid length, or entropion due to excessive palpebral length (macropalpebral fissure syndrome)? In macropalpebral fissure syndrome, the entropion often occurs in conjunction with an ectropion of other portions of the eyelid margin i.e. diamond eye.

In cats, and also brachycephalic dogs, medial canthal entropion can be difficult to identify, requiring careful and close inspection. A tight medial canthal ligament may pull the medial eyelid inwards, particularly in brachycephalic breeds. With loss of retrobulbar fat associated with ageing, entropion can also occur, and this form is more common in elderly cats. Hotz Celsus will usually be curative, although due to the enophthalmos, increased conjunctival show and recess is expected in these patients.

Lateral canthal entropion may cause a lateral epiphora, and is almost pathognomonic. Tightness of the lateral canthal tendon has been reported as an important contributory factor in wide-skulled breeds (such as Mastiffs and Rottweilers), and may require lateral canthal tendonotomy to resolve the in-rolling.

Entropion can also be encountered secondary to scarring (cicatricial entropion) as a result of previous surgery, eyelid injury or dermatopathies. Spastic entropion results secondary to blepharospasm associated with a painful ocular condition. This may be encountered in cats secondary to FHV-1 corneal ulceration. Eyelid fibrosis over time results in a permanent entropion requiring surgical correction even after the corneal/conjunctival discomfort has resolved. A spastic component may complicate a conformational entropion, and is common in muscular breeds, such as Rottweilers, where the spasm must be addressed to prevent entropion recurrence.

Most cases of entropion can be corrected using a Hotz-Celsus procedure. The Hotz-Celsus procedure involves resection of a crescent shaped are of skin in the affected eyelid. The first incision should be made parallel to the eyelid margin, 1-2mm from the margin (leaving sufficient skin to place a suture). Then a second incision is made to create a crescent, the depth of which is dictated by the amount of out-turning required. The crescent can be lopsided to account for where the greatest out-turning is required. The crescent of skin is removed and the defect closed using 6/0 coated Vicryl, generally by placing sutures at bisecting intervals to avoid a ‘dog-ear’ of redundant skin at one end of the wound.

Diagram of Hotz-Celsus procedure (on a normal eye)

In cases of combined entropion and ectropion (diamond eye) this may be combined with lid shortening (wedge resection) procedures. As mentioned above, certain cases may benefit from lateral canthal tendonotomy (wide-skulled breeds; i.e. release) whilst others require lateral canthal stabilization (Bloodhounds, St Bernhard dogs etc.; i.e. tension). Medial entropion, especially in conjunction with trichiasis from a large nasal fold, may require modified procedures (e.g. medial canthoplasty, modified Hotz-Celsus) to eliminate the entropion and trichiasis fully (see later).

The lateral canthal tendonotomy is achieved by grasping the lateral canthus with a towel clamp and lifting anteriorly. This should place the tendon under tension so that is can be easily palpated through the lateral conjunctival sac. A small snip incision is made through this conjunctiva with scissors overlying the tendon and blunt dissection is undertaken to reach the tendon. The tendon is then severed and tension can generally be felt to substantially ‘give’ when this tendon has been correctly severed.

5. Ectropion – when lids are too long

Ectropion is also commonly a breed-related issue and may result in chronic conjunctivitis. When mild, and unassociated with clinical signs (or very mild signs), this may not require correction, but management using artificial tear products. In some cases a chronic mucoid to mucopurulent discharge with or without a follicular conjunctivitis (lymphoid hyperplasia) may be present as a result of the increased conjunctival exposure.

Wedge or ‘house-shaped’ resection (lid shortening) is usually sufficient to correct ectropion, although occasionally lateral canthal stabilisation is also required due to excessive laxity and droop that may compromise vision and surgical outcome (e.g. Bloodhounds).

The wedge (or house-shaped) resection

Shortening of the lid can be achieved by two incisions perpendicular to and through the eyelid margin separated by the length of intended shortening. It is essential to make the eyelid margin incision at 90’ to the margin to facilitate accurate closure of the margin incisions (figure of 8 suture). More distally the incisions can be extended in a ‘triangle’ or ‘house-shape’ and the wound is closed into a vertical line. The wound should be closed in two layers, and the first suture should be the eyelid margin (figure of 8) suture to ensure accurate apposition of the margin. This is the most critical suture to get correct as a defect or notch in the eyelid margin is capable of causing long-term injury to the cornea and conjunctiva. A figure of 8 suture is the ideal suture to approximate the margin incisions. It is worth practicing this suture.

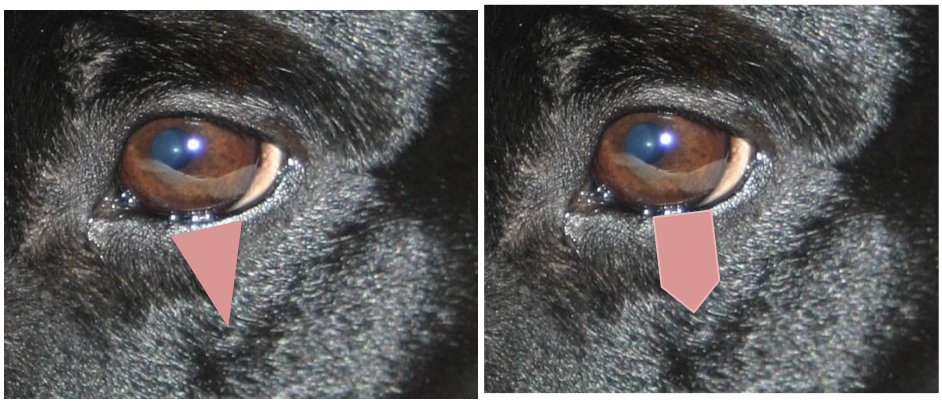
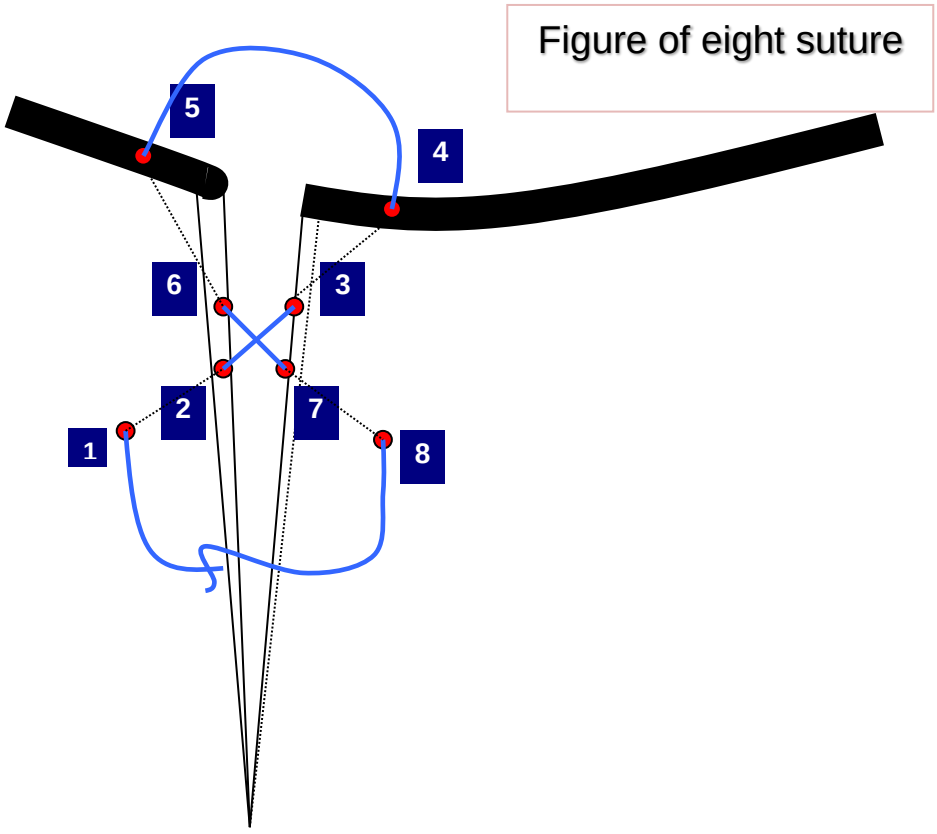


Diagram of wedge or house shaped eyelid shortening procedures (on a normal dog)



Eyelid margin notch with cicatricial hair misdirected and contacting the cornea. Image courtesy AHT.

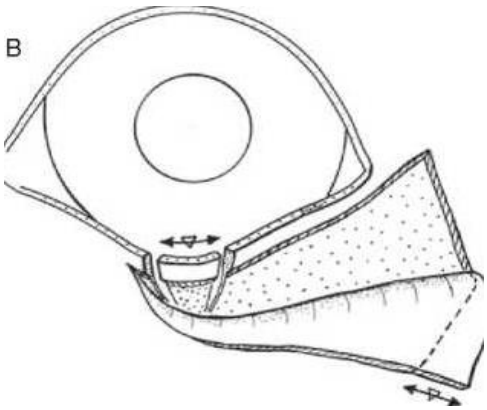
Lid shortening with lateral canthal stabilisation

a. Wedge resection combined with a lateral canthal stabilising suture

Here the lids (upper and lower) are initially shortened to the desired length and followed by a horizontal incision at the lateral canthus. A mattress suture of non-absorbable material (typically 2/0-4/0 Ethilon depending on case) encompassing the lateral canthus (into fibrous tissue but not penetrating margin) and the lateral orbital ligament is placed to stabilise the lateral canthus relative to the orbital ligament. The desired amount of lateral tension can be achieved depending on how tightly this suture is placed.

b. Modified Kuhnt Symanowski

This technique combines a wedge resection lid shortening procedure with a lateral canthal tension by first removing a wedge of eyelid (often encompassing the kinked margin if present) and then creating a flap of skin from below the eyelid margin (not lid-splitting) and resection of a similar length wedge of skin (as the lid margin wedge) at the lateral margin of this flap. When sutured this then adds a mild lateral tension to the wound.



http://aibolita.com/eye-diseases/37451-ectropion-and-oversized-palpebral-fissure-macro-or-euryblepharon.html

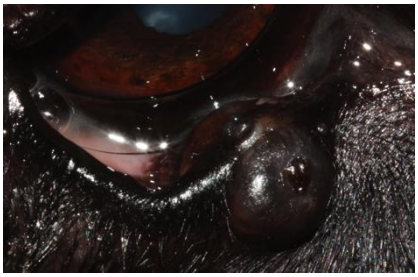
6. Entropion-ectropion complex – the diamond eye dilemma

Longer than normal eyelids (macropalpebral fissure) may be encountered as a conformational issue in a number of dog breeds, and can result in a diamond eye appearance. This conformation predisposes to lower ectropion alone when mild, but an entropion-ectropion complex when more marked. Many breeds may also have 'kinks' in the eyelid margin typical in diamond eye, and require excision when addressing the entropion and ectropion as this portion of eyelid will not lie flat post-operatively (more fibrotic). Some breeds with diamond eye will also have laxity of their lateral canthus resulting in droop of the eyelids, and this may impede vision. Lid shortening is the mainstay of correction of diamond eye, but where excessive eyelid droop is present, lateral canthal stabilisation can be very helpful (see earlier).

Brachycephalic breeds such at the pug and Pekingese breeds may also have macropalpebral fissures in conjunction with their exposed globes, resulting in excessive globe exposure. As the long eyelids are stretched over the relatively exophthalmic globe ectropion is rarely encountered, and the issue is more one of lagophthalmos (failure to complete a blink resulting in inadequate tear film distribution and central corneal exposure). Medial canthal entropion is common in these breeds due to the tight medial canthal ligament also present. Techniques that might be appropriate for these cases include modified Hotz-Celsus procedures, medial and/or lateral canthoplasty, some combined with medial canthal tendonotomy. Some may also need surgical resection or reduction of facial folds (see earlier).

7. Eyelid masses – the small and the enormous

Generally when attempting to resect an eyelid mass and achieve a primary closure the length of excision will need to be less than one third of the eyelid length. These can be resected using a wedge or 'house-shaped' resection and closed as we might for a simple lid-shortening procedure. Beyond this size, a blepharoplastic procedure will be required – i.e. requiring some reconstruction of eyelid margin. There are a number of possible techniques, involving sliding or rotating tissue into the deficit. Reconstruction of an eyelid margin is trickier than restoration of a tissue deficit alone as the margin is a very specialised region of mucocutaneous junction that is not easily imitated.



Eyelid mass

The behaviour of the mass and therefore requirement for a greater surgical margin for cure (e.g. mast cell tumour, melanoma) will also dictate which technique is the most appropriate. In the dog, most eyelid masses are benign and the commonest tumour type is the tarsal adenoma. This tumour type can be resected with a minimal margin (1-2mm). A mast cell tumour would need a minimum of 2cm margins and that may mean loss of the lid(s) entirely and quite radical reconstructive surgical requirements. Techniques for reconstructing the eyelid include: H-plasty, Sliding semi-circular canthoplasty and lip to lid procedure.

Credit – Martin Coster DACVO, Boston Massachusetts, USA

On occasion a mass may require such a large area of resection for surgical cure that the globe has to be sacrificed to that end. Axial pattern flaps may be required to fill the large deficit.