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Ophthalmic Surgery Mini Series

Session 3: The surgical options for eye removal

Claudia Hartley
BVSc CertVOphthal DipECVO MRCVS
European & RCVS Specialist in Veterinary Ophthalmology

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The surgical options for eye removal

Dogs vs. Cats vs. Rabbits – the potential pitfalls of each when considering enucleation

The feline globe has a relatively short optic nerve, similar to that of the brachycephalic breeds of dog, and as such are at heightened risk for inadvertent tractional injury to contralateral optic nerve via the chiasm. Extreme care must be taken in these situations to avoid anterior traction. For this reason the placement of an artery forcep clamp or ligature on the optic nerve and vascular bundle is not recommended as the additional orbital space required for this manoeuvre (over simple sectioning of the optic nerve and orbital fascia with a pair of scissors) may cause traction to be placed on the contralateral optic nerve.

The rabbit has large tear glands in the orbit and the retrobulbar lobes of these glands rest in close proximity to the large orbital venous sinus. It is preferable not to disturb the venous sinus, and therefore the retrobulbar lobe of the tear gland is usually left intact, and is not reportedly associated with post-operative complications (presumably due to involution). The presence of the orbital venous sinus is also a risk for haemorrhage during orbital curettage (exenteration) for a retrobulbar abscess or in caudal maxillary molar extraction.

Transconjunctival enucleation – pros & cons, & how to do it

A transconjunctival enucleation has the advantage of staying close to the globe with increased surgical visibility. It is possible to preserve more orbital tissue because of this enhanced visibility, and some surgeons argue that this affords less orbital sinking post-operatively (i.e. better cosmesis).

The primary disadvantage of the transconjunctival technique is that the conjunctival sac is breached such that infectious or neoplastic contamination of the orbit is possible where this exists. Therefore this technique should not be used when conjunctival/corneal infection or neoplasia is present.

The technique begins with a lateral canthotomy to increase exposure. Thereafter a conjunctival 360’ periotomy (incision through the conjunctiva parallel to limbus) is performed, ideally at a distance of 5mm from the limbus (leaving ample conjunctival tissue at the limbus with which to manipulate the globe.

Dissection through Tenon’s fascia should expose the sclera and the rectus and oblique extraocular muscles insertions. These muscles are extremely active and therefore have a profound vascular supply. For good haemostasis it is prudent to section each extraocular muscle at its tendinous insertion and not through the muscle belly. Each insertion can be isolated by Stevens tenotomy scissors with one blade under the tendon and one below and advanced anteriorly until its junction with the sclera.

Once each of the insertions has been sectioned the globe is rotated medially by grasping the perilimbal conjunctiva to expose the retractor bulbi extraocular muscle and is sectioned close to its sclera attachment. The globe will now rotate freely but remains anchored by the optic nerve and posterior orbital fascia.

By rotating medially once again a pair of curved scissors (e.g. Metzenbaum) can be introduced next to the optic nerve from the lateral position. The optic nerve and fascia are sectioned a few millimetres posterior to the sclera. It is not necessary to place artery forceps over the optic nerve and fascial bundle prior to sectioning and may increase the risk of inadvertent traction and contralateral optic nerve injury.

Haemorrhage is controlled by digital pressure, often by packing the orbit with a radio-marked swab and pressure applied to this for up to 5minutes. Persistent haemorrhage is rarely encountered in a healthy (non-coagulopathic) patient but adjunctive options include placement of a biodegradable haemostatic agent, or bipolar cautery (N.B. monopolar cautery should be avoided to avoid risk of optic nerve or brain injury as current passes down orbital remnant of optic nerve to complete the circuit with the footplate under the patient).

Finally, the eyelid margins are incised parallel to their length and dissected posteriorly to remove the remaining conjunctiva and the third eyelid. Failure to excise all conjunctival and third eyelid tissue can result in a persistent mucinous secretion in the orbit, frequently culminating in a sinus tract when this secretion leaks through wound dehiscence. Careful haemostasis of the adnexal tissue at resection will reduce the post-operative bruising that is visible to the owner so is worth investing the time to do.

The subcutaneous layer (Tenon's fascia and orbital septum) are closed first and in a watertight fashion. This allows any collection of orbital fluid (haemorrhage or serous-based) to tamponade behind this layer. Suture material is one of personal surgeon choice but a 3/0 or 4/0 absorbable material is recommended. After this, the skin may be closed with an intradermal suture pattern (buried) using an absorbable suture (e.g. 6/0 polyglactin) or skin layer using an absorbable or non-absorbable suture material (N.B. this may be dependent on patient temperament, ease of suture removal post-operatively, and likelihood of wound interference by the patient).

Transpalpebral enucleation – pros & cons, & how to do it

This technique is useful where ocular surface neoplasia or infection is present and contamination of the orbit is undesirable.

In this technique the eyelids are apposed and conjunctival sac is closed – either by a continuous suture (e.g. 2/0 or 3/0 suture material) or using Allis tissue forceps across the eyelid margins to close the palpebral fissure. A skin incision is then made parallel and 5mm from the eyelid margins and connected medially and laterally at the respective canthi.

The skin is then dissected posteriorly and circumferentially, taking care not to enter the conjunctival sac. This is continued until past the conjunctival fornices, when the sclera is reached and gentle anterior traction on the eyelid closure suture or Allis tissue forceps can facilitate deeper orbital dissection.

Again, extraocular muscle insertions are identified and sectioned in turn. The optic nerve is sectioned and the globe plus eyelids, conjunctival sacs and third eyelid and gland are removed en bloc. Wound closure is as for the transconjunctival technique.

Post-operative management after enucleation

Analgesia (multimodal if required but in many cases NSAIDs are sufficient) and an Elizabethan collar are recommended. Most patients will be more comfortable post-operatively than pre- and therefore the drive for self-trauma should be expected to be minimal. Antibiotic cover will depend on the reason for enucleation (presence of pre-existing infection or not) and where considered a clean wound intraoperative intravenous antibiotic cover may be sufficient.

Exenteration – why and how to do it

Exenteration is the en bloc surgical removal of all orbital contents to the orbital apex. The commonest indication for exenteration is the presence of an orbital neoplasm. The amount of periocular skin included in the exenteration will depend on the extent of the orbital neoplasm and its involvement/not of the eyelids.

Dissection from skin to the orbit is via the soft tissues and thereafter posteriorly should follow the periosteal margin of the orbit, which is included in the resection. This is a useful surgical margin as it is relatively resistant to neoplastic invasion/breach.

The ventral floor of the orbit is incomplete in the dog and cat and the periorbital fascia is the line of dissection to the orbital apex here. The lateral orbital ligament is generally left in situ if possible (sufficient margin), and forms the lateral boundary of resection. The orbital apex is ligated and sectioned, and the resected tissue should be submitted en bloc for histopathological examination, including assessment of the margins of resection for the neoplasm.

Post-operative orbital sinking of skin is expected and is more marked than with enucleation alone. If resection has been confidently complete some surgeons will elect to place an orbital implant to improve cosmesis.

Orbital Prosthesis

Placement of an orbital prosthesis may improve the unsightly appearance of the sunken orbit. There is a range of silicone ball sizes and the appropriate size should be chosen based on orbital dimensions.

After enucleation the silicone sphere is placed into the orbit and the subcutaneous tissue and eyelid skin are closed over the top of the prosthesis. Some surgeons prefer to resect the anterior quarter of the sphere to provide a flattened anterior surface (so the skin lies flat rather than convex). Some surgeons also prefer to place the implant behind a tennis racket like mesh suture that is placed running across the orbit from the orbital periosteum to periosteum (where retained i.e. not possible in exenteration patients).

Alternatively a mesh implant (e.g. Prolene™) can be sutured across the orbital rim (with a non-absorbable suture) to create a flattened membrane for the eyelid skin to rest upon.

Potential complications include infection, either at the time of surgery or some time post-operatively (sometimes quite distant) due to haematogenous colonisation. This generally requires removal of the implant and debridement of the cavity to clear the infection. In some cases the implant may erode through the skin and be extruded.

Evisceration and Intrascleral Prosthesis – pros & cons, & how to do it

Evisceration and intrascleral prosthesis (ISP) describes the surgical procedure of a conjunctival incision over the dorsal globe followed by a non-overlapping scleral incision into the globe, evacuation of all intraocular contents, including: iris, ciliary body, choroid, retina, vitreous and lens. This is followed by irrigation and aspiration of the corneoscleral shell (ensuring no uveal material remains) and implantation of a black silicone ball into this shell. The size of prosthesis required is frequently judged on size of the fellow eye where disease is unilateral. The scleral incision must be large enough to accommodate the silicone sphere as tearing of the sclera on insertion makes closure complicated. A dedicated (Carter) sphere introducer is available and greatly facilitates prosthesis placement.

The ball should be placed under strictly aseptic conditions as introduction of infection at placement increases the risk of wound dehiscence and ball extrusion. The sclera is closed separately from the conjunctival incision and a 6/0 absorbable continuous suture is usually adequate for both layers.

Evisceration and ISP is only indicated in non-infectious and non-neoplastic ocular conditions necessitating globe removal. The classical example of this is the chronic end-stage primary glaucoma patient.

This procedure is designed to improve cosmesis of the surgery, but it is important to bear in mind that this is for the benefit of the owner entirely. This raises important ethical considerations. Where an owner feels unable to maintain the human-animal bond with their pet as a result of the disfigurement of enucleation (this is perhaps most pertinent for bilateral enucleations) there is an argument that the patient stands to benefit from the improved cosmesis by maintenance of an important social bond for them.