How to use the EQUIVET Ocular Sub-Palpebral Lavage set

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This economical lavage system has been specially designed to be simple to use, sympathetic to the tissues of the eyelid and conjunctiva and convenient for the practitioner. The foot plate is soft and designed to fit comfortably against the conjunctiva without causing discomfort or damage.

The detailed instructions below should be carefully read before starting the procedure.

EQUIPMENT REQUIRED:

ALWAYS ensure that all the required equipment is present. You will need:

i. Suitable sedatives and restraint equipment
ii. Local anaesthetic solution for injection
iii. Topical local anaesthesia for the conjunctiva
iv. Clippers and surgical scrub materials.
v. A KRUUSE lavage system in a sterile wrap. Check the packet for contents against the list shown.
   • The pack should contain the trochar with a protective cover over the sharp end. An attached lavage tubing with a stirrup shaped footplate at the other end.
   • The kits are equipped with the required trochars but the tubes can be bought separately so it is important to check carefully that the trochar matches the size of the lavage tubing especially if more than one kit is prepared!
   • The trochar must be treated very carefully to ensure that it remains sharp.

Note:
Do not pass the catheter through a hollow needle; if this is done the conjunctival hole will be too large and the ‘foot plate’ may pull through and lie sub-conjunctivally (defeating the objective!).
i. Sterile surgical gloves
ii. A roll of zinc oxide adhesive tape to make fastening “butterflies”.
iii. A tube of “super-glue” or suture materials such as 2/0 Polysorb on a cutting needle to fasten / fix the tube in position
   – The adhesives are less traumatic and make the procedure easier overall.
iv. Sterile saline and syringes to flush the system after completion to ensure that it is working properly.

Use the 8 French tubing if you plan to infuse a thicker medication, i.e. methycellulose or plasma.
• The 8 French tubing has a smaller ratio of tube outside diameter to width of foot plate which is why there is more chance of conjunctival pull through if a radial tear in the conjunctiva is created at the time of implantation.

PRELIMINARY PROCEDURES:
1. Restraint is critical – sedation is invariably required if the system is to be placed in a standing (non-anaesthetised) horse).
   a. It is important that the placement is accurate and head movement makes this difficult as well as potentially dangerous.
   b. Suitable sedation is with an alpha-2 agonist and an opioid administrated intravenously.
   c. Stocks and / or nose ‘twitching’ may help.
2. The upper eyelid is clipped and prepared for surgery – there is no need to clip off the eyelashes!
3. Plait the mane hairs to create several “pigtails” down the mane from the pole to the withers.
   • These will form the fastening method for the tube.
4. It is helpful to use an auriculo-palpebral (motor) blockade so that the upper eyelid is flaccidly paralysed.
5. Anaesthesia of the conjunctiva and upper lid are essential.
   • Conjunctival anaesthesia can be achieved through topical instillation of a topical ophthalmic anaesthetic (such as oxybuprocaine, promethocaine or proxymetacaine) into the conjunctival sac some 5 – 10 minutes before attempting to place the lavage system.
   • Repeat this immediately before the procedure.
6. Regional anaesthesia of the frontal nerve and if necessary local infiltration around the expected site of egress of the lavage system is also necessary.

IT IS ESSENTIAL THAT ANALGESIA OF BOTH THE CONJUNCTIVAL AND THE UPPER EYELID IS COMPLETE TO FACILITATE ACCURATE PLACEMENT OF THE LAVAGE SYSTEM.

TECHNIQUE:
1. Surgically scrub the skin at the exit site.
2. Instill antibiotic drops into the conjunctival sac.
3. Prepare for surgical procedure using surgical scrub and sterile gloves.
4. Connect the open end of the tubing to the “keyed” area on the blunt end of the trochar. and keep the tube away from contact with non-sterile surfaces (it can conveniently be coiled up in the hand holding the trochar).
5. Lift the upper eyelid up and test the extent of conjunctival analgesia in the conjunctival fornix using a blunt probe.
   • Only when there is no response should the procedure continue.
6. Direct the sharp end of the trochar towards the back of the fornix slightly lateral of the mid-12 o’clock position (12 - 1 o’clock position for the right eye or the 11-12 o clock position for the left eye. On penetration of the conjunctiva gently ‘walk’ the point of the trochar off the orbital bone until it passes through the eyelid.
   • The ideal exit point is around 1 cm forward from the orbital rim.
   • Note that the trochar is angled to make this procedure simpler and more accurate.
   • Be sure to make a clean entry through the conjunctival fornix.
   • Avoid lateral (tearing) movements of trochar point as these could result in a radial conjunctival tear and then the foot plate may pull through.

NOTE:
The only other acceptable site for insertion is in the medial corner of the lower lid – the insertion is made outside the third eyelid in the lower medial canthus. Placement is similar but there are problem with the angling of the trochar when this site is used. It does however, provide a good mechanism for medication when the upper lid is damaged or when upper lid placement is otherwise inappropriate.

7. Draw the trochar through the upper eyelid carefully so as to avoid any pressure being applied to the globe itself and draw the tube through once it is delivered on the end of the trochar.
   • Make sure the foot plate is seated and aligned comfortably in the upper fornix.
   • When correctly placed the foot plate should be almost invisible and the opening facing slightly backwards.
   • Excessive tension on the tube must be avoided – a comfortable gentle tension will locate the plate correctly.
   When correctly placed there is no material risk of corneal contact with the plate.
8. Dry the tubing carefully with a sterile swab and, using 2 – 3 cm pieces of zinc oxide adhesive dressing tape, create a series of ‘butterfly’ tabs across the tubing. The first of these should be exactly where the tubing exits skin. A piece of zinc oxide tape about 2.0 cm wide is usually suitable. The two “wings” are used to attach tubing to skin by methacrylate adhesive (or sutures or surgical staples).
   • This will lock the tube in position and prevent both slackness and excessive tension from developing. This is therefore a critical procedure to the future comfort and efficiency of the system.
   • The section of tubing distal to the first piece of tape should be slackened to form an “S” shape to reduce any tension within the eyelid portion of the tube. The next “wing” of tape should be applied just distal to the “S”; this is usually on the forehead.
   • The proximal edge of the tape should be against the skin exactly where tube exits and tape should be placed on the tubing while applying slight traction to tube to ensure that foot plate is located securely in the fornix. Rub a smooth instrument on the surface of tape where it comes in contact with tubing to assure adhesion – otherwise the tube may “move” within the butterfly.
   • Alternatively if the system is not likely to be left for more than a few days, the exit point can be touched with cyano-methacrylate glue (Super Glue). It is important however, to recognise that the glue may make the tube brittle at the exit point so this should not be done if a prolonged placement is likely. This approach may also make removal difficult.

9. Lead the tube towards the forelock and pass it through the plaited pigtails so that the end of the tube lies near the withers on the side opposite to the diseased eye.

Useful Tip:
Cut the closed end off a needle canister and pass the tube through the canister from the cut end. This is fastened firmly to the catheter that will be introduced into the end of the lavage tubing. When this is done the most fragile component of any lavage system (the join between the injection catheter and the lavage tubing) will be very well protected.

10. Carefully locate the blunt catheter into the open end of the tube and fit the injection port. Fasten the needle protector firmly to the catheter head.
   • The injection port is valved to prevent ingress of infection or foreign matter but a cap should always be placed.
   • All injections should be carried out in a sterile fashion (swab the port before use) using clean / sterile gloved hands and a sterile syringe.

11. Test the patency of the system by injecting around 5 - 10 ml saline.

Note:
The tubing has a significant volume (the wider tubing obviously has a greater dead space volume) and therefore small volumes of medication may not reach the conjunctiva.

Methods to ensure effective delivery include:
   i. Introduce a bleb of air into the catheter at either end of the medication and observe for the bubbles arriving in the conjunctiva (this is sometimes less comfortable for the horse)
   ii. Ensuring that a suitable volume of medication is always used so that the medication is fully delivered to its target (1 ml is usually enough for the fine catheter type while 2 ml is usually enough for the wider tube. This will waste some medication but at least it ensures delivery.
   iii. Plasma should not be left in the tube between administrations in case it clots or dries and then blocks the foot plate.
   iv. Continuous stream systems are available for connection to the tube delivering a predetermined volume of medication in a set time. Note however that these tubes are calibrated for an aqueous solution so if plasma is being delivered that way the ‘rate tube’ needs to be higher. Powered injectors avoid the need for rate limiting tubes and balloons etc.

12. The lavage system has been designed to stay in place for up to 2 - 3 weeks but there remains a risk of infection at the site. Prolonged placement can result also in catheter fracture, dislodgement or granuloma formation.
   • If longer therapy is required, the veterinary surgeon should consider replacing the lavage catheter with a new one.
   • When a new system is fitted, the entry site should be far enough away from the first site to avoid creating a too large conjunctival hole as this could result in ‘pull-through’ of the footplate.

13. The sutures must be checked regularly especially after the first few days as it is common for the sutures to loosen. If the sutures or tape are loose or coming off, they should be replaced.

REMOVAL OF THE SYSTEM:
The system is easily removed in most cases. However, sometimes it is more difficult. Attempts to turn the eyelid out and digitally remove the foot plate should be avoided – eye trauma is very likely to occur then. Similarly removal by rapid pulling on the tube from the eyelid side causes significant trauma. The easy way to remove it is to cut the tubing about 4 - 5 cm away from the entry port on the eyelid and introduce a piece of sterile surgical suture material down the tube until its end can be grasped from the eye surface – usually the material will bulge out and grasping is very simple. A small knot just bigger than the internal diameter of the
tube is tied in the suture material (usually 2 overhand knots laid on top of each other are enough). When the suture is gently pulled
the knot will engage on the catheter and the lavage system and foot plate will follow smoothly and atraumatically.

PROBLEM SHOOTING!

*** WHEN PROPERLY PLACED THE SYSTEM SHOULD BE COMFORTABLE AND PAIN FREE ****.

1) PULL THROUGH

   The foot plate pulls through to lie sub-conjunctivally (medication is not delivered to the conjunctival sac!)
   This can be due to:
   a. Inappropriate trochar size or the use of the hollow needle insertion system that inevitably makes a much larger hole than
      is strictly necessary.
   b. Tearing of the conjunctiva by lateral movement of the trochar during insertion
   c. Excessive tension applied to the tube during placement.

2) BLOCKAGE

   a. If due to medication flush with saline and consider replacement of the system if this does not relieve the problem
      (consider using wider bore system)
   b. If due to kinking – check the tube carefully – especially at the eyelid entry point and at the injection port to ensure that
      the angle is not very tight.

3) LAVAGE TUBING FRACTURE OR BRITTLENESS

   a. The common sites for fracture and brittles are the eyelid portal and the injection port.
   b. The later case can be avoided almost completely by using the cut off needle cover as outlined above.
   c. Damage at the eyelid portal is usually due to excessive tension or to the use of methacrylate glue or to an excessive
      angle at the point of exit so that there is an obstruction to the free flow of the solutions.

4) INFECTION

   a. This is due to poor technique in most cases but in cases where there is severe conjunctival infection in the first place
      some infection tracking along the tube is almost inevitable.
   b. This can be addressed by the use of topical antibiotics (usually inserted via the system itself) or systemic antibiotics
      where required. Antiseptic ointment applied to the eyelid portal can be helpful.

5) DISCOMFORT:

   a. This is due either to infection or to excessive tension on the tube or to too little tension (resulting in corneal
      contact (see below). If the system creates discomfort it should be carefully reassessed and if necessary removed and
      replaced.
   b. It is sometimes very difficult to tell if the discomfort is due to the system or to the condition present in the first place.
   c. LOCAL ANAESTHETIC SOLUTIONS should NOT be used to mask the discomfort caused by the system – the cause
      must be addressed.

6) CORNEAL ULCERATION

   a. Ulceration can arise as a result of foot plate contact with the cornea from:
      • poor placement (too shallow an insertion into the eyelid resulting in the foot plate lying directly on the cornea)
      • Too slack tension on the tube resulting in downward movement of the foot plate.
      • Where the system is inserted through a swollen eyelid it may become very “slack” once the swelling subsides. This is
         an important consideration in the monitoring of the system especially where the horse is not in a hospital situation.

7) DIFFICULTY WITH REMOVAL

   a. Attempts to remove the tube with the fingers or surgical instruments are often traumatic and should not be required (see
      above).
   b. The major complication with removal arises when the plate has been pulled through into the sub-conjunctival tissues.
      In this event the lavage solutions will not be easy to inject, will not be visible and will cause swelling of the adjacent
      conjunctiva. Furthermore attempts to remove the tube with the suture method described above will be fruitless
      – the suture material will be difficult to introduce and will not appear in the conjunctival sac.
   c. In this event, the only method of removal is direct tension on the tube – it may be helpful to widen the palpebral port
      slightly with a scalpel blade to make the damage less severe.