

Equine Emergencies Online 'Mini Series'

Session 2: The Painful Eye, Choke and Respiratory Distress

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The horse's eye is situated in a particularly prominent and unprotected site. This, along with the horse's tendency to startle means that the eye and periocular region is particularly prone to trauma. The most common ophthalmic emergencies are related to external trauma and include corneal trauma and ulceration, eyelid lacerations, orbital trauma and secondary uveitis.

On the telephone

It is usually difficult for an owner to give you a useful description of any ocular pathology, as the eye will normally be painful and tightly closed. While waiting for you to arrive, ask the owner to take the horse out of bright sunlight and if possible arrange an area so that you can examine the horse's eye in as little ambient light as possible. Bathing or wiping the eye should be discouraged.

At the yard

History

- Last seen normal / first seen abnormal?
- Was any injury to the eye seen by the owner?
- Any previous problems with either eye?
- Any medication already given?
- Other medical conditions?

Examination

- Don't go straight to the painful eye
- General physical examination: Assess any underlying systemic disease
- General external examination of the horse's head:
 - E.g. mentation / dysphagia / nasal discharge
 - Look carefully for any asymmetry – head tilt / muzzle deviation / depth of supraorbital fossae, deviation of the mandible / facial swellings etc.

- Any asymmetry around eyes – globe size and position / orbit / eye lash angle / blepharospasm
- Palpate for any pain/crepitus around orbit/face.
- An approximation of comparative intraocular pressure (IOP) can be obtained by standing in front of the horse, using index finger of each hand on top of upper eyelid of both eyes and feeling for intraocular pressures (IOP). Acute uveitis usually causes decreased IOP, glaucoma causes increased IOP. Palpation is usually easier after sedation, and it should not be done in any cases where there is a risk of globe rupture (corneal laceration / deep ulcers). For an accurate IOP measurement tonometry using a device such as Tonopen or Tonovet is required.



Left image: Horse with right sided exophthalmos and bulging supraorbital fossa caused by a retrobulbar mass

Right image: Horse with right sided ventrally angled eyelashes and deep supraorbital fossa after rupture of the cornea.

Reflexes:

- Stand in front of the horse and ensure consistency between both sides.
- Menace (response) – assesses vision. Careful not to create air currents. Assess from rostral and caudal directions. Dull horses or those with facial nerve paralysis can have a reduced/absent menace response, despite a functional visual neural pathway. Tapping the face just adjacent to the eye can improve the response from a dull or stoic horse.
In the dark/low light
- Pupillary light reflexes (PLR): PLR is slow and subtle in the horse compared to other species. Direct PLR is difficult to assess if the eye is shut, there is marked corneal oedema or miosis. An indirect PLR to the contralateral, uninjured eye can be used to confirm that the retina and optic nerve of the injured eye are intact. If necessary the PLR can be performed after sedation/ AP block.
- Dazzle reflex: Useful if there is severe corneal oedema/miosis. It is performed by suddenly and silently shining a bright light into the affected eye and looking for a blink response. Both the PLR and dazzle are subcortical reflexes, so a positive reflex does not necessarily mean that the horse can 'see'. It does mean that the retina/optic nerve are functional.

Close ophthalmic examination

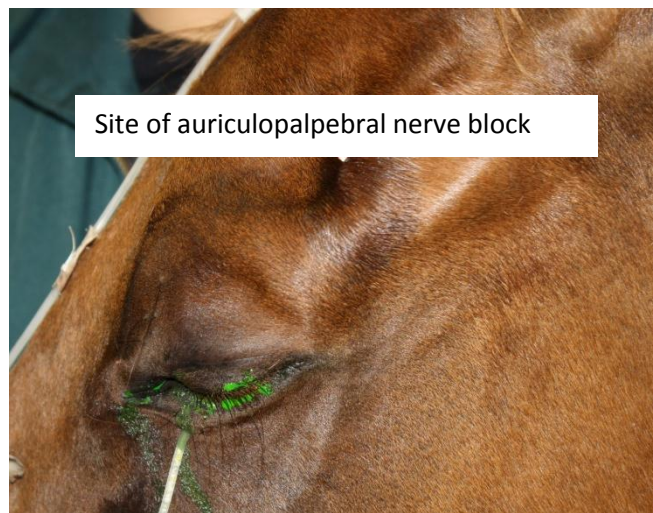
Start with the 'normal' eye (otherwise you forget and miss bilateral pathology), then move to the painful eye.

Aids to examination of a painful eye:

1. Sedation: e.g. detomidine / butorphanol. Also analgesic which aids examination
2. Auriculopalpebral nerve block. Easy and quick to perform. 2-3ml of 2% lignocaine / mepivacaine, injected with 25Ga needle. Wipe with spirit, inject subcutaneously over the highest point of the zygomatic arch (Feel for the nerve between skin and bone). Takes 5-10 minutes to work.

Ophthalmic examination

- Discharge – type/amount?
- Orbit – any fractures / pain on palpation
- Lids – lacerations / ectopic cilia / masses / 3rd eyelid swelling.
- Conjunctiva: Swelling/oedema. Examination under the eyelids for foreign bodies using a sterile cotton bud and topical local anaesthesia can be performed after assessment and staining of the cornea.
- Cornea – use a bright light source and shine from oblique angles as well as straight. If your ophthalmoscope has a slit setting use this from an angle. Look for opacities/discontinuity in the surface. Neovascularisation from the limbus indicates a more chronic disease process.
- Anterior chamber: Any aqueous flare ('headlights in the fog') or other abnormalities – blood/pus/fibrin. Again a focal or slit light source from different angles helps accentuate abnormalities.
- Iris: Normal colour? Uveitis can cause reddening or darkening of the iris.
- Compare pupil sizes – stand in front of horse and use bright light to look at each eye in turn. Most common cause of anisocoria is miosis (pupil constriction) caused by anterior uveitis. Mydriasis (pupil dilation) is rare, but most commonly seen secondary to glaucoma or previous use of a mydriatic. Oculomotor nerve dysfunction is also a possible cause.
- Lens: Assess lens position/opacity. Lens (sub)luxation can occur with trauma or secondary to uveitis or glaucoma. Anterior luxation (in front of pupil) can be recognised easily, posterior subluxation is normally associated with an aphakic (without lens) crescent.
- The posterior segment is less commonly involved in ophthalmic emergencies. A detached retina appears as a grey hazy veil, normally remaining attached at the optic disk. Ultrasonography is recommended to confirm this diagnosis.



Supplementary techniques

- Fluorescein staining.
 - Should always be performed in painful eye examinations.
 - Either use a ready made solution or a moistened strip.
 - Gently lavage out excess with sterile saline.
 - A blue filter on a light source helps identify subtle staining.
 - Epithelium and descemet's membrane don't take up stain. Stroma stains strongly. Partial thickness epithelial erosions or under-run epithelium stain weakly.
 - Fluorescein stain at nasal ostium after 10 minutes indicates patency of nasolacrimal duct.

- Rose Bengal: Use 0.5% solution, then flush out with saline. Can be performed after fluorescein. Stains partial thickness epithelial erosions / deficits in tear film. Causes some discomfort for the horse.

- Corneal culture / cytology.
 - Not normally required for simple, superficial/uncomplicated ulcers on first presentation.
 - For larger, deeper or obviously infected ulcers corneal swabs should be taken (preferably without the use of topical local anaesthetic) ideally before starting topical antimicrobials.
 - Corneal cytology should also be taken from all but the simplest corneal ulcers, and stained to check for fungal hyphae, bacterial colonies and predominant cell type present.

- Look under all 3 eyelids for any foreign bodies when there is corneal ulceration. Care not to put any pressure on the globe if there is any risk of perforation. Apply topical local anaesthetic, then use a sterile cotton bud/swab to lift and sweep under the lids. Non-rat tooth forceps can be used to lift the 3rd eyelid.

Approach to diagnosis and management of some common ophthalmic conditions

Corneal ulceration

- Clinical signs normally include:
 - Blepharospasm
 - epiphora
 - corneal oedema
 - signs of secondary uveitis (miosis, aqueous flare, pain, photophobia)

- Diagnosis is by fluorescein staining. Remember descemetocoeles don't stain in the centre.

- Fungal ulcers are rare in the UK but are often characterised by 'cake frosting' appearance to the ulcer bed, surrounded by a furrow.

- What depth is the ulcer? Use a bright light source from all angles to assess.

- Is there a foreign body in the cornea or elsewhere in the eye?

- Is there iris prolapse through a penetration? (care – iris is dark and can look like foreign body)

- Is there secondary uveitis?

Management

Treat ulcers early and aggressively.

Corticosteroids are contraindicated in fluorescein positive ulcers, even in the presence of secondary uveitis.

Management of superficial ulcers - The '4As'

1. **Antimicrobials** (topically): e.g. Chloroamphenicol (ensure passport section IX is signed) / gentamicin. Ointments last longer than solution. Ideally administer at least 4x/day initially.
2. **Anticollagenase** (topically). For all but very superficial ulcers. Put 5ml of sterile water in a purple top EDTA tube and use topically. Ideally administered every 2hrs, as often as possible.
3. **Atropine**: If secondary uveitis is present (constricted pupil, aqueous flare) administer 1% atropine every few hours until pupil is dilated. With mild uveitis pupil normally dilates after 1 treatment. (Warn owners that pupil can stay dilated for 4-5 weeks). Often after pupil is dilated the eye is normally much more comfortable, and administering other medications will be easier.
4. **Anti-inflammatories**: IV / PO flunixin for secondary uveitis.
5. If pupil is dilated keep horse out of sunlight or fit a shaded mask.
6. Recheck minimum q 2days and ulcer should be healed in 2-6 days.

Management of stromal (moderate depth) ulcers

1. Consider placing a sub palpebral lavage catheter. If owner will struggle to give frequent treatments consider hospitalising.
2. Take swab for C+S, and consider scraping for corneal cytology from periphery of ulcer.
3. Antimicrobials: Frequent application of solutions ideal – Ciprofloxacin / gentamicin / tobramycin q 2-6 hrs. Adjust according to C and S results.
4. Anticollagenase: EDTA (see above) q 2-6 hrs.
5. Atropine: if any evidence of uveitis, or as preventative. If corneal oedema means you can't visualise anterior chamber/pupil administer topical 1% atropine q 4-6 hrs for 24 hrs, then reassess.
6. Anti-inflammatories: Flunixin PO/ i/v
7. Keep out of sunlight.
8. Regular rechecks. Monitor for uncontrolled uveitis, and indolent (non healing) or melting ulcers, as these require different management.

Management of more severe ulcers:

- Descemetocelles, deep or melting ulcers and full thickness penetrating foreign bodies should be referred as they are often requiring surgery and intensive management.
- Administer i/v anti-inflammatory such as flunixin but before administering any topical medication speak to the referral centre.
- Manipulate the eye/eyelids as little as possible to avoid rupture.

Conjunctivitis:

Can occur as primary condition, often as hypersensitivity to dust/pollens etc.

Clinical signs:

Swollen, red conjunctiva, discharge, moderate discomfort. Globe normal.

Treatment:

- Topical corticosteroid +/- antimicrobial. E.g. Maxitol ointment BID for 5 days.
- Corticosteroids contraindicated if corneal ulceration present.
- Systemic NSAID.

Anterior uveitis

Most commonly occurs secondary to corneal ulceration, ocular or orbital trauma, or occasionally to a systemic disease. Primary and recurrent (equine recurrent uveitis, ERU) also exist.

Clinical signs: Pain, lacrimation, diffuse corneal oedema, conjunctival oedema/redness, aqueous flare, miosis (constricted pupil), photophobia, fibrin deposits in anterior chamber. Intraocular pressure normally low in acute uveitis.

Management:

- Fluorescein stain to check no corneal ulceration before using topical corticosteroids.
- Anti-inflammatories:
 - Systemic – Flunixin, full dose initially then for primary/ERU give 4 week decreasing dose when uveitis is controlled.
 - Topical: If no fluorescein uptake give corticosteroid with good penetration – prednisolone acetate/ dexamethasone q4-6hrs.
- Atropine: Give to effect until pupil dilated. If corneal oedema obscures anterior chamber but uveitis suspected then administer atropine anyway.
- Keep out of sunlight.
- If ERU consider further diagnostics such as leptospirosis serology or investigating another infectious aetiology.

Eyelid Laceration

- These should be repaired as quickly and accurately as possible.
- Accurate alignment of the lid margin is essential to avoid long term complications such as corneal ulceration.
- Can normally be performed standing, but consider GA for difficult horses/large lacerations.
- Always check for other traumatic injuries – e.g. corneal damage or secondary uveitis.
- Sedate horse heavily, use AP block and topical LA on cornea. Resting horse's head on straw bales/head stand can help.
- Line block with local anaesthetic. For middle 1/3 of upper eyelid supraorbital regional nerve block effective.
- Lavage laceration with sterile saline or 5% povidine iodine.
- Use minimal debridement and don't resect tissue, even if suspicious it is non-viable. Eyelids are very vascular and have good capacity to heal.
- Laceration should be closed in 2 layers
- First use 4-0 – 6-0 absorbable suture in a simple interrupted or continuous pattern in the tarsal plate (white, firm tissue) in the middle of the eyelid, ensuring the suture does not penetrate the tarsal conjunctiva.
- Then place figure of 8 suture to align eyelid margin. Use 4-0 – 6-0 non absorbable suture. Ensure suture ends don't touch cornea.
- Then close the skin with non absorbable suture (3-0 or 4-0 is ideal) in a simple interrupted pattern, ensuring the suture ends can't touch the cornea.

- Aftercare: Systemic tetanus prophylaxis, anti-inflammatory and antimicrobial medication.
Topical antimicrobial medication. Some horses may require face mask to avoid self trauma.

Suture pattern for repair of lower eyelid laceration

a: Absorbable suture layer in tarsal plate

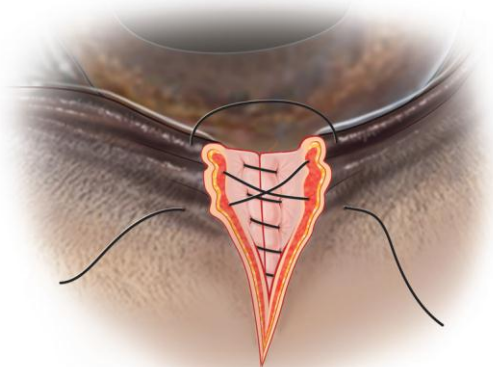
b: Figure of 8 suture placed to align eyelid margin

c: Closure of the skin

(Images from: Archer, D. *Handbook of equine emergencies*. Saunders 2013)

Orbital trauma / fractures

- Common, often accompanied by marked swelling.
- Check for concurrent injuries/neurological status.
b

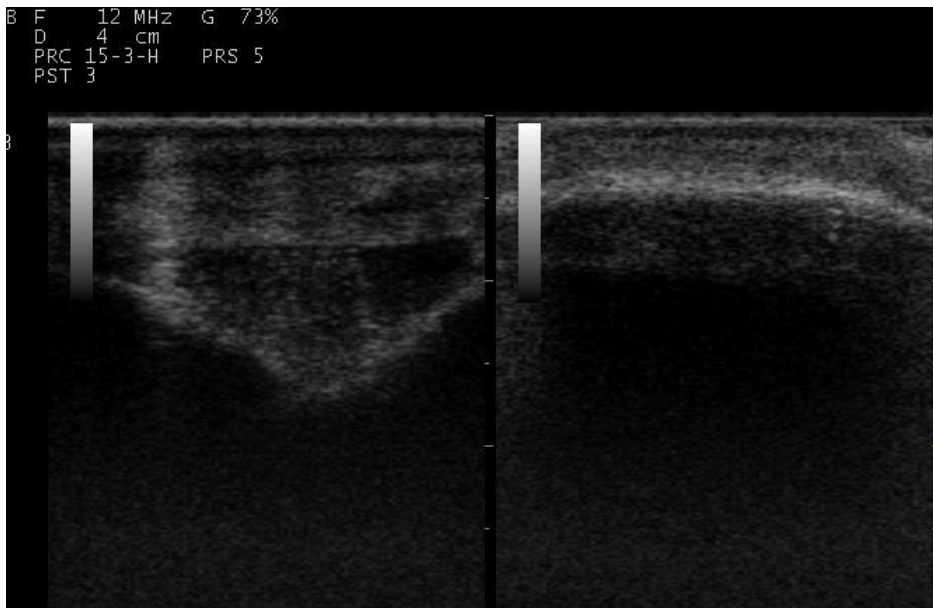


- Palpate carefully for crepitus / discontinuity of bony orbit and other facial symmetry.

- If the eye is open check for
 - vision (menace)
 - corneal damage
 - secondary uveitis
 - lens luxation
 - retinal detachment if negative menace

- Ultrasonography: If eyelids are so swollen assessment of globe isn't possible visually. Can assess if pupil is miotic, retinal detachment and lens luxation. Also orbit rim can be imaged (see below)

- Radiography: difficult area as superimposition of multiple structures on normal views. Oblique / dorsoventral views useful.
- Referral for CT offers best images to assess for fractures.
- Simple, minor fractures of bony orbit can sometimes be realigned by traction on fragments using e.g. retractor. Some require surgical repair and internal fixation.
- Anti-inflammatories, antimicrobials and treatment of any ocular pathology.



This horse had history of trauma to the left orbit, and presented with periocular swelling. The image on the left shows a displaced fracture of the dorsal left orbital rim. The image on the right is the normal, contralateral side shown for comparison.

Capaldo, F and Komaromy, A. M 2006. Ophthalmic Emergencies, *Clin Tech Equine Pract* 5: 134-144
 Dallap Schaer, B 2007 Ophthalmic emergencies in horses. *Vet. clin. North Am. Equine Practice* 23, 49-65

Oesophageal Obstruction ("Choke")

Oesophageal choke is a common condition in equine practice, and will normally self resolve or respond to basic medical management. Occasionally obstructions require more prolonged treatment, or occur secondary to another condition.

On the telephone:

A diagnosis of choke can often be strongly suspected on the telephone, with dullness and saliva +/- feed from the mouth being the most commonly reported abnormalities.

Differential diagnoses for this clinical signs include pharyngeal dysfunction and spontaneous reflux secondary to gastric distension. The latter is a life threatening condition requiring immediate gastric decompression. It will normally be accompanied by severe colic pain and/or severe dullness however. Choke cases are normally just quiet/dull and the abnormal signs are often witnessed starting acutely after a feed.

For witnessed, recent onset cases of choke I often advised the owner to monitor their horse for 30-40 minutes and then report back, as frequently the obstruction will spontaneously clear. The horse will look brighter and the drooling stop rapidly when the obstruction clears.

Whilst monitoring the horse or waiting for you to arrive ask the owner to ensure that the horse has no access to feed or water. Gently massaging the left neck might help and probably doesn't do any harm.

At the yard

History:

- Last seen normal/first seen abnormal
- What abnormal signs have been seen?
- What has the horse been eating and when?
- Previous episodes of choke
- Any other medical conditions?
- History of oral examinations/dental treatment

Clinical Examination

- A general physical examination is essential to detect any primary cause of choke, such as a myopathy, grass sickness or tetanus. Deep crackles may be auscultated over the trachea due to aspiration.
- At presentation the most common clinical signs of simple oesophageal obstruction are:
 - Drooling and nasal return of saliva and food
 - dullness/anxiety
 - repeated swallowing action
 - spasm of neck muscle
 - coughing
- If the choke has been present for a longer period of time dehydration, metabolic derangements and aspiration pneumonia might be present.
- There is sometimes a swelling at the site of the obstruction, most commonly at the thoracic inlet.
- Care of hyperlipaemia in ponies/donkeys (esp. if obese) with prolonged anorexia.

Initial management

1. Do general physical exam, to check for any underlying conditions and for aspiration pneumonia/dehydration.

2. Administer sedation ($\alpha 2$ agonist and butorphanol iv). Lowers head and reduces anxiety

+/- Buscopan compositum as spasmolytic

+/- Oxytocin (10-20 IU i/v) only for proximal obstructions, peak effect 15 mins, might cause colic/sweating, contraindicated in pregnant mares

Sometimes the obstruction clears with these treatments alone.

3. Pass a nasogastric tube – mark on tube with marker pen expected distance to pharynx and stomach. If possible use tube with single hole at end not side holes. When tube can't be passed = obstruction, assuming proximal to stomach. Don't force tube to clear.

4. **Gently** lavage obstruction with warm water using pump or funnel, keeping head of horse as low as possible to minimise tracheal contamination. Top up sedation as required, and have someone keep the head down.

5. If obstruction has cleared, water stops refluxing back up oesophagus and out of nose/mouth. After lavaging try passing tube further. If no progress continue to lavage.

6. Confirm obstruction has cleared by passing tube to stomach. Administer water/electrolytes (5-6L to 500kg horse), esp. if horse is dehydrated.

Aftercare for uncomplicated cases:

- Give access to water only, no feed for 6 hours.
- If horse must be turned out allow grazing only.
- After 6 hours give grazing /wet mash. Gradually reintroduce small amounts of soaked hay/haylage after 24-48 hrs. Reintroduce the concentrate feed after 2-3 days.
- Antimicrobials indicated if any signs of aspiration pneumonia.
- Antiinflammatories (NSAID) if any signs of aspiration pneumonia/pain or oesophagitis suspected.
- Fluid therapy rarely required unless prolonged obstruction.
- Always perform an oral examination to check teeth, even if performed recently.

Long term prevention:

- Slow down eating by placing a brick/stone in the feed bowl
- Always access to water
- Regular dentistry
- Wet down concentrate feed

Treatment of refractory cases

- Continue lavaging obstruction for 20-30 minutes, ensuring head is kept low. Use very gentle force with the tube on the impaction.
- If no success administer NSAID and antimicrobial medication with view to returning in 2-3 hrs.
- Monitor horse closely for hydration (clinical examination, PCV/TP), and if required administer i/v fluids.
- Continue intermittent lavage for up to 24hrs, after which if still obstructed the horse should be referred for further investigation/treatment.
- Pass a cuffed endotracheal tube (e.g. 22mm diameter) via the nostril into the proximal oesophagus. Through it pass a small diameter stomach tube down to the site of obstruction. This allows a high volume lavage while minimising the risk of aspiration pneumonia. (See photo)

Further investigation of refractory cases

Endoscopy: ideally a 2m endoscope can be used to visualise, locate and characterise the obstruction, and assess the pharynx and oesophageal mucosa. Foreign bodies can often be removed using transendoscopic forceps. Water can be injected into the middle of the bolus of feed by passing a catheter down the instrument channel. The trachea can also be assessed for feed contamination (frequently present).

Radiography: Look for radiopaque foreign bodies, site of obstruction and length of bolus. Possible oesophageal penetration can be recognised by gas lucencies in tissue planes. Barium contrast agent is contraindicated if oesophageal rupture is suspected.

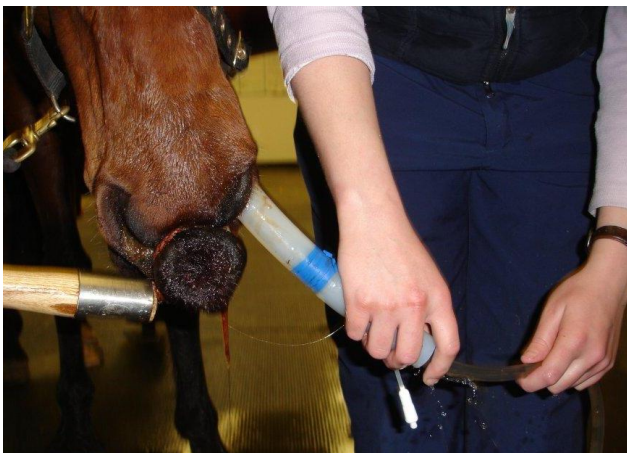
Ultrasonography: This can help locate an obstruction and help visualise any extraluminal mass.

GA lavage with the body elevated above the head can be used in refractory cases.

Oesophagotomy is a 'last resort' for foreign body /food bolus removal. Complications are common including chronic recurrent oesophageal obstruction due to stricture formation.

Following longer term obstructions there is likely to be pressure necrosis of the oesophageal wall and iatrogenic damage to the pharynx and oesophagus from nasogastric intubation. Aspiration pneumonia

is also common. Treatment includes minimal, liquid feed, omeprazole, sucralfate, anti inflammatories and antimicrobials. Regular monitoring for pneumonia/pleuropneumonia is advisable.



Causes of choke

Intralumin al	Extraluminal	Motility Disorders
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Simple feed impaction Foreign body Stricture Diverticulum Neoplasia Dehydration	Neoplasia Abscessation Lymphadenopathy Intramural inclusion cysts Persistent right aortic arch	Oesophagitis (post-choke) Post-sedation Oesophageal spasm? Idiopathic megaesophagus Tetanus Myopathy Grass sickness
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Dysphagia

Dysphagia is rarely an emergency, but still might require a weekend call, and can sometimes be associated with marked oral pain.

Pain related	Neurogenic	Obstructive
Pharyngeal/oral foreign body Dental pathology (e.g. fracture) Buccal/lingual abscess Oral trauma Mandibular fractures	Head Trauma Guttural pouch disease Lead poisoning Botulism Equine grass sickness Hepatoencephalopathy Tetanus	Oesophageal / pharyngeal obstruction Neoplasia Lymph node abscess (e.g. strangles)

- A full clinical examination should be performed before examining the mouth, to ensure that dysphagia is not part of a wider clinical condition such as botulism or grass sickness.
- If oral pain is suspected, ensure that an external examination of the head is performed before placing an oral speculum. Look for asymmetry, pain on palpation and any incisor misalignment which could indicate a mandibular fracture.
- A head torch, dental syringe, full mouth speculum and dental mirror will allow a full oral examination.
- In addition to examining the teeth for fractures/diastemata etc remember to palpate under the tongue for foreign bodies.
- If a foreign body is suspected (acute onset ptalyism) a full examination should include opening the mouth as wide as possible with the speculum and palpating all the way to back to the oropharynx. You need to trust your speculum to do this! Objects (e.g. twigs) can get lodged there which are not visible orally or endoscopically via the nasopharynx.
- Peripheral or central neuropathies affecting the pharyngeal nerves will cause dysphagia and/or nasal discharge of feed. Lesion such as guttural pouch myocosis normally require endoscopy for diagnosis, but other conditions such as chronic grass sickness or botulism are normally diagnosed by clinical signs alone.

Treatment

- Depends on the underlying cause of the dysphagia.

- It is important to keep dysphagic horses hydrated – monitor for dehydration and treat appropriately.
- To stop the horse getting malnourished try feeding horse/pony nuts which have been soaked to a slurry, which requires minimal mastication and has a high energy concentration. If necessary this can be administered by nasogastric tube. Vegetable oil can also be used to provide further caloric support.
- Analgesia is indicated for pain/inflammation related dysphagia, and antimicrobials if aspiration pneumonia is a risk.
- Caution of hyperlipaemia in dysphagic ponies/donkeys, especially if obese. Dullness and anorexia are normally the earliest clinical signs of hyperlipaemia. Serum triglycerides >5 g/L is diagnostic.

Respiratory Distress

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DIFFERENTIAL DIAGNOSIS OF RESPIRATORY DISTRESS

- Upper Respiratory Tract Obstruction
 - Bilateral laryngeal/pharyngeal paralysis
 - Liver disease
 - Lead toxicity
 - Botulism
 - Guttural pouch mycosis
 - Idiopathic in neonates
 - Epiglottitis/arytenoid chondritis
 - Masses
 - Polyps
 - Tumours
 - Strangles / other lymph node swelling
 - Guttural pouch empyema
 - Tracheal collapse / obstruction
- Lower Respiratory Tract
 - Heaves (recurrent airway obstruction)
 - Acute Lung Injury / Acute Respiratory Distress Syndrome

- Pulmonary oedema
- Pleuropneumonia
- Pneumonia
- Pulmonary abscessation
- Pulmonary neoplasia
- Pleural effusion
- Interstitial lung disease
- Mediastinal masses
- Anaphylaxis
- Trauma, pneumothorax
- Fractured ribs / flail chest in foals
- Severe abdominal distension
- Diaphragmatic hernia
- Severe anaemia
- Hyperthermia / heat stroke
- Anhydrosis
- Severe pain
- Severe metabolic acidosis
- Toxins e.g. monensin

EMERGENCY MANAGEMENT OF RESPIRATORY DISTRESS

Upper Respiratory Tract Obstruction

Severe upper respiratory tract obstruction can be life threatening and require emergency tracheostomy. The optimal site is the mid 1/3 – upper 1/3 cervical trachea where the sternocephalicus muscle bellies diverge and the tracheal rings are more readily palpable. The skin is sterilely prepped and local anaesthetic deposited subcutaneously and in the deeper tissues unless tracheostomy is being performed as a life saving measure. A midline skin incision (approximately 8-10cm) is made through the skin and subcutis and the sternothyroideus muscle bellies separated to expose the trachea. The annular ligament of the trachea is incised horizontally between the tracheal rings through a maximum of one half of the tracheal circumference. The tracheostomy tube is inserted and then secured in place. If no tracheostomy tube is available, a 'field tracheostomy tube' can be fashioned from a syringe case/barrel with the enclosed end cut off or plastic milk container handle.

Careful management of a tracheostomy tube is required. The tube should be removed and cleaned twice daily with dilute antiseptic solution and rinsed with water. The area distal to the stoma should be cleaned of discharge and barrier cream e.g. vaseline applied.

Once upper airway obstruction is resolved, the tracheostomy tube can be removed and the stoma allowed to heal by secondary intention, usually in about 14 days.

Bronchodilator Therapy for flare ups of RAO/heaves

A single dose of intravenous atropine (0.01 mg/kg i.v. slowly) or hyoscine (0.3 mg/kg iv) is useful as rescue therapy for severely obstructed heaves horses, and a significant improvement in respiratory rate and effort should be seen 10 minutes after injection. Due to side effects of ileus, mydriasis and tachycardia however, they should not be used for longer term therapy of heaves horses. Owners should be warned of the possibility of colic as a side effect, which is usually mild and transient if it occurs. Hyoscine is associated with fewer side effects compared to atropine, and but has a shorter duration of action. If atropine and hyoscine are unavailable iv clenbuterol (0.8 µg/kg iv) can be given as an alternative. Inhaled bronchodilators (e.g. ipratropium) are also effective.

Beta-2 agonists are useful for longer term bronchodilator therapy and can be given orally, intravenously or by inhalation. Clenbuterol is the most commonly used beta-2 agonist however the lower recommended dose rate (0.8 µg/kg) often fails to cause effective bronchodilation whilst the

higher dosage (up to 3.2 µg/kg) frequently causes trembling, sweating, colic and tachycardia, particularly if given intravenously.

Hypoxaemia is a common complication of bronchodilator therapy (of any kind) apparently due to V/Q mismatching, particularly in patients with a PaO₂ < 64 mmHg. When possible in such cases, oxygen supplementation should be given in conjunction with bronchodilators.

Corticosteroids

Lower respiratory tract inflammation is the underlying cause of bronchoconstriction and increased mucopus production seen in RAO/heaves. Corticosteroids are the mainstay of long term pharmacological management of RAO/heaves, and treatment should start at the time of an acute flare-up of heaves. Intravenous dexamethasone (0.06mg/kg) is most commonly used initially, after discussion of possible adverse effects with the owner. This would also be used for cases of anaphylaxis or severe laryngeal oedema. For longer term management of RAO inhaled corticosteroids are optimal.

Diuretics

Furosemide at 1 mg/kg i.v. is useful in cases of pulmonary oedema

Oxygen Supplementation

If available, supplementation of oxygen can help reverse hypoxaemia unless it is due to significant right to left shunting of pulmonary blood. Oxygen delivery should be at least 10L/min and is usually supplied by intranasal placement of a delivery tube. The tube is inserted to a pre-determined length measured from the nares to the medial canthus of the eye. If long-term oxygen supplementation is required, warming and humidification of oxygen is desirable to prevent desiccation of airway epithelium. This can be achieved by bubbling the oxygen through a canister of warm, sterile saline.

Chest Drains

Thoracocentesis is indicated to remove pleural effusions restricting lung expansion. The usual puncture site is in the ventral third of the right 6th -7th intercostal space or left 8th -9th intercostal space however location is best determined by identification of fluid by ultrasonography. A large area should be clipped and prepared aseptically. Local anaesthetic is infiltrated subcutaneously and into the intercostal muscles down to the level of the parietal pleura. Care should be taken to avoid the lateral thoracic vein which runs subcutaneously over the ventral chest wall. A stab incision is made through the skin with a scalpel taking care to avoid the vessels which run along the caudal margin of the ribs. A blunt ended cannula (e.g. a metal teat cannula) is then pushed through the intercostal muscles and through the parietal pleura. If the cannula is to be left in situ, a large gauge (e.g. 28Fr) chest drain (e.g. Portex) should be used and a one way valve, e.g. a Heimlich valve or a condom with the tip cut off, should be secured over the end.

For pneumothorax drainage of air from the pleural cavity can be achieved by insertion of a needle/catheter attached to a syringe and three-way tap into the dorsal pleural cavity.

Adapted from notes by Brielle Rosa DVM PhD.