Vestibular Disease: Temporohyoid Osteoarthropathy*

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Temporohyoid osteoarthropathy is a common cause of peripheral vestibular disease in horses. This disorder should be the primary diagnostic differential in cases of acute-onset vestibular dysfunction with facial nerve paralysis. The cause of temporohyoid osteoarthropathy is unknown; however, septic and non-septic degenerative processes have been proposed.

Neurologic dysfunction in horses with temporohyoid osteoarthropathy is an acute manifestation of chronic bony proliferation of the petrous temporal bone and stylohyoid bone, resulting in ankylosis of the temporohyoid joint. The hyoid apparatus is linked to the tongue and larynx; therefore, fusion of the temporohyoid joint impairs flexibility of the unit. In this disease process, mastication or vocalization transfers lingual and pharyngeal forces to the stylohyoid bone, producing osseous proliferation and eventual fracture of the stylohyoid bone or petrous temporal bone.

Neurologic signs are not initially apparent during formation of proliferative osteitis and temporohyoid joint fusion. However, in the later stages of disease, the petrous temporal bone fractures, causing neurologic signs associated with temporohyoid osteoarthropathy. The fracture line extends into the cranial vault at the level of the internal auditory meatus, inducing direct trauma to the vestibulocochlear and facial nerves and hemorrhage into the middle and inner ear. Occasionally, the fracture line extends to the foramen lacerum, caudal to the petrous temporal bone, where the glossopharyngeal and vagal nerves exit the skull. Trauma to these nerves caused by the fracture may result in dysphagia for several days. Inflammation from the disease process may extend through the internal acoustic meatus and lead to focal suppurative meningitis.

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at the level of the pons, resulting in fever and depression. Secondary meningitis worsens the prognosis for recovery. Rupture of the tympanic membrane and drainage of exudate from the external meatus occur in horses but are probably unrecognized in most cases.

**Diagnostic Criteria**

**Historical Information**
- Adult horses (≥2 years of age).
- No breed or gender predilection.
- Head tossing or head shaking is an early clinical sign that often precedes vestibular dysfunction.
- Facial nerve paralysis may precede vestibular signs in some horses.

**Physical Examination Findings**
- Vital signs are within normal limits.
- Peripheral vestibular syndrome characterized by:
  - Head tilt (toward the lesion).
  - Horizontal nystagmus (fast phase away from the lesion).
  - Circling (toward the lesion).
  - Torticollis.
  - Strabismus (ipsilateral, ventrolateral).
- Head tossing/ear flopping, pain on palpation of the base of the ear, and head shyness are early clinical signs that may precede petrous temporal bone fracture.
- Facial nerve paralysis (drooping of the ipsilateral ear, eye, and muzzle) with loss of menace and palpebral reflexes.
- Corneal ulceration resulting from failure to blink (cranial nerve VII dysfunction) and disruption of parasympathetic innervation to the lacrimal gland (reduced tear production).
- Difficult prehension due to paralysis of the muzzle and pain associated with the fracture.
- Possible dysphagia due to damage to the glossopharyngeal and vagus nerves if the petrous temporal bone fractures.
- Complete or partial hearing loss is common on the affected side. In horses with bilateral structural abnormalities, partial hearing loss may be present contralateral to vestibular signs.

**Diagnostic Findings**

**Endoscopic Examination of the Upper Airway (Including Guttural Pouches)**
- More sensitive than radiographic examination for detection of early osseous proliferation.
- Endoscopic examination of the guttural pouch identifies osseous proliferation of the proximal insertion of the stylohyoid bone at the level of the temporohyoid joint (FIGURE 1).
- This condition can be unilateral or bilateral, so it is important to endoscopically examine both guttural pouches.

**Radiography**
- Standing lateral radiographs of the skull and ventrodorsal radiographs of the skull while the patient is under general anesthesia reveal sclerosis of the tympanic bulla and the proximal portion of the stylohyoid bone.
- Because of minimal displacement of fracture fragments, the actual fracture of the petrous temporal bone may be difficult to identify.
- Sequential lateral oblique radiographic views of the skull at varying angles may aid in localizing a fracture.

**Computed Tomography**
- Computed tomography with the patient under general anesthesia provides excellent visualization of any bony abnormalities. If surgery...

**Critical Point**

This disorder should be the primary diagnostic differential in cases of acute-onset vestibular dysfunction with facial nerve paralysis.
is planned, computed tomography should be performed immediately before surgery.

Laboratory Findings
- Complete blood count and serum chemistry analysis results are typically unremarkable.
- Neutrophilia may be present in horses with focal meningitis.

Other Significant Diagnostic Findings
- Otoscopic examination (using an 8-mm flexible endoscope) should be performed with the patient under sedation to identify rupture of the tympanic membrane.
- Schirmer’s test confirms reduced tear production.
- Cerebrospinal fluid (CSF) should be analyzed in horses with signs of depression to detect focal meningitis at the fracture site.
- Aggressive antimicrobial therapy is warranted in horses with abnormal CSF cytology characterized by neutrophilic inflammation (normal: five cells/µL) and an increased protein level (normal: 80 mg/dL) consistent with bacterial infection. Ampicillin and chloramphenicol or rifampin are appropriate choices for initial therapy, pending results of bacterial culture and sensitivity.

Differential Diagnosis

**Equine Protozoal Myelitis**
- Concurrent brainstem dysfunction may be detected during neurologic examination.
- Diagnosis is based on immunoblot analysis of CSF to detect antibodies against *Sarcocystis neurona*. In addition, an indirect fluorescent antibody test (IFAT) may be conducted on whole blood or CSF to detect antibodies to *S. neurona*. The IFAT maintains validity for CSF samples in the presence of blood contamination up to 100,000 erythrocytes/µL.

**Head Trauma**
- Diagnosis is based on radiographic examination of the skull.
- Identification of fracture of the petrous temporal bone without proliferation of the stylohyoid bone is consistent with fracture due to head trauma.

**Polyneuritis Equi**
- Clinical signs of cauda equina dysfunction (urinary and fecal incontinence, perineal hypalgesia) are evident during neurologic examination.

**Head Shaking Syndrome**
- Before fracture, horses with temporohyoid arthropathy may demonstrate head tossing as their only clinical sign, particularly under tack. This syndrome can be ruled out based on abnormal findings on upper airway endoscopy.

**Lightning Strike**
- Acute unilateral vestibular disease (with or without facial nerve paralysis) due to degeneration and necrosis of the sensory hair cells of the inner ear.
- Diagnosis is based on history and exclusion of other differentials.

**Summary of Diagnostic Criteria**
- Endoscopic examination of the guttural pouch reveals bony proliferation of the proximal stylohyoid bone.
- Radiographic evaluation may not be necessary if endoscopic examination of the guttural pouch is diagnostic.
- If radiographic or endoscopic abnormalities are not apparent, clinical signs may result from inner ear effusion (this is rare). Nuclear scintigraphic evaluation of the skull may identify early bony lesions.

**Treatment Recommendations**

**Initial Treatment**
- **Trimethoprim–sulfamethoxazole** (15–30 mg/kg PO q12h for 30 days).
- **Phenylbutazone** (2 mg/kg PO q12h for 14 days) or **flunixin meglumine** (0.5–1.1 mg/kg PO q12h for 14 days).
- **Corticosteroids** (dexamethasone: 0.05–0.10 mg/kg IV q24h) have been used as a potent antiinflammatory therapy. Because of the immunosuppressive and systemic adverse effects of dexamethasone, caution should be exercised.

**Critical Point**
- Head tossing or head shaking is an early clinical sign that often precedes vestibular dysfunction.
Alternative/Optional Treatment

Partial Stylohyoid Ostectomy
- Surgical removal of a 2-cm midshaft segment of the stylohyoid bone dissipates forces generated by the hyoid apparatus during normal lingual and laryngeal movement.
- Ideally done before onset of neurologic dysfunction to prevent fracture of the petrous temporal bone.
- When performed in a group of horses after petrous temporal bone fracture (vestibular/facial nerve paralysis), approximately 40% of the horses improved.
- Dysphagia and difficult prehension may be observed for 1 week after surgery.

Ceratohyoidectomy
- Surgical disarticulation of the ceratohyoid bone from the basihyoid bone, followed by disarticulation of the ceratohyoid–stylohyoid joint, is performed on the affected side.
- Broad-spectrum antimicrobials should be administered for 2 to 4 weeks.
- Antiinflammatory therapy is recommended for 1 to 2 weeks.
- It is reported that most horses appear more comfortable and return to eating within 3 to 5 days after surgery.

Supportive Treatment

Regular ophthalmic examinations
- Because of facial nerve paralysis, it is imperative to monitor the horse's eye for corneal ulceration and to treat it appropriately with antimicrobials (e.g., neomycin–bacitracin–polymyxin).
- If uveitis is present, additional treatment, including 1% atopic ointment, is warranted.

Ophthalmic ointment to treat or prevent corneal ulcers. Ophthalmic preparations with corticosteroids are contraindicated. Monitor the corneal ulcer carefully for signs of change.

1% Atropine ophthalmic ointment (as needed to maintain mydriasis) for horses with

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acute uveitis (e.g., aqueous flare and miosis).

- Offer soft feeds for 2 to 3 weeks to minimize pain and prevent further displacement of fracture fragments.
- Check teeth for molar points and float carefully, if needed, to avoid oral ulceration secondary to paralysis.

Patient Monitoring

- Clinical signs are most severe at the time of fracture. Circling, disorientation, and nystagmus resolve within days or weeks due to visual compensation.
- Romberg's test (blindfolding and cautious manipulation) should be conducted to differentiate improvement in vestibulocochlear nerve function from central compensation due to visual input. Caution is imperative when blindfolding affected patients, which may fall suddenly due to loss of visual input. A subtle head tilt persists in most cases. Facial nerve paralysis often improves but rarely resolves.

Farm Management

- Horses should be maintained in a stall with secure footing for the first 2 to 3 weeks until visual compensation eliminates disorientation.
- Soft feeds and/or mashes can help minimize pain and prevent further displacement of fracture fragments.
- After the initial 2 to 3 weeks of stall rest, horses can be maintained at pasture. They may decompensate for a few seconds when moving from bright to dark conditions because of the loss of visual compensation.

Milestones/Recovery Time Frames

- **1 to 2 weeks:** Dysphagia and difficult prehension improve.
- **2 to 3 weeks:** Nystagmus, circling, and loss of balance improve.
- **2 to 3 months:** Facial nerve paralysis may improve.

Treatment Contraindications

- Hard feedstuffs (i.e., cracked corn).
- Ophthalmic preparations with corticosteroids.
- In a horse with a break in the blood–brain barrier due to a petrous temporal bone fracture, we observed hyperresponsiveness and seizure after administration of enrofloxacin. Enrofloxacin is not labeled for use in humans due to adverse central nervous system effects (including seizure). Caution should be exercised when using enrofloxacin in patients with temporohyoid osteoarthropathy and a break in the blood–brain barrier.

Prognosis

**Favorable Criteria**

- Resolution of vestibular dysfunction. Few horses regain vestibulocochlear nerve function. The clinician can differentiate complete resolution from visual compensation by blindfolding.
- Resolution of facial nerve paralysis.

**Unfavorable Criteria**

- Clinical signs of secondary meningitis: fever, depression, seizure.
- Melting corneal ulcer ipsilateral to facial nerve paralysis; may require enucleation.

**Critical Point**

Otoscopic examination (using an 8-mm flexible endoscope) should be performed with the patient under sedation to identify rupture of the tympanic membrane and detect contralateral otitis.

**Recommended Reading**