Pathogenesis, diagnosis, surgery and management of temporohyoid osteoarthropathy

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INTRODUCTION

The temporohyoid joint is a permanent synchondrosis, in which the petrous part of the temporal bone is attached to the proximal extremity of the stylohyoid bone via the tympanohyoid cartilage (Sisson 1975). Degenerative change (termed temporohyoid osteoarthropathy - THO) results in thickening of the proximal portion of the stylohyoid bone and ankylosis to the petrous temporal bone. Two clinical syndromes are recognised. The first consists of abnormal behaviour, such as signs of head shaking; resistance to the bit, ear rubbing, resentment of head manipulation and difficulty chewing (Blythe and Watrous 1984; Blythe and Watrous 1990). The second clinical presentation is that of acute or subacute onset facial and/or vestibular nerve deficit believed to occur following petrous temporal bone fracture (both nerves course through this structure). In the largest retrospective study, 88% of horses were found to have facial nerve and 70% vestibulocochlear nerve deficits (Walker et al. 2002). Signs of facial nerve dysfunction commonly include facial asymmetry and corneal ulceration; vestibular signs include head tilt, nystagmus and ataxia.

PATHOGENESIS

Blythe and Watrous (1984) propose that THO is the result of a chronic disease process secondary to low-grade otitis media. They speculated that otitis media results in osteitis of the tympanic bulla, which then gravitates ventrally to involve the bones and cartilage of the temporohyoid joint, leading to the arthritic changes and eventual joint fusion. This infectious aetiology was supported by recognition of proteinaceous exudates in the tympanic cavity or infiltration of inflammatory cells in the mucosal surface lining of the tympanic bulla at necropsy, of three horses with THO (Blythe and Watrous 1990; Blythe 1997). The withdrawal of fluid containing increased protein and cells following tympanocentesis in some horses with the clinical signs of head shaking or radiographic evidence of THO has also been used to support an infectious cause (Blythe and Watrous 1990). Furthermore, some horses with THO and subsequent acute fracture of the petrous temporal bone have cerebrospinal fluid cytological changes consistent with bacterial meningitis (Blythe and Watrous 1990). Degenerative joint disease (Mayhew 1989) and trauma (Johnson 2001) are both considered as possible alternatives. These scenarios seem more plausible, as chronic otitis media is rarely reported in the mature horse (Firth 1977) and bilateral disease has been reported in approximately 16% (Blythe and Watrous 1990) or 30% (Walker et al. 2002) of horses with secondary neurological signs. Banks (1993) stated that the ultimate fate of a synchondrosis, such as the temporohyoid joint, is conversion to a synostosis. Although in humans, the stylohyoid is cartilaginous and ligamentous, its ossification and ankylosis to the petrous temporal bone increase with age and is sometimes associated with pathologic sequelae – so called Eagle’s syndrome. (Eagle 1937;1948;1949; Gozil et al 2001). Meningitis secondary to a degenerative rather than infectious primary aetiology can be explained by ascending bacterial infection from the guttural pouch or elsewhere.

DIAGNOSIS

The imaging modalities available for the diagnosis of conditions affecting the temporohyoid joint include radiography, endoscopic, computed tomography (CT) and scintigraphy (Barakzai 2005). Endoscopic examination of the stylohyoid bone within the guttural pouches has provided the most widely used, sensitive and reliable means of diagnosing THO (Hassel et al. 1995; Walker et al. 2002) and is available to most practitioners. Note that because many horses have bilateral disease, it is prudent to examine the unaffected side also. Radiographic interpretation of the temporohyoid joint can be difficult due to the complex anatomy of the region, with many soft tissue, bone and air-filled structures overlying the area of interest. In a retrospective study of 33 cases, radiographic abnormalities were only evident in 83% of horses with THO (Walker et al. 2002). Nonetheless, with care, radiography can be diagnostic and may enable visualisation of a fracture. Generally lateral and oblique lateral views are taken in the standing sedated horse, so as to visualise the proximal stylohyoid region. Dorso-ventral radiographs are also possible in the sedated animal and this view allows a direct comparison of left and right sides. Standing radiography can be difficult however in an ataxic animal or one with a severe head tilt and occasionally general anaesthesia may be necessary, even though this can lead to additional problems on recovery. Walker et al. (2002) considered that CT allowed exceptional visualisation of...
bone involvement, including the visualisation of osseous proliferative lesions and precise delineation of fractures that are not often visible radiographically. CT has also provided a definitive diagnosis of THO, where no bony abnormalities were detected on endoscopic examination (Walker et al. 2002). Occasionally scintigraphy may be useful, particularly in longstanding cases (Frame et al. 2005). Atlanto-occipital or lumbosacral cerebrospinal fluid collection is recommended in all cases of confirmed THO because of the risk of ascending bacterial meningitis following petrous temporal bone fracture that can be life threatening. Cytological analysis (a differential leucocyte count and total protein measurement) and culture is required.

TREATMENT, SURGERY AND MANAGEMENT

When end-stage ankylosis of the temporohyoid joint has occurred, the stylohyoid bone is effectively rigidly attached to the petrous part of the temporal bone. As such, the forces generated by the hyoid apparatus during its normal movement are impaired and transmitted to the petrous temporal bone. The stylohyoid bone itself can act as a long leverage arm and acutely result in acute stress fractures of the petrous temporal bone itself. Because the vestibulocochlear sensory organ and nerve are located within the petrous temporal bone and the facial nerve transsects it, this will result in vestibulocochlear and/or facial nerve dysfunction. Prophylactic surgery is aimed at disrupting lever action of the stylohyoid bone during cranio-caudal movement and is recommended to avoid fracture or allow for fracture immobilization and optimal healing chances, in cases where a fracture has occurred. We have recently described a case series with complications of the standard partial stylohyoidectomy, which was the recommended procedure up until then (Pease et al., 2004). Due to these complications, a safer, easier and more long-lasting surgical procedure was developed, namely the complete ceratohyoidectomy. With the horse in dorsal recumbency, an approach is made by bluntly separating omohyoideus and hyoglossus muscles, then the ceratohyoid’s articulation with the basihyoid bone is disarticulated first using curved Mayo scissors. The hypoglossal nerve and branches of the lingual nerve are identified as they course over the lateral aspect of the rostral third of the ceratohyoid bone and are isolated using a Penrose-drain. Then the ceratohyoid’s articulation with the stylohyoid bone can be disarticulated and the complete ceratohyoid bone can be removed. In addition medical treatment should be initiated, preferably prior to surgery. The likely inflammation around the fracture site should be treated, typically using non-steroidal anti-inflammatory drugs. Possible concurrent bacterial otitis media/interna or perhaps concurrent meningitis, should be treated aggressively with broad-spectrum antibiotics. The horse should be stabilized in a padded stall with good footing, and might need intravenous fluid therapy, especially as some horses panic in the acute stages and are often transported to a clinic. Finally, but importantly, treating or preventing corneal ulcerations associated with facial nerve paralysis or keratitis sicca is extremely important and should be initiated immediately. A long-term solution is often a multifocal split-lid tarsorrhaphy.

REFERENCES