

Reduction of temporomandibular joint (TMJ) luxation in a horse - case report

[Redução de luxação da articulação temporomandibular (ATM) em equino – relato de caso]

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ABSTRACT

Luxation of the temporomandibular joint (TMJ) in horses, despite being an uncommon condition, is often associated with local trauma involving the head. Its clinical importance is mainly related to the painful injury and impairment of the multiple movements involved in chewing and breaking foods. The objective of the current work is to describe the manual reduction technique of TMJ dislocation in a 6-year-old Mangalarga Marchador stallion with a history of inability to close the oral cavity and lateral displacement of the mandible. In the radiographic and ultrasonographic evaluation of the region a rostral displacement of the mandibular condyle was observed. Manual reduction was effective with the patient under dissociative anesthesia, progressing to medical discharge within 12 days.

Keywords: dislocation, equine, temporomandibular joint

RESUMO

A luxação da articulação temporomandibular (ATM) dos equinos, apesar de ser uma condição incomum, tem sua importância clínica principalmente relacionada à injúria dolorosa e ao prejuízo dos movimentos múltiplos envolvidos na mastigação e na quebra dos alimentos. Assim, o presente trabalho tem como objetivo descrever a técnica de redução manual da luxação de ATM em um equino. Foi atendido um garanhão Mangalarga Marchador, de 6 anos de idade, com histórico de incapacidade de fechamento da cavidade oral e de deslocamento lateral da mandíbula. Nas avaliações radiográfica e ultrassonográfica da região, observou-se deslocamento rostral do côndilo da mandíbula. A redução manual foi eficaz, com o paciente sob anestesia dissociativa, com progressão para a alta médica em 12 dias.

Palavras-chave: articulação temporomandibular, deslocamento, equino

INTRODUCTION

The temporomandibular joint (TMJ) of horses is a synovial joint formed between the base of the zygomatic process of the temporal bone and the condylar process of the mandible. In addition to the synovial structures common to other joints, the TMJ is distinguished by having an articular cavity covered by fibrocartilage and divided into two distinct compartments, separated by a fibrocartilaginous disc (Sisson, 2001; Moll and

May, 2002; Rodríguez *et al.*, 2006). Due to its complexity, equine TMJ stands out for allowing multiple movements, such as lateralization, flexion, extension, abduction, adduction, and lowering and elevation of the mandible, associated with grinding and chewing food, while still being able to perform sliding and hinge movements (Lima, 2019).

The occurrence of TMJ luxation is rare in the equine species and refers to the non-reducible displacement of the mandibular condyle, leading to structural incompatibility between the articular surfaces of the condylar process and the mandibular fossa (Baker, 2002). The treatment of dislocations can be conservative, through manual reduction maneuvers and coaptation of the articular faces, or surgical through condylectomy, which can be partial, in simpler cases, or complete in more advanced and complicated cases (Baker, 2002; Devine *et al.*, 2005; Schumacher, 2006; Carmalt, 2019). In human medicine, TMJ subluxations and luxation are common, usually bilateral, acute or chronic, and are classified according to displacement, as anterior, posterior, superior, medial, or lateral (Akinbami, 2011).

In this sense, the present case report aims to describe the manual reduction of TMJ luxation in an equine and the positive clinical outcome of the technique.

CASE REPORT

A 6-year-old Mangalarga Marchador stallion, weighing 415kg, was presented at the Hospital de Equinos Clinilab, with a history of inability to close the oral cavity and lateral displacement of the mandible, after release in an individual pasture. No lesions on the head compatible with trauma were observed, and it was not reported that the animal had a habit of cribbing.

Upon physical examination, the horse presented normal colored mucous membranes, a capillary filling time of 2s, heart rate of 60 bpm, respiratory rate of 20 mpm, and normal intestinal motility on abdominal auscultation. Upon inspection and palpation of the oral cavity, there was no dental occlusion between the lower and upper hemiarches, with lateral deviation of the mandible to the right.

Upon inspection of the left face, an increase in volume compatible with the region of the zygomatic process of the temporal bone was observed. Due to the painful sensitivity, for palpation of the region, the patient was sedated with detomidine hydrochloride at 1% (0.015 mg/kg, IV) and an intra-articular application with 5 mL of lidocaine hydrochloride at 2% without vasoconstrictor was performed in the

left TMJ. During palpation, an alteration in the anatomical conformation of the left TMJ was evidenced, suggestive of deviation from the physiological axis of the mandible condyle. No signs of fracture, such as palpable fragmentation or a crackling sound were observed.

To investigate the altered region, complementary X-ray and ultrasound examinations were performed. In the radiographic evaluation of the skull, laterolateral and ventrodorsal projections were carried out, with exposure factors of 80 kVp and 3.2 mAs, through which we observed rostral displacement of the mandibular condyle, incongruity between the articular faces and loss of the joint space relationship between the condylar process of the mandible and the mandibular fossa of the zygomatic process of the temporal bone (Fig. 1).

In the ultrasound examination, with a linear probe of 7.5MHz, positioned on the lateromedial aspect in relation to the skull, loss of the joint relationship between the retro-articular process of the temporal bone and the condyle of the mandible was observed, evidenced by the non-identification of the triangular structure of the articular disc between them, which is easily visualized in normal joints. In addition, it was possible to observe an increase in joint fluid. These findings, in association with the clinical signs and in the absence of bone fracture, confirmed the diagnosis of unilateral rostral dislocation of the left TMJ.

For the treatment, initially an attempt at manual reduction was performed, with the patient in quadrupedal support and sedated. However, due to mandibular movement restriction, manipulation under dissociative anesthesia was chosen. The animal was sedated with 10% xylazine hydrochloride (1 mg/kg, IV), and induced with 10% ketamine hydrochloride (3mg/kg, IV) in association with diazepam (0.1mg/kg, IV).

The reduction occurred with the animal in right lateral recumbency and with the aid of a dental support fulcrum positioned between the molar teeth of the left hemiarch, functioning as a lever. Thus, once the fulcrum was positioned, force was exerted by leveraging it, while manual pressure was exerted on the rostral portion of the maxilla and mandible (Fig. 2A). The pressure

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exerted under the maxilla was aimed at supporting and stabilizing the animal's head so that the force and traction necessary for the displacement of the mandible in the ventrocaudal direction could be exerted. After the audible and palpable sensation of reduction, with consequent repositioning of the condyle of the mandible in its relationship with the mandibular fossa of the zygomatic process of the temporal bone, traction was discontinued.

Immediately after the reduction, which lasted approximately 10 minutes (considering the time of positioning the horse's head, placing the fulcrum, and the repositioning maneuver, using the force of two male individuals weighing approximately 70 and 90 kg), the occlusion teeth of the upper and lower hemiarches were reestablished (Fig. 2B) as well as the normal movement pattern of the mandible.



Figure 1. Laterolateral projection demonstrating rostral displacement of the condyle of the left mandible and loss of the joint space relationship between the condylar process of the mandible and the mandibular fossa of the zygomatic process of the temporal bone.



Figure 2. Joint repositioning under dissociative anesthesia. A) Fulcrum positioned between the molars of the left hemiarch and pressure exerted on the rostral portion of the maxilla and mandible; B) Occlusion of the incisor teeth immediately after the procedure.

Therapy after TMJ luxation reduction and joint realignment consisted of phenylbutazone (1.1 mg/kg, IV, SID) for 7 days and dexamethasone (0.1 mg/kg, IV, BID) for 5 days, with progressive dose decreases from the 2nd day. Local cryotherapy (for 10 min, 6x a day/ 3 days) and laser therapy (6J/point, 1x a day/ 6 days) sessions were performed. The patient also

underwent two chiropractic sessions, with adjustments to the pelvis and neck (joints closely linked to the TMJ) and subtle biodynamic manual therapy with release of the cranial sutures. *Kinesio taping* and *cross taping* were also used, with the aim of improving blood and lymphatic circulation through skin stimulation.

The patient's diet was based on grass and moistened feed for the first two days after the reduction, and the return to dry food occurred as the capacity for lateral excursion of the mandible evolved. Twelve days after admission to the hospital, the patient presented complete normality of lateral excursion of the mandible, the absence of painful sensitivity to palpation, and a reduction in edema in the TMJ region. An intra-articular infiltration with 6mg of triamcinolone acetonide and 20mg of sodium hyaluronate was performed in the left TMJ and the patient was discharged.

DISCUSSION

TMJ disorders in horses are uncommon and often neglected, which may be related to the difficulty in diagnosing subtle changes (Moll and May, 2002; Schumacher, 2006). More serious alterations, such as fractures, subluxations, and dislocations involving the TMJ, have an etiology often associated with local trauma, usually resulting from kicks in the lateral region of the face or accidents in which the animal applies sudden tension with its head trapped, by opening the oral cavity (Baker, 2002; Devine *et al.*, 2005).

Although in the present case there was no report of possible trauma to the patient and the physical examination did not show wounds or local abrasions, the suspicion of a traumatic etiology cannot be ruled out, since the animal was loose in a paddock and without continuous monitoring. In human medicine, TMJ dislocations of atraumatic origins are described, in which the anterior displacement of the mandibular condyle can occur during normal muscular activity of opening the mouth, such as in yawning (Bessa-Nogueira, 2004), however, there are no reports of this type of dislocation in equines.

Considering the clinical symptoms of the horse, signs such as lateral swelling of the face, dental malocclusion (non-apposition of the incisors), and the inability to close the mouth due to rostral displacement of the mandible condyle are compatible with TMJ alterations (Baker, 2002; Devine *et al.*, 2005; Schumacher, 2006), which could be confirmed by complementary X-ray and ultrasound exams.

Radiographic examination of the TMJ is performed by means of right and left laterolateral, dorsoventral (or ventrodorsal) incidences, and lateral oblique projections, aiming at individualizing the right and left joints (Ramzan *et al.*, 2008; Schumacher 2006). In these projections, the superimposition of the bony structures of the skull makes it difficult to differentiate the anatomical contour of the joint, and subtle radiographic changes are difficult to detect (Ramzan *et al.*, 2008). In the present case, the laterolateral and ventrodorsal projections were sufficient to confirm the rostral dislocation of the mandibular condyle.

With respect to the manual resolution of the dislocation approach, with the patient under sedation, despite being used in human medicine (Akinbami, 2011), it has not yet been described in the literature for the equine species. It is probable that in horses the failure observed in the present report may be justified by the complexity of the structures involved in the movement and stability of the TMJ, which include the masticatory muscles, that have faster contraction rates than most other striated muscles (Baker, 2002), in addition to the lateral and caudal ligaments (Sisson, 2001; Rodríguez *et al.*, 2006).

The elevation or closing of the jaw, in addition to being involved in breaking down food, occurs against the resistance of gravity. Thus, this movement is based on the rhythmic contraction of the large muscle mass formed by the masseter, temporalis, and medial pterygoid muscles (which adhere to the capsule and articular disc). The lateral pterygoid muscles and the occipital mandibular part of the caudal belly of the digastric muscle are responsible for the depression or opening of the mandible, considered to have a smaller volume when compared to the group of elevator muscles (Sisson, 2001; Baker, 2002).

In human TMJ dislocation, spasm of the mandibular elevator muscles leads to trismus and prevents the condyle from returning to the mandibular fossa (Akinbami, 2011). Considering that the same process occurs in TMJ dislocation in horses, the large mass of the mandible elevator muscles can be considered as the most resistant factor in the process of

manual reduction of the rostral displacement of the mandibular condyle.

The protocol of pre-anesthetic medication and anesthesia induction by associating an alpha 2 adrenergic agonist with a dissociative agent and a benzodiazepine, used in this case, in addition to promoting dissociating the thalamocortical and limbic systems, includes two central myorelaxant drugs (Rankin, 2015). It is probable the success of manual reduction in these conditions can be attributed to the action of drugs such as xylazine hydrochloride and diazepam which, by generating the effect of muscle relaxation, possibly facilitated and allowed the maneuver of ventrocaudal displacement and repositioning of the mandibular condyle. In addition, the dental support fulcrum, used as a lever on the molar teeth on the side of the displaced TMJ (Schumacher, 2006; Carmalt, 2019), contributed to the success of the reduction.

The postoperative procedures, aiming at controlling inflammation, reducing pain, stimulating tissue regeneration, and facilitating the chewing process, also contributed to the clinical improvement and return of the animal to sports activities, with the absence of complications or recurrence of the dislocation.

CONCLUSION

Temporomandibular joint dislocation should be approached as a clinical emergency and manual reduction is effective with the patient under dissociative anesthesia.

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