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Case Report - Veterinary Medicine

Traumatic laryngeal hemiplegia in cattle – case report

[*Hemiplegia laríngea traumática em bovinos - relato de caso*]

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ABSTRACT

Laryngeal hemiplegia is characterized by paralysis or paresis of one or both arytenoid cartilages, frequently reported in horses. In cattle no reports have been found yet. The diagnosis is based on clinical signs, endoscopy, and ultrasound findings. The aim of this study is to report a case of laryngeal hemiplegia in cattle, regarding the etiology and importance of imaging methods for the diagnosis of diseases in bovine medicine.

Keywords: cattle, imaging diagnosis, paralysis, arytenoid cartilages

RESUMO

A hemiplegia laríngea é caracterizada por paralisia ou paresia de uma ou ambas as cartilagens aritenoides, frequentemente relatada em cavalos. Em bovinos, ainda não foram encontrados relatos. O diagnóstico é baseado em sinais clínicos, endoscopia e achados ultrassonográficos. O objetivo deste estudo é relatar um caso de hemiplegia laríngea em bovino, quanto à etiologia e à importância dos métodos de imagem para o diagnóstico de doenças na medicina bovina.

Palavras-chave: bovinos, diagnóstico por imagem, paralisia, cartilagens aritenóides

INTRODUCTION

The larynx has important functions in air traffic, phonation and gives protection to the respiratory system for swallowing (Barone, 1997). Laryngeal diseases in cattle are uncommon, but neoplasms and arytenoid chondritis due to necrotic laryngitis have been reported as a cause of inspiratory dyspnea and stridor (Fubini and Ducharme, 2004; Boileau *et al*., 2009; Larde *et al*., 2014).

Laryngeal hemiplegia is characterized by paresis or paralysis of one or both arytenoid cartilages, usually reported in young horses or individuals with poor athletic performance (Martin *et al*., 2000; Brown *et al*., 2004; McCarrel and Woodie, 2015). This condition results in reduced or absent mobility of the arytenoid cartilage and vocal fold, increasing inspiratory resistance and decreasing the air flow (Morris *et al*., 1990; Holcombe, 2006;). Paralysis of the arytenoid cartilages is a consequence of a neuropathy of the recurrent laryngeal nerve, with progressive loss of myelinated fibers resulting in a neurogenic atrophy of the intrinsic laryngeal muscles (Fulton *et al*., 2012; Piero and Robertson, 2015).

Clinical signs consist mainly of intolerance and inspiratory noise (“roaring”) during exercise (Martin *et al*., 2000; McCann, 2000; Franklin and Allen, 2017). Diagnosis is based on a history of poor performance in addition to endoscopic observation of reduced or absent motility of the arytenoid cartilage and vocal fold (Fulton *et al*., 2012).

Ultrasound methods also have diagnostic value in cases of recurrent laryngeal neuropathy, providing additional information to endoscopic examination, but it still has little use for

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evaluations of the upper respiratory tract of cattle (Chalmers *et al*., 2006a; Garrett *et al*., 2011).

Treatment recommendations vary depending on the severity of laryngeal hemiplegia. Even though conservative methods are described for mild cases, severe cases require surgical treatment. The practitioner must consider the presentation, possible complications, and the prognosis regarding the persistence of clinical signs and future purpose of the animal (McCann, 2000; Davenport and Parente, 2003).

The aim of this study is to report a case of right unilateral laryngeal hemiplegia in Holstein cow and, considering it is an unusual diagnosis, discuss the probable etiology, as well as the importance to increase the usage of diagnostic imaging methods in the clinical routine of the bovine medicine practitioner.

CASE DESCRIPTION

A five-year-old lactating Holstein cow, kept in a semi-intensive system, was presented with apathy, anorexia, hypogalactia, dysphagia, cough and severe sialorrhea.

During anamnesis, it was reported the occurrence of a cervical abscess approximately three months ago. The farmer attempts to drain this abscess on his own without success. The possible origin was a cervical trauma caused by headlocks. Due to the animal's discomfort and the swelling in the site of the trauma, veterinary care was requested, and a new drainage was performed.

There was a significant improvement of the lesion, but a large amount of fibrous tissue was formed in the region. In addition, the cow started to show signs of dysphagia, intense sialorrhea and nasal secretion (Fig. 1).

In a second clinical examination, it was observed (Fig. 2) a firm volume mass, with approximately 15 cm in diameter in the right cervical region, between the second and fourth cervical vertebrae. The lesion had firm consistency and some floating points, but showed no sensitivity or temperature increase on palpation. In the right auditory canal, a large amount of purulent secretion with fetid odor was observed.

Figure 1. Holstein cow presenting nasal secretion with food particles.

Figure 2. Volume increase in the cranial part of the right cervical region of a Holstein cow.

Inspection of the oral cavity and external palpation of the esophagus showed no significant alterations. Feed was offered to the animal, which had reduced appetite, but showed interest in silage and managed to swallow. To exclude the possibility of partial esophageal obstruction, a Thygessen probe was passed through the esophagus, showing no resistance in its passage to the rumen.

In the specific examination of the respiratory system, the cow presented tachypnea, inspiratory dyspnea with audible snoring sounds and stertorous breathing, especially in the cranial regions of the lungs.

Given the complexity of the condition, the animal was referred to the Large Animal Sector of the Veterinary Hospital of the University of Passo Fundo, for endoscopy examination. The animal was sedated with 0,01mg/kg intravenous detomidine hydrochloride and kept standing. A flexible gastroscope (Storz) was used and the examination was performed by the nasoarcheal route. Lidocaine 2% gel was used to lubricate the flexible part of the endoscope.

Nasal cavity, larynx, trachea, bronchi, and initial esophagus were evaluated, and the alterations consisted of hyperemia and paralysis of the right side of the arytenoid cartilage, characterizing a unilateral laryngeal hemiplegia. When entering the trachea, a large amount of greenish colored secretion was observed.

After diagnosis, treatment was instituted for possible compression and infection of the innervation of the larynx, for the ear canal infection and to a possible aspiration pneumonia, consisting in ceftiofur at a dose of 2mg/kg every 24 hours for 7 days, dexamethasone 10mg every 24 hours for 5 days (reducing the dose gradually from the third day) and analgesia with dipyrone at a dose of 25mg/kg, every 24 hours for 5 days. In addition, the auditory canal was washed and cleaned with 0.9% saline solution. Furthermore, the owner was instructed to avoid the animal's access to the headlocks to prevent further damage.

About two months after the first examination, the animal did not show any significant

improvements and a new endoscopy was performed to follow up the case. The animal did not present any abnormalities in swallowing and there were significant fluctuations in milk production over time.

On clinical examination, physiological parameters were found within the physiological range for the species. In the examination of the respiratory system, respiratory sounds were increased, followed with some episodes of non-productive coughs. The cow was emaciated (BCS 1, Scale 1-5), and the cervical mass presented in the right antimere was even larger. Moreover, the same lesion was observed on the left side of the neck with approximately 20 cm in diameter. Palpation of both antimeres showed no temperature increase or sensitivity.

In the second endoscopic evaluation, the right-sided arytenoid was still paralyzed, with no adduction or abduction movements occurring (Fig. 3A). Mucus and a significantly smaller amount of fluid were observed in the trachea lumen (Fig. 3B).

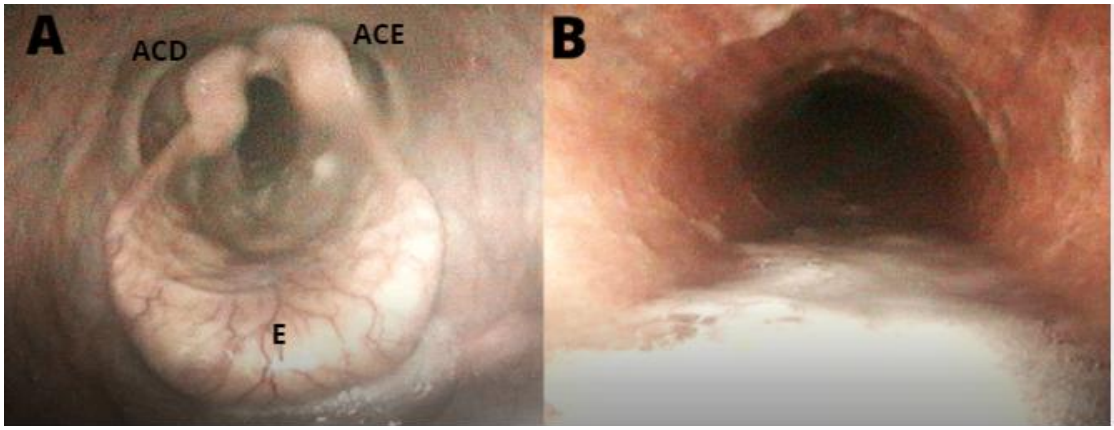

Figure 3. Image obtained using an endoscopic device in a female Holstein bovine. (A) Paralyzed right arytenoid cartilage (ACD), left arytenoid cartilage (ACE) and epiglottis (E), (B) mucus and fluid present in the trachea.

Ultrasound evaluation (Mindray DP 2200 device and 6,5 MHz Mindray model 65C15EAV microconvex transducer) of the larynx and cervical region was performed. The exam was carried out on the two antimers between the atlas and the fourth cervical vertebra showing edema and an extensive area of tissue fibrosis with echogenic and hyperechogenic points distributed between the muscle fibers, both on the right side (Fig. 4A) and on the left side (Fig.4B).

The lesions presented greater severity and chronicity in the right antimere, making it difficult to assess the length of the lesion due to its depth, also due to the device limitations. In the left antimere, there was fibrosis and a greater amount of fluid between muscle fibers, suggesting a more recent lesion due to the presence of edema. In the evaluation of the larynx, with the objective of delimiting its structures and evaluating arytenoid cartilages, the transducer was positioned in the rostroventral, mid-ventral (Fig. 5), right and left caudolateral window of the larynx (Fig.6) and ultrasonography was performed longitudinally. The animal's prognosis was defined as unfavorable, with no significant improvements observed.

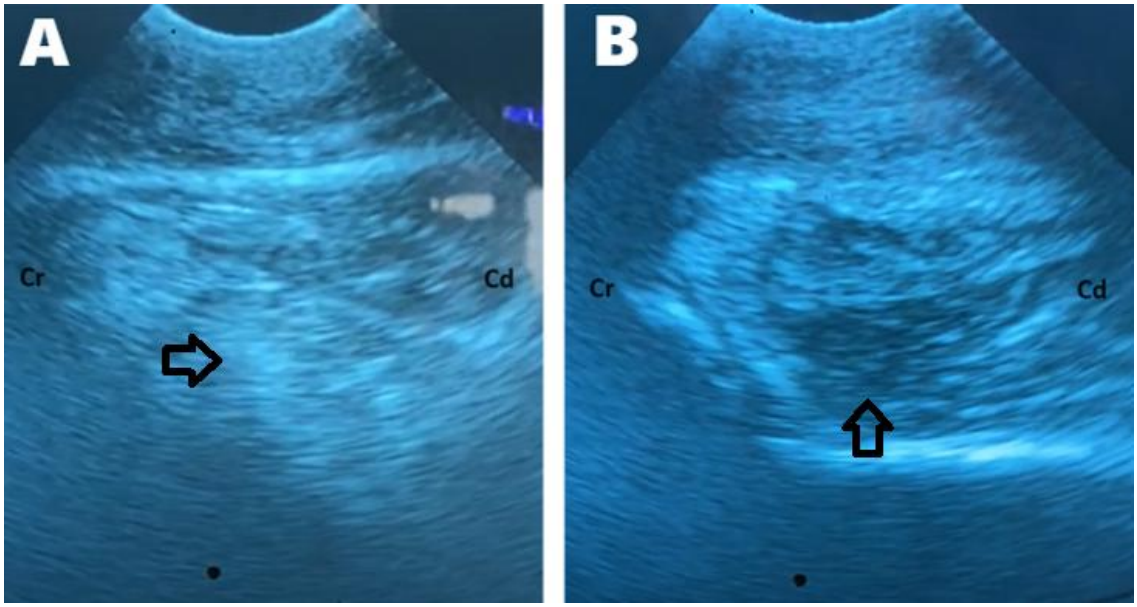

Figure 4. Ultrasound evaluation of the cervical region of a Holstein cow utilizing a Mindray DP 2200 device and Mindray microconvex transducer model 65C15EAV with frequency of 6.5 MHz. The images show a volume increase in (A) Right antimere and (B) left antimere. Cranial (Cr) and Caudal (Cd).

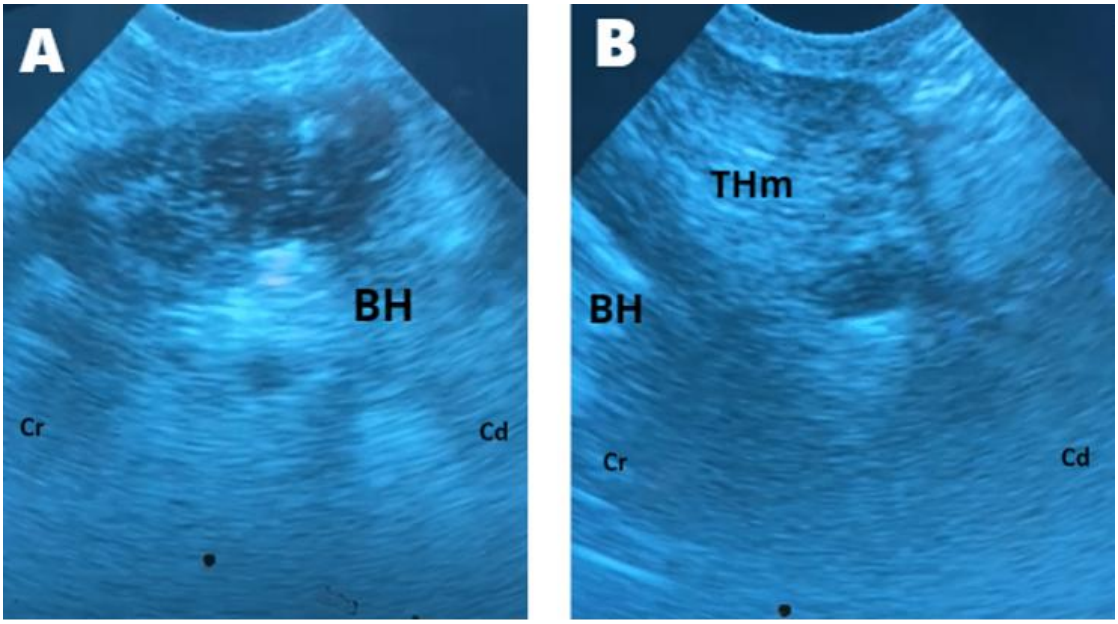

Figure 5. Ultrasound of the larynx with Mindray DP 2200 device and Mindray microconvex transducer model 65C15EAV with frequency of 6.5 MHz in female Holstein bovine. (A) Rostroventral window showing the base of the hyoid bone (BH), (B) medioventral window, showing the base of the hyoid bone (BH) and the thyrohyoid muscle (THm). Cranial (Cr) and Caudal (Cd).

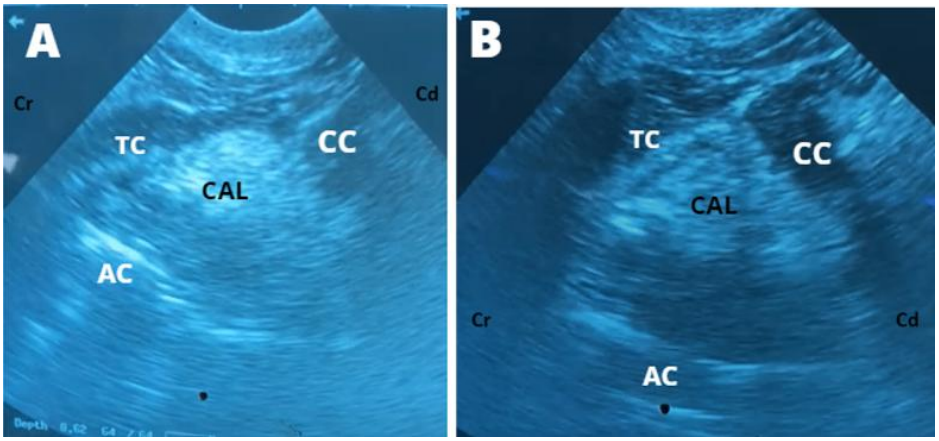

Figure 6. Ultrasound of the larynx in female Holstein bovine with a Mindray DP 2200 device and Mindray microconvex transducer model 65C15EAV with frequency of 6.5 MHz. (A) Right caudolateral window and (B) left caudolateral window, showing cricoide cartilage (CC), the lateral cricoarynitis muscle (CAL), arytenoid cartilages (AC) and thyroid cartilage (TC). Cranial (Cr) and Caudal (Cd).

DISCUSSION

Laryngeal diseases are uncommon in cattle (Boileau *et al*., 2009; Larde *et al*., 2014) and there are no reports of right laryngeal hemiplegia affecting cattle in literature, indicating that the disease is either uncommon or infrequently diagnosed. In horses, right side paralysis is rare and often related to a non-idiopathic etiology, with a reserved prognosis. On the other hand, left hemiplegia has a higher prevalence and the cause is still unknown (Dixon *et al*., 2001; Davenport and Parente, 2003; Garrett *et al*., 2009).

In agreement with the etiology described in horses, the findings observed in this case are in line with right laryngeal paralysis reports linked to trauma or surgical procedures in the cervical region (Dixon *et al*., 2001; Fulton *et al*., 2012). In this case, the animal experienced repeated trauma to the proximal region of the neck, making the lesion deep and chronic, mainly in the right antimere, possibly being the cause of the arytenoid cartilage paralysis, because it encompasses the path of laryngeal innervation, especially of the recurrent laryngeal nerve.

Thus, etiology may be related to both nerve compression by edema and fibrosis, as well as the spread of the infection installed after the abscess perforation, resulting a neuropathy by perineural infection. Another indication of the spread of the infection in the region was otitis in the same antimere of the laryngeal hemiplegia.

In goats, laryngeal paralysis has been associated with severe cases of copper deficiency by ingestion of large amounts of iron, resulting among other symptoms, in the degeneration of recurrent laryngeal nerves and neurogenic atrophy of the cricoarytenoid and cricothyroid muscles, resulting in stridor (Sousa *et al*., 2017). Nevertheless, in this case the animal had a balanced diet and evidence of minerals imbalances was not observed.

Ultrasound and endoscopic examinations are widely used in bovine species in veterinary university facilities but are less commonly used in the field by veterinary practitioners, due to the equipment cost and difficulties related to the equipment transportation (Nuss *et al*., 2011; Kofler *et al*., 2016; Younghye *et al*., 2018). In this case, direct semiological methods were not sufficient to establish a definitive diagnosis, emphasizing the importance of imaging methods to improve diagnostic accuracy in bovine medicine.

Nowadays, interest in endoscopy use to explore the respiratory, gastrointestinal, and reproductive tract of ruminants are increasing, mainly because it presents practicality in its realization (Franz, 2011). Even though it has been described by Hilding (1968) in calves a long time ago, the technique is still poorly studied and there is little knowledge about normal and pathological findings in cattle, making the diagnosis difficult (Batista *et al*., 2016).

The endoscopic examination in cattle can be performed with the animal standing and under minimal or moderate sedation, characterizing the technique as minimally invasive (Franz, 2013). In this case, a rinolaryngotrachebronchoscopy technique by the nasopharyngeal route was performed, allowing internal visualization of structures and identification of diseases (Anderson *et al*., 1994; Franz, 2011).

The diagnosis of laryngeal hemiplegia was obtained with the assistance of an endoscopic exam. The trachea and main bronchi were also evaluated, allowing identification of a large amount of tracheal fluid on the first exam and a reduced amount in the second, which may be related to continued decompression of the larynx due to clinical treatment.

Cases of pharynx trauma due to inadequate oral administration of medicines have already been reported in cattle. Depending on the extent of the lesions and possible larynx damage, aspiration pneumonia can occur because of a possible motor dysfunction (Davidson *et al*., 1981). Considering the amount of fluid found in the trachea during the endoscopic examinations, it is possible that during the swallowing, a certain amount of saliva, water or ruminal fluid may have passed into the respiratory system, due to dysfunction in the right arytenoid cartilage, causing an aspiration pneumonia.

For functional evaluations in horses, temporary occlusion of breathing on endoscopy examination favors the abduction movement of arytenoids, by increasing the inspiratory efforts. Because at rest the respiratory rate is low, cartilage movements are more subtle, making it difficult to observe (Chalmers *et al*., 2006a). In this case it was not necessary to perform this procedure, because compared to horses, cattle have a higher respiratory rate, which allowed the observation of the arytenoid movements even with the animal at rest.

When it comes to non-luminal structures such as cartilage and laryngeal muscles, endoscopic examination becomes limited (Bernier *et al*., 2016), and ultrasound techniques can be used for soft tissue assessments involving the respiratory tract of cattle (Fubini and Ducharme, 2004).

In horses, ultrasound techniques to access the larynx have been described through rostroventral, medioventral, caudoventral and caudolateral acoustic windows (Chalmers *et al*., 2006b). Because of anatomical differences, some of these windows may be less important in cattle. The technique used in this case has already been described in the evaluation of the tympanic and larynx leaflets of calves by Gosselin et al., (2016), with some adaptations due to differences in the ultrasound apparatus, where the base of the hyoid bone, the thyrohyoid muscle and lateral cricoarytenoid, in addition to the thyroid cartilage and arytenoids, could be delimited.

The probe positioning in the caudolateral window allowed, in addition to the delimitation of the structures, to observe the movement of the left arytenoid cartilage and unlike this, the paralysis of the right arytenoid, further facilitating the diagnosis of this disease in the field in a minimally invasive and low-cost way.

In cases of suspected recurrent laryngeal neuropathy in horses, auxiliary evaluations have already been performed on endoscopy examination at rest and in motion, correlating abnormal arytenoid movement with the echogenicity of the lateral cricoarytenoside muscle (Chalmers *et al*., 2006a) and although the etiology is not yet fully understood, one of the consequences of denervation is atrophy and loss of functions of the laryngeal adductor muscles such as lateral cricoarytenoid, increasing its echogenicity (Duncan *et al*., 1991; Harrison *et al*., 1992).

In conclusion, the use of imaging tests such as endoscopy and ultrasound were efficient for the diagnosis of laryngeal hemiplegia in cattle. Further studies to assess the degree of paralysis and echogenicity of adjacent muscles are necessary to assess the severity of the disease, improving definitions, therapeutic conducts and prognosis in the bovine species.

REFERENCES

ANDERSON, D.; DeBOWES, R.; GAUGHAN, E.; YVORCHUK, K.; JEAN, S.T. Avaliação endoscópica da nasofaringe, faringe e laringe de vacas Jersey. *Am. J. Vet. Res*.,v.55, p.901-904, 1994.

BARONE, R. *Anatomie comparee des mammifères domestiques*: Tomo 3: Splanchnologie 1 appareil digestif, appareil respiratoire. 3.ed. Paris: Vigot, 1997.

BATISTA, C.F.; BERTAGNON, H.G.; BELLINAZZI, J.B. *et al.* Avaliação endoscópica do sistema respiratório de bovinos sadios. *J. Cont. Educ. Anim. Sci. CRMV-SP*, v.14, p.36-41, 2016.

BERNIER, G.V.; BABKINE, M.; FRANCOZ, D. Ultrasonography of the tympanic bullae and larynx in cattle. *Vet. Clin. Food Anim. Pract*., v.32, p.119-131, 2016.

BOILEAU, M.J.; JANN, H.W.; CONFER, A.W. Use of a chain écraseur for excision of a pharyngeal granuloma in a cow. *J. Am. Vet. Med. Assoc*., v.234, p.935-937, 2009.

BROWN, J.; DERKSEN, F.J.; STICK, J.A.; HARTMANN, W.M. *et al*. Efeito da laringoplastia na redução do ruído respiratório em cavalos de corrida com hemiplegia laríngea. *Vet. Equinos J*., v.36, p.420-425, 2004.

CHALMERS, H.J.; CHEETHAM, J. YEAGER, A.E. *et al*. Ultrassonografia do lar equino ynx. *Vet. Radiol. Ultrasound*, v.47, p.476-481, 2006b.

CHALMERS, H.J.; CHEETHAM, J.; MOHAMMED, H.O.E.; DUCHARME, N.G. Ultrassonografia como auxílio no diagnóstico de neuropatia laríngea recorrente em cavalos. In: Anais do SIMPÓSIO VETERINÁRIO AMERICAN COLLEGE OF VETERINARY SURGEONS, 2006, Washington. *Proceedings*… Washington: ACVS 2006a. p.3-4.

DAVENPORT, G.; PARENTE, E.J. Distúrbios da laringe. *Clín. Vet. Equine*, v.19, p.169-187, 2003.

DAVIDSON, H.P.; REBHUN, W.C.; HABEL, R.E. Pharyngeal trauma in cattle. *Cornell Vet*., v.71(1), p.15-25, 1981.

DIXON, P.M.; McGORUM, B.C.; RAILTON, D.I. *et al*. Paralisia laríngea: estudo de 375 casos em uma população mestiça de equinos. *Equine Vet. J*., v.33, p.452-458, 2001.

DUNCAN, I.D.; AMUNDSON, J.; CUDDON, P.A. *et al*. Denervação preferencial dos músculos adutores da laringe equina. 1: Patologia muscular. *Vet. Equinos J*., v.23, p.94-98, 1991.

FRANKLIN, S.H.; ALLEN, K.J. Avaliação da função dinâmica do trato respiratório superior no atleta equino. *Educ. Vet. Equina*, v.29, p.92-103, 2017.

FRANZ, S. Endoscopy in cattle. *Tierärztl. Prax. Ausg. G Großtiere Nutztiere*, v.39, p.281-288, 2011.

FRANZ, S. Endoscopy in ruminants – endoscopy of the respiratory tract in cattle: indications, possibilities and limits. *Tierarztl. Umsch*., v.68, p.411-416, 2013.

FUBINI, S.L.; DUCHARME, N.G. Surgery of the bovine adult respiratory and cardiovascular systems. In: DUCHARME, N.G.; DESROCHERS, A.; MULON, P.Y.; NICHOLS, S. *Farm animal surgery*. St Louis: Saunders, 2004. p.193-209.

FULTON, I.C.; ANDERSON, B.H.; STICK, J.A.; ROBERTSON, J.T. *"Larynx" equine surgery*. 4.ed. [St. Louis: Elsevier], 2012. p.592-620.

GARRETT, K.S.; WOODIE, J.B.; EMBERTSON, R.M. Associação de esteira avaliação endoscópica das vias aéreas superiores com resultados de ultrassonografia e avaliação endoscópica das vias aéreas superiores em repouso. *Equine Vet. J*., v.43, p.365-371, 2011.

GARRETT, K.S.; WOODIE, J.B.; EMBERTSON, R.M.; PEASE, A.P. Diagnóstico de displasia laríngea em cinco equinos por meio de ressonância magnética e ultrassonografia. *Equine Vet. J*., v.41, p.766-771, 2009.

HARRISON, G.D.; DUNCAN, I.D.; CLAYTON, M.K. Determinação da idade precoce de início da neuropatia laríngea recorrente equina. 1. Patologia muscular. *Acta Neuropathol*., v.84, p.307-315, 1992.

HILDING, A.C. Experimental bronchoscopy: resultant trauma to tracheobronchial epithelium in calves from routine inspection. *Trans. Am. Acad. Ophthal. Otolaryngol*., v.72, p.604-613, 1968.

HOLCOMBE, S.J. A review of upper airway anatomy and physiology of the horse. In: AMERICAN ASSOCIATION EQUINE PRACTITIONERS ANNUAL RESORT SIMPOSIUM, 8., 2006, Rome, *Proceedings*… Rome: AAEP, 2006. p.1-9.

KOFLER J, FRANZ S, FLÖCK M, WITTEK T. Diagnóstico por imagem em medicina bovina. In: WORLD BUIATRICS CONGRESS, 29., 2016, Dublin. *Proceedings*... Dublin: Phileo, 2016. p.70-79.

LARD, H.; NICHOLS, S.; BABKINE, M.; CHÉNIER, S. Laryngeal obstruction caused by lymphoma in an adult dairy cow. *Can. Vet. J.*, v.55, p.136-140, 2014.

MARTIN, B.B.; BEEF, V.B.; PARENTE, E.J.; SAGE, A.D. Causas do mau desempenho dos cavalos durante o treinamento, corridas ou exibições: 348 casos (1992-1996). *J. Am. Vet. Med. Assoc*., v.216, 554-558, 2000.

McCANN J. Diagnóstico diferencial de ruídos respiratórios anormais no cavalo em exercício. *Na Prática*, v.22, p.370-381, 2000.

MCCARREL, T.M.; WOODIE, J.B. Atualização em distúrbios laríngeos e tratamento. *Vet. Clin. North Equine Pract*., v.31, p.13-26, 2015.

MORRIS, E.A.; SEEHERMAN, H. J.Evaluation of upper respiratory tract function during strenuous exercise in racehorses. *J. Am. Vet. Med. Assoc*., v.196, p.431-438, 1990.

NUSS, K.; SCHNETZLER, C.; HAGEN, R.; SCHWARZ, A.; KIRCHER, P. Aplicação clínica da tomografia computadorizada em bovinos *Tierarztl. Prax. Ausg. G Grosstiere Nutztiere*, v.39, p.317-324, 2011.

PIERO, F.D.; ROBERTSON, J. The basics of equine neuropathology. In: FURR, M.; REED, S. *Equine neurology*, 2.ed. New Jersey: Wiley-Blackwell, 2015. p.366-378.

SOUSA, RFA; ALMEIDA, VM; NETO, JE *et al.* Neuropatia laríngea em caprinos adultos com deficiência de cobre. *Vet Pathol*, v.54, p.676-682, 2017.

YONGHYE, RO; WOOJAE, C; HOYUNG, K. et al. Diagnóstico de Cisto Laríngeo por Endoscopia Respiratória em Bovinos da raça Hanwoo com Broncopneumonia crônica. *J. Vet. Clin*., 35:57-59, 2018.