***Arq. Bras. Med. Vet. Zootec.*, v.76, n.5, e13107, 2024**

http://dx.doi.org/10.1590/1678-4162-13107
Original Article - Veterinary Medicine

Evaluation method for identification of tail blocking in horses

[*Método de avaliação para identificação de bloqueio da cauda de equinos*]

M.E. *Neto*, G.M. *Pivato*, G.C. *Silva*, G.M. *Raphaelli*, L. *Gheno*, A.J. *Torres*, R.A. *Oliveira*, R.A. *Fioretti*, B.R. *Curcio*, C.E.W. *Nogueira*

Universidade Federal de Pelotas, Pelotas, RS, Brasil

ABSTRACT

This study aims to standardize the clinical and complementary examination using surface electromyography (EMG) to assess the neuromuscular function of the equine tail. Firstly, clinical examinations of the tails and EMG measurements were performed on ten healthy animals without any tail interference or manipulation. This initial experiment aimed to establish a baseline for clinical examination and EMG results. The animals underwent tail nerve plexus blockade in the second experiment using an anesthetic agent. The objective compares the clinical examination and EMG findings between the anesthetized and non-manipulated tails. Finally, two animals were used in the third experiment, where peripheral infiltration of the tail nerve plexuses was performed using a neurolytic agent. The study successfully obtained a pattern for the clinical examination of a healthy equine tail and established a pattern for the clinical examination of a tail after infiltration with anesthetic and neurolytic agents. Significant differences were observed in the clinical examination before and after the application of local anesthesia, as well as in the EMG values before and after local infiltration with anesthetic (P=0.04) and neurolytic agent (P=0.03). The presented study introduces a clinical examination protocol that utilizes surface electromyography as a diagnostic tool for cauda equina block.

Keywords: blocking, horses, nerves, neurolytic, tail

RESUMO

Este estudo visa padronizar o exame clínico e complementar, mediante a utilização de eletromiografia (EMG) de superfície, para avaliar a função neuromuscular da cauda equina. Primeiramente, foram realizados exames clínicos das caudas e medições EMG em 10 animais saudáveis, sem qualquer interferência ou manipulação da cauda. Esse experimento inicial teve como objetivo estabelecer um padrão de exame clínico e dos resultados de EMG. Os animais sofreram bloqueio do plexo nervoso da cauda no segundo experimento com o uso de agente anestésico. O objetivo compara o exame clínico e os achados EMG entre as caudas anestesiadas e saudáveis. Por fim, dois animais foram utilizados no terceiro experimento, em que foi realizada infiltração periférica dos plexos nervosos da cauda com agente neurolítico. O estudo obteve com sucesso um padrão para o exame clínico de uma cauda equina saudável e estabeleceu um padrão para o exame clínico de uma cauda após infiltração com agentes anestésicos e neurolíticos. Diferenças significativas foram observadas no exame clínico, bem como nos valores EMG antes e após a infiltração local com anestésico (P=0,04) e agente neurolítico (P=0,03). O estudo apresenta um protocolo de exame clínico que utiliza a eletromiografia de superfície como ferramenta diagnóstica para o bloqueio da cauda equina.

Palavras-chave: bloqueio, cauda, cavalos, nervos, neurolítico

INTRODUCTION

The practice of tail blocking in athletic horses, achieved using innervation-reducing drugs, has become a recurring issue in certain equestrian modalities and requires intervention (Tutko *et al.*, 2010). Anesthetizing or blocking the function of the horse's tail during competitions not only contradicts animal welfare principles but also violates the competition rules set by the Fédération Equestre Internationale (FEI), which

Corresponding author: netomarcoseduardo@gmail.com
Submitted: July 21, 2023. Accepted: Frebuary 6, 2024.

explicitly denounces this practice as abusive (Veterinary…, 2023). Such measures hinder the horse's ability to express pain or discomfort, as emphasized by Dyson and Pollard (2021). Over the past decade, tail manipulations have been observed in athletic horses, aimed at "improving" results by concealing defects or restricting tail movements (Caudas…, 2022). These procedures include tail anesthesia and neurectomy (Curiosidades…, 2010), and their prevalence in equestrian competitions compromises the natural quality of the animals' movements (Tira…, 2015). Equestrian sports websites and breeders' resources abound with texts, articles, and videos discussing these manipulations. The FEI has highlighted the urgency to detect tail anesthesia manipulations, protect animals from mistreatment, and hold those responsible accountable (Statutes, 2021; General…, 2023). Authorities overseeing good practices and animal welfare in equestrian sports require objective methods to identify the misuse of medications and drugs in competitive settings.

The equine tail, a crucial component of the horse's body, serves multiple functions, including balance, self-grooming, protection, and socialization (Dyson and Pollard, 2021). Comprised of approximately 20 vertebrae covered by musculature arranged in a circular manner (König, 2016), the equine tail intertransversal muscles connect adjacent transverse processes and receive innervation from the dorsal branch of the local spinal nerve (Budras, 2009). Injuries or diseases affecting the tail's nervous plexus can result in loss of function (Nout-Lomas, 2022). Tail injuries induced by regionally innervating drugs have been frequently observed in certain equestrian sports and necessitate counteractive measures, as they compromise the horse's quality of life (Tutko *et al*., 2010; Queiroz, 2020). Furthermore, the horse's tail remains a critical indicator of pain, stress, and discomfort (Dyson and Pollard, 2020), with subtle, irregular, and unnatural movements being indicative of such conditions (Dyson and Pollard, 2021).

In recent years, there has been a growing demand for clinical evaluations employing complementary diagnostic methods capable of localizing and assessing the severity of tail injuries (Ridell *et al.,* 2019). Electromyography (EMG) is an invaluable diagnostic tool that aids in the identification of neuromuscular disorders (Williams, 2018), allowing the clinician to evaluate muscle recruitment, muscle participation time, and the extent of muscle involvement during specific movements by measuring myoelectric impulses (Wijnberg and Fransen, 2016). Electromyography can be performed using either invasive depth electrodes or non-invasive surface electrodes, with the latter being more widely utilized due to their practicality and non-intrusive nature, capturing the sum of action potentials from muscle fibers in the surrounding area (Enoka and Duchateau, 2015).

This study aims to propose a clinical and complementary examination protocol utilizing surface electromyography (EMG) to identify potential tail blockages in athletic horses during competitions.

MATERIALS AND METHODS

This study involved 12 horses of undefined breed, but Criolo type, with mean and standard deviation weight of 350±32,3kg, with mean and standard deviation of age 6,66±6,21 years old. from the Equine Breeding Teaching and Experimentation Center of Palma (CEEEP). The horses were transported to the Hospital of Veterinary Clinics (HCV) at the Federal University of Pelotas (UFPel), Capão do Leão campus, located 15km from Capão do Leão, RS, Brazil. The study protocol was approved by the ethics committee for animal experimentation at UFPel (CEUA 23110.019067/2021-17). All horses enrolled in the study were in good health and received consistent management and nutritional care throughout the experimental period. Standardized preparation procedures were followed for all examinations. A trichotomy measuring 5x5cm was performed in the dorsoplantar region of the calcaneal bone of the left pelvic limb, and a trichotomy measuring 5cm in width and 8cm in length was performed in the dorsal portion of the tail, approximately 10cm below the sacrococcygeal joint. The horses underwent a comprehensive clinical examination, which included visual inspection and palpation of the entire length of the tail to assess changes in volume, sensitivity, and temperature. Flexion tests, involving flexion of the tail in both upward and downward directions, as well as laterality tests, involving flexion of the tail to the right and left, were performed. Furthermore, mobility and tension of the tail were assessed using a "balance" test, which required extending the tail and lightly tapping its ventral portion. A sensitivity test was also conducted, involving the application of gentle pressure to the base of the tail with a pointed instrument, without causing perforation. All clinical evaluations were carried out by a single examiner, and a standardized methodology was followed (Table 1).

Table 1. Methodology for the clinical examination of equine tail

Method	No mobility	Low mobility	Natural Mobility	Excess mobility
Visual Inspection	-	X	Xx	xxx
Flexion	-	X	Xx	xxx
Laterality	-	X	Xx	Xxx
“Balance”	-	X	Xx	Xxx
Sensitivity	-	X	Xx	Xxx

• Visual Inspection: the tail should exhibit natural mobility, moving in sync with the horse's overall movements. Abnormalities were considered when the tail remained excessively positioned between the legs, lacking movement, or exhibited uncontrolled lateral movements.

• Flexion and Laterality Test: a healthy tail should display natural tension and resistance during manipulation when flexed or moved laterally.

• "Balance" Test: this test involves extending the tail and applying gentle ventrodorsal stimuli. A normal tail should exhibit firmness, tension, and limited mobility during this test.

• Sensitivity Test: pressure is applied to the tail using a pointed instrument, avoiding skin perforation. A healthy tail should exhibit a reflexive response indicating sensitivity and a painful sensation.

• Stimulus Test: by massaging and manipulating the anal sphincter with the index finger, the natural response of a healthy tail is to raise and maintain an elevated position for approximately 10 s, demonstrating tension.

After conducting the clinical examination of the tail, electromyography (EMG) was performed following a standardized methodology. The (MioTool®, Miotec, Brasil) model was used as the EMG device. An electrode with a "ground" function was placed on the trichotomy in the calcaneus of the left pelvic limb, as previously described. Additionally, two electrodes were positioned on each antimere of the tail's dorsal portion, approximately 10 cm below the sacrococcygeal joint within the trichotomy (Fig. 1). Evaluations were conducted with the tail at rest without any stimuli, and subsequently with anal sphincter stimuli to simulate tail movement. The EMG results were expressed in microvolts (μV) using data from the tail. The assessments in this study were always carried out by the same team, with each person always performing the same functions. For all stages of this study, descriptive statistics were performed on all data using mean and standard deviation, to assess differences between data, the Student's t test was used, and the Tukey's t test was used to rule out individual variations, and this is a study that deals with cause and effect. The study consisted of three distinct experiments:

Figure 1. Position of the electrodes on the horses' tail to perform the EMG exam

Experiment 1 - Ten healthy animals without any tail alterations underwent daily clinical and EMG examinations for seven consecutive days, resulting in a total of 70 examinations. This experiment aimed to establish a pattern of clinical examination and obtain mean values and standard deviations of EMG results in µV for animals without tail alterations.

Experiment 2 - In this experiment, the same ten animals received an anesthetic injection into the tail's nerve plexus using lidocaine 2% (Hypocaína, lidocaine hydrochloride, Hypofarma®, Brasil). A total of 10mL of lidocaine was injected at four different points (2.5ml in each of the points): two points in each antimere of the tail, both above and below the sacrococcygeal joint. Clinical examinations of the tail and EMG were performed prior to anesthesia, approximately 10 minutes, after infiltration, and 24h after the nerve plexus block in each animal. The objective was to evaluate the differences in clinical evaluation and EMG readings of the tail before and after the nerve plexus block.

Experiment 3 - For this phase, two new animals that were not previously involved in the experiments were selected. Clinical examinations of the tail and EMG were conducted at time 0 without any manipulation. Subsequently, the injection of neurolytic into the tail's nerve plexus was performed using 100% grain alcohol (Grain alcohol, Synth®, Brasil). A total of 10mL of grain alcohol was injected at four different points, two in each antimere of the tail above and below the sacrococcygeal joint. Clinical examinations of the tail and EMG were performed approximately 10 minutes after the infiltration with grain alcohol, as well as at 24, 48, 72, 96, 120, and 240h after the block to assess the effects over time.

RESULTS

In Experiment 1, a pattern of clinical examination of the tail was established for healthy horses without any alterations, as presented in Table 2.

Table 2. The evaluation method as described above, was obtained from healthy animals without alterations in the tail

Method	Response
Visual inspection	x/xx
Flexion	x/xx
Laterality	x/xx
“Balance”	x/xx
Sensitivity	xx/xxx

The electromyography (EMG) readings for the unaltered tail of a healthy horse at rest showed an average of 3.84µV, while stimulation of tail movement resulted in an average of 26.71µV (Table 3). The peak values observed were an average of 7.72µV at rest and 64.26µV during stimulated tail movement (Table 3).

Table 3. Mean and standard deviation of µV, and peaks reached on EMG examination of the tail without alteration in healthy horses

	Exam average.		Peaks reached, in the exam.	
	N	µV (Mean±SD)	N	µV (Mean±SD)
Rest	70	3.84+-3.90	70	7.72+-6.71
Motion	70	26.71+-27.91	70	64.26+-63.07

In Experiment 2, a pattern of clinical examination for healthy horses without anesthetic blockade was obtained, and it matched the findings of Experiment 1, as shown in Table 4. Following the injection of lidocaine into the nerve plexus, the visual inspection of the tail indicated reduced movement, with only tail laterality observed. The flexion, laterality, and "balance" tests exhibited greater mobility, while the sensitivity test did not evoke a pain reflex.

Table 4. Clinical examination of the equine tail after nerve plexus *anesthesia with lidocaine*

Method	Response
Visual Inspection	X
Flexion	XXX
Laterality	XXX
“Balance”	XXX
Sensitivity	X

In terms of EMG, without nerve plexus anesthesia using lidocaine, the average reading for the tail at rest was 4.08µV. After nerve plexus anesthesia with lidocaine, the average decreased to 2.29µV. A subsequent EMG examination was conducted 24h after nerve plexus anesthesia, resulting in an average reading of 4.67µV with the tail at rest (Fig. 2).

When tail movement was stimulated, the average reading without nerve plexus blockade was 29.76µV. However, after nerve plexus anesthesia with lidocaine, the average dropped to 2.75µV. Following 24h of nerve plexus anesthesia, a new electromyographic examination was performed, and the average reading during tail movement was 21.20µV (Fig. 3).

The influence of tail nerve plexus anesthesia on the average µV values indicated that they consistently remained below 3µV, exhibiting no significant difference (P>0.05) in microtension between the tail at rest and in motion during nerve plexus anesthesia (Fig. 4).

In Experiment 3, a pattern of clinical examination for healthy horses without anesthesia was obtained, which aligned with the findings of Experiments 1 and 2, as shown in Table 5. Following the block of the nerve plexus with grain alcohol, visual inspection revealed reduced tail movement, with only laterality observed. Similar to Experiment 2, the flexion, laterality, and "balance" tests exhibited greater mobility, whereas both the sensitivity test and the clinical pattern remained consistent for up to six days.

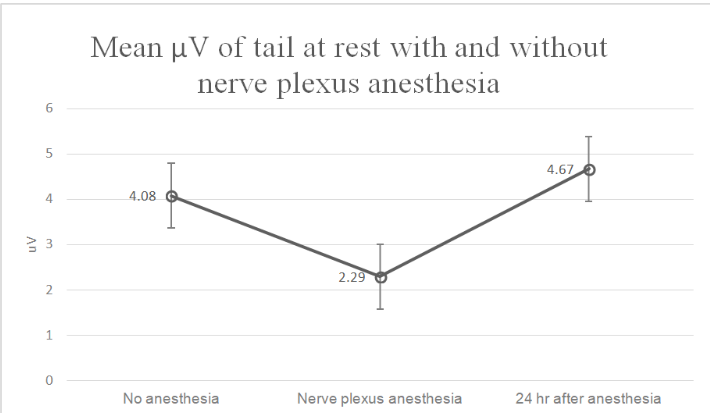

Figure 2. Mean µV of equine tail at rest with and without nerve plexus anesthesia.

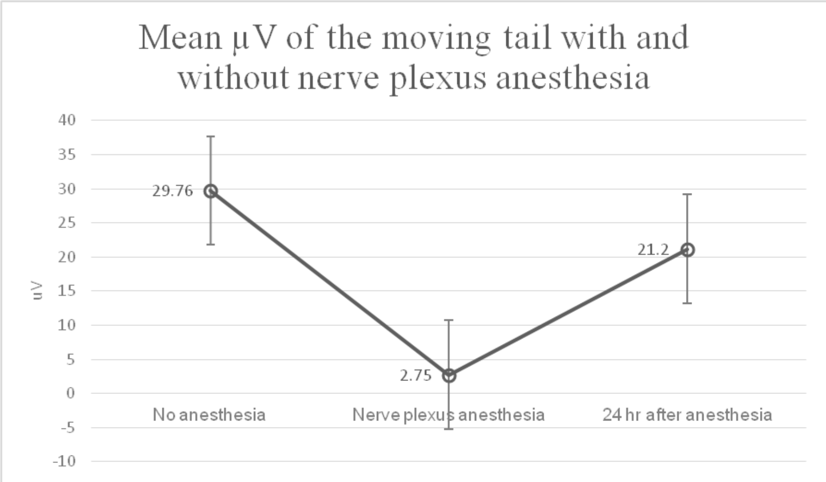

Figure 3. Mean µV of the moving equine tail with and without nerve plexus anesthesia.

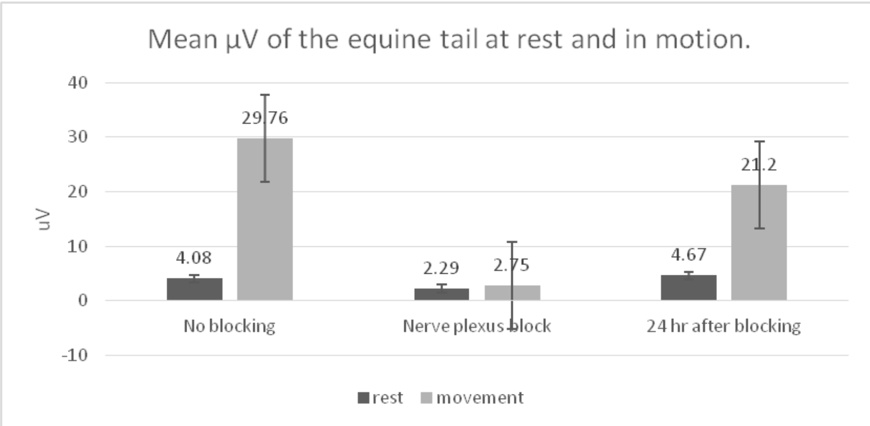

Figure 4. Comparison of µV of the cauda equines in motion and at rest without infiltration and with nerve plexus infiltration with lidocaine.

Regarding the EMG examination of the tail prior to nerve plexus anesthesia with grain alcohol, the average reading at rest was 6.11µV, with an average peak of 9.54µV. During tail movement, the average reading was 21.54µV, with an average peak of 46.55µV (Table 6).

Table 5. Clinical examination of the equine tail after nerve plexus block with grain alcohol

Method	Response
Visual inspection	X
Flexion	XXX
Laterality	XXX
“Balance”	XXX
Sensitivity	X

Table 6. Mean and standard deviation µV of the tail and peak µV reached at rest and in motion prior to block on EMG examination of the tail.

	Exam average.		Peaks reached, in the exam.	
	N	Mean±SD µV	N	Mean±SD µV
Rest	2	6.11+-1,11	2	9.54+-3,40
Motion	2	21.55+-8,09	2	46.55+-28,79

The tail's EMG examination was conducted after administering grain alcohol anesthesia to the nerve plexus. This examination was repeated over six consecutive days, resulting in a total of 12 examinations across two animals. The average resting EMG amplitude of the tail was found to be 2.89µV, with the highest recorded peak reaching an average of 5.27µV. When the tail was in motion, the average EMG amplitude was 2.86µV, with the highest recorded peak reaching an average of 4.06µV (Table 7).

Table 7. Mean and standard deviation µV and peak µV reached on EMG examination of the tail at rest and in motion after block

	Exam average.		Peaks reached, in the exam.	
	N	µV (Mean±SD)	N	µV (Mean±SD)
Rest	2	2.89+-1.50	2	5.27+-3.75
Motion	2	2.86+-1.66	2	4.06+-2.38

Following the anesthesia of the tail's nerve plexus with grain alcohol, there was a noticeable reduction in the average µV of the horses' tails both at rest and in motion. This reduction persisted for up to six days, and as a result, the EMG amplitudes did not exceed 10µV (Fig. 5 and 6).

The findings of Experiments 2 and 3 align with the observed µV pattern in Experiment 1. Statistical analysis using Student's t-test revealed a significant difference between the examination results of animals with anesthetized and non-anesthetized tails (P<0.05) (Table 8).

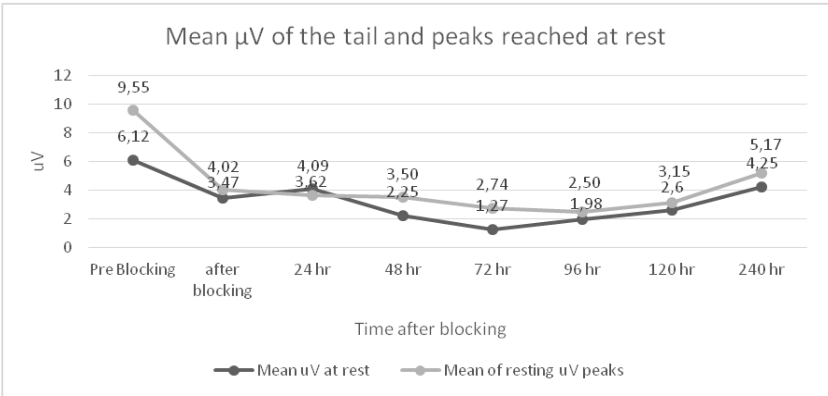

Figure 5. Mean resting tail µV pre- and post-anesthesia with grain alcohol.

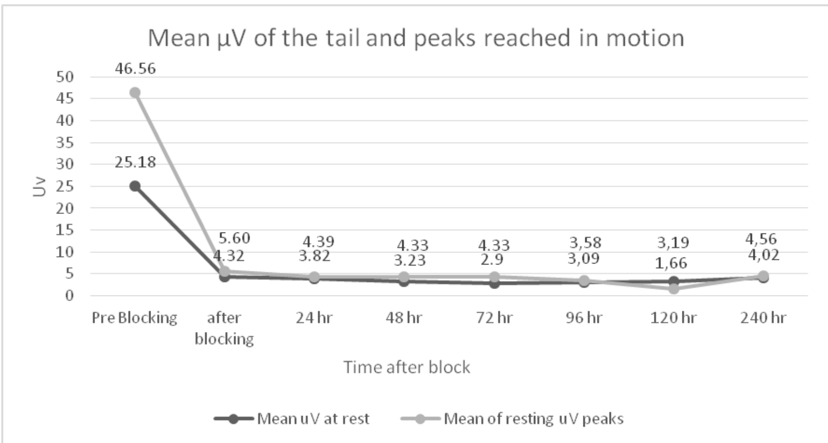

Figure 6. Mean µV of the tail pre- and post-anesthesia with grain alcohol.

Table 8. Mean and standard deviation of µV of the tail at rest and in motion, with and without nerve plexus anesthesia

Tail situation	Handling	N	µV (Mean±SD)	P value
No anesthesia	Rest	12	4.37+-0.41	
	Movement	12	25.48+-6.05	0.04
Anesthesia whit lidocaine	Rest	12	2.29+-1.57	
	Movement	12	2.75+-1.63	
No anesthesia	Rest	2	6.11+-1.11	
	Movement	2	21.55+8.09	0.03
Anesthesia whit alcohol	Rest	2	2.89+-1.50	
	Movement	2	2.86+-1.66	

In Experiment 3, grain alcohol was selected as the agent due to its demyelinating properties, which can induce nerve injuries and hinder tail movement. It should be noted that this product has been previously employed for such purposes but may result in prolonged tail immobility for up to six months.

To account for potential individual variations influencing the µV results of the horses' tail following nerve plexus infiltration with anesthetic and neurolytic agents, Tukey's test was conducted with a significance level of 5%. The experiments, involving different animals, revealed no significant differences in the µV values. Moreover, there were no variations observed in the µV values of the tail at rest or during stimulated movement following the nerve plexus infiltration (Table 9).

Table 9. Mean µV of all experiments of the studies with different animals compared to each other

<table>
<tr><th>Experiment</th><th>Mean Rest</th><th>P value</th><th>Mean motion</th><th>P value</th><th>Mean anesthesia rest</th><th>Mean anesthesia motion</th><th>P value</th></tr>
<tr><td>1</td><td>3.84</td><td></td><td>26.71</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">2</td><td>4.08</td><td rowspan="4">0.1</td><td>26.76</td><td rowspan="4">0.8</td><td>2.29</td><td>2.75</td><td rowspan="4">0.2</td></tr>
<tr><td>4.67</td><td>21.2</td><td>2.89</td><td>2.86</td></tr>
<tr><td rowspan="2">3</td><td>6.11</td><td>24.55</td><td rowspan="2">3.47</td><td rowspan="2">4.32</td></tr>
<tr><td>6.12</td><td>25.18</td></tr>
</table>

DISCUSSION

Tail blocking, induced using drugs that reduce innervation, has been a recurring issue in some equestrian disciplines and requires effective measures to address it (Tutko *et al*., 2010). One of the clinical demands in this context is the standardization of an examination that correlates clinical data with complementary diagnostic methods, providing insights into the location and severity of neuromuscular injuries (Figueiredo *et al.*, 2012). In our study, the clinical examination of the tail proved valuable in assessing mobility, sensitivity, and tension, which can indicate reduced activity in one or both antimeres and potential injuries associated with such conditions. By comparing the clinical examinations of a healthy tail as a standard, (Table 1) and a tail infiltrated with an anesthetic agent (Table 5), significant differences in mobility and sensitivity were observed (Table 2).

Electromyography (EMG) has been increasingly used as a complementary diagnostic tool in veterinary medicine (Williams, 2018). This method allows for the evaluation of muscle electrical activity and aids in determining whether the origin of the lesion is neurogenic (Wijnberg and Fransen, 2016). Electromyography can provide information about muscle viability and the degree of innervation (Enoka and Duchateau, 2015). In our study, we employed EMG as a complementary diagnostic technique to assess possible tail diseases in horses. By evaluating the loss of myoelectric potential in the tail, we observed that the average amplitude without nerve plexus infiltration during tail movement was 29.76µV, while after infiltration with lidocaine, it decreased to 2.75µV. A subsequent EMG examination performed 24h after nerve plexus anesthesia showed an average amplitude of 21.20µV during tail movement. The results of our study demonstrated that the infiltration of the nerve plexus of the tail with an anesthetic agent significantly reduced the myoelectric potential, highlighting the impact of this procedure on tail movement. This observation aligns with the findings of Barsanti *et al*. (2021), who evaluated the myoelectric capacity of large muscle groups in horses and reported that the average µV values obtained in EMG exams remained unchanged even during motion after a nervous plexus injury. The scarcity of literature on EMG evaluations of the tail in horses further emphasizes the novelty and importance of our study's findings.

In Experiment 1, we established a reference standard for the clinical examination and EMG of healthy horse tails using 10 different animals. A total of 65 examinations were conducted to determine the reference values for EMG in horses without tail abnormalities. The average amplitude at rest was 3.84µV, and during tail movement, it reached 26.71 µV, with peak values of up to 7.72µV and 64.26µV, respectively. These reference values remained consistent in subsequent experiments, demonstrating the reproducibility of the initial findings. It is noteworthy that despite an extensive search, no existing literature on EMG values and descriptions specific to horse tails was found. EMG captures the action potentials generated by motor units during muscle activity (Enoka and Duchateau, 2015), indicating the underlying muscle fiber movement. When muscle fibers contract in response to motor impulses, they undergo depolarization and polarization processes, resulting in the creation of measurable electromagnetic fields that are detected in EMG examinations (Wijnberg and Fransen, 2016).

In Experiment 2, the neuromuscular activity of the tail was compared before and after infiltration of the tail's nervous plexus with lidocaine. The µV values of the tail without infiltration were consistent with the average values described in Experiment 1, measuring 4.37µV at rest and 25.48µV with tail movement stimulation. However, after nerve plexus infiltration, the average values decreased to 2.29µV at rest and 2.75µV with tail movement stimulation. The pre- and post-block values showed a significant difference ($P<0.04$), indicating a change in the µV values of the tail following anesthetic infiltration. Interestingly, when comparing the mean µV of the tail at rest and during movement after nerve plexus infiltration with an anesthetic agent, no difference was observed ($P<0.2$). This finding suggests that the infiltration of the tail's nerve plexus directly affects the tail's ability to move. Barsanti *et al*. (2021) reported similar results in their evaluation of the myoelectric capacity of large muscle groups in horses with muscle disorders. The researchers found that the average µV measured in the EMG exam did not change even during motion after these muscles suffered a nerve plexus injury. The data obtained in Experiment 2 of our study were not found in the existing literature, which lacks comprehensive results of evaluations and examinations specifically focused on the tail of horses and EMG examinations an important tool for assessing neuromuscular capacity by capturing and recording the presence or absence of myoelectric signals, representing the myoelectric activity during defined muscle events (Barsanti *et al*., 2021). The test allows for the observation of differences in myoelectric activity between different regions of the tail and the presence or absence of myoelectric activity (Williams, 2018), aiding in the identification of specific injury sites through myoelectric conduction of the tail (Barsanti *et al*., 2021).

In Experiment 3, the clinical pattern and average µV values of the tail without nerve plexus infiltration were consistent with those observed in Experiment 1, measuring an average of 6.12µV at rest and 25.18µV during movement. However, after infiltration of the nervous plexus with grain alcohol, the clinical examination of the tail revealed limited natural movement, excessive flexibility upon manipulation, and reduced response to painful stimuli, consistent with the findings from Experiment 2 and presented in Table 6. The EMG examination following nerve plexus infiltration with grain alcohol showed a reduction in the average µV values ($P<0.03$), measuring 3.47µV at rest and 4.22µV during tail movement. These results indicated a difference between the µV values of the healthy tail and the infiltrated tail, which were observed consistently over six consecutive days, as shown in Figures 4 and 5. The study revealed a significant difference in both the clinical examination of the tail and the mean µV obtained by EMG ($P<0.03$) between the healthy tail and the tail after nerve plexus infiltration with lidocaine or grain alcohol. There was no significant difference in tail µV values at rest between the non-infiltrated and infiltrated nerve plexus conditions ($P<0.1$). Additionally, with the infiltration of the nerve plexus of the tail using lidocaine or grain alcohol, no significant difference was observed ($P<0.8$) between the tail at rest and during movement. These findings regarding the EMG values expressed in µV of the equine tail without alteration and after infiltration with anesthetic and neurolytic agents are believed to be the first of their kind, as they were not found in the existing literature.

The equine tail serves fundamental functions in the life and well-being of the species (Budras, 2009; Sturn *et al*., 2018; Nout-Lomas, 2022). The loss of natural mobility in the tail due to local anesthetic infiltration hampers its movement and prevents the expression of pain and discomfort, making diagnosis challenging (Dyson and Pollard, 2020, 2021). Therefore, it is crucial to seek methods that assess the origin and characteristics of possible injuries (Williams, 2018). In various equestrian sports, an increasing number of horses have been reported with anesthetized tails. The present study addresses the current need for a standardized clinical evaluation and the utilization of a complementary method to detect tail blockage in horses to mitigate this procedure.

CONCLUSIONS

This study introduces a clinical examination protocol utilizing surface electromyography as a diagnostic tool for identifying horse tail block.

ACKNOWLEDGEMENTS

Thanks are due to the Hospital de Clínicas Veterinarias for providing the horses and materials. We would also like to express our gratitude to Dr. Maria Helena Fenalt for her important contribution to this article.

REFERENCES

BARSANTI, R.R.; FONSECA, B.P.A.; SILVATTI, A.P. *et al* Descriptive electromyography signals analysis of equine longissimus dorsi, rectus abdominis and gluteus medius muscles during maneu Vers used to activate the core. *Braz. Arch. Vet. Med. Anim. Sci*., v.73, p.843-852, 2021.

BUDRAS, K.D. *Anatomy of the horse*. Nova York, NY: Thieme Medical Publishers. 2009. 210p.

CAUDAS bloqueadas. Belo Horizonte: ABCCMM, 2022. Disponivel em: https://www.youtube.com/watch?v=aJ8sbUnHqMI&t=23s. Acessado em: 17 jul. 2023

CURIOSIDADES do MM- cauda morta. Belo Horizonte: MMARCHADOR TV, 2010. Disponivel em: https://www.youtube.com/watch?v=7bdKZlOXNSI&t=8s. Acessado em: 17 jul. 2023

DYSON, S.; POLLARD, D. Application of a ridden horse pain ethogram and its relationship with gait in a convenience sample of 60 riding horses. *Animals*, v.6, p.1044-1058, 2020.

DYSON, S.; POLLARD, D. Application of the ridden horse pain ethogram to elite dressage horses competing in world cup grand prix competitions. *Animals*, v.11, p.1187-1203, 2021.

ENOKA, R.M.; DUCHATEAU, J. Inappropriate interpretation of surface EMG signals and muscle fiber characteristics impedes understanding of the control of neuromuscular function. *J. Appl. Physiol*., v.119, p.1516-1518, 2015.

FIGUEIREDO, T.; DZYEKANSKI, B.; KUNZ, J. *et al*. The importance of thermographic examination in the evaluation of the locomotor apparatus in athletic horses. *Electr. Sci. J. Vet. Med*., v.50, p.45-52, 2012.

GENERAL regulations. 24.ed. Lausanne: Fédération Internationale Equestre, 2023. 70p.

KÖNIG, H.E. *Anatomy of domestic animals:* text and color atlas. Nova York: Thieme Medical, 2016. 856p.

NOUT-LOMAS, Y.S. Traumatic nervous system injury. *Vet. Clin. North Am. Equine Pract*., v.38, p.363-377, 2022.

QUEIROZ, L.C.R. *Bem-estar e desempenho do cavalo atleta.* 2020. 58f. Trabalho Conclusão de Curso (Graduação em Zootecnia) - Pontifícia Universidade Católica, Goiânia, GO.

RIDDELL, L.P.; YOSHIMURA, S.; MACKAY, A.V.; WILSON, D.G. Sacrococcygeal luxation and complete tail amputation following a tail pull injury in a horse. *Can. Vet. J*., v.60, p.1094-1098, 2019.

STATUTES FEI. 24.ed. Lausanne: Fédération Internationale Equestre, 2021. 41p.

STURN, R.; LIMA, F.; RIBEIRO, A. Good practices and welfare in equestrian horses: opportunities for improvement. *Biosphere Encycl*., v.15, p.208-217, 2018.

TIRA dúvidas - cauda bloqueada. Belo Horizonte: MMARCHADOR TV, 2015. Disponível em: https://www.youtube.com/watch?v=p8LoJR-x78E. Acessado em: 17 jul. 2023

TUTKO, J.M.; SELLON, D.C.; BURNS, G.A. *et al*. Cranial coccygeal vertebral fractures in horses: 12 cases. *Equine Vet. Educ*., v.14, p.197-200, 2010.

VETERINARY regulations. 24.ed. Lausanne: Fédération Internationale Equestre, 2023. 123p.

WIJNBERG, I.D.; FRANSEN, H. The potential and limitations of quantitative electromyography in equine medicine. *Vet. J*., v.209, p.23-31, 2016.

WILLIAMS, J.M. Electromyography in the horse: a useful technology? *J. Equine Vet. Sci*., v.60, p.43-58, 2018.