

CASE REPORT

Use of ozone therapy to control chronic pain in equine laminitis

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ABSTRACT

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Purpose

Laminitis is the inflammation of the dermal and epidermal blades of the hoof. The use of ozone has already demonstrated promising effects in horses, through postoperative analgesia, antioxidant effect in athletic animals and even chronic laminitis. Thus, the objective of this article is to describe the use of ozone therapy in different methodologies (intramuscular points, acupoints and footbath) in the aid of pain control in an equine with chronic laminitis.

Methods

An equine male, 513 kg, English Thoroughbred, seven years old, was referred with severe laminitis with 20 days of progression, after transportation of approximately 780 km, after its acquisition. Upon clinical examination, the animal demonstrated degree 4 of laminitis (scale from 1 to 4) and alternating support of the thoracic limbs. The radiographic examination showed rotation of the distal phalanx in all digits and the diagnosis was chronic laminitis. The initial therapeutic protocol was meloxicam (0.6 mg/kg, SID, IM) for two days, flunixin meglumine (1.1 mg/kg, SID, IM) for three days, followed by firocoxib (0.1 mg/kg, SID, PO) for more than 120 days. During all the treatment, the use of omeprazole (4 mg/kg, SID, PO) and acepromazine (0.01 mg/kg, BID, IM) was maintained, as well as corrective hoof trimming and bandaging with soft material on the sole. In order to promote better analgesia and greater patient comfort with minimal adverse effects, the use of firocoxib was interrupted and 20 ozone therapy sessions were instituted. The protocol consisted of bilateral administration of oxygen / ozone (40 ug/ml, IM) in pre-scapular, scapular, post-scapular and acupuncture points (LI11 POINT), as well as ozonized footbath for hoof cleaning.

Results

Two months after the beginning of treatment the patient showed significant improvement of body condition and better walking with evolution to score 2 of laminitis, without any side effect.

Discussion

The pain control verified in this patient can be explained by the action of ozone in the inflammatory cascade, that is, altering the degradation of arachidonic acid and with it the inhibition of pro-inflammatory cytokines.

Conclusion

We concluded that the ozone therapy technique was satisfactory in controlling chronic laminitis pain.

Keywords

Claudication, horse, ozone, acupoints, minor autohemotherapy, footbath

PURPOSE

Laminitis is the inflammation of the dermal and epidermal blades of the hoof (1). The predisposing factors of this condition include: grain overload, endotoxemia, colic and limb overload (2). Laminitis is classified as acute, subacute and chronic, the chronic state being reached when there is radiographic evidence of digital collapse (dorsal rotation, symmetrical or asymmetrical distal phalanx displacement), regardless of its duration. This radiographic signal is extremely important because it is highly related to the prognosis as well as the therapy to be chosen (3).

The treatment consists of pain management through the use of non-steroidal anti-inflammatory drugs (NSAIDs), hoof trimming and corrective horseshoeing in order to offer greater comfort to the patient (4). However, due to a multifactorial characteristic of the origin of pain in these animals, pain control becomes challenging, leading to low success rates with conventional therapies, thus leading to the search for new drugs and therapies to control this type of pain (5, 6).

Ozone therapy uses ozone, which is an unstable, colorless gas with a peculiar odor, composed of three atoms of oxygen (7). Once inside the body, medicinal ozone has an analgesic effect through the oxidation of pain receptors and regulation of caspase pathways with consequent action on inflammatory cytokines (8, 9).

The use of ozone has already demonstrated promising effects in horses, through postoperative analgesia, antioxidant effect in athletic animals and even chronic laminitis (10, 11, 12). Thus, the objective of this article is to describe the use of ozone therapy in different methodologies (intramuscular points, acupoints and footbath) in the aid of pain control in an equine with chronic laminitis.

METHODS

A male equine, 513 kg, English Thoroughbred, seven years old, used for running was referred with severe claudication of 20 days of evolution, after transportation of approximately 780km, after its acquisition. When the animal was purchased, it was only inspected and previous history of affections was not identified. The diet consisted of 1.5kg of oats, 2kg of commercial feed (both parceled out twice a day), 7.5kg of alfalfa and ad libitum water.

The physical examination showed a heart rate (HR) of 36 beats per minute (bpm), respiratory rate (RR) of 24 movements per minute (mpm), thermometry of 38°C and a capillary reperfusion time (CRT) of two seconds. In the inspection, alternation of support in the thoracic limbs, depression in the coronary edge, sole pressure sensitivity in the toe area, palpable digital pulses and high

temperature in all the hooves were observed, with Obel claudication grade IV (13). The radiographic examination verified the rotation of the distal phalanx in all digits (Figure 1). Based on clinical and radiographic findings, the diagnosis was chronic laminitis.

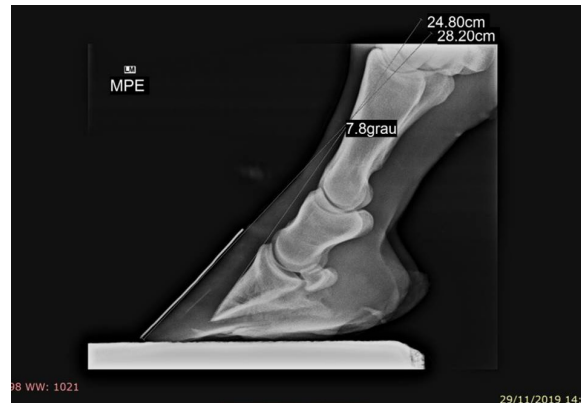


Figure 1.

Left pelvic limb distal radiographic image (LFP) in the lateromedial projection demonstrating plantar rotation of the distal phalanx of an equine with chronic laminitis.

The initial therapeutic protocol chosen was meloxicam (0.6 mg/kg, SID, IM) for two days, flunixin meglumine (1.1 mg/kg, SID, IM) for three days, followed by firocoxib (0.1mg/kg, SID, PO) for more than 120 days. During all the treatment, the use of omeprazole (4mg/kg, SID, PO) and acepromazine (0.01 mg/kg, BID, IM) was maintained, in addition to corrective hoof trimming every 15 days, bandaging with soft material on the sole, resting in a stall lined with rubber floor and wood chips. The diet was restricted to the supply of Tifton hay, water and mineral salt only.

Penetration of the sole was found in all limbs (Figure 2), except the left pelvic limb, and antisepsis of the sole wound was performed with degermant and topical iodopovidone, followed by coverage with sterile gauze, bandage with hydrophobic cotton and crepe dressing. In the adjacent areas of the sole lesion an alcoholic 10% iodinated contrast dye was applied. The bandaging was repeated more frequently at the beginning of the treatment (every 48 hours), with bandage change intervals increased throughout the treatment (once a week).

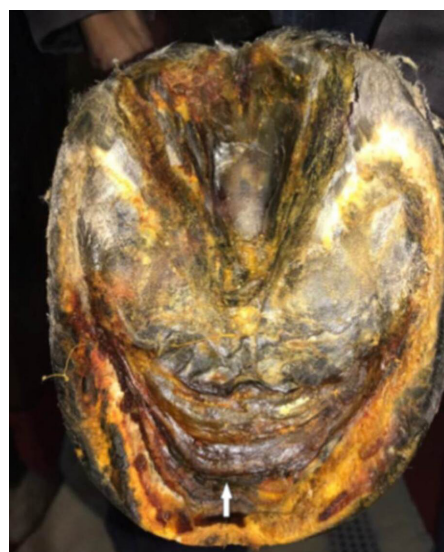


Figure 2.

Region of the right pelvic sole of an equine with chronic laminitis, where the lesion caused by the perforation of the third phalange (white arrow) can be observed.

After the interruption of firocoxib, 20 ozone therapy sessions were instituted, twice a week. The ozone generating equipment was the Ozone&Life® model O&L1.5RM (São José dos Campos, São Paulo, Brazil), and the protocol for gas application was based on Coelho et al. [12] and consisted of bilateral administration of the oxygen/ozone mixture (40 ug/ml IM) in pre-scapular, scapular, post scapular points (Figure 3A). The protocol also consisted of using minor autohemotherapy ozonized in an acupuncture point (LI11 POINT) (Figure 3B), which consisted in collecting blood from the left jugular vein, with syringe properly prepared with ozone gas which, after homogenization, was applied directly on the caudal triceps brachii muscle, as well as the water footbath of each hoof for 10 minutes through the Ozone generator equipment Ozone&Life® model O&L HOME (São José dos Campos, São Paulo, Brazil)(Figure 3C) and after that the bandage on the hooves.

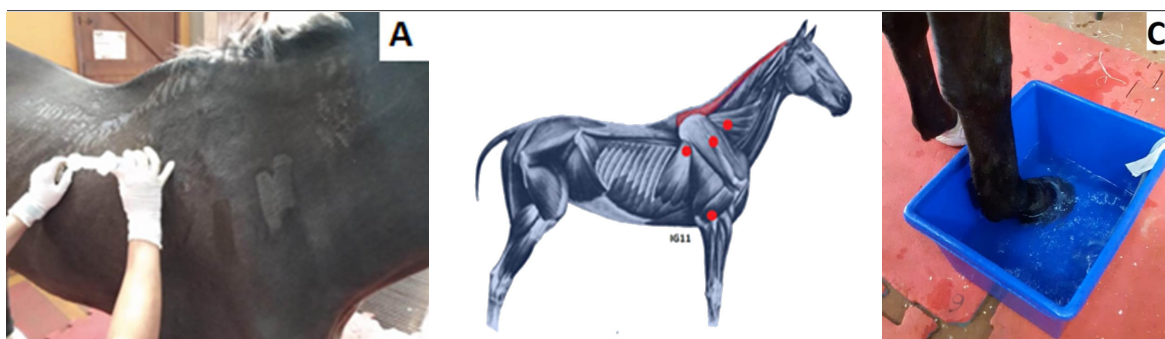


Figure 3.

(A) Administration of ozone gas via intramuscular route at the post-scapular point in horses with chronic laminitis. (B) Representative scheme of intramuscular administration points of ozone gas (pre-scapular, scapular and post-scapular) and acupuncture point (LI11 POINT) through minor auto-hemotherapy. (C) Chronic laminitis-carrying equine receiving ozone therapy through water footbath in right thoracic limb.

After two months of treatment with ozone therapy associated with hoof trimming, the patient demonstrated significant improvement in body condition and better walking with improved score of claudication (Obel grade II) (13). With regard to sole lesions there was also control of infection and improvement of the appearance of the wound. After four months of ozone therapy the patient was discharged from hospital.

DISCUSSION

The use of ozone therapy associated with corrective hoof trimming in this report provided analgesia to an equine with chronic laminitis, perpetuating a greater comfort and increase in the time of the patient in season, as well as a positive evolution in the case. Pain control is usually performed by NSAIDs. However, its prolonged use is not recommended due to the various undesirable effects (14). In this report, during the use of firocoxib, the patient presented a stabilization of the clinical picture, with no improvement or worsening. In view of this situation, we decided to start ozone therapy sessions based on Coelho et al. (12) in order to obtain complete clinical improvement as well as interruption in the use of anti-inflammatory drugs.

For Iliakis et al. (15), the pain control verified in this patient can be explained by the action of ozone in the inflammatory cascade, that is, altering the degradation of arachidonic acid and with it the inhibition of pro-inflammatory cytokines. In addition, the use of ozone therapy through the technique of minor auto-hemotherapy in English Thoroughbred horses, as is the case of the patient in the report, has already demonstrated beneficial effects, especially in the antioxidant capacity (11).

Studies comparing the analgesic control between a NSAID and ozone gas were performed by Teixeira et al. (16), with the individual use of meloxicam or intrarectal ozone and in acupuncture points, in the postoperative period in female dogs submitted to ovarian-hysterectomy, which demonstrate that the control of inflammatory pain was equivalent between ozone gas and a NSAID. In the present report it was possible to observe a superior favorable result with the use of ozone therapy without having the adverse effects of anti-inflammatory drugs.

In horses, chronic inflammatory disorders such as laminitis observed in this case, may be related to neuropathic pain, its main characteristic being a continuous pain and typically little responsive to many analgesics used (17). Regarding this neuropathic pain, Fuccio et al. (9) observed that a single subcutaneous application of ozone in mice with peripheral neuropathy was effective in pain control, suggesting that this modulation would be involved through the inhibition of pro-inflammatory proteases, as well as a potent antioxidant action in the prevention of neural sensitization. Similarly, in the study by Coelho et al. (12) in the treatment of chronic laminitis in an equine, using intramuscular, peritendinous and intrarectal administration of oxygen/ozone as the only therapy, they observed significant improvement after six months of treatment. In the present report, adequate analgesia, with a patient in season and with significant reduction of claudication was obtained after four months of treatment.

The use of the minor auto-hemotherapy technique with ozone at acupuncture point LI11 in the patient of this report had the intention of adding the therapeutic action of each technique and obtain better comfort for the patient. According to Escodro et al. (10) the use of ozone at the LI11 point (point of immunity) by means of the minor auto-hemotherapy technique in the postoperative period of equine orchietomy promotes excellent control of postoperative pain, without the need for any other analgesic.

The rapid and significant healing evolution was observed in the lesions originated from the perforation of the sole by the third phalange. This fact was observed mainly by the use of the footbath with ozone gas, a method not yet described in the literature consulted. However, its use was performed with the support of the antiseptic, antimicrobial and healing action of ozone (18).

Regardless of the drug treatment chosen for pain control, the corrective hoof trimming should always be performed in order to adjust the new angulation between the third phalange and the hoof wall, as well as to reduce the tension of the deep digital flexor tendon (19), providing greater patient comfort, a fundamental step for the control and management of the equine with laminitis, as observed in this report.

CONCLUSION

Based on this report, it is concluded that ozone therapy in different methodologies is effective in the control of chronic pain and recovery of the laminitis bearing equine.

REFERENCES

1. Stashak TS. *Claudicação em equinos segundo Adams*. 5.ed. São Paulo: Roca; 2006.
2. Heymering, HW. 80 causes, predispositions, and pathways of laminitis. *The Veterinary Clinics Of North America*. 2010; 26(1):13.
3. Hood DM. Laminitis in the horse. *Veterinary Clinics of North America: Equine Practice*. 1999; 15:287-294.
4. Orsini JA, Wrigley J, Riley P. Home care for horses with chronic laminitis. *Veterinary Clinics: Equine Practice*. 2010; 26(1):215-223.
5. Faramarzi B, Lee D, May K, Dong F. Response to acupuncture treatment in horses with chronic laminitis. *The Canadian Veterinary Journal*. 2017; 58(8):823
6. Morgan SJ, Grosenbaugh DA, Hood DM. The pathophysiology of chronic laminitis: pain and anatomic pathology. *Veterinary Clinics of North America: Equine Practice*. 1999; 15(2):395-417.
7. Kirchhoff VWJH. *Ozônio e radiação UV-B*. São Jose dos Campos: Transtec, 1995. 66p.
8. Re L, Sánchez GM, Mawsouf N. Clinical evidence of ozone interaction with pain mediators. *Saudi Med J*. 2010; 31(12): 1363-1367.
9. Fuccio C, Luongo C, Capodanno P, Giordano C, Scafuro MA, Siniscalco D, et al. A single subcutaneous injection of ozone prevents allodynia and decreases the over-expression of pro-inflammatory caspases in the orbito-frontal cortex of neuropathic mice. *Eur J Pharmacol*. 2009; 603:42–49.
10. Escodro PB, Joaquim JGF, Tobyas M, Oliveira AS, Escodro LO, Santos Filho EM, et al. Autohemotherapy at acupuncture points post orchietomy surgery in cart horses-eight cases report, *Vet e Zootec*. 2012; 19(4):502-507.
11. Tsuzuki N, Endo Y, Kikkawa L, Korosue K, Kaneko Y, Kitauchi A, et al. Effects of ozonated autohemotherapy on the antioxidant capacity of Thoroughbred horses. *Journal of Veterinary Medical Science*. 2015; 77(12): 1647-1650.
12. Coelho CS, Abreu-Bernadi W, Ginelli AM, Spagnol T, Gardeli LS, Souza VR. Use of ozone therapy in chronic laminitis in a horse. *Journal of Ozone Therapy*. 2015; 1(1).

13. Obel N. Studies on the histopathology of acute laminitis. *Vet. Stockholm*. 1948; 1:1-50
14. Hopster K, Van Eps, AW. Pain management for laminitis in the horse. *Equine Veterinary Education*. 2018; 31(7):384-392.
15. Iliakis E, Valadakis V, Vynios DH, Tisiganos CP, Agapitos E. Rationalization of the activity of medical ozone on intervertebral disc: a histological and biochemical study. *Rivista di Neuroradiologia*. 2001;14:23-30.
16. Teixeira LR, Luna SPL, Taffarel MO, Lima AFM, Souza NR, Joaquim JGF. Comparison of intrarectal ozone, ozone administered in acupoints and meloxicam for postoperative analgesia in bitches undergoing ovariohysterectomy. *The Veterinary Journal*. 2013; 197(3):794-799.
17. Guedes A. Pain management in horses. *Veterinary Clinics: Equine Practice*. 2017; 33(1):181-211
18. Sciorsci RL, Lillo E, Occhiogrosso L, Rizzo A. Ozone therapy in veterinary medicine: a review. *Research in Veterinary Science*. 2020.
19. Morrison S. Chronic laminitis: foot management. *Veterinary Clinics: Equine Practice*. 2010; 26(2): 425-446.