

HYDROGEL BASED ON BACTERIAL CELLULOSE ASSOCIATED WITH DIODE LASER IN THE TREATMENT OF EQUINE SARCOID – CASE REPORT

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Abstract: Sarcoid is the most common cutaneous neoplasm in horses, being characterized as a specific fibroepithelial tumor. The etiology is related to bovine papillomavirus type I or II). With five different clinical presentations and usually multiple, it has a locally aggressive character with infiltrative capacity and refractoriness to therapies. Diode laser surgery has become a promising therapy for the treatment of equine sarcoid. Bacterial cellulose (BC)-based hydrogel has been used as a local dressing, helping in the repair process of various types of wounds. The aim of this case report was to present the use of a CB-based hydrogel in a wound after tumor excision performed with a diode laser, with unsatisfactory healing. Subsequently, a satisfactory evolution of the healing process was observed, with the wound being covered by granulation tissue, with evident contraction and epithelialization after nine days of hydrogel application. In 40 days the wound was completely healed. For eighteen months after the thermal treatment, no history of relapses was observed. It is recommended to associate surgical excision of the neoplasm with diode laser with topical use of a 1% bacterial cellulose-based hydrogel in the treatment of equine sarcoid.

Keywords: biocellulose, wound, horse, laser, sarcoid.

INTRODUCTION

Sarcoid is the most common cutaneous neoplasm in horses, being characterized as a specific fibroepithelial tumor that affects all races, genders, coats and ages, with more frequent occurrence in animals between one and six years old (Knottenbelt et al., 2005). There is also no seasonal influence, having been reported in several regions of the world, including Brazil, causing significant economic losses to the equine industry (Cremasco et al., 2010).

The etiology is related to the bovine papillomavirus (BPV type I or II), belonging to the Papillomaviridae family, which has species capable of infecting human and animal epithelial cells, causing proliferative lesions known as papillomas and condylomas (warts) (Knottenbelt et al. Despite being species-specific, they are also capable of infecting other species causing different pathological conditions (Cremasco et al., 2010).

The transmission mechanism and pathogenesis of BPV in the equine species are not completely understood. It is known that in horses the infection occurs through direct or indirect contact with infected cattle and horses (Bogaert et al., 2008). Recent studies indicate that the fly *Stomoxys calcitrans* may be involved in the transmission of BPV, through its contact with exposed bovine papillomas (Haspelslagh et al., 2018). Additionally, the animal's immune status and its genetic predisposition play an important role in the development of lesions (Bogaert et al., 2008).

There are six types of clinical presentations, classified according to the macro and microscopic analysis of the lesion: occult, verrucous, nodular (subdivided into subtypes A and B), fibroblastic, malignant and mixed (verrucous associated with occult or nodular associated with fibroblastic). A sarcoid can evolve into another type, or a single tumor can give rise to multiple lesions, as a result of trauma or an invasive procedure, such as excision or biopsy of a lesion (Knottenbelt, 2005).

A definitive diagnosis is essential for successful treatment. Although there are several diagnostic techniques, such as evaluation of cell proliferation markers, virus detection or viral genetic material, histopathological evaluation is a more used technique, due to its low cost associated with reliable results (Gomiero, 2014).

Several therapies can be used in the

treatment of equine sarcoid, such as topical applications of antivirals, immunotherapy, radiotherapy, chemotherapy and surgical procedures. However, no therapeutic approach is totally effective or universal for all possible tumor types and locations, mainly due to the high recurrence rates after the end of treatment (Gomiero, 2014). Therefore, it is essential to combine one or more therapies during treatment.

Diode laser surgery has become a promising therapy for the treatment of equine sarcoid, as it is a safe, low-cost option with a favorable prognosis, due to its mechanism of action, which is based on the vaporization of neoplastic cells through the thermal energy contained in the laser beam, generating irreversible focal coagulative necrosis (Hernandez-Divers, 2008), allowing a precise delimitation of the surgical margin and hemostasis, consequently reducing pain, edema and post-operative care time. procedures (Palmer, 1996).

Bacterial Cellulose (BC) is a natural biopolymer that can originate from numerous microorganisms, however, gram-negative bacteria of the genus *Gluconacetobacter* stand out due to their ability to produce cellulose in commercial quantities (Pilehvar-Soltanahmadi et al., 2018).

BC has been used as an interactive wound dressing in the form of a membrane, with the function of protecting and covering the wound bed, maintaining the water content at the site and the transfer of oxygen between the wound and the environment, given its hydrophilic properties, together with its high rate of hydration, biocompatibility, and stimulation of fibroblast proliferation (Carbinatto et al., 2018). This way, BC acts as a biological interface and promotes more efficient healing than other products used for this purpose (Pilehvar-Soltanahmadi et al., 2018).

The defibrillation process of BC membranes originates a dispersion of nanofibers that can

be incorporated into hydrogels, giving rise to a promising therapeutic possibility for the treatment of burns, chronic ulcers and other skin lesions (Gupta et al, 2016; Picolotto et al., 2019).

REPORT

A Quarter Horse, male, castrated, 9 years old, 460 kg, was attended at the Veterinary Hospital “Luiz Quintiliano de Oliveira” (FMVA/UNESP) presenting multiple granulomatous lesions on the body, suggestive of sarcoids. A mixed lesion (nodular/fibroblastic) stood out on the left face (maxillary region) (**Figure 1A**), with approximately 9 cm², progressive growth and evolution of 2 years.

The treatment initially instituted consisted of excision of the granulomatous lesion using a diode laser of 4400mW, 4J and continuous frequency (**Figure 1B and C**), with the animal under general inhalatory anesthesia. Fragments of the removed tissue were sent for histopathological examination, confirming the diagnosis of mixed sarcoid. In the postoperative period, phenylbutazone (4.4 mg.Kg-1/IV/q24h – 3 days) and enrofloxacin (5 mg.Kg-1/IM/q24h – 10 days) were administered. The surgical wound was treated using topical polyvidone-iodine and repellent spray based on silver sulfadiazine, with the aim of consolidating healing by second intention.

After 24 days of treatment, with no favorable evolution of healing after excision, topical application of a 1% bacterial cellulose-based hydrogel (Nexfill® - GSeven) was added to the therapy, which was applied daily on the wound (Figure 2), after cleaning with saline solution. Subsequently, a satisfactory evolution of the healing process was observed (Figure 3), since the wound was completely covered by granulation tissue, with evident contraction and epithelialization after nine days of hydrogel application (Figure 3 (C)). After 40 days with the use of the hydrogel,

complete healing of the wound was observed.

For eighteen months after the described thermal treatment there was no history of relapses. When the patient was evaluated again, there were no skin abnormalities at the site, with a discreet scar being visible.

DISCUSSION AND CONCLUSION

During the care of horses with cutaneous neoplasms, it is extremely important to carry out a complete examination, from anamnesis, in search of the history of multiple lesions with recurrences, as in the case of this report, to specific ones of the integumentary system, using complementary tests, such as histopathology, essential for the precise definition of the diagnosis (Gomiero, 2014).

Despite adequate veterinary care, it is currently not possible to state the exact etiology of sarcoid in animals. It is believed that the undoubted possibility of this case is related to the combination of papillomavirus infection and a greater susceptibility in some genetic lineages of animals, such as the Quarter Horse breed (Cremasco et al., 2010).

The multiple lesions in different regions of the body is an evident characteristic of the equine sarcoid. There is a higher frequency in the head region, due to greater exposure to trauma that may predispose to the appearance of the sarcoid (Knottenbelt, 2005; Cremasco et al., 2010).

The mixed characteristic evidences the variability of sarcoid evolution (Knottenbelt, 2005), in this case punctually the transition from the nodular to the fibroblastic type.

Despite the consolidated recommendation for the use of diode laser for the excision of different neoplasms, this report elucidates the unfavorable evolution of surgical wound healing, until the association of hydrogel based on bacterial cellulose, which was satisfactorily important for the resolution of this surgical wound.

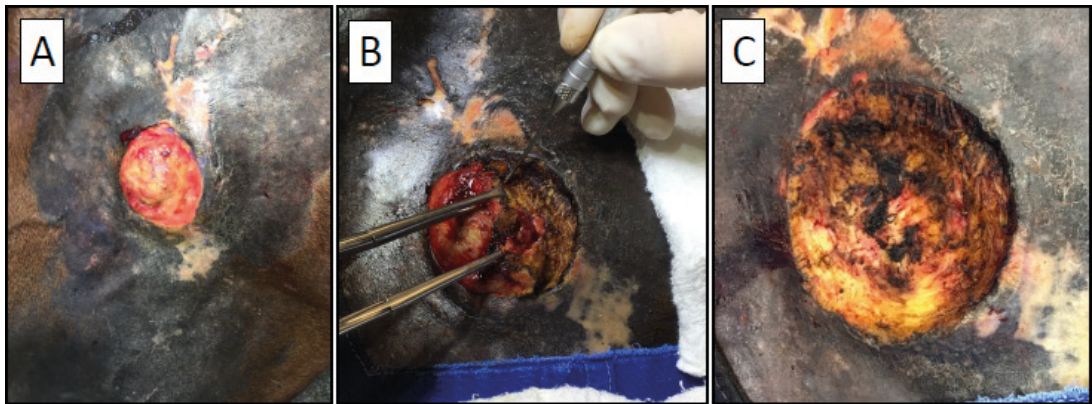


Figure 1. (A) photographic image of the granulomatous wound in the left maxillary region of a horse; (B) Excision of the sarcoid using a diode laser; (C) Wound immediately after diode laser excision.

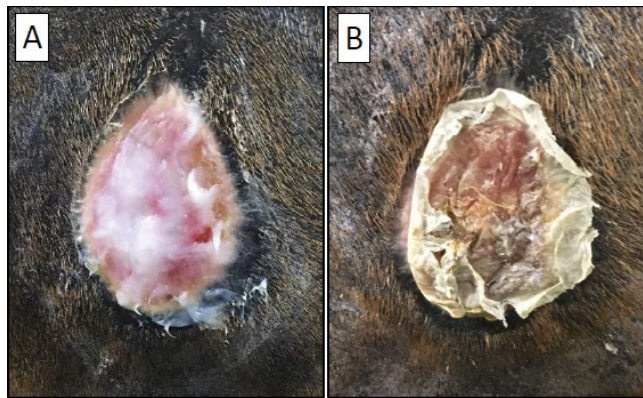


Figure 2. (A) Photographic image illustrating the bacterial cellulose-based hydrogel layer immediately after application on the wound. (B) The same wound after 24 hours. The presence of the hydrogel is observed forming a membrane adhered to the wound.

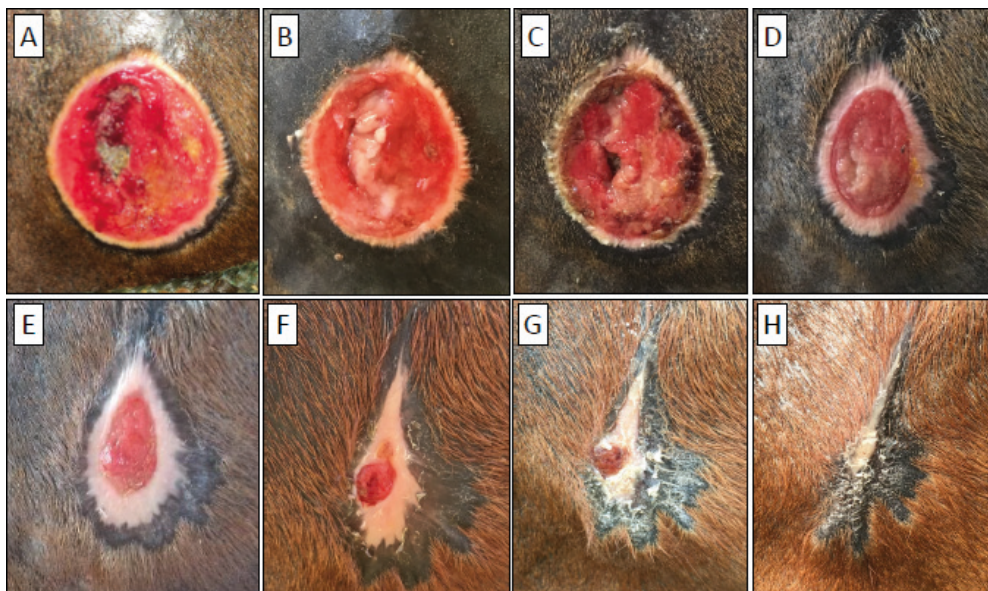


Figure 3. Photographic image of the evolution of wound healing after application of the bacterial cellulose-based hydrogel: (A) day 0; (B) day 1; (C) day 5; (D) day 9; (E) day 18; (F) day 31; (G) day 40; and (H) after 6 months, no recurrence observed.

It is believed that the use of BC acted positively in the proliferation of fibroblasts (Carbinatto et al., 2018), and in the protection of the irregular wound bed (Gupta et al., 2016), preventing contamination by environmental dirt and drying of the wound, since in the face region it is not possible to use protective bandages.

It must be noted that, despite the success in the local treatment of this neoplasm, this

association of therapies does not allow the cure of the sarcoid in the horse, and the possibility of recurrences cannot be ruled out. Thus, serial clinical evaluation remains of great importance throughout the life of this horse.

The association of surgical excision with diode laser and 1% bacterial cellulose-based hydrogel may be an alternative for the treatment of equine sarcoid.

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