

## TREATMENT OF THE EXUBERANT GRANULATION TISSUE IN HORSE USING ELASTIC LIGATURE: CASE REPORT

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### **Abstract**

*Wounds that occur on the horse distal limb may evolve with the appearance of an exuberant granulation tissue that causes discomfort both to the animal and to the owner. Granulation tissue usually appears in the healing phase, but it evolves in excess due to the area prone to infection, with low blood supply, difficult to suture and in continuous movement. This case report describes the treatment of an exuberant granulation tissue in a mixed Romanian horse breed by histiotripsy using an elastic ligature. The success of the treatment consisted in gradual ablation of exuberant tissue given by the suppression of blood circulation, limited the local infection and subsequent stimulation of scarring. During the treatment, episodes of mild lameness and localized edema may occur, and in case of unexpected elimination of the exuberant mass a massive haemorrhage will occur.*

**Key words:** exuberant granulation tissue, healing phase, histiotripsy.

### **INTRODUCTION**

In horses, the frequent causes of appearance of the exuberant granulation tissue - EGT is represented by the unsutured wound and inappropriate local treatment. Large-breed horses are at higher risk than ponies or smaller breeds (Varasano et al., 2018; Bertone, 1989). Wounds localized at the trunk region have less complications and faster heal rate than wounds located at the distal part of the limb.

The anatomical characteristics of the distal limb (absence of the panniculus carnosus muscle) and an inappropriate hygiene with development of a local infection are some of the most common and frustrating complications that disturb the healing and develop a fibroproliferative disorder known as Exuberant Granulation Tissue (EGT) (Naldaiz-Gastesi et al, 2018).

The clinical presentation of EGT is similar to that of human keloid and these conditions have a number of pathophysiologic and histopathologic aspects in common.

In particular, chronic inflammation, aberrant angiogenesis, and defect of wound epithelialisation and contraction are observed (Theoret et al., 2013)

In clinical practice, suture of the skin wound in area as distal limb may encounter difficulties because of the factors that include loss of tissue, excessive skin tension, old wounds. In this case, when the wound can not be sutured to have an evolution for primary healing, the wound will take the direction for secondary intention healing with the development of the granulation tissue (Theoret, 2009). In secondary intention healing, the inflammatory response becomes chronic and alterations appear in cytokine profiles that lead to high levels of pro-fibrotic mediators and reduce levels of cells for differentiation of fibroblast into the myofibroblast necessary for wound contraction. Fibroblasts can contribute to chronic inflammation, and reciprocally, inflammatory cytokines promotes fibroblast to myofibroblast transition, facilitating fibrosis (Hacket, 2011).

Because of the vascular disruption and high oxygen consumption by metabolically active cells, the area of the early wound is depleted of oxygen and become hypoxic. Hypoxia can induce cytokine and growth factor production from macrophages, keratinocytes, and fibroblasts (Celeste et al., 2011; Bishop, 2008). Also, in the absence of effective

decontamination, the inflammation may be prolonged. Both bacteria and endotoxins can lead to the prolonged elevation of pro-inflammatory cytokines such as interleukin-1 (IL-1) and TNF- $\alpha$  and elongate the inflammatory phase (Guo & DiPietro, 2010; Hacket, 2011.). If this continues, the wound may enter a chronic state and fail to heal. The chronic inflammatory response activates macrophages and lymphocytes which lead to the release of growth factors and cytokines which intensifies collagen synthesis. EGT is more likely to develop in wounds with foreign material, chronic infection or chronic inflammation (Hacket, 2011; Guo & DiPietro, 2010, Theoret et al., 2016).

Once developed and protruding over the wound margins, the EGT affect the epithelialisation and wound contraction, and predisposes the wound to infection and more traumas. Some theories say that the best current therapy remains surgical excision of the protruding tissue opposite to topical applications of corticosteroids and local administer of caustic agents are not recommended and must be avoided as much as possible in order not to maintain a chronic inflammation (Stastak et al., 2008; Hacket, 2011).

The administration of the steroid anti-inflammatory drugs are known to inhibit wound restoring because of anti-inflammatory effects and suppression of cellular wound responses, including fibroblast proliferation and reduced wound contraction. (Franz et al., 2007)

The method of treatment that we have chosen consists in applying an elastic ligature constriction around the EGT, at its base to the limit of the skin in order to stop the blood circulation and following this necrosis of the excess tissue.

## MATERIALS AND METHODS

The Surgery Clinic of the Faculty of Veterinary Medicine from Timișoara was requested for an examination of a mixed Romania horse breed mare with age of 5 years old. The horse belonged to a farm located in another county. Following the trip to the farm, at clinical examination, the horse presented an exuberant mass localized on the medial part of the limb

dorsal to the fetlock. The owner described that 6 months ago, the animals cut itself into a metal wire and did not benefit from a medical consult and was treated with antibiotic spray only.

The physiological constants indicate a normothermic animal (37.6<sup>0</sup>C), heart rate of 38 bpm, respiratory rate of 16 breaths/minute. The animal presents a discomfort while walking, which occurs after touching the formation with the other limb. Besides this, the mare was in good shape, alert and responsive.

At the first examination, the mass had the size of 15x20 cm and the prominent mass had 10 cm, pus and swelling of the tissue were observed around the base of the mass (Figure 1). At the touch there was no pain.



Figure 1. First examen of the Exuberant granulation tissue - Dorso-medial to the fetlock

The animal was restrained using a combination of chemical solution and physical method. The chemical restrain was obtain after administering xylazine (0.5 mg/kg i.v.) and for physical restrain two ropes were applied individually on the pastern area and then was knotted together over the withers. Local anaesthesia was accomplished by subcutaneous infiltration of 10 ml of 2% lidocaine around the mass.

With the animal restrained in patrupodal position, a local antiseptic such betadine was applied at the base of the exuberant tissue and on the surrounding skin. An elastic material was applied around the base of the tissue and in

intimate contact with the skin. The elastic material surrounded the exuberant tissue once and after that was tightened up as closely as possible (Figure 2).



Figure 2. Applying the elastic constriction ligature

After this procedure, the owner would apply a local antiseptic daily. This procedure was made on 27.10.2017. Until the next visit the owner did not report that the animal manifested any pain or local bleeding.

On the second visit, the procedure was repeated, and within 2 weeks after this application, the formation was eliminated as a result of crushing and vasoconstriction. After the mass of tissue was removed a significant haemorrhage occurred which was stopped by thermal cauterization using a metallic object which was initially heated and after that a bandage was applied. The remaining tissue did not exceed the margins of the wound, the colour was pink and red and bled a lot when it was touched. The indication for the owner was to change the bandage at 2-days interval for a week and then let the wound uncovered.

The following weeks of treatment consisted in applying a local antiseptic, and the wound edges were buffered with a mixture of Herba-sol solution and EpiteLin unguent.

On the third visit, on 16.04.2018 the presence of a scarring area beginning at the edges of the initial wound margins and a new exuberant tissue centrally positioned was observed. The presence of the exuberant tissue Figure 3 that had the following size 5x5 cm, required application of a new elastic ligature.



Figure 3. Third examen - center - presence of a new exuberant granulation tissue

This time the formation fell after 3 days and the haemorrhage was minimal and was stopped after applying a compressive bandage. The indication for the owner consisted in changing the bandage at 2-days interval for a week and then let the wound uncovered. The recommendations consisted in applying a local antiseptic and Herba-sol solution and EpiteLin unguent over the defect. The defect has healed within 6 months with scar tissue development (Figure 4).



Figure 4. Cured plaque (only scar tissue)

During the treatment, the mare was kept in a separate box with dry bedding from straw.

## RESULTS AND DISCUSSIONS

The elastic ligature constriction method has the effect of stopping blood circulation and mechanical crushing of the tissue.

After the exuberant granulation tissue was eliminated, the treatment consisted in stimulation of wound margins contraction and scar tissue formation. It also aimed the preventing of local infection and keeping the animal in a dry environment.

During the secondary intention healing the appearance of exuberant granulation tissue in the centre of the defect was noticed and a scar tissue developed at the periphery. During the healing phase, there was no local infection.

A major complication occurred following the detachment of the formation and was resolved by thermal cauterization with a metallic object which was initially heated.

Within 6 months of secondary wound treatment scar tissue was developed the entire surface.

There exist a variety of methods of treatment for exuberant granulation tissue.

For the treatment of the skin tumours, since antiquity the application of a ligature that surrounds the formation has been used and in time it was known that they would be eliminated (Papavramidou et al., 2010).

A method of treatment for the exuberant granulation tissue consisted in intralesional injection of 4% formaldehyde and after 3 administrations the tissue had decreased in dimension and a crust has appeared on the surface (Varasano et al., 2018).

Another method consisted in intralesional injection of corticosteroid and had suppressive effects on the inflammatory process in the wound and secondarily from reduced collagen and glycosaminoglycan synthesis and inhibition of the fibroblast (Gauglitz, 2013). Also, the use of a topical application of a corticosteroid can have a certain effect against relapse (Theoret, 2016).

Surgical resection is preferred by some authors because it is easy to perform, provides tissue for histologic exam, and preserves the skin margin (Bertone, 1989).

After the mass was removed, to prevent the formation of a new exuberant tissue, the wounds have to be left open to the air and eliminate the all the irritant mechanical factor (Bertone, 1989; Hacket, 2011).

A silicone gel wound dressing it is applied on the wound surface and gradually it will decrease oxygen tension in the tissues until the point of anoxia, when fibroblasts can no longer

function and undergo apoptosis (Hacket, 2011; Celeste et al., 2011).

A complex method of treatment to increase the healing consists in using the skin graft (Bristol, 2005). Free skin grafts are categorized by thickness and type. Full-thickness grafts include epidermis and the entire dermis (Toth et al., 2010). Split-thickness grafts include epidermis and a portion of dermis. Full- and split-thickness grafts can be either sheet grafts or island grafts. Island graft techniques include punch, pinch, tunnel and modified meek grafts. The advantage of island grafts is that the failure or loss of only graft does not affect other grafts in the wound (Schumacher & Hanselka, 1989). The limit of the treatment was due to the impossibility of transporting the horse to the clinic.

## CONCLUSIONS

The elastic ligature constriction represents a solution for removal the exuberant granulation tissue.

Secondary intention healing was successful after removing the excessive tissue and applying local treatment.

## ACKNOWLEDGEMENTS

This study was realised using the support and infrastructure project “*Dezvoltarea infrastructurii de cercetare, educație și servicii în domeniile medicinei veterinare și tehnologiilor inovative pentru RO 05*”, cod SMIS-CSNR 2669.

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