

## PROUD FLESH SURGICAL MANAGEMENT IN HORSE : A CASE REPORT

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### *Abstract*

*Proud flesh or exuberant granulation tissue is a frequent complication in equine distal limb wounds, often delaying healing. This case report presents a 4-year-old Sandalwood pony mare with proud flesh on the left hindlimb. Diagnostic evaluation, including hematology and histopathology, revealed signs of active inflammation and fibroblast proliferation. Surgical excision and debridement were performed under sedation and local anesthesia to expose healthy tissue in order to support proper healing. Postoperative care included NSAIDs, antibiotics, hemostatic agents, and oral omeprazole to prevent gastric irritation. Daily bandage changes and veterinary monitoring contributed to a satisfactory healing outcome without complications. This case highlights the importance of combined surgical and medical management treatment is effective in treating equine proud flesh.*

**Keywords:** health, proud flesh, equine wounds, surgery, wound healing

## INTRODUCTION

Managing cutaneous wounds in horses can be particularly challenging and often requires careful attention or even costly and extended treatment due to few factors such as significant tissue loss, high skin tension, contamination, and delayed wound healing process (Théoret *et al.*, 2013). Proud flesh is a frequently encountered complication in equine wounds and typically involves a combination of delayed healing, infection, and the overgrowth of granulation tissue (Mondal *et al.*, 2016). Wounds in horses can be infected due to various external factors such as wound contamination with fecal matters, dirt, and foreign bodies (Orsini *et al.*, 2017). In the other hand

proud flesh often seen in lower limb area due to lower oxygen saturation values compared to oxygen saturation in other body parts (Carnevali *et al.*, 2014).

Histopathological findings of granulation tissue typically show the presence of inflammatory cells, keratinocytes, fibroblasts, and newly formed capillaries (Xue and Jackson, 2015). The complexity of equine wound care majorly depends on the wound's location, severity, and type so the most effective approach to manage and treat exuberant granulation tissue or proud flesh still requires further clinical study (Freeman *et al.*, 2018). This study case aimed to discuss the surgical management of proud flesh in the horse's distal extremities.

## MATERIAL AND METHOD

### Case History

A 4 year old sandalwood pony mare was purchased by the current owner at a reduced price due to a pre-existing medical condition. The concern was the presence of proud flesh that located on the distal region of the horse's left hind limb. The owner reached a veterinarian and ultimately chose to have the proud flesh surgically removed.

Prior the surgery anamnesis and general examination were performed. Beside that transrectal ultrasonography was conducted to confirm that the mare was not pregnant in order to ensuring the safety usage of the sedatives and analgesics that planned. Blood samples were collected and submitted for hematological analysis, while a biopsy of the granulation tissue was taken to support histopathological evaluation.

The primary goal of the procedure was to excise all granulation tissue and to debride the wound surface for re-establish a healthy healing environment. The mare had also been appropriately administered deworming treatment, tetanus vaccination, and vitamin injections prior to the surgical procedure.

### Diagnosis

Blood sampling and a biopsy of the granulation mass were taken prior to surgery in order to support an accurate diagnosis. Blood was collected from the jugular vein and brought to laboratory for analysis.

### Treatment

Pre-operative protocol was started by injecting sedation and analgesia using Detomidine (13 µg/kg BW, IV) and Butorphanol (26 µg/kg BW, IV) to achieve both calming and pain relieving effects. The granulation tissue was initially cleansed with NaCl solution. Prior to lidocaine administration, ethyl chloride spray was applied topically to reduce

surface sensitivity and followed by local anesthesia Lidocaine (20 ml in total, IM). Surgical excision and debridement were performed using a sterile scalpel blade. During the excision continuous saline irrigation using NaCl and/or hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) was used to maintain a clear surgical field, and heart rate was monitored regularly to ensure cardiovascular stability.

Right after the surgical procedure done, the mare received an injection of Hemostop<sup>®</sup> K that contains Vitamin K and Carbazochrome (1 ml / 10 kg BW, IV) for 2 days, Flunixin (1 ml/ 45 kg BW, IV) given for 3 days, and Prostrep 200-250 that contains Procaine penicillin G and Dihydrostreptomycin sulphate (1 ml / 10 kg BW, IM) given for 5 days. Beside that Omeprazole also given orally for 3 days. Bandage was applied, replaced, and supervised everyday for several days by veterinarian. Before applying a bandage to protect the fresh surgical site, topical antibiotics was applied topically as an antimicrobial measure to reduce the risk of secondary infection.

## RESULT

Hematological analysis revealed the sign of leukocytosis, lymphopenia, and thrombocytosis that shows in table 1.

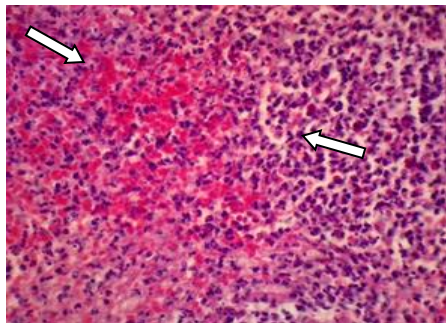
**Table 1.** Blood Analysis Result

Hematology	Result	References*
Hemoglobin	11,1	10,1-16,1 g/dL
Erythrocyte	6,5	6,0-10,4 x 10 <sup>6</sup> /µL
Hematocrit	29,1	28-46 %
MCV	44,8	37-49 fl
MCH	17	13,7-18,2 pg
MCHC	38,1	35,3-39,3 %
Leukocyte	37,000	5.600-12.100 µL
Neutrophil	87,8	52-70 %
Eosinophil	0	0-7 %
Basophil	0	0-2 %

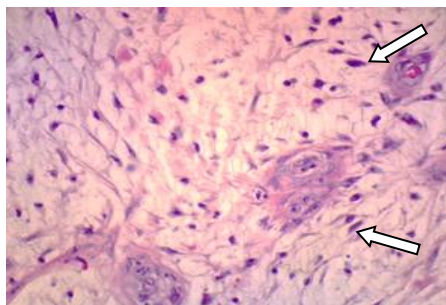
Limfocyte	5,8	21-42 %
Monocyte	3,2	0-6 %
Trombocyte	6,05	1-5 x 105/ $\mu$ L

\*Reference values based on Patrick & Smith (2011).

Meanwhile, histopathological examination of granulation mass showed sign of diffuse infiltration of polymorphonuclear inflammatory cells (Figure 1) and the presence of fibroblast-like cells within the dermal layer of the skin (Figure 2). These hematological and histopathological findings together provide strong evidence of an ongoing inflammatory or infectious process, which may have played a key role in the development of the proud flesh.



**Figure 1.** Diffuse polymorphonuclear inflammatory cell infiltration



**Figure 2.** Fibroblast-like cells that present within the dermal layer of skin

A field diagnosis was established based on the anamnesis and signalment, revealing the presence of a prominent granulation tissue mass located on the distal limb of the mare. Following a series of treatments, the granulation tissue was

successfully removed and debrided, resulting in marked clinical improvement (Figure 3).



**Figure 3.** Proud flesh in distal region of the horse's left hind limb (left). Proud flesh after surgical treatment (right)

## DISCUSSION

Proud flesh is a term that referred after exuberant granulation tissue in equine (Shivaramu *et al.*, 2021). Proud flesh is frequent case in horse that include complication of wound infection, excessive granulation tissue, and hypertrophic scarring that prevent proper wound healing process, where its often seen as presence of excessive granulation tissue with dark red fleshy look that protrude out from the wound and often discharging a sanguineous fluid (Mondal *et al.*, 2016). Microscopically, the epithelial surface appears ulcerated, while the dermal layer consists of granulation tissue with prominent neo-angiogenesis (Varasano *et al.*, 2018).

Before the surgical procedure carried out blood tests and a biopsy of the granulation tissue were performed. A biopsy of the granulation mass for histopathological examination along with blood tests were performed to support a proper diagnosis. The hematological findings in this 4 year old mare showing possible a inflammation with sign of elevated white blood cell count or leukocytosis (37.700/ $\mu$ L), mainly due to a high percentage of neutrophils 87.8% that

commonly seen in natural body response to infections and ongoing inflammation (Weiss and Wardrop, 2023). Lymphopenia with 5.8% result was also observed, showing possible prolonged inflammation (McCance and Huether, 2023). In addition, the platelet count was elevated ( $6.05 \times 10^5/\mu\text{L}$ ) that may represent a reactive response to inflammation (Kaushansky *et al.*, 2021). Histopathological examination showed diffuse infiltration of polymorphonuclear inflammatory cells and the presence of fibroblast-like cells within the dermal layer of the skin.

In this case, surgical intervention was performed to excising and debriding the granulation tissue to promote optimal wound healing. Excision and debridement were carried out as thoroughly as possible to expose healthy tissue and eliminate necrotic or excessive granulation tissue that can hind the healing process (Saharan *et al.*, 2023).

Beside the surgical approach, it is also important to do a proper post-operative care to prevent further complication. Post-operative treatment includes several injection as Hemostop<sup>®</sup> K that contain Vitamin K and Carbazochrome to help control bleeding, Flunixin as an anti inflammatory drug to control inflammation, reduce pain, and minimize fever, also Prostrep 200-250 that contain Procaine penicillin G and Dihydrostreptomycin sulphate was given as an antibiotics. Oral omeprazole is also administered as a preventive strategy to reduce the risk of gastric irritation associated with NSAID treatment (Bishop *et al.*, 2021). Following the medical treatments, along with regular bandage changes and veterinary supervision, the wound showed a satisfactory healing response as it shows an improvement without any further complications.

## CONCLUSION

This case highlights the importance of accurate diagnosis, appropriate surgical management, and also comprehensive post operative care in the successful resolution of proud flesh in equine distal limb wounds. Surgical excision and debridement, along with postoperative anti-inflammatory, antibiotic, and supportive care, promote effective healing. Consistent wound management and veterinary supervision are key to prevent complications and achieve successful recovery.

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