

Surgical Management of Exuberant Granulation Tissue in Equines: A Study of Eight Cases

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Abstract

Exuberant granulation tissue, commonly known as proud flesh/ fibroplasia, is a frustrating complication of wound healing and is mostly seen in the equines. The study was conducted on eight (six males and two females) clinical cases of exuberant granulation tissue (EGT) in equines brought to Veterinary Clinical Complex (VCC). Lesions were 15 days to 6 months old in these cases. Being more prone to injury, the limbs were affected in five cases. Surgical resection of this EGT was carried out in all the cases and the biopsy samples were taken. Histopathologically, granulation tissue was characterized by the proliferation of fibrous tissue along with blood vessels and inflammatory cells. Homecare was done with the help of antibiotics, analgesics, Vitamin-B Complex, and Vit. C. All the cases recovered after 2-3 weeks of the treatment without any complications.

Keywords: Equine, Granulation Tissue, Histopathology, Proud Flesh.

Introduction

Proud flesh is a complication of wound healing and composed of excessive granulation tissue in an exuberant manner with dark red fleshy appearance. It discharges sanguineous fluid, often protruding out from the wound, and prevents further wound healing (Mondal *et al.*, 2016; Dubey *et al.*, 2020). Continuous irritation, movement, or trauma at the wound site leads to excess and abnormal production of granulation tissue (Vegad, 2001). The granulation tissue is a high cellular, vascular, functional structure directed primarily 'to clean' the impaired area, 'to fill' the existent gap, and 'to feed the growing, active new mesenchymal tissue (Linares, 1996). However, it can also impede wound healing by hampering epithelial relocation and contraction if it turns extreme and protrudes above the adjacent skin edges and leads to the development of significant elevation above the wound edges, causing inhibition of epithelial migration. The outcome is often unsightly delayed wound repair and/or secondary complications like bacterial or fungal infections (Bertone, 1989). Granulation tissue is composed of collagen, elastin, proteoglycans, and hyaluronic acid. Furthermore, it is characterized by fibroblasts along with the newly formed capillaries and the presence of keratinocytes and inflammatory cells (Xue and Jackson, 2015).

The pathophysiology of EGT in horses is not yet clearly defined but several contributing factors such as anatomy and function of the distal limb, high motion areas, low oxygen tension and blood flow, chronic contamination, a difference in concentration of Transforming growth factors (TGF- β 1), the disparity between the synthesis and degradation of collagen and a prolonged low grade of inflammation favours the genesis of EGT (Lepault *et al.*, 2005). In addition, low oxygen tension, associated with newly formed micro-vessels, might further stimulate angiogenesis and encourage fibro-proliferative disorders (Celeste *et al.*, 2011; Deschene *et al.*, 2012). EGT usually occurs when there are injuries of the distal limbs (below knee/hock) because distal areas are mainly comprised of bone, ligaments, and tendons and lack underlying muscle which allows for an excessive amount of tension in those areas (Miller *et al.*, 2000). Formation of EGT is affected by several factors such as bandaging, location and motion at the wound site, tissues involved, breed, and iatrogenic factors (Wilmink and Weeren, 2004). Topical antibiotic ointments are frequently used with bandages over wounds, which further makes a moist, hypoxic environment that stimulates EGT formation. Therefore, the present study aimed to surgically treat the EGT and investigate the histopathological alterations in equines.

Description of Cases and Treatment

The present study was conducted on eight cases of proud flesh in equines brought to VCC, of the university. There was also a history of injury in these cases resulting in the formation of proud flesh. All these cases were of 15 days to 6 months old. Out of eight cases (six males and two females), limbs were affected in five horses, as limbs are more prone to injury (Fig 1-8). The descriptions of all these cases are given in Table -1.

Table 1: Description of all cases of EGT in equine

Sl. No.	Case No.	Area/ Part involved
1.	Male	Left Hind Limb
2.	Male	Left Hind Limb
3.	Male	Chest
4.	Male	Left Hind Limb
5.	Male	Left Hind Limb
6.	Female	Chest
7.	Male	Scrotal area
8.	Female	Right Hind Limb

All the equines were fasted for 12 hrs and were administered with inj. Tetanus toxoid (1500 I.U.) intramuscularly aseptically prior to surgery. The equines were pre-medicated with inj. xylazine (1.1 mg/kg body weight) and inj. butorphanol (0.03mg/kg body weight), intravenously. Anaesthesia was induced and maintained with inj. thiopentone sodium solution (5%). The proud flesh was excised aseptically and the bleeding vessels were ligated using absorbable suture material or were arrested by local application of potassium permanganate crystals. In this process, the granulation tissue was excised to be level with the skin edges (Fig. 9a and b). Once the tissue was debrided, a pressure bandage was applied to help stop the bleeding (Fig. 13). The representative tissue sample was

fixed in 10% formalin and processed for histopathology and stained with haematoxylin and eosin as per Luna (1968). Inj. Ceftriaxone Sodium @ 25-50mg/kg I/M BD and Inj. Phenyl butazone @ 4.4mg/kg I/M BD, Inj. Vit. B Complex @ 10 ml (total dose) IM OD and Inj. Vit. C @ 7.5gm (total dose) I/M OD were administered for 7 days. Besides, Bol. Serratiopeptidase (Bol. DPSERA-S® 120 mg, Indo Safe Pharmaceuticals) PO OD was advised for 10 days. All the cases recovered after 2-3 weeks of the treatment without any complications (Fig. 10).

In the present study, the granulation tissue was excised to be level with the skin edges and for further confirmation of the nature and type of tissue growth, histopathology was performed. In the present study, the hind limbs were affected in 62.5 % of cases. Histopathological examination revealed the presence of granulation tissue in all the cases. Granulation tissue was characterized by the proliferation of fibrous tissue along with blood vessels and inflammatory cells (Fig.11). In case No. 5, an excessive number of eosinophils were present (Fig.12).



Fig.1



Fig.2



Fig.3



Fig.4



Fig.5



Fig.6



Fig.7



Fig.8

Fig. 1-8: Gross appearance of EGT lesions in equines



Fig. 9(a and b): Granulation tissue was excised to be level with the skin edges of equine



Fig. 10: At 2-3 weeks of treatment

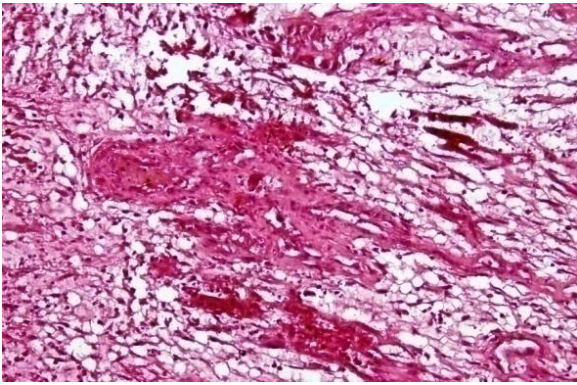


Fig. 11: Microphotograph of equine tissue sample suffering from EGT condition showing granulation tissue characterized by proliferation of fibrous tissue (black arrow) along with blood vessels and inflammatory cells. (H&E stain) (x400)

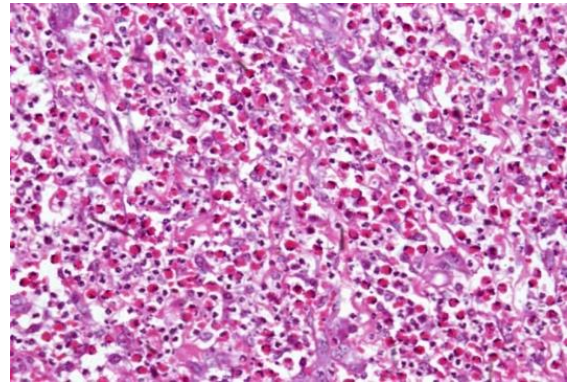


Fig. 12: Microphotograph of equine tissue sample suffering from EGT condition showing granulation tissue with an excessive number of eosinophils (black arrow) in case No. 5 (H&E stain) (x400)

Discussion

Wound healing in horses is often complicated by the formation of exuberant granulation tissue/proud flesh in which the granulation tissue proliferates to an excessive end thereby preventing wound re-epithelization (Cochrane *et al.*, 2003). This type of tissue is unhealthy and wounds will not mend until it is debrided. Microscopically, the epithelial surface appears ulcerated, while the dermal layer consists of granulation tissue with prominent neo-angiogenesis (Varasano *et al.*, 2018). On the basis of gross and microscopic findings, EGT was confirmed.

Many treatment modalities for the management of proud EGT have been debated in the literature such as chemical cauterization, thermo-cauterization, cryosurgery, bandaging, electromagnetic stimulation, topical antimicrobials, gentian violet, tetra-chloro-decaoxide and boric acid ointment impregnated gauge, steroids application or surgical excision (Bertone, 1989; Eesa and Bader, 2011) followed by skin grafting (Mondal *et al.*, 2016). Neovascularization with the proliferation of endothelial cells along with infiltration of different mononuclear cells and fibroblasts on H & E staining of the tissue samples is regarded as confirmation for EGT (Basha *et al.*, 2019).

The surgical resection of the exuberant granulation tissue is considered the best treatment modality (Shivaraju *et al.*, 2021) because it is easy to perform, provides tissue for histological evaluation, and preserves the epithelial margin. The healing in surgically resected EGT cases is faster than in non-surgically resected masses (Eesa and Bader, 2011). Serratiopeptidase eliminates inflammatory swelling, accelerates liquefaction of pus, and enhances the action of antibiotics (McGrath and Gary, 2005). Noteworthy, bandages can promote the development of EGT in different ways, including the decrease in oxygen tension in the wound tissue. Contrarily, the use of bandages can also promote healing (Theoret and Wilmink, 2008). The decision to use bandages should therefore always be taken judiciously. The current study has presented the successful management of exuberant granulation tissue in eight horses, by surgical excision under general anesthesia followed by regular dressing, antibiotics, and anti-inflammatory drugs therapy.

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Contribution by Authors

Equal contribution

Conflict of Interests

There is no conflict of interest.

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