Meeting challenges of equine wound management

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ABSTRACT

Equine wounds are some of the most challenging ailments faced by vets because of a number of factors, each of which needs to be considered for successful treatment. No all-encompassing treatment is available for wounds in horses, given the diverse nature of presentation. As a result, many factors need to be considered to elicit effective treatment. This article addresses considerations for management of wounds, and attempts to provide the reader with an overview of how to approach wound assessment.

Wounds in equine practice can be challenging due to prolonged treatment, cost and sometimes unknown outcome (Baxter, 1998). Wound size does not always correlate with the severity of the wound as often, small innocuous wounds can involve vital structures. This may be complicated by delayed healing on distal limbs compared to that at other parts of the body (Sørensen et al, 2014).

Figure 1. A large chronic wound over the dorsal aspect of the tarsus. The wound is healing by secondary intention. Image: © Dave Rendle.

Wounds may be restricted to the skin, but often involve underlying and adjacent tissues. Open wounds are classified into type of trauma, such as abrasions, lacerations, avulsions or incisions. It is helpful to consider the nature of the wound as this may indicate the severity.

Closed wounds can easily be overlooked. Crushing or contusion injuries, which at the time of trauma do not have skin loss, can have substantial disruption to the underlying tissues, with future skin loss and prolonged recovery.

Wound healing can be divided into three phases (Auer and Stick, 2012)

- inflammatory or lag phase – which involves haemostasis and acute inflammation
- proliferative phase – when tissue formation occurs
- remodelling phase – during which the healing tissue regains strength

These phases overlap and should occur in a timely manner to achieve functional and anatomic integrity. For this to occur, the practitioner should aim to create an ideal healing environment

through treatment choices. Ideally, management of equine wounds allows the healing process to progress unhindered.

Initial examination

As with any disease or injury, a comprehensive physical examination is key. The overall health status of the patient should be assessed as systemic disorders may delay wound healing (Stashak, 1991a). Tetanus status of the patient should also be known. To perform a full clinical examination, a safe environment for both horse and handler must be provided.

Patient restraint may require sedative use. Commonly, ?-2 agonists will provide adequate restraint and can be used in combination with an opioid to provide greater sedation and analgesia (Stashak, 1991b). Phenothiazine tranquillisers, such as acepromazine, should be avoided due to their peripheral vasodilator effects, which may result in a serious decrease in blood pressure, particularly in those horses that have had significant blood loss and may be in shock (Gasthys et al, 1990).

Imaging is a vital component for wound assessment and should be used to ascertain the involvement of underlying and adjacent structures. Radiography will determine osseous damage, while ultrasonography can be used to determine soft tissue and synovial damage, and is the most sensitive method of determining damage to the periosteum. If there is a high suspicion of involvement of underlying structures, probing the wound will limit the usefulness of future ultrasonographic examination as it instils air into the wound. Therefore, the use of ultrasonography should be considered as a primary tool in determining the extent of any puncture wound.

Advanced imaging has revolutionised the investigation of penetrating solar injuries. MRI can pinpoint a nail tract and take the guesswork out of which structures are in order to allow fast and effective treatment to be performed as necessary (Werpy, 2014).

Blood loss

Treatment should aim to control bleeding, which can be achieved with pressure bandaging. General anaesthesia should be avoided due to the increased risks involved in a cardiovascularly compromised patient. Wounds involving a major blood vessel are most commonly found in the pastern region involving the palmar/plantar digital vessels. Suturing palmar digital vessels is usually impossible because the severed ends retract into the wound.
If larger vessels are involved ligation may be necessary.

Wound healing is not affected by anaemia until the PCV falls to less than 2% or dehydration accompanies blood loss. This hypovolaemic state results in vasoconstriction and reduced oxygen tension at the site of injury, increasing the risk of infection by slowing chemotaxis and phagocytosis (Wilson, 2005).

Repair

Figure 2. A three-layer full limb dressing will minimise movement and aid healing of the limb. Image: © Dave Rendle.

The prime objective of repair is re-establishing an epithelial cover and recovery of tissue integrity, strength and function (Auer and Stick, 2012). If an injury involves loss of skin with an intact blood supply, primary closure should be performed (Hendrix and Baxter, 2005). Historically the “golden period” of four to 12 hours has been considered the time during which primary closure can be accomplished with little risk of infection. However, this is heavily dependent on others factors, such as contamination, mechanism of injury, degree of trauma, initial management and location of the wound (Wilson, 2005).

Covering exposed bone or tendon with soft tissue is thought to decrease the formation of

sequestrum and improve healing. Closing as much of the wound as possible will improve cosmetic and functional outcome and lessen the amount of second intention healing required (Hendrix and Baxter, 2005).

A large retrospective study revealed primary closure was successful in only 24% of horse wounds and 39% of pony wounds, more than half of which were located on the limb (Wilmink et al, 2002) indicating the majority of wounds heal by secondary intention.

Delayed healing

Many wounds cannot be sutured because of massive tissue loss, extreme contamination, continuous movement
and skin tension, as well as a long interval since the time of injury. If a wound has significant swelling or contamination, making primary closure impossible, delayed closure should be attempted.

Wet-to-dry bandaging can be used to debride the wound and reduce swelling (Hendrix and Baxter, 2005) with the principal aim of treatment to create a non-contaminated wound suitable for closure.

Second intention healing leads to scar tissue formation, and function and appearance may be adversely affected. However, this form of healing may be the only viable option for a wound that has a large amount of skin loss at the time of injury or a non-viable blood supply. Healing of this kind consists of fibroplasia followed by wound contraction and epithelisation.

Treatment should be aimed at creating a healthy bed of granulation tissue devoid of any necrotic tissue. Sharp debridement of the wound may be required to remove necrotic tissue. Bandage techniques must aim to reduce movement at the wound site as well as reduce further contamination. External coaptation may be used in addition to bandaging to achieve limb immobilisation (Whitfield-Cargile et al, 2011). Skin grafting may be required to allow complete healing, but this should be delayed for six to eight weeks to allow maximum skin contraction to occur before grafting (Hendrix and Baxter, 2005).

Tendon involvement

Wounds with extensor tendon involvement have a more favourable prognosis compared to those that involve flexor tendons (Foland et al, 1991; Belknap et al, 1993; Bertone, 1995). Reports of prognosis following flexor tendon injury vary from 18% to 60% of horses returning to their previous level of exercise (Foland et al, 1991; Whitfield-Cargile et al, 2011). Surgical debridement under general anaesthetic and tenorrhaphy may be required in extreme injuries.

Casting the limb or a PVC splint can be used in addition to bandaging to provide stability of the limb following primary repair of the tendon or wound. Limb function may return in three to six weeks

(Hendrix and Baxter, 2005) – at which point external support may be removed.

Nerve damage

If nerve damage occurs in the distal limb, which is most often noted with pastern or heel bulb wounds, little deleterious effect is seen on the patient and it rarely impacts on treatment choice. The palmar digital nerves will regrow after transection in an attempt to re-innervate the area.

Neuroma formation is a rare complication of neuronal healing, but can be a cause of persistent lameness. If this consequence occurs, clinical signs include focal pain on palpation at the site of the wound. Diagnosis involves infiltrating the area with local anaesthetic and finding a positive response to lameness. Treatment involves surgical removal (Hendrix and Baxter, 2005).

Sequestrum and foreign body

In wounds where medical management is unrewarding and persistent draining tracts form, foreign body or necrotic material should be considered as an underlying cause. Both present with similar clinical examination findings and require surgical removal (Gift and Debowes, 1989).

Figure 3. A large chronic wound at the point of the hock is an extremely challenging region to deal with due to the high motion in this area. Image © Dave Rendle.

Any area of bone that has little soft tissue covering is susceptible to sequestrae formation. The most common sites include the dorsal metacarpus, metatarsus, skull, calcaneus, distal radius, tibia and phalanges (Lewis and Heinze, 1970). The affected sites most commonly have some degree of soft tissue swelling and, often, a coexisting draining fistulous tract. There is rarely significant

lameness, but often pain on palpation of the region (Moens et al, 1980).

Sequestrum formation often occurs due to periosteal disruption, the underlying cortical bone is prone to developing ischaemia, because the periosteum supplies blood to this zone. For a sequestrum to then develop, secondary bacterial colonisation occurs. This may be due to direct contamination from the wound, but has also occurred with blood-borne bacteraemia where no associated wound was found. Treatment of choice is sequestrectomy (Clem et al, 1988; Gift and Debowes, 1989; Firth, 1987; Lewis and Heinze, 1970) and prognosis following sequestrum removal is good, provided there is not extensive associated soft tissue, tendon or bone injury sustained at time of trauma.

A penetrating foreign body should be differentiated from that of a sequestrum with diagnostic imaging as clinical signs are similar. Many horses with foreign bodies present with a non-healing persistent draining tract. Treatment also requires surgical removal of the foreign body as well as dissection of any associated necrotic tissue.

Antimicrobials

Antimicrobial medication should be considered an adjunct to the general care of wounds and not a substitution for lavage, drainage and other physical care intended to promote healing (Brumbaugh, 2005). Antibiotic choice should be determined by culture and sensitivity in the case of chronic draining wounds.

Axillary wounds should be monitored closely for the development of subcutaneous emphysema and impending pneumothorax. If primary closure is not possible in these cases, the wound should be packed and the horse cross-tied to avoid movement and exacerbation of sucking air into the thoracic cavity (Hendrix and Baxter, 2005).

If a wound is found to communicate with a synovial structure, the gold standard treatment remains arthroscopic lavage under general anaesthesia. It is essential synovial involvement is found in a timely manner and prognosis following treatment of a wound involving a synovial structure is good, with 80% of horses returned to their pre-operative level of activity (Wright et al, 2003).

Wound anaesthesia

To perform wound repair in the standing horse, neuroleptanalgesia and local anaesthesia may be required, especially in the distal limb where horses can be extremely sensitive. Intralesional anaesthesia with 2% concentrations of lidocaine or mepivicaine is effective and safe. Studies have inconsistently reported they may inhibit collagen synthesis, platelet aggregation and bradykinin-stimulated antiaggregation of platelets, and may cause vasoconstriction and thrombosis in micro vessels (Borg and Modig, 1985; Grant et al, 1989; Berntsen et al, 1992; Az-ma and Hardian, 1995; Drucker et al, 1998). However, the benefits of their use often outweigh the disadvantages.

Dead space

Dead space allows the seepage and accumulation of blood and serum in a warm and moist environment that is ideal for bacterial proliferation, thus encouraging infection (Wilson, 2005). To obliterate dead space, layered wound closure, compression bandages, drainage or suture obliteration may be required (Trotter, 1989).

Recent advances

Most recent advances in wound management include the use of ultrasonic-assisted wound therapy and a vacuum-assisted closure wound lavage system for successful management of a chronic sepsis of the antebrachiocarpal joint (Rettig and Lischer, 2015). Promising findings have also been published looking at the use of mesenchymal stromal cells to improve cutaneous healing in vitro (Bussche et al, 2015).

Equine wound management is a commonly encountered, yet complex, presentation. To provide optimum treatment and outcome, a thorough physical examination must be performed. Additionally, imaging may be required to fully ascertain the structures involved.

Only with this information can a reasonable treatment plan and prognosis be determined.

A thorough knowledge of anatomy and relevance of location can help to speed up relevant treatment and improve costs and outcome.

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