

THERAPEUTIC APPROACH IN MANAGING DEGLOVING INJURIES OF THE FRONT LIMBS IN A DOG - A CASE REPORT -

**Alexandra PETEOACA, Andreea ISTRATE, Ana GOANTA,
Gina GIRDAN, Alina STEFANESCU, Andrei TANASE**

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Mărăști Boulevard, District 1, Bucharest, Romania

Corresponding author email: alexandra_peteoaca@yahoo.com

Abstract

The aim of this case report is to present an accessible therapeutic approach that facilitates the healing of extensive degloving wounds. A 3 months old dog was presented to the emergency room for traumatic injuries with extensive tissue necrosis and infection of the front limbs. The animal was recumbent, tachypneic and exhibited pain. The temperature, blood pressure, heart rate were in the normal range. Further investigation revealed no osseous implication and a moderate to severe anaemia. The emergency treatment was focused on pain management, fluid therapy and primary care of the wounds. The wound management followed this succession: wet-to-dry dressings for the first two days, surgical debridement, honey dressings, hydrocolloid dressings alongside supportive therapy. This approach promoted the healing process, resulting in a full reepithelialization of the affected area, eliminating the need for skin grafts or reconstruction techniques. The honey and hydrocolloid dressings have to be properly used in the correct phase to offer a good healing environment for reepithelialization. We concluded that wound management should be a global approach that combines systemic and nutritional support with topical healing promoters.

Key words: degloving wound, honey dressing, hydrocolloid, infected wound, traumatic injury.

INTRODUCTION

Wound management is one of the most discussed subjects in medical literature. There are numerous articles that argue the advantages and disadvantages of commercial dressings. Comparative studies and detailed articles discuss each step of the healing process and recommend several protocols to apply in extensive wounds and burns. An agreement about the best products and the sequence in which they should be applied was never reached, but several guidelines have been created (Woodlands, 2014; Abramo et al., 2008; Anderson, 1996).

A degloving or a shearing wound represents a severe type of soft tissue injury in which the skin loses attachments to the subcutaneous tissue. Most times the affected skin is not completely detached, from the surrounding skin, but is disconnected from the tissues underneath (Tsioliet et al., 2019).

The most common cause of degloving injuries in dogs is the motor vehicle accident, during which the limbs are sheared in contact with the ground.

Frequently the distal area of the limbs is affected, a low number of cases present with thoracic or abdominal degloving injuries are mentioned in the literature.

It is unanimously believed that all patients with degloving wounds should be first considered as emergencies due to the traumatic shock and receive proper care and therapy according to this status. Wound management comes second and should begin only after the patient is stable, except in patients with massive active bleeding. Since degloving injuries arise from traumatic events often the level of wound contamination is really high. Until a long-term plan is conceived, the wound should be cleaned, dressed and analgesia should be provided.

The wound healing process can be divided into 4 stages:

- Inflammatory phase;
- Debridement phase;
- Proliferation phase;
- Maturation phase (Rice, 2000).

The inflammatory phase begins immediately after the traumatic event and defines the short interval in which the wound bed is filled with blood and lymph, in which vasoconstriction

followed by clot formation and vasodilation occur. This is the beginning of a series of events involving inflammatory cells and mediators that prepare the wound for the following healing stages.

In the debridement phase, the necrotic tissue (the non-viable tissue impeding the healing process and being a good environment for bacterial proliferation) is removed by an autolytic process.

The proliferation phase is characterized by granulation based on two main elements: capillaries and fibroblasts.

Wound contraction represents the centripetal movement which pulls wound margins towards its centre and diminishes its extent. Wound contraction happens simultaneously with granulation and stops when the tension in the surrounding skin is too high or when the wound edges are in direct contact.

Epithelialization is the third process of the proliferative phase that consists of epithelial cells proliferation and migration from the wound edges towards the middle of the defect.

The maturation phase lasts up to 1-2 years after the traumatic event occurred. The initial collagen is replaced by a stronger form of collagen, which determines an increase in strength of the scar tissue. The mature scar tissue will only reach 80% of the strength of the original epithelium, this new tissue being weaker, less elastic, without pigmentation, without hair follicles and sweat or sebaceous glands (Pavletic, 2010).

The products used in wound vary according to the healing phase.

After an initial thorough assessment, the wound has to be re-evaluated periodically to decide if changes have to be made in the management protocol chosen for each particular case (Bowl & Friend, 2011).

From a functional point of view wound care products can be classified as follows:

- Wound protection products;
- Wound hydration products;
- Moisture retention products;
- Exsudate management products;
- Wound debridement products.

Most products existing on the market for wound management have two or more of these properties and multiple potential uses

(Campbell, 2006; Doughty, 2005; Morgan et al., 1994; Ramsey et al., 1995; Stashak et al., 2004).

In this context, we are describing a case in which we managed degloving wounds using a complex medical approach, that combines topical application of several products and systemic support.

MATERIALS AND METHODS

The patient was presented during the night shift at the emergency room, after being found by the side of the road. Due to the fact that the dog was a stray, there was no background information. After a first assessment of the case, it could be said that the dog preferred lateral recumbency, it had degloving wounds on both front limbs and severe pain was evident when trying to change its position. Its rectal temperature was in the normal range (38.9°C), it was tachypneic, with a normal heart rate frequency. At the time of admission, the dog weighed 6 kg and was approximately 2 to 3 months old.

A rapid assessment of haemoglobin and hematocrit was performed on a Hemo Vet Veterinary Hemoglobin Analyzer, with the following findings: Hb 9.3 g/dL, Hct 27%. An intravenous catheter was inserted into the saphenous vein for intravenous (IV) fluids, the animal was hospitalized and admitted to the intensive care unit.

Analgesia was provided first as a bolus (buprenorphine) and was continued as a constant rate infusion, as a pain-free animal is one of the main goals of emergency medicine and wound management. An IV antibiotic was used (ceftriaxone) considering the high level of contamination of the wound bed.

Due to the extensive wounds that involved both front limbs up to humerus, with great alteration of the soft tissue, it was clinically impossible to determine if the bones were affected in the unanesthetised patient. The extent of the injuries in the left front limb was larger compared to the right. The injuries presented with extensive oedema and necrotic tissue, along with foreign bodies, dirt, grass awns, vegetable debris were easily visible. The hair was clipped and a wound toilet was performed

with saline solution and a covering bandage was applied until the next day.

The next morning the radiographic examination (Fig. 1) revealed no osseous implication, although clinically there was a visible leg axis deviation, probably caused by the articular and soft tissue injuries and potential nutritional deficiency.



Figure 1. Antero-posterior X-Ray of the front limbs

Once a fracture was excluded, a carpal hyperextension syndrome was suspected, ligament injuries in the carpal region being a differential diagnosis.

A complete blood count and serum chemistry were performed. Low hematocrit and hemoglobin levels associated with low total protein were the most worrying laboratory findings. Due to the large area of skin loss, a great amount of plasma and implicitly protein was lost through extravasation similar to burn patients with extensive wounds.

To combat the protein loss and anaemia, a fresh blood transfusion was performed. IV fluids were given for several days alongside antibiotic and analgesic therapy. Due to the cost of the treatment and the good evolution of the wound healing, the owner declined the antibiogram. Malnutrition alters the healing process, thus nutritional support must be provided. Sometimes the animal is in too much pain to eat and simply addressing this issue will solve the lack of appetite.

More rigorous wound management was started on the second day of hospitalization. Although

analgesics were given, the animal exhibited a high level of pain and therefore sedation was required for mechanical debridement and dressing application. The dog was recumbent for the first few days.

At this point, some of the necrotic tissue that was clearly non-viable was removed. Grass



Figure 2. Aspect of the left front limb after the surgical debridement

awns that migrated and were visible on the surface of the wound and healthy skin were extracted. The soft tissue that remained intact on the front limbs was swollen.

On day 4 a surgical debridement under general anaesthesia was performed, removing all non-viable tissue and trying to preserve all questionable viable tissues for later re-evaluation (Fig. 2).

On the same day, a CBC (complete blood count)

revealed decreased haemoglobin and hematocrit levels (Hb 7.7 g/dL, Ht 23%), and a second transfusion was done.

The autolytic debridement was really slow and a ring of necrotic tissue began to act as a tourniquet making it necessary to perform a surgical debridement to create clean and active wound edges to promote and facilitate healing. Although the left forelimb was covered with a flap of skin, there was no vascularisation and this tissue became necrotic and had to be removed. All tissue that seemed viable was preserved.

The wound appeared clean, but there was extensive exsudation and more autolytic debridement was expected to occur.

During the first couple of days, the dressings were changed twice daily, using a dry-to-dry bandage technique at first and then using a silver sulfadiazine ointment as an antiseptic under the dry gauze.

Starting day 4 a honey dressing was chosen for this case, for the remaining of the debridement phase in order to promote granulation (Fig. 3).

The evolution was favourable, the dog started eating by itself, began to walk for short periods of time and exhibited less pain. Alongside the dressings, systemic support was provided with

pain medication, antibiotics, osteoarticular supplements and a balanced diet for growing dogs.



Figure 3. Applying a honey dressing over a wound

For the first week, the bandages were changed twice daily. At each bandage change, the wound was lavaged with a lactated Ringer's solution, removing all the dead tissue and exudate, leaving the wound bed clean and less susceptible to bacterial infection. The lavage was stopped as soon as the granulation started and the wound had a clean aspect (Buffa et al., 1997).

Honey dressings were used due to the multiple healing properties that honey offers and due to the low cost of this technique.

Honey was applied both directly on the wound or on the gauze, and we found it best to add the honey to the dressing and then apply it on the wound surface, rather than directly on the wound. When the exudation is more intense is better to use more fluid honey, at body temperature. When the granulation process begins and the exudation diminishes it is better to use a more solid form of honey, which is easier to apply, especially when large areas are involved and because it takes more time until it is absorbed by the gauze (Fig. 4).

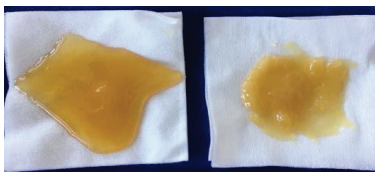


Figure 4. Honey dressings: liquid honey (left) and chrystalized honey

The honey should be applied in a thick layer, so there is always a layer of honey

between the gauze and the wound, thus preventing the gauze to act as a wet to dry bandage.

For the first couple of days, we used a coarse woven gauze, recommended for the debridement stage. This type of dressing is not

intended for direct contact with the wound, as it leaves lint, is abrasive and not sufficiently absorbent. A non-woven gauze was used for the following days. The latter has superior absorbent capacity due to the fibres being tightly pressed together. This fabric is softer and more resistant to tear, leaves little to no fibres and adheres less to the wound bed. We found that having increased absorbency prevents the honey from reaching the outer layers of the bandage for a longer period of time (Fig. 5).

In order to facilitate the development of a healthy bed of granulation, the honey dressing was changed twice daily for the first week followed by a daily change of the dressings (Gethin, 2008).

The wound was reassessed daily as the patient was hospitalized. To prevent damage to the

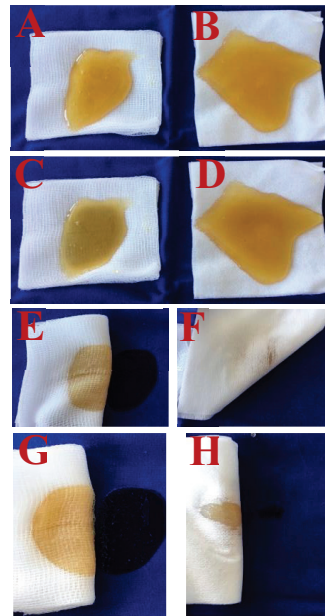


Figure 5. Absorbency difference between woven and non-woven gauze when used for honey dressings: A-honey application on a woven gauze; B-honey application on a non-woven gauze; C-aspect of the honey dressing after 30 minutes (woven gauze); D-aspect of the honey dressing after 30 minutes (non-woven gauze); E-honey absorbed into the woven gauze after 30 minutes; F-honey slightly absorbed into the non-woven gauze after 30 minutes; G-honey absorbed into the woven gauze after 120 minutes; H-honey slightly absorbed into the non-woven gauze after 120 minutes

bandages and perturbation of wound healing, the dog wore an Elizabethan collar during the entire treatment period.

The application of honey dressings was ceased on day 13 when the wound had a healthy granulation bed that allowed the second intention healing to occur and the epithelialization process started (Vyhlidalova et al., 2018).

From this point, hydrocolloid dressing was used (Fig. 6). The hydrocolloid dressing was changed every other day for the first week and then at every 3-4 days (Gouletsou et al., 2016), (Thomas, 2008).



Figure 6. Hydrocolloid dressing applied of the left and right leg starting day 13

The patient was discharged after 39 days.

The wound bed shrunk considerably on the left leg, while the wounds on the right leg were closed at the time of the discharge.

The owner had to bring the dog to bandage change twice per week, the evolution under the hydrocolloid dressing being satisfactory (Hess, 1999).



Figure 7. Right front leg digital wound aspect (A-day 2; B-day 11; C-day 13; D-day 26; E-day 29; F-day 31; G-day 37; H-day 45; I-day 52)



Figure 8. Right front limb wound healing aspect

(A-day 2; B-day 9; C-day 11; D-day 15; E-day 29; F-day 34; G-day 37; H-day 45; I-day 52)

The evolution of the wound healing process during the first 52 days is presented in Figures 7, 8 and 9.

The owner stopped bringing the dog for bandage change for almost 3 weeks, doing this procedure in a different clinic. The dog left unsupervised and without the E-collar for a couple of days. The dog was brought back to the clinic on day 80 with a contaminated wound on the left leg, larger than the defect that it had on the last follow-up (day 52). The dog was rehospitalized and the wound management was reconsidered. After the wound regained a clean aspect, using lavage and a hydrocolloid paste, we went back to the Hydrocolloid dressings, which we changed every 2-3 days.



Figure 9. Left front limb wound healing aspect (A-day 2; B-day 5; C-day 6; D-day 10; E-day 12; F-day 13; G-day 27; H-day 39; I-day 52)

A complication that we encountered using only the hydrocolloid dressing was hypergranulation, a process which stops the healing process by pausing it during the granulation phase (Fig 10).

The new epithelium that is forming, can't slide over the granulation bed, which makes the wound contraction also impossible.

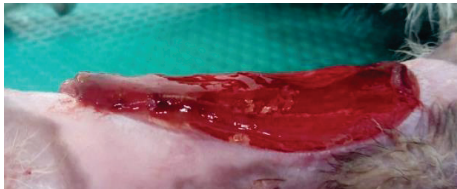


Figure 10. Hypergranulation aspect of the wound. A rim of granulation tissue developed, interfering with the epithelialization and wound contraction

To solve this problem we changed the dressing again, using the honey dressing with a daily change for the following period.

The patient remained hospitalized until the primary healing process occurred, with full wound closure. The left leg, that had more extensive wounds, has fully re-epithelialized at day 170 (Fig. 11).

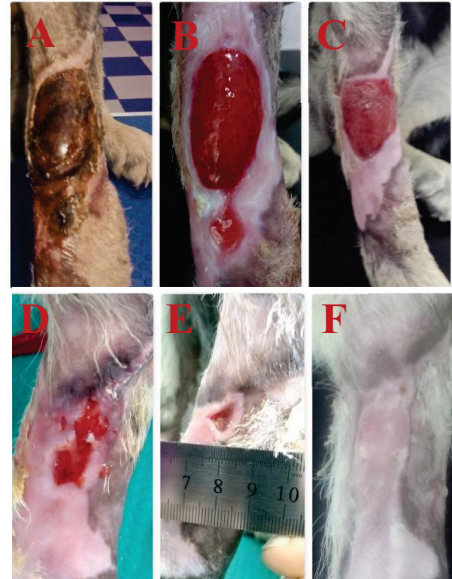


Figure 11. Left front limb wound aspect during the second hospitalization period (A-day 80; B-day 94; C-day 116; D-day 136; E-day 164; F-day 170)

The recommendation for these cases is to proceed with as much caution as before the wound is closed, due to the fact that the new epithelium is really thin and fragile, gaining strength slowly over a long period, which can extend up to 1.5 years.

If the dog is restless, tends to excessively lick the wound area and is prone to reopen the wound, it should continue to wear the e-collar and/or some sort of protective bandage over the newly re-epithelialized area.

The dog was discharged with fully healed front limbs, at almost 7 months of age, and a weight of 23 kg (Fig. 12). A slight lameness of the front

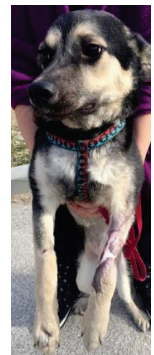


Figure 12. Full re-epithelialization of the shearing wounds (day 200)

left leg could be observed after excessive effort, but with no pain exhibited on the orthopaedic examination.

RESULTS AND DISCUSSIONS

Using this complex approach we obtained full epithelization of these shearing wounds located on the front limbs, with medium scarring and with hair regrowth over a significant area.

Often a lingering foreign body is a common cause for delayed healing, in this case, several grass awns were found in the soft tissue surrounding the wound, once the inflammation started to diminish.

Due to the anatomical characteristics of the affected area, where the muscular structures are poor and the skin is less elastic than in other areas, and tightly covers the limbs, the wounds couldn't be closed with sutures (Budras et al., 2007). Tension sutures weren't a choice either, the peri-wound tissues were not healthy enough to hold the sutures.

A surgical approach that could've been considered in this case, was the use of a skin graft, but this reconstruction technique was impossible as the lesion had intense exsudation and oedema, low vascularization, and thin edges of uncertain viability. The wounds characterised by these elements are best left to heal by second intention.

A dog with anaemia suffers delayed wound healing due to the fact that less oxygen reaches the affected tissues, and addressing this problem implicitly helps with the healing process.

Although at first, we preferred to apply tight bandages to help diminish local oedema, the other layers of bandage should be applied looser, to allow the oxygen to reach the wound, oxygen is one of the essential elements a wound needs to heal.

The bandage had to cover the paw, as the distal extremity was prone to swelling due to the damaged venous and lymphatic system of the limbs.

A properly made bandage has to have a layer that is in direct contact with the wound called the dressing (different types as described in the article), a second absorptive layer and an outer protective layer, each of these having an important role in wound management (Fig. 13).

While the honey has to extend its coverage beyond the wound edges, the hydrocolloid dressing should only cover the wound bed, as it may lead to maceration of the skin when left in contact with the healthy tissue for several days.

There is a lot of controversy around honey dressing and which type is best for topical medical use (Malone & Tsai, 2016; Mathews et al., 2001; Medhi et al., 2008; Ruiter et al., 2007; Bergman et al., 1983). From our experience the crystallized form is better from a technical point of view, being easier to apply and remaining longer on the wound surface until it is absorbed into the bandage.

We used crystallized acacia honey from a local producer, not a store brand. The only FDA (Food and Drug Administration) approved honey is the Manuka Honey, but a lot of articles on wound management both in humans and animals, mention other types of honey being used, especially raw honey, with the main concern being clostridial contamination (Bischofberger et al., 2011; Grego et al., 2016). There are commercial honey ointments but they are recommended for less extensive injuries. The topical application of honey offered a physical barrier against contamination because of its viscosity, and through its antiseptic properties.

Under the honey dressing, the wound underwent an autolytic debridement, removing all necrotic tissue in a couple of days. The honey deodorized the wound, promoted angiogenesis and granulation by providing a moist, nutritional, antimicrobial environment.

Using honey as a dressing choice is more messy and difficult to handle compared with the more modern wound dressings, but these technical difficulties can be easily overcome (Bose, 1982; Yaghoobi et al., 2013).

The hydrocolloid dressing provided a moist environment, by promoting epithelialization and wound contraction under a gel-like layer, held within an adhesive outer layer that is

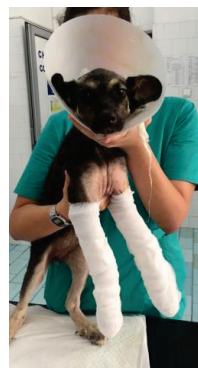


Figure 13. The aspect of the covering bandage

hydrophobe and impermeable to other contaminants (Singh et al., 2004). The wound remained hydrated while the mild drainage was absorbed by the hydrocolloid dressing. These dressings do not require frequent changes and are less painful to change, allowing the wound to heal undisturbed. The hydrocolloid allowed the healing to move forward because if the repair phase, during which granulation occurs, persists, the epithelization will be stopped or delayed, as it was the case during the second hospitalization.

CONCLUSIONS

This case illustrates that the honey dressing is a good choice for the first stages of the healing process until epithelialization starts; the hydrocolloid dressing offers a good environment for wound healing during the proliferation phase; the efficacy of the combined use of honey and hydrocolloid dressings should be proved in a complex study on multiple dogs with various wound types; There is not a single dressing that works in all the healing phases and each wound has to be assessed individually and re-evaluated periodically and the bandage changed in accordance with the healing process. Proper care and monitoring are easier if the animal is hospitalized at least for the first period. Systemic support should be provided, the case should be approached globally and focus should not remain solely on wound management. Several complications should be expected as wound healing is a complex and time-consuming process, these often being slow to heal injuries.

REFERENCES

- Abramo, F., Argiolas, S., Pisani, G., Vannozzi, I. and Miragliotta, V. (2008). Effect of a hydrocolloid dressing on first intention healing surgical wounds in the dog: a pilot study. *Australian Veterinary Journal*, 86(3), pp.95-99.
- Anderson, D. (1996). Wound management in small animal practice. *In Practice*, 18(3), pp.115-128.
- Bergman, A., Yanai, J., Weiss, J., Bell, D. and David, M. (1983). Acceleration of wound healing by topical application of honey. *The American Journal of Surgery*, 145(3), pp.374-376.
- Bischofberger, A., Dart, C., Perkins, N. and Dart, A. (2011). A Preliminary Study on the Effect of Manuka Honey on Second-Intention Healing of Contaminated Wounds on the Distal Aspect of the Forelimbs of Horses. *Veterinary Surgery*, p.n/a-n/a.
- Bose, B. (1982). HONEY OR SUGAR IN TREATMENT OF INFECTED WOUNDS?. *The Lancet*, 319(8278), 963.
- Bowl, K. and Friend, E. (2011). Small animal wound management: Options for wound closure. *Companion Animal*, 16(5), pp.13-18.
- Budras, K., McCarthy, P., Fricke, W., & Richter, R. (2007). *Anatomy of the Dog* (pp. 16-28). London: Manson Pub.
- Buffa, E., Lubbe, A., Verstraete, F. and Swaim, S. (1997). The Effects of Wound Lavage Solutions on Canine Fibroblasts: An In Vitro Study. *Veterinary Surgery*, 26(6), pp.460-466.
- Campbell, B. (2006). Dressings, Bandages, and Splints for Wound Management in Dogs and Cats. *Veterinary Clinics of North America: Small Animal Practice*, 36(4), pp.759-791.
- Doughty, D., (2005). Dressings and More: Guidelines for Topical Wound Management. *Nursing Clinics of North America*, 40(2), pp.217-231.
- Gethin G. (2008). Efficacy of honey as a desloughing agent: overview of current evidence. *EWMA J* 8:31–35
- Gouletsou, P., Galatos, A., Psalla, D., Lymperis, A., Papazoglou, L., Karayannopoulou, M., Tsioli, V. (2016). Effects of two occlusive, hydrocolloid dressings on healing of full-thickness skin wounds in cats. *Veterinary And Comparative Orthopaedics And Traumatology*, 29(04), 298-305.
- Grego, E., Robino, P., Tramuta, C., Giusto, G., Boi, M., & Colombo, R. et al. (2016). Evaluation of antimicrobial activity of Italian honey for wound healing application in veterinary medicine. *Schweiz Arch Tierheilkd*, 158(7), 521-527.
- Hess, C. (1999). When to use hydrocolloid dressings. *Nursing*, 29(11), 20-21.
- Kirpensteijn, J., & Haar, G. (2013). *Reconstructive Surgery and Wound Management of the Dog and Cat* (1st ed.). Manson Publishing Ltd, pp.21-44.
- Malone, M., and Tsai, G., (2016). Wound healing with Apitherapy: A Review of the Effects of Honey. *Journal of Apitherapy*, 1(1), p.29.
- Mathews, Karol, Binnington, G., Allen. (2001). Wound Management Using Honey. *Compendium on Continuing Education for the Practising Veterinarian -North American Edition*.
- Medhi, B., Puri, A., Upadhyay, Sujata, Kaman, Lileswar. (2008). Topical Application of Honey in The Treatment of Wound Healing: A Metaanalysis. *JK Science: Journal of Medical Education & Research*.
- Morgan, PW, Binnington, AG, Miller, CW et al. (1994). The effect of occlusive and semi-occlusive dressings on the healing of acute full-thickness skin wounds on the forelimbs of dogs. *Vet Surg*, 23:494–502.
- Pavletic, M. (2010). *Atlas of small animal wound management and reconstructive surgery* (pp. 11-153). Hoboken: Wiley Blackwell.
- Ramsey, DT, Pope, ER, Wagner-Mann, C, Berg, JN, Swaim, SF. (1995). Effects of three occlusive

- dressing materials on healing of full-thickness skin wounds in dogs. *Am J Vet Res*;56:941–949.
- Rice, J. (2000). Secondary Intention Wound Healing-Pathophysiology and Management. *Collegian*, 7(3), 40-41.
- Ruiter, M., Rijkenhuizen, A. (2007). Topical application of honey: An alternative way of treating wounds in veterinary medicine?. *Pferdeheilkunde Equine Medicine*, 23(1), 70-76.
- Singh, A., Halder, S., Chumber, S., Misra, M., Sharma, L., Srivastava, A. and Menon, G. (2004). Meta-analysis of Randomized Controlled Trials on Hydrocolloid Occlusive Dressing Versus Conventional Gauze Dressing in the Healing of Chronic Wounds. *Asian Journal of Surgery*, 27(4), pp.326-332.
- Stashak, T., Farstvedt, E. and Othick, A. (2004). Update on wound dressings: Indications and best use. *Clinical Techniques in Equine Practice*, 3(2), pp.148-163.
- Thomas, S. (2008). Hydrocolloid dressings in the management of acute wounds: a review of the literature. *International Wound Journal*, 5(5), 602-613.
- Tsioli (B. ΤΣΙΩΛΗ), V., and Dermisiadou (E. ΔΕΡΜΙΣΙΑΔΟΥ), E. (2019). *Management of distal limb skin defects in dogs and cats*.
- Vyhlídalová, D., Kozáková, R., & Zeleníková, R. (2018). Management of non-healing wounds with honey dressings: a literature review. *Central European Journal Of Nursing And Midwifery*, 9(3), 880.
- Woodlands, C. (2014). Wound management in veterinary practice. *Veterinary Nursing Journal*, 29(3), pp.83-86.
- Yaghoobi, R., Kazerouni, A., Kazerouni, O. (2013). Evidence for Clinical Use of Honey in Wound Healing as an Anti-bacterial, Anti-inflammatory Anti-oxidant and Anti-viral Agent: A Review. *Jundishapur Journal Of Natural Pharmaceutical Products*, 8(3), 100-104.