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Grape seed oil in the treatment of severe wound in a dog - case report

Óleo de semente de uva no tratamento de ferida grave em cão - relato de caso

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ABSTRACT: The aim of this study is to describe, for the first time, the use of grape seed oil in the treatment of a severe wound in a dog. A 10-year-old Dalmatian female dog presented with an abscess in the cervical region that progressed to cutaneous necrosis, resulting in a large wound. Samples were collected for culture and antimicrobial sensitivity testing (TSA). *Staphylococcus pseudointermedius* and multidrug-resistant *Escherichia coli* were isolated from the wound. The lesion was surgically debrided, and topical treatment with grape seed oil was initiated. The patient was followed until complete healing, which occurred in 28 days. The wound area was measured at seven-day intervals until complete healing (D0, D7, D14, D21, and D28), with the respective measurements being 11204.8 mm2, 4348.0 mm2, 2414.9 mm2, 120.2 mm2, and 0.00 mm2. The wound contraction potential was calculated for the intervals of 0 to 7, 7 to 14, 14 to 21, and 21 to 28 days, and it was -61.19%, -44.45%, -95.02%, and -100.00%, respectively. The complete healing of the wound at 28 days post-debridement indicates that grape seed oil is an alternative for wound treatment in dogs.

KEYWORDS: Abscess, tissue repair, essential oils, resveratrol, bacterial culture.

RESUMO: O objetivo deste estudo é descrever, pela primeira vez, o uso do óleo de semente de uva no tratamento de uma ferida grave em um cão. Uma cadela Dálmata, de 10 anos de idade, apresentou abscesso na região cervical que evoluiu para necrose cutânea, resultando em uma ferida extensa. Foram coletadas amostras para cultura e teste de sensibilidade antimicrobiana (TSA). *Staphylococcus pseudointermedius* e *Escherichia coli* multirresistentes foram isolados da ferida. A lesão foi desbridada cirurgicamente e iniciado tratamento tópico com óleo de semente de uva. O paciente foi acompanhado até a cicatrização completa, que ocorreu em 28 dias. A área da ferida foi medida em intervalos de sete dias até a cicatrização completa (D0, D7, D14, D21 e D28), sendo as respectivas medidas 11.204,8 mm^2, 4.348,0 mm^2, 2.414,9 mm^2, 120,2 mm^2 e 0,00 mm^2. O potencial de contração da ferida foi calculado para os intervalos de 0 a 7, 7 a 14, 14 a 21 e 21 a 28 dias e foi de -61,19%, -44,45%, -95,02% e -100,00%, respectivamente. A cicatrização completa da ferida aos 28 dias pós-desbridamento indica que o óleo de semente de uva é uma alternativa para tratamento de feridas em cães.

PALAVRAS-CHAVE: Abscesso, reparo tecidual, óleos essenciais, resveratrol, cultura bacteriana.

INTRODUCTION

Various microorganisms inhabit the intact skin as commensals. In this sense, it acts as a protective barrier against biological, physical, and chemical agents. In situations where the skin barrier is compromised, bacteria such as *Staphylococcus* and *Streptococcus* can become pathogenic, causing inflammation and tissue infection (Bernardo; Santos; Silva, 2019).

Cutaneous abscesses usually occur after the loss of skin integrity or as a secondary response to other diseases. Identification of the causative agent and evaluation of its antimicrobial sensitivity are essential (Ulrych, 2023). Treatment necessitates surgical drainage and debridement, followed by care for the resulting wound. Numerous therapies can be instituted, including the use of topical, systemic, or combination pharmacological agents (Bizinoto *et al.*, 2022a;

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Bizinoto *et al.*, 2022b; Marques; Abbade, 2020). Currently, herbal substances such as aloe vera, calendula, grape, among others, have been used for the treatment of wounds, as these products have proven to be effective in optimizing wound healing and contribute to the reduction of antibiotic use and microbial resistance (Nascimento *et al.*, 2022).

Among the herbal remedies, grape seed is rich in phenolic compounds such as catechins, epicatechins, proanthocyanidins, resveratrol, and gallic acid, with antioxidant action that assists in the modulation of the inflammatory process and wound healing (Souza; Vieira; Putti, 2018). Thus, the aim of this study is to report, for the first time, the clinical use of grape seed oil for the treatment of a severe, extensive, deep, and contaminated wound in a dog.

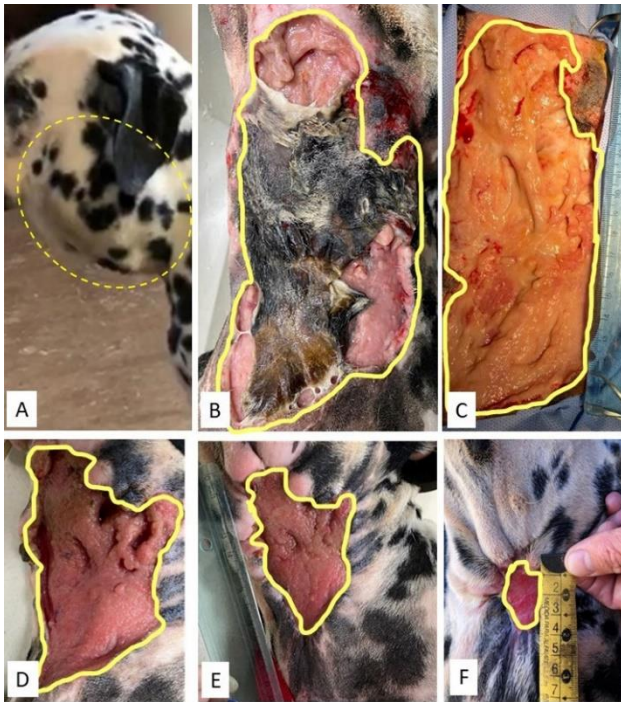
CASE REPORT

A 10-year-old female Dalmatian dog weighing 25 kg was brought to the Centro de Saúde Animal- UNICERP, clinic located in Patrocínio-MG. The patient presented with a swelling below the jaw that extended to the neck. During the clinical examination, the dog had a rectal temperature of 40.1°C, reactive popliteal lymph nodes, and a swelling extending from the jaw arch to the cervical region. The swelling had a rigid, irregular consistency without local increased temperature and caused significant discomfort upon palpation of the area (Figure 1A). A complete blood count was requested, revealing normocytic normochromic anemia, leukocytosis with neutrophilia, monocytosis, lymphocytosis, and thrombocytosis.

It was determined that the swelling was caused by a subcutaneous abscess. Approximately 1 liter of purulent discharge was drained from the region. A sample of the drained content was collected for bacterial culture and antimicrobial sensitivity testing (AST). The growth of *Staphylococcus pseudointermedius* was identified, which showed sensitivity to fluoroquinolones (ciprofloxacin, enrofloxacin, marbofloxacin, and norfloxacin), macrolides (azithromycin, erythromycin), lincosamides (clindamycin), and sulfonamides (sulfazothrim), but resistance to amoxicillin with clavulanic acid, ampicillin, cephalexin, penicillin, oxacillin, doxycycline, and tetracycline.

The skin in the corresponding area of the swelling necrosed (Figure 1B), necessitating surgical debridement of the devitalized tissue. The patient was administered pre-anesthetic medication with acepromazine (0.3 mg/kg, i.v., single dose) (Acepran® 0.2% - Vetnil, Louveira, SP, Brazil) and fentanyl (1 µg/kg, i.v., single dose) (Fentanest® - Cristália Produtos Químicos Farmacêuticos Ltda, Itapira, SP, Brazil), and prepared for the procedure with a 5 cm radius margin beyond the wound for clipping. Induction was performed using propofol (6 mg/kg, i.v., bolus) (Propovan® - Cristália Produtos Químicos Farmacêuticos Ltda, Itapira, SP, Brazil), and maintenance was carried out with inhaled isoflurane (Isoforine Cristália® - Cristália Produtos Químicos Farmacêuticos Ltda, Itapira, SP, Brazil) diluted in 100% oxygen. The animal was monitored using a multiparameter equipment [Previtec].

The surgical field was prepared with alcoholic chlorhexidine antiseptic (single application) (Riohex 2%® - Rioquímica, São José do Rio Preto, SP, Brazil) and degreaser (single application) (Riohex 2%® - Rioquímica, São José do Rio Preto, SP, Brazil). Subsequently, all necrotic tissue was removed using a No. 24 scalpel blade. Grape seed oil (topical application, twice a day, for 28 days) (Distrol® - Distrol Extração Vegetal, Bom Jesus dos Perdões, SP, Brazil) was then applied to the entire extent of the wound, which was covered with a bandage. In the postoperative period, grape seed oil was exclusively used as the treatment. The oil was applied using a spray bottle, covering the entire wound area three times a day for 28 days. Before application, the lesion was cleansed with topical 0.9% sodium chloride physiological saline solution (TID, for 28 days) (Eurofarme® - Eurofarma, São Paulo, SP, Brazil). The patient was evaluated every 7 days in the postoperative period until complete healing (Figure 1C, D, E, F). After 14 days of the procedure, a new sample was collected from the wound surface using a sterile swab for bacterial culture and AST, as well as a complete blood count and biochemical tests including urea, creatinine, alanine aminotransferase (ALT), alkaline phosphatase (ALP), calcium, ionized calcium, phosphorus, total cholesterol, total bilirubin,



Source: Author's personal collection.

Figure 1. Treatment progression with grape seed oil in a female dog weighing 25 kg with a wound secondary to an abscess. Note in "A" the swelling located below the jaw that extends throughout the cervical region (yellow circle). "B" Cervical region of the dog after abscess drainage. Extensive wound present in the ventral cervical region, extending from the height of the first molar to the fifth cervical vertebra (highlighted area in yellow). Notice the presence of necrotic tissue throughout the extent of the lesion, followed by wound healing in the cervical region after debridement of the infected wound. In "C," the wound can be observed on the day of surgical debridement (D0). View tissue healing in "D, E, and F" on D7, D14, and D21, respectively.

total protein, and fractions (albumin and globulin) to assess liver enzymes and renal markers. No second culture, growth of *Escherichia coli* was observed. This bacterium was sensitive to the antibiotics ceftiofur, ciprofloxacin, enrofloxacin, imipenem, and marbofloxacin, and resistant to amikacin, amoxicillin, amoxicillin with clavulanic acid, ampicillin, cephalexin, chloramphenicol, doxycycline, streptomycin, colistin, sulfazothrim, and tetracycline. The complete blood count showed thrombocytosis, and there were no alterations in the biochemical tests for urea, creatinine, ALT, alkaline phosphatase, calcium, ionized calcium, phosphorus, total cholesterol, total bilirubin, total protein, and fractions (albumin and globulin).

In the postoperative period, the wound was photographed every 7 days (D0, D7, D14, D21, and D28) for a total of 28 days, when the lesion was completely healed. The obtained images were evaluated using ImageJ® software (National Institutes of Health, USA) to measure the area of the cutaneous wound in mm². The wound contraction potential (CP) was calculated for the intervals of 0 to 7, 7 to 14, 14 to 21, and 21 to 28 days after surgery using the formula CP = [(AF - AI) x 100] / AI, where AI is the initial area of the wound and AF is the final area of the wound. The areas obtained on D0, D7, D14, D21, and D28 were 11204.8 mm², 4348.0 mm², 2414.9 mm², 120.2 mm², and 0.00 mm², respectively (Figure 2A). The CP obtained for the intervals of 0 to 7, 7 to 14, 14 to 21, and 21 to 28 days were -61.19%, -44.45%, -95.02%, and -100.00%, respectively (Figure 2B).

DISCUSSION

Breakage of the cutaneous barrier and previous infections are the most common causes of cutaneous abscesses. They are commonly diagnosed in various body regions (Marques; Abbade, 2020). When located in the cervical region, they are more severe infections as they can cause obstruction of the airways (Malheiro *et al.*, 2017). In the present case report, the cause of the abscess was not determined. However, there are reports of cutaneous abscesses related to insect bites, such as spiders, and snakebites from *Bothrops* genus snakes (Valdoleiros *et al.*, 2021).

The isolation of *Staphylococcus pseudointermedius*, resistant to beta-lactams and tetracyclines, raised concerns about the progression of the lesion and generalization of the infection. Fortunately, the reduction of microbial load through wound debridement and the use of grape seed oil were sufficient to control the infection, allowing the patient's immune system to overcome the infection and the wound to heal without complications. Bacteria of the *Staphylococcus* genus can become resistant to all classes of available antibiotics, especially *Staphylococcus aureus*. Therefore, new research avenues are being explored for treatments against these agents to reduce the use of antibiotics (Guo *et al.*, 2020). In the present case report, grape seed oil was used to enhance wound healing, avoiding prolonged use of antibiotics.

The isolation of *Escherichia coli* from the collected material on the wound bed surface at 14 days of treatment does not necessarily mean that this microorganism was causing an infection, as the macroscopic aspect of the wound was good, the wound bed was completely granulated without signs of necrosis or purulent discharge. In a study with human ICU patients, the main genus of bacteria isolated from abscesses was *Streptococcus*, and no anaerobic bacteria were isolated (Nascimento *et al.*, 2022). In a study involving dogs and the evaluation of 30 wounds, the primary bacteria isolated were *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Enterococcus spp.*, *Streptococcus spp.*, *Enterococcus spp.*, and *Staphylococcus spp.* (Arias; Padilha; Perugini, 2017), similar to what was observed in the patient in this case report.

The contraction potential of -61.19% observed between days 0 and 7 reflects an excellent outcome, showing a reduction of more than half the area of an extensive wound in the first week of treatment. In the initial phase, it is important to control infection and modulate inflammation (Bizinoto *et al.*, 2022a), and grape seed oil contains polyphenolic compounds such as proanthocyanidins and resveratrol with proven antimicrobial and anti-inflammatory (Poljsak; Kreft; Glavac, 2020), which explains the findings. Overall, essential oils have physicochemical characteristics that favor rapid and proper wound healing, in addition to possessing antimicrobial properties (Saporito *et al.*, 2018). The use and study of these natural

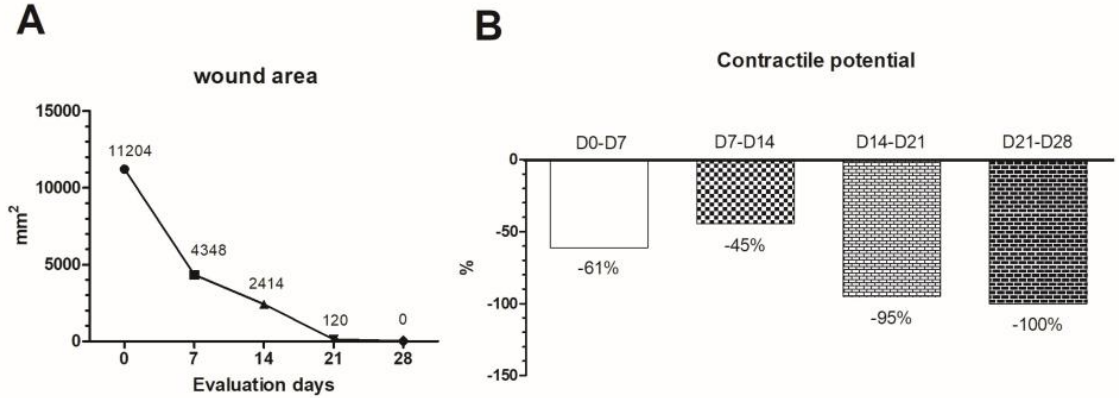


Figure 2. "A" Wound area over 28 days of treatment with grape seed oil. "B" Contraction potential of the cervical cutaneous wound area in the dog in the intervals of days D0-D7, D7-D14, D14-21, and D21-D28 after treatment with grape seed oil.

substances have increased considerably due to their low toxicity, as well as their ability to reduce oxidative stress, favoring the healing process (Sharma *et al*., 2019).

Although the contraction potential of the wound was slightly lower (-44.45%) between days 7 and 14, this does not indicate an inadequate effect of the treatment. During this period, there was a predominance of the proliferative phase with the filling of the injured area by granulation tissue, both in depth and extent. The contraction potential considers exclusively the progression of healing in extent, meaning the evolution of healing in depth was not considered in this calculation. The proliferative phase generally begins on the 4th day and extends until the 14th day (Bizinoto *et al*., 2022a), but various factors can interfere with both the onset and completion of this phase.

When grape seed oil was used in the treatment of cutaneous wounds in rats, increased neovascularization and collagen synthesis were observed in the wound bed, favoring the repair phase. In addition to increase in hydroxyproline content in granulation tissue, promoting a dense collagen matrix (Rekik *et al*., 2016).

The higher contraction potentials observed between days 14 and 21 (95.02%) and from 21 to 28 (-100.00%) suggest a favorable effect of grape seed oil on the contraction and epithelialization phases. In addition to all the benefits already discussed regarding grape seed oil, it also acts as a lipid barrier, reducing water loss through the cutaneous lesion and promoting a favorable microenvironment for tissue repair (Poljsak; Kreft; Glavac, 2020).

CONCLUSION

The complete healing of an extensive, deep, and contaminated wound, treated topically with grape seed oil, demonstrates the effectiveness of this product in reducing inflammation and contamination, optimizing the wound healing processes without causing side effects in dogs. Therefore, it can be concluded that grape seed oil is a viable alternative for the treatment of wounds in dogs. Additional advantages worth highlighting include its low cost and ease of application to the injured tissue.

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