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Clinical Report

Extensive mammary wound treatment in ewe using a rubber elastic suture technique combined with aloe gel

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Extensive wounds may not be able to heal by primary intention, due to the lack of tissue. Moreover, treatment of these wounds by secondary intention is more difficult in production animals, due to the high investment requirement and long recovery time. Therefore, new approaches that favor short-term recovery are desirable. This study reports the application of an elastic suture technique for the treatment of an extensive mammary wound. This technique was applied in a lactating ewe with gangrenous mastitis, resulting in extensive tissue necrosis and loss of mammary tissue. Extension of the wound made complete coaptation of the wound edges impossible. Elastic sutures were chosen as they allow a constant and moderate tension that gradually induces approximation of the skin edges. The wound showed a significant decrease in extension before removal of the stitches, demonstrating the successful application of this technique in wound closure surgery. The elastic suture is presented as a new management option for extensive wounds in the field of veterinary medicine.

INTRODUCTION

Wound treatment is a challenge in the field of veterinary medicine, particularly for production animals, as keeping an animal in confinement or even care in the field can be expensive and laborious. Therefore, treatment options that favor animal recovery in a short period are fundamental.

The treatment applied to a certain wound depends of the characteristics of the lesion, such as the time of appearance, extension, localization and contamination. Based on these considerations, treatment by primary intention (suture), secondary intention (open wound treatment) or tertiary intention (a combination of both kinds) can be applied (THAKARE; CHAUDHARI; PATIL, 2011).

The use of sutures has advantages over treatment by secondary intention, as the latter requires a longer treatment period due to the requirement for frequent wound dressing (MAGALHÃES et al., 2015). However, suture application may not be possible for wounds with a large extension, as coaptation of the wound edge is limited by the amount of skin and its elasticity. Furthermore, the tension of the suture can cause rupture of the stitches.

The application of an elastic suture technique, which uses sterile rubber bands in place of conventional suture surgical thread, is an interesting alternative. The elastic suture technique has been described in a wide variety of reports regarding the treatment of large skin wounds in humans (OLIVEIRA; NIGRI, 2012; SANTOS; OLIVEIRA, 2012; ALVAREZ; SIQUEIRA; VILHORDO, 2014).

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The elastic suture technique involves fixing the rubber band at one extremity of the wound using nylon thread, after which the rubber band is then folded onto itself to make an "X" shape. Each part is then fixed with a simple stitch at each side of the wound. This procedure is performed until sutures cover the entire wound (OLIVEIRA; SANTOS, 2012; ALVAREZ; SIQUEIRA; VILHORDO, 2014). The purpose of this type of suture is to promote gradual and constant approximation of the tissues through tension applied by the rubber band. This tension results in progressive approximation of the wound edges to make coaptation possible without promoting excessive strain on the edges, which can cause tissue laceration and suture dehiscence (ALVAREZ; SIQUEIRA; VILHORDO, 2014).

We were unable to find any studies in the field of veterinary medicine that have evaluated the use of this technique in animal species, except for an experimental study in rabbits aimed at comparing the viability of other treatment techniques for use in humans (MAGALHÃES et al., 2015). Therefore, this study reports use of the elastic suture technique in a ewe affected by gangrenous mastitis that was submitted to total-left and partial-right mastectomy, in order to observe its effectiveness in the treatment of large wounds in animals.

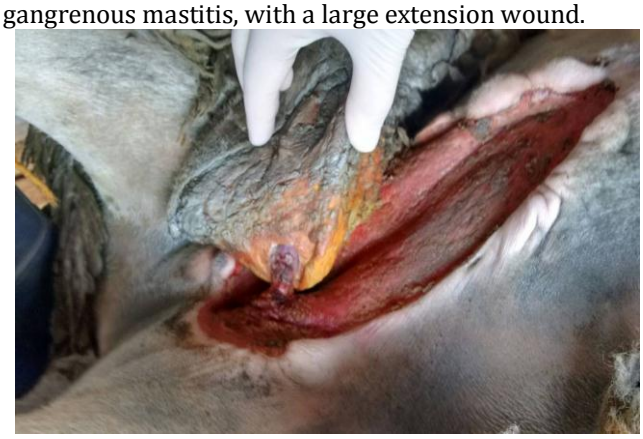
CASE REPORT

A lactating adult ewe (Ile de France × Texel crossbreed) was treated at the Sheep Production and Integrated Crop-livestock Center of Midwest State University (Guarapuava, Paraná State, Brazil) due to a case of gangrenous mastitis. Systemic antibiotic therapy with Enrofloxacin 2.5% (25 mg/10 kg) and intramammary antibiotic treatment with Gentamicin (250 mg) was performed. We also applied Flunixin meglumine as an anti-inflammatory (1.1 mg/kg) and Trichlormethiazide as a diuretic (100–200 mg per dose). The treatment applied was palliative, with daily wound cleaning and application of an aloe gel (*Aloe vera*) as a natural healing agent. However, due to the characteristic rapid progression of this kind of infection, the mammary gland affected lost its function and tissue necrosis developed (Figure 1).

Due to the large extension of the necrotic area, treatment by secondary intention was expected to require a long period until complete wound healing. Faced with this situation, and with the aim to study a new approach for the treatment of large wounds in veterinary medicine, we applied the elastic suture technique to reduce the size of the wound.

To perform this procedure, the ewe was firstly sedated with xylazine (0.2 mg/kg), and positioned and maintained in a dorsal decubitus position. Antisepsis was performed, followed by local anesthesia surrounding the area using 1% lidocaine hydrochloride without a vasoconstrictor.

Figure 1 – Mammary tissue with necrosis due to gangrenous mastitis, with a large extension wound.



Source: Author's personal collection.

Section and ligature of the remaining mammary gland tissue was performed (Figure 2). Next, we performed subcutaneous divulsion around the extension of the wound, with debridement of the skin edges and healing tissue of the wound. Edge approximation was initiated using a rubber band, which was fixed with simple stitches using 4.0 nylon thread. The technique was applied over the entire extension of the wound, and only a small portion of the wound without edge coaptation remained, due to a lack of tissue (Figure 3). Closure of the dead space could not be performed due to the distance between the wound edges.

Figure 2 – Transoperative wound aspect (A) before removal of the remaining mammary gland tissue, and (B) with the wound surface prepared for lesion closure.

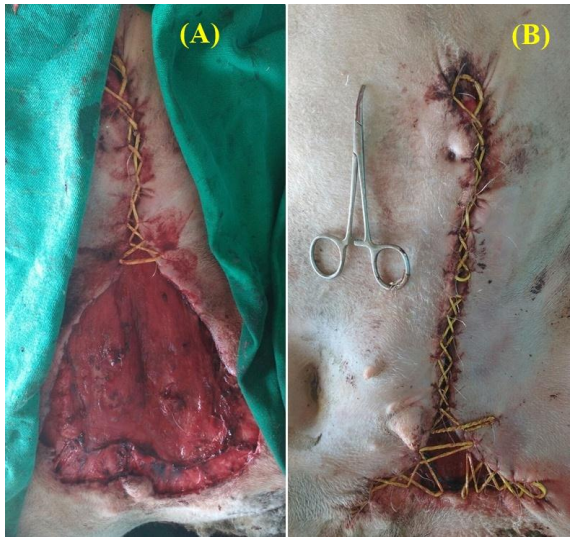
Source: Author's personal collection.

During the postoperative period, Flunixin was used as a painkiller (1.1 mg/kg), and antibiotic therapy was performed with pentabiotic (6 ml/100 kg). After the procedure, the ewe ate normally and remained stable. The surgical scar was cleaned daily using a sterile saline solution. The wound was dressed using aloe gel and

crystal sugar, and a repellent containing Fipronil was applied around the wound.

Skin retraction was observed as the postoperative period progressed, and as a consequence, some portions of the rubber band slackened, and in other sections, the rubber band had deteriorated. However, significant wound resolution was observed, and new stitches were not required. A secondary intention treatment method was chosen for the remainder of the treatment, with complete removal of stitches at 21 days postoperative (Figure 4).

Figure 3 - (A) Placement of the elastic suture on the wound at the beginning, and (B) final aspect of the reduced wound.



Source: Author's personal collection.

Almost complete wound healing had occurred at 77 days postoperative (Figure 5), when the animal was submitted to slaughter.

Figure 4 – Wound aspect 21 days postoperative after removal of the elastic suture stitches.

Source: Author's personal collection.

Figure 5 – Wound aspect 77 days postoperative following secondary intention treatment, showing almost complete wound healing.

Source: Author's personal collection.

DISCUSSION

The elastic suture has been applied, mainly in human medicine, as a new approach for the treatment of large wounds, for which suture by primary intention is not initially possible due the lack of coaptation or excessive tension in the sutures (NORONHA et al., 2014; MAGALHÃES et al., 2015). This technique uses a rubber band which is fixed to the lesion edges in an "X" shape, and the wound gradually reduces due to the continuous application of tension promoted by the rubber band (PETRAGLIA NETO; TAVARES FILHO, 2016). This technique allows the use of conventional sutures for coaptation of the edges if necessary.

For care of a surgical wound, different protocols can be applied. In this study, we chose to apply sugar and aloe gel after the wound had been cleaned with saline solution, as these are effective and low-cost alternatives for wound treatment. The crystal sugar presents the benefit of being bactericidal or bacteriostatic, in addition to providing nutrients to the damaged cells and stimulating the granulation tissue (LIMA et al., 2011). The aloe gel has healing, anti-inflammatory and bactericidal properties, as well as providing vitamins, minerals and essential amino acids and polysaccharides which stimulate reepithelialization of the tissues (OLIVEIRA; SOARES; ROCHA, 2010; FREITAS; RODRIGUES; GASPI, 2014). However, even with the benefits provided by these natural agents, at 7 days

postoperative the non-coapted wound area became infected, which promoted stitch dehiscence after several days. According to Bischofberger et al. (2010), edema, drainage, infection and dehiscence are the most common postoperative complications.

The animal was maintained in a clean environment during the postoperative period, with frequent cleaning of the enclosure to decrease the chance of wound contamination. However, due the location of the wound, the bandages did not remain fixed for the entire period between wound dressings, which reduced its physical protection. In addition, the presence of dead space in the non-coapted area may have contributed to the development of a discrete infection. Dilute iodine solution was used to clean the wound until the infection had been resolved. When the infection was no longer present, the wound was dressed following the initial protocol, using only saline solution, sugar and aloe gel. In this study, no other complications were observed.

During the process to approximate the wound edges, the rubber band slackened in some sections, and had broken in others. According to Petroianu (2010), performing new stitches or changing the rubber band may be necessary. This procedure aims to keep the tension when tissue approximation is not yet sufficient, as use of the elastic suture assists skin approximation through constant application of tension. In this study, we chose to keep the original sutures to not submit the animal to further surgical stress, as sufficient closure of the wound was observed. The treatment was then continued with secondary intention, with complete removal of the sutures at 21 days postoperative (Figure 4).

Different methods can be applied for the treatment of lesions caused by gangrenous mastitis. The chosen approach depends primarily on the condition of the tissue, the purpose and the general condition of the animal. Rizzo et al. (2015) performed two different procedures in goats that had an udder infection without any large lesions in the adjacent tissues. In one animal, unilateral mastectomy and suture by primary intention was performed, and in the other, curettage was performed to allow healing by secondary intention. The authors highlighted that mastectomy and primary intention treatment with the suture was associated with a reduced recovery period compared to the secondary intention treatments. In another study, Meirelles, Santos and Buteri (2010) treated a ewe that had lost its mammary gland and had a large lesion arising from gangrenous mastitis by primary intention. The authors obtained total coaptation of the wound edges, which was not present in the ewe described in this case report.

These previous studies emphasize that the clinical-surgical outcomes vary according to the case and the condition of the wound presented by the animal requiring treatment. Following evaluation of the wound, and determining that total primary closure would be impossible, we chose to apply the elastic suture technique, aimed at promoting gradual approximation of the wound edges and reducing extension of the lesion.

Other options that have been successfully used to treat extensive skin wounds are grafting and skin flaps. However, these options are dependent on the availability of the donating area, which can be limited (MAGALHÃES et al., 2015). In addition, the use of these techniques is often associated with graft rejection and dehiscence, with injury recurrence (VENDRAMIN; FRANCO; FRANCO, 2010). Therefore, it is necessary to research new methods that facilitate treatment of extensive wounds. The elastic suture has been suggested to be an effective alternative that promotes satisfactory results, in addition to its easy application and low cost (VIDAL; MENDES JÚNIOR; SANCHES, 2014; SANTOS; OLIVEIRA, 2012).

In a study that compared different ways to treat large wounds in rabbits, Magalhães et al. (2015) evaluated wound closure by secondary intention, grafting and elastic suture methods over a 21-day period. The authors noticed partial or total loss of the graft in 90% of the studied animals, highlighting the risk of failure of this procedure. Wound closure was verified in 60% and 80% of the animals subjected to the grafting and elastic suture methods, respectively, with no statistically significant differences between these methods. Regarding the animals that were treated by elastic suture, histological examination demonstrated that the final scar showed satisfactory morphological maturation and tensile strength. Therefore, the authors concluded that the elastic suture technique was as effective as closure by grafting, but was simpler and easier to perform.

The use of an elastic suture does not require any extra wound care besides routine procedures such as cleaning and adequate protection (PETROIANU, 2010). However, one possible disadvantage of this technique is related to management of the rubber bands, which can slacken as the wound closure evolves, or eventually break up. Slackening of the rubber band is not a disadvantage, as it shows the effectiveness of this technique for promoting approximation of the wound edges. In contrast, breaking of the rubber band, as noted in this study and in the study by Magalhães et al. (2015), presents an obstacle as it often requires additional procedures to reapply the rubber bands.

Considering the advantages of the elastic suture technique, other elastic materials should be evaluated. Noronha et al. (2014) and Petraglia Neto and Tavares Filho (2016) used the elastic material from the top edge of the cuff of a sterile glove. While the aim of these studies was to report the use of the elastic suture, and not to test the suture material itself, the authors did not observe any disintegration of the elastic material. Thus, the use of elastic from a glove could be a low-cost option,

with the added benefit of being more resistant. However, further studies focused on the suture technique and the elastic materials should be performed in order to confirm these suggestions.

In this study, after the elastic suture had been removed, almost complete healing of the wound was verified 77 days postoperative (Figure 5). The animal was then submitted to slaughter, as the wound would not promote rejection in the slaughterhouse. Without the mammary gland, the animal also becomes unable to produce milk for its offspring, which compromises the productive and reproductive success of the system. It is important to note that the use of this technique aimed determines the technique viability in animals, and not recovery the animal described in this case report for production. However, for animals of high genetic quality, this technique can be performed to reduce the recovery time of animals in a similar condition, because the evolution of reproductive biotechnologies allows reproduction of an animal, without the necessity of this animal beget and raise their offspring.

The results from this study were satisfactory, as the wound presented sufficient closure in a short time period. However, use of the rubber band presents some limitations, particularly regarding maintenance of the rubber band, which depends on the dimensions of the affected area. These limitations may arise from the small number of studies focused on the application of this technique in veterinary medicine, which makes it difficult to comprehensively discuss its application. Therefore, this case report is intended to encourage new studies focused on the use of this elastic suture technique for treating large wounds in domestic animals, which despite being widely used in humans, is a new treatment approach in veterinary medicine.

CONCLUSIONS

Use of the elastic suture technique is believed to have contributed to the reduced time required for wound healing in the ewe. With adequate maintenance, this technique is promising for the treatment of large wounds in domestic animal species in cases lacking sufficient tissue, thereby optimizing the healing process.

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