Small animal wound care part 2 – closure and topical therapies

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This two-part article looks at some reported advances in companion animal wound care, with part one (*VT*47.02) having covered negative pressure wound therapy (NPWT). This second part will look at some of the other topical therapies available and options for wound closure.

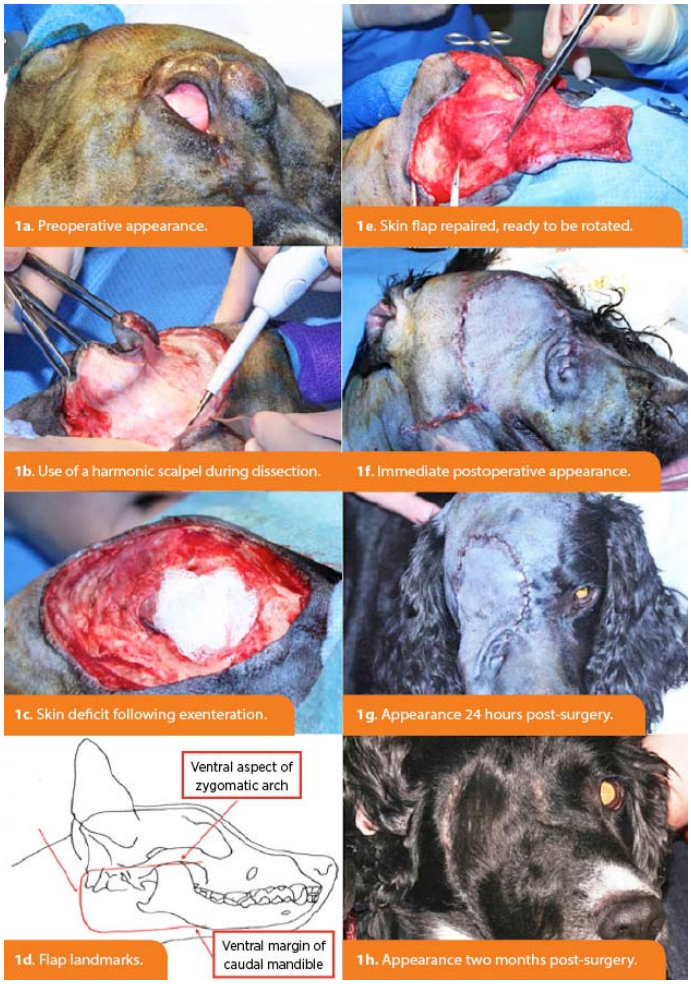


Figure 1. Resection of an intermediate grade soft tissue sarcoma of the right upper eyelid in a spaniel[21]. Exenteration of the right globe and orbital contents was performed, along with a wide

skin excision (3cm lateral margins and a deep fascial place). A complex facial skin flap, involving the inferior and superior labial arteries and the angularis oris artery was raised. As described by Yates et al[22], flap landmarks were the ventral aspect of the zygomatic arch, the ventral margin of the caudal mandible and the wing of the atlas (**1d and 1e**). The flap was rotated and sutured into position, while the donor site was closed primarily and without tension (**1f and 1g**). Image: AHT.

Regardless of the treatment used, it is imperative generous, multimodal analgesia should be provided to every patient, discussion of which is outside of the scope of this article. Additionally, clinicians should also be mindful novel treatments are not always superior treatments – evidence-based medicine should be practised wherever possible.

Suture material

Knotless barbed sutures are available in various sizes and polymers, and contain regular unidirectional or bidirectional barbs that reportedly allow tension to be distributed uniformly across the suture length[1]. Elimination of knots achieves a reduction in surgical time and foreign material, and barbed sutures have been used in many human tissues[1-3].

The author uses barbed sutures regularly to achieve skin closure in companion animals, with excellent cosmetic results, and similar anecdotal information exists from other clinicians. Reported successful use in small animals mainly involves the gastrointestinal tract[4-6], although a small number of patients have undergone successful midline coeliotomy closure using barbed sutures[7]. Cadaveric or in vitro studies have been completed with variable results for conditions such as diaphragmatic herniorrhaphy[8], tendon repair[9], cystopexy[10] and cholecystoduodenostomy[11].

Antibacterial-impregnated (for example, triclosan) suture materials are available and are reported to result in an inhibition of bacterial colonisation of the suture, and a reduction in surgical site infections by up to 30% in humans[12-14]. Unfortunately, a paucity of similar studies exist assessing the use of such sutures in the canine or feline species.

In one study, no significant difference in surgical site infection was seen following tibial-plateau-levelling osteotomy surgery after use of conventional or triclosan-impregnated sutures[15], while, in a separate experimental study, use of triclosan-impregnated sutures in patients with established urinary bladder infections resulted in a reduction of the bacterial numbers on and around the suture material, along with improved wound healing[16]. Larger clinical studies are desperately required to investigate use of barbed and antibacterial-impregnated sutures in veterinary species.

Skin flaps

In veterinary species, we are fortunate to have a wealth of local and axial pattern flaps available for closure of skin defects, all of which have been beautifully described elsewhere[17].

Several papers have explored less commonly used flaps, or novel flaps entirely, including:

- The lateral caudal axial pattern flap in 13 dogs to reconstruct gluteal, dorsal and perineal skin defects[18].
- The experimental use of the axial pattern flap based on the cranial cutaneous branch of the saphenous artery, expected to cover the cranial aspect of the distal thigh and stifle, the popliteal region caudal to the stifle and the proximal medial crus[19].
- The experimental and clinical use of the angularis oris flap to provide hirsute, full-thickness skin coverage of a variety of large facial defects[20-22] (**Figure 1**).

Honey

Honey is increasingly used in vet practice. It:

- effectively decreases inflammatory oedema
- attracts macrophages
- accelerates sloughing of devitalised tissue
- provides a local cellular energy source
- forms a protective protein layer over the wound and encourages the development of a healthy granulation bed[23]

Honey's antibacterial property is a result of its high osmolarity and acidity (pH 3.6 to 3.7), with manuka honey being uniquely effective in a catalase environment[24].

In vitro susceptibility to manuka honey has been demonstrated with *Escherichia coli*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Serratia marcescens*, *Streptococcus pyogenes*, *Staphylococcus aureus* (including meticillin-resistant strains) and, interestingly, *Candida albicans*[25,26].

While a large number of papers describe the use of honey in human skin wounds, resulting in successful healing where previous treatments have failed[27-29], a few small studies have been reported in the veterinary literature[23, 30-33].

A Cochrane review concluded: "Honey appears to heal partial thickness burns more quickly than conventional treatment (which included polyurethane film, paraffin gauze, soframycin-impregnated gauze, sterile linen and leaving the burns exposed) and infected postoperative wounds more quickly than antiseptics and gauze. Beyond these comparisons, any evidence for differences in the effects of honey and comparators is of low or very low quality and does not form a robust basis for decision making[34]." Larger clinical studies are required in veterinary medicine to investigate the use of honey in wound healing.

Nanocrystalline silver

Nanocrystalline silver dressings (NSDs) offer a slower release of silver ions into the wound compared with traditional silver dressings and creams (that is, silver sulphadiazine), which results in a longer acting, broad-spectrum bactericidal effect[35]. NSDs can be changed up to every three days, which is an improvement over the two-to-three times a day application required for silver sulfadiazine cream[36].

However, care should be taken with the use of NSDs, because silver deposition may reach toxic levels in smaller patients – particularly cats[37] – while bacterial resistance may be possible through the acquisition of a sil gene[38].

Veterinary reports of NSDs are few, but include treatment of dogs and a cat (following burns, surgical wounds and necrotising fasciitis) using NSD with NPWT36,39,40. Large-scale veterinary studies are required to further corroborate the initially promising results for NSDs.

Other novel modalities for open wounds

Additional novel techniques have been described in humans for treatment of open wounds, but little comparable veterinary data are available at this stage.

Explored modalities include:

- Maggot debridement therapy: the application of sterile maggots of the green bottle fly, Lucilia sericata, into chronic wounds reportedly effectively achieves debridement of necrotic tissue, reduction in bacterial contamination and formation of granulation tissue[41]. Maggots are considered to be safe to use in dogs, cats and rabbits, and case reports documenting success do exist[30].
- Low-level laser therapy, which is reported to reduce inflammatory reaction, increase collagen deposition, increase myofibroblast proliferation, increase tensile strength, reduce healing time and speed up wound contracture[42-44]. However, the success found in the treatment of chronic wounds could not be reproduced in acute wounds[45].
- Platelet-rich plasma, which has been shown to accelerate tissue healing in previously delayed or chronic wounds[46] and works by secretion of growth factors following platelet activation. This leads to accelerated endothelial and epithelial regeneration, and stimulate angiogenesis, collagen synthesis, soft-tissue healing and haemostasis[47]. Its successful use has been widely reported in human medicine48-50 and similar results have also been reported in many veterinary species, including small animals4[7,51-53].

- Companion animal wound care – latest advances **(part 1)**

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