# Use of topical insulin therapy to promote second intention healing following soft tissue sarcoma removal in Pogona Vitticeps: a case study

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ABSTRACT: The use of topical insulin therapy for promotion of second intention healing has been investigated in a case study following removal of a soft tissue sarcoma in a Bearded Dragon (Pogona Vitticeps). Topical Insulin therapy appears to be beneficial in promoting second intention healing in Pogona Vitticeps although consideration is needed when using on sites associated with neoplasia. A preferred suitable dressing medium for reptiles has been identified for future use. More research is needed through practical application of current studies into wound management in reptiles to be able to improve the management of future cases such as this.

Keywords: topical insulin; bearded dragon; reptiles; sarcoma; second intention healing

## Introduction

A 4 year-old male Bearded Dragon (Pogona Vitticeps) presented with a large mass on the caudal aspect of the head (Figure 1). The mass had been present and growing for approximately five months without any medical or surgical intervention; during this time the animal had not had any investigations due to financial constraints of the owners. The Bearded Dragon had subsequently been surrendered to a rescue centre who then pursued treatment within the first week of keepership after establishing that the animal was eating, defaecating and passing urates normally. A fine needle aspirate was not performed prior to the surgery due to the financial limitations of the rescue centre. Enrofloxacin was commenced 48 hours pre-operatively at 10 mg/kg orally once daily, Meloxicam was commenced on the same day at a rate of 0.3 mg/kg orally once daily. Oral Meloxicam and Enrofloxacin at these doses were administered daily throughout the duration of the wound treatment.

## Treatment

The mass was surgically removed leaving behind a large open surgical wound (Figure 2). There was insufficient tissue to close the

**Figure 1.** 26/2/18 – pre op; Mass prior to surgical intervention.

DOI: 10.1080/17415349.2020.1719946

**Figure 2 & 3.** 28/2/18 – Day 0; Mass removed during surgery.

**Figure 4.** 1/3/18 – Day 1; surgical wound 24 hours after surgery.

wound enough for it to heal by primary intention and the decision was made to manage the open wound and allow it to heal by second intention (Figure 4). The mass was sent to an external laboratory for histological analysis and was identified as a soft tissue Sarcoma (Figure 3). Several factors can affect the healing process; tension, bacterial contamination, malnutrition, wound temperature, and underlying systemic disease (Murgia, 2016). Immediately post operatively a foam dressing (Allevyn®, Smith & Nephew, n.d.) was applied with hydrogel (Intrasite®, Smith & Nephew, n.d.) to prevent wound dehydration or contamination, and absorb any exudate or haemorrhage. During the surgery and recovery from anaesthesia the lizard was kept at a species-specific optimum temperature of 34 degrees Celsius with the use of a heat mat and piece of foil blanket big enough to cover him from the shoulders to the tip of the tail including the limbs. Being ectothermic, reptiles from warmer climates will suffer from hypothermia if a heat source is not provided. Hypothermia can increase anaesthetic recovery times, delay wound healing, increase rates of infection and cause cardio-respiratory depression (Dodham, Robertson, Taylor, & Waters, n.d.), all of which can lead to patient morbidity and mortality.

Selecting a suitable dressing for use on a large wound in a difficult area was a challenge (Figure 5); Opsite flexigrid® (Smith & Nephew, n.d.) was chosen as the preferred wound dressing for its lightweight self-adhesive properties, flexibility and moisture permeability. The dressing could be cut to size easily and applied with minimal stress to the animal (Figure 7). When the dressing was removed each day, it was loosened with a little saline and came away easily without removing any granulation tissue. Prior to selecting the Opsite Flexigrid®, foam dressings cut to size and fastened with silk tape were applied but these appeared bulky, unstable and irritating to the patient. A traditional bandage style dressing was also trialled but due to the location of the wound and conformation of the patient this was also deemed unsuitable.

There were concerns that a large open wound in a species with prolonged healing times would result in patient morbidity; Latney (2018) reported that wound contracture and re-epithelisation can take 84 days in Lizards. It was decided that for such a large wound on the head of an animal requiring intense heat to thermoregulate, additional resources were needed to restore the skin as quickly as possible.

In a study by Negrini et al. (2017) the use of topical porcine insulin proved beneficial in reducing second intention healing times for surgically induced wounds in a group of forty-four healthy red eared sliders (Trachemys Scripta). Within the study Negrini et al. stated "Topical insulin is a potentially useful therapy in skin wounds of Trachemys Scripta and should be evaluated in non-experimental wounds of turtles and other reptiles". The growth factors within the insulin were shown to reduce second intention healing times which would prove useful in a patient with a large open wound and for reptilian species with known poor contractility of the integument. At days 7 and 14 wound contraction was similar in both the insulin treated and the control group of turtles. The progression was also at a similar rate but, after the initial period, the wounds in the control group reversed the trend at day 21 and the wound area slightly increased whereas the wounds in the insulin-treated group contracted faster so that at day 28 the mean wound size in the control group and insulin-treated group were 91.41% and 67.15% respectively. This is a difference in mean wound area of 24.26%, a reduction in wound size of nearly a quarter. The information within this study was utilised and the suggested dose rate of 5iu/ml porcine insulin (caninsulin, MSD) in a glycerol carrier was administered topically daily from day one.

**Figure 5.** 6/3/18 – Day 6; wound 6 days after surgery.

**Figure 6.** 11/3/18 – Day 11; wound 11 days after surgery, size is visibly reducing.

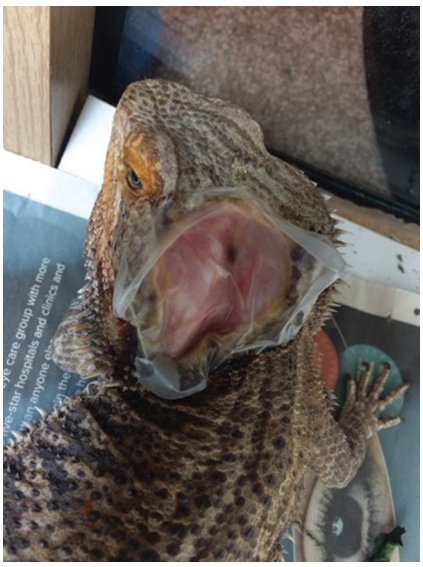

**Figure 7.** 13/3/18 – Day 13; Opsite Flexigrid dressing in situ.

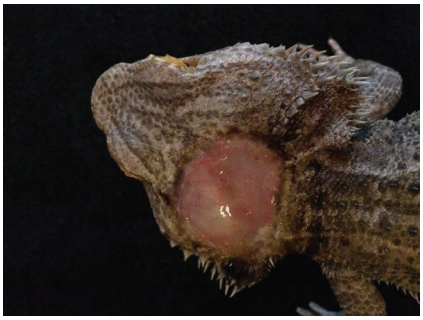

**Figure 8.** 20/3/2018 – Day 20; wound 20 days after surgery.

**Figure 9.** 27/3/2018 – Day 27; wound 27 days after surgery.

Following removal of the dressing each day, the wound was flushed with 10mls of warm 0.9% Saline solution using a 10 ml syringe and a 23-gauge needle. No direct debridement was performed with any swabs or cotton wool at any stage as this could have removed any developing granulation tissues. There were no signs of infection at any stage of healing. After wound cleansing, topical insulin suspension was applied; enough to cover the open wound with a thin layer that would not saturate the surrounding scales (Figure 8). This suspension required refrigeration between uses due to the insulin content denaturing at room temperature (MSD, 2016). Throughout the duration of the treatment there was no evidence of any maceration of the area being treated and the irrigation was well tolerated.

The surgery site had not visually reduced in size until day 11 (Figure 6) post-surgery. Following the initial 11 days the wound healing process appeared to rapidly increase and the site reduce steadily in size. On day 27 (Figure 9) post-surgery significantly less topical insulin – glycerol suspension was required due to the reduced surface area of the wound and the decision was made to no longer apply the Opsite flexigrid ® dressing. The wound did not dehydrate, and a normal tissue appearance was maintained. In Negrini's study in 2017 he found that mean wound contraction was higher in the insulin-treated group and the differences were significant at day 28, a conclusion which appears to be reflected by our case study.

During the treatment period the animal was housed in a domestic setting away from other animals to reduce stress. The ambient temperature of the habitat was maintained between 31.7*c and 34 *c. Optimal wound healing temperatures in reptiles were not investigated as part of this case study however the preferred body temperature of 34 °C (University of Queensland Australia, 2015) was taken into consideration. A heat mat was used in conjunction with a basking lamp to provide a sufficient ambient temperature for normal behaviour and function without creating an intense basking spot where the wound could become burned or scalded from direct heating. No loose substrate was used due to the risk of ingestion and adhesion to the wound. Newspaper was selected and changed daily to reduce the risk of infection from faecal contamination. A 12% UVB bulb was used for 12 hours per day to maintain normal mineral utilisation and promote normal behaviour. The Bearded Dragon ate well throughout treatment, being fed mainly dandelion, rocket, leafy greens and grated butternut squash with a light dusting of a multivitamin powder and calcium supplement. Vegetation had been selected as the primary food as adult bearded dragons are predominantly vegetarian (Girling & Fraser, 2007). Medication was administered by first injecting the drug into a sub adult locust and

**Figure 10.** 29/3/2018 – Day 29; wound 29 days after surgery – small mass re-growing on cranio-medial aspect of wound.

allowing the dragon to naturally chase and eat the insect, thus reducing any further stress or damage to the wound through handling.

Sadly, the Bearded Dragon was euthanised on day 30 as the mass had started to regrow on the cranio-medial aspect of the wound (Figure 10). A second surgery was attempted to remove the re-growth; however, it had infiltrated the underlying tissues and was too extensive to remove and result in a fair prognosis.

## Conclusion

There is extensive research in mammalian medicine which supports the use of topical insulin to reduce second intention healing times such as those by Lui and Martins-Green (2008) and Kassem and Trau (2007), however, at the time of treatment of our patient, information pertaining to the use of topical insulin in an area with neoplastic cells was not readily available. Many polypeptide growth factors have proven to play a role in the development of tumours in human medicine (Witsch et al., 2010) however, there are many complex variables which must be present in order for the neoplasm to appear. It is unclear if the growth factors in the porcine insulin may have contributed to the re growth of the neoplasia however it did have the desired effect on the second intention healing. Further studies on topical insulin use in reptilian species on a larger scale are warranted to explore this treatment further and for it to become a justified treatment option to be practically applied in the veterinary field.

## Acknowledgment

Dr J. Aldred, BVetMed MRCVS.

## Disclosure statement

No potential conflict of interest was reported by the authors.

### References

Dodham, J., Robertson, S., Taylor, P., & Waters, C. (n.d.). Anaesthesia: Temperature regulation. *Vetstream*. Retrieved from https://www.vetstream.com/treat/canis/freeform/anesthesia-temperature-regulation

Girling, S., & Fraser, M. (2007). Systemic Mycobacteriosis in an Inland Bearded Dragon (Pogona Vitticeps). *Veterinary Record, 160*(15), 526–528. [e-journal] doi:10.1136/vr.160.15.526

Kassem, R., & Trau, H. (2007). The effect of topical insulin on the healing process of second degree burn in guinea pigs. *Journal of the American Academy of Dermatology, 56(Suppl. 2)*, AB207. [abstract].

Lateney, L. (2018). Wound management in exotic species. [PDF] *PVMA*. Retrieved from https://cdn.ymaws.com/www.pavma.org/resource/resmgr/docs/Spring_Clinic_Proceedings/Latney/PVMA_2018_Wound_Healing.pdf

Liu, Y., & Martins-Green, M. (2008). Insulin acceleration [sic] of healing and its effects on human microvascular endothelial cells. *Wound Repair and Regeneration, 16*, A21.

MSD Animal Health. (2016). Caninsulin 40 iu/ml suspension for injection. Retrieved from http://www.noahcompendium.co.uk/?id=-454391

Murgia, D. (2016). Management of traumatic and surgical wounds in cats and dogs. [PDF] *Vet Times*. Retrieved from https://www.vettimes.co.uk/article/management-of-traumatic-and-surgical-wounds-in-cats-and-dogs/?format=pdf

Negrini, J., Mozos, E., Escamilla, A., Perez, J., Lucena, R., Guerra, R., & Ginel, P. (2017). Effects of topical insulin on second-intention wound healing in the red-eared slider turtle (Trachemys scripta elegans) – a controlled study. *BMC Veterinary Research, 13*(1), 160. Retrieved from https://bmcvetres.biomedcentral.com/articles/10.1186/s12917-017-1082-8 doi:10.1186/s12917-017-1082-8

Smith & Nephew. (n.d.). OPSITE FLEXIGRID. Retrieved from http://www.smith-nephew.com/professional/products/advanced-wound-management/opsite/opsite-flexigrid/

The University of Queensland Australia. (2015). How to care for your bearded dragon. Retrieved from https://small-animal.hospital.uq.edu.au/bearded-dragon

Witsch, E., Sela, M., & Yarden, Y. (2010). Roles for growth factors in cancer progression. *Physiology, 25*(2), 85–101. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3062054/