CASE REPORT

An axial pattern flap based on the dorsal perineal artery in a cat

AP Murdoch* and JGR Grandb

Case report A 3-year-old male neutered Domestic Shorthair cat was evaluated for a skin mass of approximately 2 × 3 cm arising from the right dorsolateral aspect of the tail at the junction between the proximal and middle one-thirds of the tail length. Incisional biopsy sample was consistent with granulomatous inflammation. The granuloma was surgically excised with 5 mm margins of normal skin. The resulting defect was closed using an axial pattern flap based on a cutaneous branch of the dorsal perineal artery and augmented by a local subdermal plexus transposition flap. There was 100% survival of the flaps at postoperative days 7, 15 and 21.

Clinical significance We describe an axial pattern flap based on a cutaneous branch of the dorsal perineal artery in a cat. This flap offers surgeons a viable option for closing skin defects situated on the proximal one-third of the tail and a practical alternative to tail amputation.

Keywords cats; dorsal perineal artery; tail; wounds

Abbreviations CBDPA, cutaneous branch of the dorsal perineal artery; DPA, dorsal perineal artery

Primary closure of skin defects on the tail can be a challenge because there is little naturally loose adjacent skin. Options include healing by second intention, direct closure under tension for small defects and tail amputation for large lesions.

Skin flaps can be random pattern subdermal plexus flaps or axial pattern flaps depending on their blood supply. Axial pattern flaps, which include a direct cutaneous artery and vein, have a superior blood supply. Numerous axial pattern skin flaps have been described in cats, with favourable survival rates and good long-term outcomes. To our knowledge, an axial pattern flap based on a cutaneous branch of the dorsal perineal artery (CBDPA) has not been described in cats or dogs. We report the successful use of this type of flap to close a defect situated on the proximal one-third of the tail of a cat following excision of a skin granuloma.

Case report

A 3-year-old male neutered Domestic Shorthair cat was admitted for assessment of a skin mass situated on the tail. Histological analysis of an incisional biopsy sample performed by the referring veterinarian revealed granulomatous inflammation, suspicious of mycobacterial infection and/or deep mycosis, but no infective organisms were seen despite specific staining. Tail amputation was initially proposed by the referring veterinarian, because of concerns over prognosis and risks with medical management of mycobacterial disease, but was declined by the owner.

General physical examination was unremarkable. There was a cutaneous mass of approximately 2 × 3 cm arising from the right dorsolateral aspect of the tail at the junction between the proximal and middle one-thirds of the tail length. The mass was well defined, alopecic, solid and non-painful on palpation, and there was no apparent involvement of the subcutaneous tissue.

The skin tension and flap design were first assessed with the cat in a standing position. The skin over the ischiatic fossa was pinched between the surgeon’s fingers to assess the inherent elasticity of the skin and its potential elevation as an axial pattern flap based on the dorsal perineal artery (DPA), and the ability to close the donor bed with minimal tension.

After anaesthesia, the cat was positioned in left lateral recumbency and the distal portion of the tail was wrapped in a sterile bandage. The right thigh and the perineal region were prepared aseptically. An en bloc excision of the granuloma was performed with 5-mm margins of normal skin. Perioperative antibiotic (cefuroxime 20 mg/kg IV, Zinacef, GlaxoSmithKline) was administered every 90 min during surgery following removal of the granuloma.

Dissection was established along the deep caudal fascia of the tail and haemostasis was achieved with bipolar electrocoagulation. A surgical marker was used to outline the limits of the available skin and the length of the flap measured to ensure it would adequately cover the skin defect (Figure 1). The flap was raised with sufficient length to close the tail defect. Two parallel lines were created from the most dorsomedial (point A) and dorsolateral (point B) aspects of the right ischiatic fossa in a caudalventral direction. The attachment between point A and point B formed the flap’s pedicle (Figure 1). The length of the flap was equal to the distance from point B to the most caudal aspect of the skin defect. The flap was 8 cm long with a 3 cm base. The flap was first elevated distally below the subdermal plexus, using stay sutures to minimise tissue handling, and then reflected dorsomedially to enable dissection and identification of the caudal gluteal artery and its main branch, the DPA, near the flap’s base in the ischiorectal fossa. The long cutaneous branch of the DPA was visualised in the centre of the raised skin flap (Figure 2). The right lateral caudal arterial was also identified in the ischiorectal fossa and preserved during dissection to free the flap near its base. The generous subcutaneous fat occupying...
the ischiorectal fossa and surrounding the aforementioned vessels was preserved in order to limit iatrogenic trauma and dead space formation.

A skin flap based on the CBDPA was finally raised. A bridging incision was made from the most cranial aspect of the skin defect to point A. The CBDPA flap was then transposed 90° dorsally to reach the defect of the tail. The entire tail defect could be filled after rotating the CBDPA flap, but we recognised intraoperatively that the use of a second local skin flap would be beneficial to minimise tension on any of the wounds. Mild lateral deviation of the anus to the right was not clinically significant.

Along the skin incisions were apposed and the subcutaneous layer closed with 3-0 poliglecaprone 25 (Monocryl, Ethicon) sutures and the skin edges apposed with 3-0 nylon (Ethilon, Ethicon) sutures. There was slight deviation of the anus to the right and minimal tension on the wound edges after closure (Figure 3). The range of motion of the tail was normal.

Recovery from surgery was uneventful and the cat was discharged from hospital the following day on meloxicam (0.05 mg/kg PO q24h for 5 days; Metacam, Boehringer Ingelheim). The owner was also instructed to restrict the cat’s activity. The cat was seen again on postoperative days 7 and 15. The surgical site healed uneventfully with complete survival of both skin flaps. Skin sutures were removed on day 15. No delayed skin flap necrosis was observed on day 21. There were no problems with the cat’s ability to defecate and urinate.

Histological examination of the resected tissue revealed a nodular pyogranulomatous inflammation and the absence of infectious organisms. A margin of normal skin and subcutis was visible surrounding the area of pyogranulomatous inflammation, confirming adequate excision of all inflammatory tissue. Bacterial and fungal culture, fungal microscopy and Mycobacterium spp. PCRs were all negative on the submitted tissue sample.

Discussion

The current case demonstrates that a CBDPA-based skin flap can be successfully used in cats for closure of skin defects situated on the proximal one-third of the tail. To the authors’ knowledge, this is the first description of an axial pattern flap based on a CBDPA in a cat.

In dogs, the DPA originates from the ventral surface of the caudal gluteal artery. It supplies the external anal sphincter and the fat and skin that cover the dorsal part of the caudal surface of the thigh and perineum. It may anastomose with the ventral perineal
artery or may replace it functionally. The DPA becomes superficial over the ischiorectal fossa and gives rise to a long cutaneous branch (CBDPA) coursing over the dorsal border of the semitendinosus muscle.\textsuperscript{11} The location of the DPA in cats has not been described nor has the angiosome supplied by the CBDPA been described in either species, but we reasoned that the CBDPA could be suitable for the development of an axial skin flap because of its substantial cutaneous ventral branch. In the absence of a cadaveric perfusion study defining the angiosome supplied by the CBDPA, the safe borders of our skin flap could not be defined. Flap dimensions were determined intraoperatively by the size of the defect to be repaired and it is likely that the borders outlined in this case underestimate the true potential dimensions of the CBDPA flap (Figure 4). Elevation of a larger flap may, however, have implications for ease of donor site closure.

Width of the flap was first defined by measuring the width of the wound defect resulting from the skin granuloma excision. Length of the flap was equivalent to the distance between the pivot point of the flap (point A) and the most caudal aspect of the defect. In the case presented here, skin flap length was more than twice the width of the flap. Elevation of the flap as an axial skin flap allowed us to increase the flap length to width ratio. Experimentally created flaps incorporating a cutaneous direct artery and vein have a 95% survival rate compared with 53.4% survival for equal-sized flaps depending only on the subdermal plexus for blood supply.\textsuperscript{1} Survival of the present CBDPA flap was excellent, with no visible areas of necrosis noted on postoperative days 7, 15 and 21.

However, the maximal dimensions of the described CBDPA-based skin flap remain to be determined.

One of the advantages of the CBDPA flap is its proximity to the tail. As our CBDPA-based flap lacked a common border with the recipient bed, the flap was incorporated into a bridging incision between the recipient and donor beds, defining our flap as an interpolation flap.

The CBDPA-based skin flap was augmented by a second skin flap elevated as a subdermal plexus flap from the bridging incision. Closure of the tail defect using only the CBDPA skin flap was possible, but we recognised intraoperatively that a second local skin flap would be beneficial to minimise tension on the wound edges after closure. No dead space was created despite using a second flap, negating the need for placement of surgical drains. It is likely that this second skin flap was supplied by the subdermal plexus branches of the left lateral caudal artery and, to a lesser extent, by branches of the right lateral caudal artery, given the presence of vascular connections between both sides. Survival of this second subdermal plexus skin flap was also 100% at all postoperative clinical assessments.

Alternative options for management of large skin defects in the tail include healing by second intention and tail amputation. Frequent dressing changes over a prolonged period intensifies overall case management, and may affect treatment costs. Also, repeated sedation or short anaesthesia is often necessary in cats for dressing changes. Tail amputation is usually associated with a low rate of postoperative complications, but the present owner declined this option. A CBDPA skin flap was performed, given the benign nature of the mass. In the case of suspected or confirmed malignancy, tail amputation would be indicated for maximising local control of the tumour.

Conclusion

Using a CBDPA flap we were able to repair a skin defect of the tail of a 3-year-old cat. Cosmetic appearance after healing was excellent and the donor site was easily closed with no tension. This flap offers to surgeons an option for closing skin defects situated on the proximal one-third of the tail and an alternative to tail amputation. We also speculate that this flap could be applied to cover defects of the caudal pelvic region and sacrum area. A cadaveric perfusion study to define the anatomical extent of this axial pattern flap is warranted to more precisely define its margins for routine use.

References

Donald Joseph McCaffrey
1935 – 2016

Donald McCaffrey was born in Melbourne, the youngest of five children. The family moved to Brisbane to be closer to extended family during World War II. Don attended St Laurence’s College in South Brisbane, excelling both academically and at sport. After the suggestion of his mother, he joined the National Bank after leaving school. However, after making friends with a veterinary student he decided that veterinary science would be far more interesting, so he enrolled at the University of Queensland. As a student he worked at multiple jobs, including postman, frangipani picker, mattress studder and shearer’s cook to subsidise his university fees. He established the University of Queensland Australian Rules Football Club where he won best and fairest and captained the team in 1957.

After graduating in 1960, Don’s first job was in practice in Korumburra with Bill Thompson, before moving to Shepparton to work with Barry Jagger in 1961. After marrying Jen Hammon in 1964 they left Shepparton to travel overseas, visiting Europe and working in the UK and Ireland for 18 months.

Returning in 1966 Don worked with Jim Howes at Cobram, then returned to Shepparton in 1968, becoming a co-partner in Shepparton Veterinary Clinic with Barry Jagger, Peter Eldsen and Mac Walker. Don remained in the practice until retirement in 2000. He shared partnerships along the way with Julian Smithers, Angus Cunningham, Geoff Withers and Peter Grant. During the 1990s Don quietly, almost secretly, undertook further study to obtain his MACVSc in Pharmacology, a remarkable commitment for someone of that age.

As a veterinarian he has been described as dependable, efficient, professional and loyal. He was also a proud family man and a great community contributor. He also had a wicked sense of humour and was a renowned practical joker. Throughout his career he was an AVA member and a regular attendee at local AVA branch meetings.

Outside veterinary life Don was involved in primary school committees and was on the interim council of Goulburn Valley Grammar School and served on the school’s board after its establishment. His two daughters and three grandchildren have attended the school. He was also a member of Rotary for some time.

In retirement, Don did not miss the day to day grind of practice life, but he did miss the farmers he had served for so many years and kept in touch regularly. He immediately learnt woodwork at TAFE and the results were a plethora of coffee tables.

After the Black Saturday bushfires of 2009, Don was part of a volunteer group who went fencing on fire-ravaged properties around Buxton and Marysville every Wednesday for 2 years.

Don served on a committee that instigated Shepparton’s Biggest Blokes Lunch, a fundraising barbeque lunch event for prostate cancer, which has now been running for several years and has subsequently been adopted in several other rural communities. Since it started, over $900,000 has been raised in Shepparton for prostate cancer research and towards providing a local prostate cancer support nurse in Shepparton.

In his early years in Shepparton Don played football for Katandra. Later, he played tennis for many years. He also played golf regularly and last played just days before his stroke. Other interests included gardening and wine appreciation.

Don McCaffrey passed away on 25th May 2016, aged 81, following a stroke. He is survived by his wife Jen, daughter Alexandra and grandchildren Donald, Hugh and Elizabeth. His daughter Sarah predeceased him.

GN Withers

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