Dermatologic Disorders
Ferret Dentistry
A 1.5-year-old, 20-kg, intact female red kangaroo (Macropus rufus) in a private exotic collection presented for acute onset lameness after a traumatic injury to its left pelvic limb from the kick of a zebra. An open fracture of the left metatarsal IV was noted as well as an inability to bear weight on the limb. Fractures of the other metatarsals were suspected due to deformity of the foot on gross inspection.

The complete blood count and serum biochemistry values were found to be within normal reference ranges. The kangaroo was sedated with tiletamine HCl and zolazepam HCl (Telazol, 100 mg/ml, 0.5 ml IM), intubated and maintained on sevoflurane and oxygen for radiography.

Radiographs revealed grade I, open, distal one-third, comminuted fractures of metatarsals I, II and III with overriding and anterior/lateral displacement (Fig 1). Metatarsal V was intact. Pending surgical reduction, the wound was cleansed with chlorhexidine and flushed with saline. A soft bandage, made from non-adherent gauze bandages (Telfa pads), cast padding and stretch gauze, was applied. Presurgical antibiotic therapy was initiated with enrofloxacin (5 mg/kg IM q24h), and pain was managed with buprenorphine (0.02 mg/kg IM PRN). During the following 48 hours, the kangaroo continued to eat and drink normally.

Kangaroo Foot Anatomy

The hind foot of the kangaroo is long and narrow with 4 digits (digit I is absent). Digits II and III are extremely slender and delicate, together forming what is essentially a single functional toe; digit IV is the large, weight-bearing digit; and digit V, the most lateral, is slightly smaller than digit IV.
Surgical Repair

Two days later, the kangaroo was anesthetized as above, and IV catheterization was performed using the right lateral saphenous vein. Administration of buprenorphine and enrofloxacin was now continued intravenously, and the animal was maintained on lactated Ringer’s solution (2.5 ml/kg/hour), which continued for the duration of the 90-minute surgery.

An incision was made over the dorsal surface of metatarsal IV for surgical exposure. Bone fragments were distracted, and metatarsal IV was placed into an anatomically correct position. A 9-hole plate was placed and secured with 8 screws providing good bone purchase. One screw was omitted due to bone apposition at this location. Bone plating was chosen because it was judged to provide the best fracture reduction, apposition and stability—critical considerations for a weight-bearing toe in such a large animal. No surgical intervention was performed on metatarsal II or III because of their slender size and inherent fragility (Fig 2).

The surgical site was copiously flushed with saline. The subcutaneous tissues were undermined as meticulously as possible to allow for full coverage over the plate with minimal tension and were closed with 2-0 PDS. The skin was closed with 2-0 nylon in a simple interrupted pattern, and a soft, padded bandage was applied. The lateral saphenous catheter was maintained for 48 hours postoperatively to allow for IV drug administration. Buprenorphine was continued IV for 4 doses PRN, and enrofloxacin was continued for 48 hours postoperatively.

After the catheter was removed, pain management was maintained with tramadol HCl (Ultram®, Ortho-McNeil, www.orthomcneil.com, 2.5 mg/kg PO), and antibiotic therapy was continued with orbafloxacin (Orbax®, Schering-Plough, www.spah.com, 5 mg/kg PO). Both medications were compounded by a local pharmacy in a banana-marshmallow base and administered for 2 weeks. During this time moderate soft tissue swelling was noted over the site of closure; this swelling gradually resolved over the next 5-7 days.

Recovery

The kangaroo was housed in the clinic for cage rest. Moderate exercise was provided via daily walks into the treatment room. The recovery diet consisted of a commercial marsupial diet (Mazuri Kangaroo/Wallaby Diet, www.mazuri.com) plus timothy hay and some fruits and vegetables as treats. Two weeks later, the skin sutures were removed. During this time period, the soft bandage was reapplied and overwrapped with Vetrap™ (3M, www.3m.com) to prevent trauma to the site from the kangaroo’s intermittent scratching and chewing. The Vetrap™ was repaired as needed, and the bandage was replaced every 4 days.

Three weeks post-surgery, radiographs were repeated, this time without sedation (Fig 3). The screws and plate were intact, there was good apposition of the bone fragments in metatarsal IV and some fibrous callus formation was noted. Bandages were reapplied to protect the wound, and the kangaroo remained in the clinic for continued cage rest (Fig 4).
Dehiscence

Approximately 1 month later, the kangaroo developed a grade II (moderate) lameness of the left hind limb. A 3-cm dehiscence of the wound was observed on the dorsal aspect of metatarsal IV, accompanied by a mild, purulent discharge. Within 48 hours, the dehiscence had exposed the metal plate on the dorsal aspect of the foot. A culture and sensitivity test revealed *E. coli*, sensitive to orbafloxacin. The area was cleansed and scrubbed, as previously described, and a soft bandage was applied to permit healing by second intention. The bandage was changed every 3-4 days. Antibiotic therapy with orbafloxacin (5 mg/kg PO q24h), as compounded previously, was instituted and continued for 8 weeks during the growth of the granulation bed.

In 6 weeks, healthy granulation tissue had closed the wound entirely. There was significant callus and fibrous tissue formation across the dorsal surface (Fig 5). Bandages were removed at this time, and the kangaroo was returned to its caretakers for stall rest.

Weather-related Lameness

In early winter, the kangaroo was permitted to go outdoors into a 12' x 12' paddock each time its stall was cleaned. Soon an intermittent, grade I (mild) lameness was noted. The lameness resolved quickly after each
incident when the kangaroo was brought back into the warmth of the pen. A decision was made to remove the plate based on the hypothesis that the lameness episodes were caused by the weather-related chilling of the metal.

Surgery was undertaken with the same anesthesia and pain management protocols as before, and a 6-cm incision was made over the entire length of the plate on the dorsal surface of metatarsal IV. The plate was removed along with 8 bone screws; the most distal screw was cultured with a result of “no-growth” (Fig 6). The incision was closed as in the first surgery, and a soft bandage was applied. The wound was cleansed and the bandage changed after 1 week. The bandage was removed after the second week at the time of suture removal. During these 2 weeks, the kangaroo received tramadol (dosed as earlier) and gradually regained full function of the limb. As a precaution, and to allow for further bone healing, the kangaroo was housed in the clinic for an additional 4 weeks, with moderate exercise daily in the treatment room.

In mid-winter, the kangaroo was returned to its indoor holding pen with two other kangaroos. Because of weather, exercise occurred only in the paddock during pen cleaning. In late spring, the kangaroo was returned to pasture where it has continued to thrive and hop freely without lameness.

Fig 7. The kangaroo was returned to its pasture several months post-surgery.

References and Further Reading
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