Pelvic Limb Amputation and Outrigger Wheel Prosthesis in a Sulcata Tortoise (Geochelone sulcata)

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Background

- Indications for tortoise limb amputation
  - Irreparable limb/joint damage or chronic pain
  - Trauma
  - Necrotizing infectious/inflammatory
  - Congenital, developmental, nutritional
  - Neoplasia (undifferentiated sarcoma, squamous cell carcinoma, cutaneous adenocarcinoma)

- Tortoise prostheses
  - Lego wheel, sectioned billiard ball, wooden block, coaster
  - Temporary wheelchair to facilitate physiotherapy
  - Polymethylmethacrylate via sectioned tennis ball mold, cortical screws

- Media attention: Prostheses in variety of animals
  - Ex: Dogs/cats (limbs, carts), dolphin (tail flukes), eagle/toucan/macaw (beak)

Case Report

- Histopathology: skin, soft tissue, bone - severe, chronic, diffuse inflammation; healthy margins
- Bacteriology: Enterobacter spp., Enterococcus spp., Micrococcus spp., Bacteroides thetaiotaomicron, Clostridium innocuum – Susceptibility supports:
  - Doxycycline 10 mg/kg PO q24h x 14d
  - Metronidazole 20 mg/kg PO q24h x 14d
- Mycoplasma: Negative
- Post-operative medical management:
  - Meloxicam 0.2 mg/kg PO q24h x 10d
  - Silver Sulfadiazine cream topically q24h x 14d
  - Metronidazole 20 mg/kg PO q24h x 14d
  - Doxycycline 10 mg/kg PO q24h x 14d
- Incision sutures removed 30d post-operative

Prostheses in variety of animals

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Aims

1. Improve function & quality of life, post-amputation
2. Novel outrigger wheel prosthetic device

Case Report

- Signalment: 3-yr-old, 5 kg, female African sulcata tortoise
- Presenting complaint: chronic progressive osteomyelitis, left pelvic pes
- History:
  - 1 month laceration, distal left pelvic limb
  - Traumatic, open etiology (long marginal scutes)
  - Rx: iodine baths, enrofloxacin PO, cepazidime IM
  - Husbandry: indoor kiddie pool, UV and heat lamp
  - Diet: Mazuri tortoise pellets, legumes, dandelion greens, raspberries
- Physical examination findings:
  - Distal left pelvic limb – grossly deformed, malodorous, blackened, swollen stifle, pes unresponsive to nociceptive stimuli
  - Carapacial pyramiding, soft plastron

Clinical pathologic:

- Active heterophilic inflammation
- Computed tomography:
  - Left pes – severe SQ emphysema, bony lysis
  - Left tibia/fibula – complete minimally displaced fractures

DIAGNOSIS: Necrotic left pes with secondary tibial/fibular fractures

Surgical intervention: amputation via disarticulation at L stifle, distal to femur

Case Report (Cont’d)

- Saggital CT view of left pelvic limb of African sulcata tortoise revealing SQ emphysema, pes bony lysis, diaphyseal tibia/fibular fractures.

Figure 3: African sulcata tortoise post-operative left pelvic amputation at stifle with horizontal mattress everting sutures along lateral thigh.

Prosthesis: Novel Outrigger Wheel Device

- Creator: Bill Bickley and team at Pet Artificial Limbs & Supports (PALS)
- Goals:
  - Protect amputated stump from abrasion/pressure sores
  - Protect plastron from erosions
  - Simulate natural mobility
  - Donned/doffed as needed
  - Allow for growth of tortoise
  - Positively impact quality of life

- Design Specifications:
  - Prosthesis/cart – polypropylene plastic & medical grade thermofoam
  - Lightweight carbon strut, aluminum attachment bracket
  - Radio control airplane landing gear
  - 3 inch diameter wheel

Figure 4: Anesthetized African sulcata tortoise receiving whole body casting to create a mold of carapace and plastron for development of a customized prosthesis.

Discussion & Limitations

- First reported outrigger wheel prosthesis successfully fitted for long term use in a tortoise

- Design intentions:
  - Single plastic base conformed to plastron to be donned/doffed, secured with two fastening across the heart straps over the carapace
  - Cushion plastron interface, allowing form-fit and mild growth
  - Attaching the wheel at end of semi-flexible strut allowed the carbon to mildly flex/deflect under tortoise’s weight as a shock absorber

- Limitations:
  - Escape from device, uncommon
  - Surface wear/tear and other damages
  - Slippage surface vs. rugged terrain
  - Challenging – amount of strut flexion to simulate natural locomotion
  - Continued growth of animal
  - Continued modifications necessary

- Conclusions:
  - Novel outrigger wheel prosthesis in tortoise = SUCCESS!
  - Emerging adjunctive therapy in veterinary medicine
  - Requires innovation, modification, and application

PATIENT UPDATE:

- Uses the prosthetic device daily
- Indoors and outdoors
- Escapes device!
- No pressure sores on amputated limb
- No erosions on plastron
- Happy mobile tortoise

Literature Cited


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