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Multi-modal Rehabilitation and Laser Acupuncture for Traumatic Peripheral Neuropathy in a Pacific Parrotlet (*Forpus coelestis*): A Case Report

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Abstract: A 3-year-old male Pacific Parrotlet (*Forpus coelestis*) presented with acute, non-weight-bearing lameness of the right pelvic limb following a traumatic injury. Physical examination revealed a laceration over the right tibiotarsus and bruising in the inguinal region. Neurological assessment showed a loss of proprioception and absence of deep pain perception in the second and third digits, while superficial pain remained intact in the first and fourth digits. Based on the distal location of the injury and the specific clinical signs, a diagnosis of peripheral neuropathy affecting the *fibularis profundus* nerve was made. A multimodal therapeutic approach was implemented, consisting of systemic medications of ceftiofur crystalline free acid, robenacoxib and vitamin B complex, in combination with pulsed electromagnetic field (PEMF) therapy, therapeutic laser, and laser acupuncture. Corrective taping using fixomul was applied to maintain functional limb alignment. The patient exhibited significant progressive improvement and achieved full functional recovery within three weeks. This case demonstrates the efficacy of integrating regenerative physical therapies with traditional medical management for avian nerve injuries.

Keyword: *Forpus coelestis*, *Fibularis profundus*, Laser acupuncture, Avian rehabilitation, Peripheral neuropathy

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Summary

This case report describes the successful management of traumatic peripheral neuropathy in a Pacific Parrotlet. The patient exhibited severe neurological deficits of the right leg, notably knuckling and a loss of deep pain perception. Treatment integrated systemic medications comprising antibiotics, NSAIDs, and Vitamin B with physical modalities incorporating PEMF therapy and laser acupuncture. Corrective taping was utilized to prevent permanent tendon contracture. Within three weeks, the bird regained full functional use of the limb. The combination of early intervention and multi-modal therapy proved essential for nerve regeneration and functional recovery in this small avian species.

Background and Clinical History

A 3-year-old male Pacific Parrotlet (*Forpus coelestis*) was presented following an acute traumatic event after reportedly catching its right leg in a cage fixture. The medical history was unremarkable, and the patient was bright, alert, and responsive on presentation. However, clinical examination revealed a complete non-weight-bearing lameness of the affected pelvic limb and a complete inability to grasp or perch.

Investigations and Diagnosis

Physical examination revealed a superficial laceration over the right tibiotarsus (Figure 1A) accompanied by localized ecchymosis within the inguinal region. Comprehensive neurological assessment identified a right-sided proprioceptive deficit, manifested as "knuckling" of the second and third digits (Figure 1B). Sensory testing indicated a loss of deep nociception in the second and third digits, while superficial nociception remained preserved in the first and fourth digits. Notably, the pedal flexor reflex was absent in the affected limb. Radiographic imaging of the pelvic limb demonstrated no evidence of skeletal fractures or joint luxations (Figure 1C). Based on the focal trauma localized to the tibiotarsus and the specific paralysis of the digital extensors, a diagnosis of focal injury to the fibularis profundus (deep peroneal) nerve was established. This neuro-anatomical localization is consistent with the superficial course of the nerve as it passes over the cranial aspect of the tibiotarsus in avian species (Harcourt-Brown, 2002).

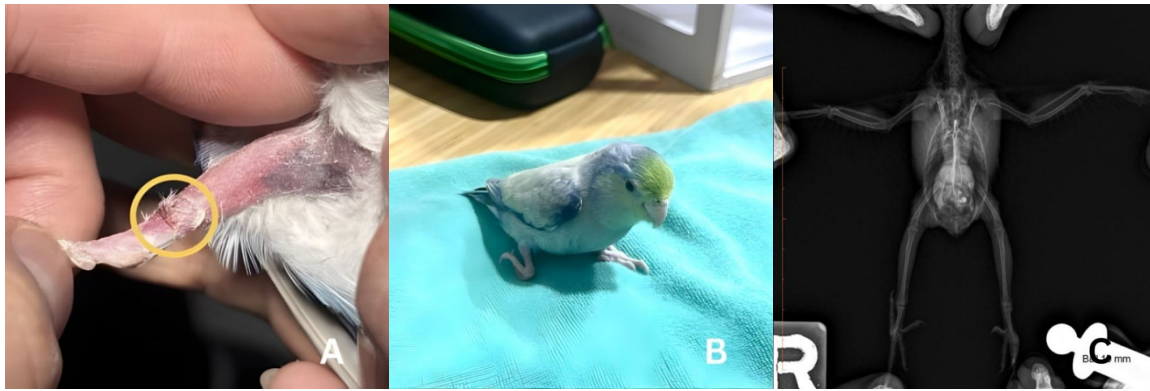


Figure 1. Clinical and radiographic findings at initial presentation: (A) Tibiotarsal laceration and ecchymosis; (B) Digit knuckling indicating proprioceptive deficit; (C) Ventrodorsal view radiograph showing no fractures or luxations.

Differential Diagnosis

The primary differential of a tibiotarsal fracture was ruled out radiographically. Although confirmatory blood and heavy metal profiles were not performed, systemic etiologies were clinically deemed improbable. Lead toxicosis was dismissed due to the strictly unilateral, focal neurological deficits and absent gastrointestinal signs. Furthermore, retained partial weight-bearing and intact sensation in the first and fourth digits effectively ruled out both renal neoplasia and proximal sciatic nerve injury, confirming a lesion distal to the tibial nerve branching.

Treatment, Outcome, and Follow-up

A multimodal therapeutic strategy was implemented, focusing on pharmacological management and physical rehabilitation.

Pharmacological Management

Systemic therapy comprised single intramuscular doses of ceftiofur crystalline free acid (50 mg/kg; EXCEDE™, Zoetis, USA) and robenacoxib (10 mg/kg; Onsior™, bela-Pharm, Germany) for infection prophylaxis and perineural edema management. Additionally, oral Vitamin B complex (2 mg/kg BID for 3 weeks; Bee Three®, Medicine Products, Thailand) was prescribed to support neural recovery. All dosages followed standard avian formularies (Carpenter *et al.*, 2023).

Physical Rehabilitation

Rehabilitation prioritized non-invasive modalities. Laser acupuncture was performed weekly to stimulate nerve recovery using the laser therapy (M-Vet, MLS®) in laserpuncture mode. The parameters of laser acupuncture at each acupuncture point were 611 Hz, intensity 1%, and a total duration of 5 seconds (4.44 J/cm²), which was repeated 3 times per point

(Petermann, 2017; Ruffoni and Pozzi, 2020) on acupuncture points: KID-1, *Liu-feng*, ST-36, BL-40, *Avian-guduan*, and LI-11 (Xie and Preast, 2007). Additionally, Pulsed Electromagnetic Field (PEMF) therapy was applied at 78 Gauss, 25 Hz, and 40% intensity for 20 minutes per session, once a week. The foot was secured in a

functional natural perch alignment using non-woven adhesive tape during the first week.

Clinical Outcome and Follow-up

The patient exhibited progressive improvement, with deep pain perception returning to all digits by the end of week one. By week three, all reflexes had normalized (Table 1, Figure 2).

Table 1. Evolution of Neurological examination result of affected limb over 3-week treatment period

Parameters	Week 0	Week 1	Week 2	Week 3
Proprioception	0	+1	+2	+2
Superficial pain nociception				
2 nd , 3 rd Digits	0	+1	+2	+2
1 st , 4 th Digits	+2	+2	+2	+2
Deep pain nociception				
2 nd , 3 rd Digits	0	+1	+2	+2
1 st , 4 th Digits	+2	+2	+2	+2
Flexor Reflex	0	+1	+2	+2
Gripping Ability	0%	25%	75%	100%

Neurological examination in Week 0 was before treatment. Results: 0 = Absent reflex, +1 = Decreased reflex, +2 = Normal reflex

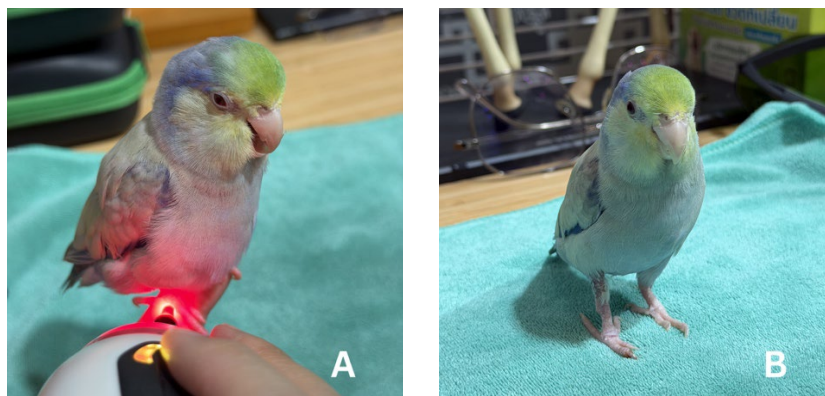


Figure 2. Multimodal rehabilitation and outcome: (A) Laser acupuncture delivered at the "*Liu-feng*" acupuncture points; (B) Full functional recovery exhibiting normal weight-bearing and standing posture.

Discussion and Learning Points

Avian-specific rehabilitation protocols for traumatic peripheral neuropathy remain limited. In dogs, mild peripheral nerve injuries have been reported to regain function within approximately 3–6 weeks, depending on injury severity and nerve type (Olaifa, 2018; Lopes *et al.*, 2022). In this avian case, complete functional recovery was achieved within 3 weeks, representing the lower end of this reported recovery range. Although spontaneous nerve recovery may have contributed to the outcome, the multimodal protocol was designed to support early functional limb use and minimize secondary complications during healing. Functional adhesive taping was applied only during the first week to maintain physiological perching alignment without complete joint immobilization, allowing the patient to stand and gradually regain limb use. This approach may reduce complications associated with prolonged disuse or rigid casting, including muscle atrophy, joint stiffness, tendon contracture, and stress (Lopes *et al.*, 2022). Laser acupuncture and PEMF were used as adjunctive, non-invasive modalities to support analgesia, neuromodulation, tissue healing, and inflammation control (Füchtenbusch and Rosin, 2018; Xie and Preast, 2007; Koh and Harrison, 2023). Deep pain perception returned by week one, gripping improved by week two, and full functional recovery including normal weight-

bearing, climbing, perching, and complete gripping was restored by week three. Long-term stability was confirmed at 6 months, indicating that this non-invasive protocol offers a viable alternative to conventional immobilization in avian rehabilitation.

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