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Innovative, non-invasive and economical repair of shell fracture in a red-eared slider (*Trachemys scripta elegans*)

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Abstract

Shell fractures are common in chelonians and represent a significant clinical challenge due to the risk of infection, prolonged healing, and functional impairment. Traditional repair techniques such as orthopedic plates, screws, and resin composites often require specialized equipment, general anesthesia, and carry inherent risks, including infection and coelomic penetration. This report describes the successful management of a shell fracture in a red-eared slider turtle (*Trachemys scripta elegans*) using an innovative, non-invasive, and economical technique. A 6-year-old female turtle weighing 3.5 kg presented with a right dorsolateral carapace to ventrolateral plastron fracture following a fall. Stabilization was achieved using sterilized clothing hooks fixed with instant super glue, reinforced with 26-gauge cerclage wire and topical tissue adhesive for sealing fracture line. Obligation to efficient surgical intervention, adequate post-operative care has resulted in uneventful recovery.

Keywords: Carapace, chelonia, fracture, shell, turtle, uneventful recovery

Introduction

Turtles are unique reptiles whose bony shell, consisting of the dorsal carapace and ventral plastron, provides vital protection against trauma and environmental hazards^[1, 2]. Despite this adaptation, shell fractures are common in both captive and free-ranging chelonians, often resulting from vehicular collisions, falls, predator attacks, or accidental mishandling^[1-5]. Such injuries compromise not only the structural integrity of the shell but also expose underlying soft tissues and coelomic organs to infection, sepsis, and high mortality risk^[1, 3-5]. Management of shell fractures aims to restore the natural barrier, stabilize mobile fragments, minimize infection, and support healing through granulation and re-epithelialization^[1, 3, 4]. A wide range of techniques, including invasive methods such as plating, wiring, and resin composites, have been described, though these often require specialized equipment, general anaesthesia, and carry risks of infection or coelomic penetration^[1, 3-6]. Recently, innovative and cost-effective non-invasive approaches including cyanoacrylate-based adhesives, hook-and-wire fixation, and tension-relief systems have been reported to yield favourable outcomes but being accessible to general practitioners and wildlife rehabilitators still remains scarce⁷. The present communication describes the successful application and management of an inexpensive, non-invasive technique for repairing shell fracture in a red-eared slider turtle (*Trachemys scripta elegans*), one of the most commonly kept pet turtles.

Case History and Clinical Examination

A 6-year-old female red-eared slider turtle (*Trachemys scripta elegans*) weighing 3.5 kg was presented to the Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar, with a history of falling from the first floor (approximately ≥ 11 feet). The animal was brought to the clinic one day after the incident, with blood and soft tissue visibly oozing from the fractured carapace.

On clinical examination, the turtle appeared dull with reduced mobility. A single fracture line was observed, extending from the right dorsolateral aspect of the carapace to the ventrolateral aspect of the plastron [Figure 1 (a, b & c)]. No internal organ protrusion was noted at the fracture site.

Diagnosis and Treatment

The diagnosis of shell fracture was established based on clinical examination. The authors observed that orthogonal radiographic projections were inconclusive due to the three-dimensional overlapping nature of chelonian anatomy unlike earlier reports [2-4].

Preoperatively, the turtle was administered with Enrofloxacin at 5.0 mg/kg body weight (Floxin Vet, 100 mg/ml, Intervet India Pvt. Ltd.) and Meloxicam at 0.2 mg/kg body weight (Melonex, 5 mg/ml, Intas Pharmaceuticals Ltd.), intramuscularly into the forelimb muscles between the elbow and shoulder using a tuberculin syringe at a 45° angle under traction. As chemical restraint was deemed unnecessary, the entire procedure was performed under physical restraint while the animal remained fully conscious.

The fracture line was thoroughly cleansed with 10% povidone-iodine solution. Since the fractured shell segments were relatively aligned, reduction and immobilization were the primary objectives. For stabilization, clothing hooks were sterilized with rectified spirit and adhered perpendicular to the carapace, approximately 0.5-1 cm from the fracture line, using Mighty Bond instant adhesive glue (Pioneer Adhesives

Pvt. Ltd.). Application of hooks with cotton produced an exothermic reaction but resulted in a stronger bond with chelonian shell. This technique was particularly effective for placement on the lateral aspect of the shell where adherence of hooks with the shell was weak and slippery.

Once the hooks were secured, 26-gauge stainless steel wire was looped across them, and gradual tightening approximated the fractured edges, reducing the gap and correcting shell depression. Following reduction, isoamyl 2-cyanoacrylate tissue adhesive (Q-fix 25, Aqmen Medtech Pvt. Ltd.) was applied along the fracture line as a bio-adhesive to reinforce wound closure (Figure 2).

Postoperatively, the same regimen of enrofloxacin and meloxicam was continued. Topical wound management included twice-daily spraying of silver nanoparticles (Pinpoint, Alembic) on the fracture site after cleansing with diluted povidone-iodine. Additionally, oral administration of multivitamin drops (Vimeral Plus, Zenex Animal Health) at 10 drops twice daily for 15 days was prescribed to reduce stress and promote healing. Access to water was restricted for 01 month to prevent sepsis of the fracture site.

The cerclage wires were cut, and the hooks were removed after 18 days using acetone-based nail enamel remover (Lakme), applied with cotton swabs to dissolve the adhesive. The patient was reviewed fortnightly, and progressive, uneventful healing of the shell fracture was observed within 21 days (Figure 3).

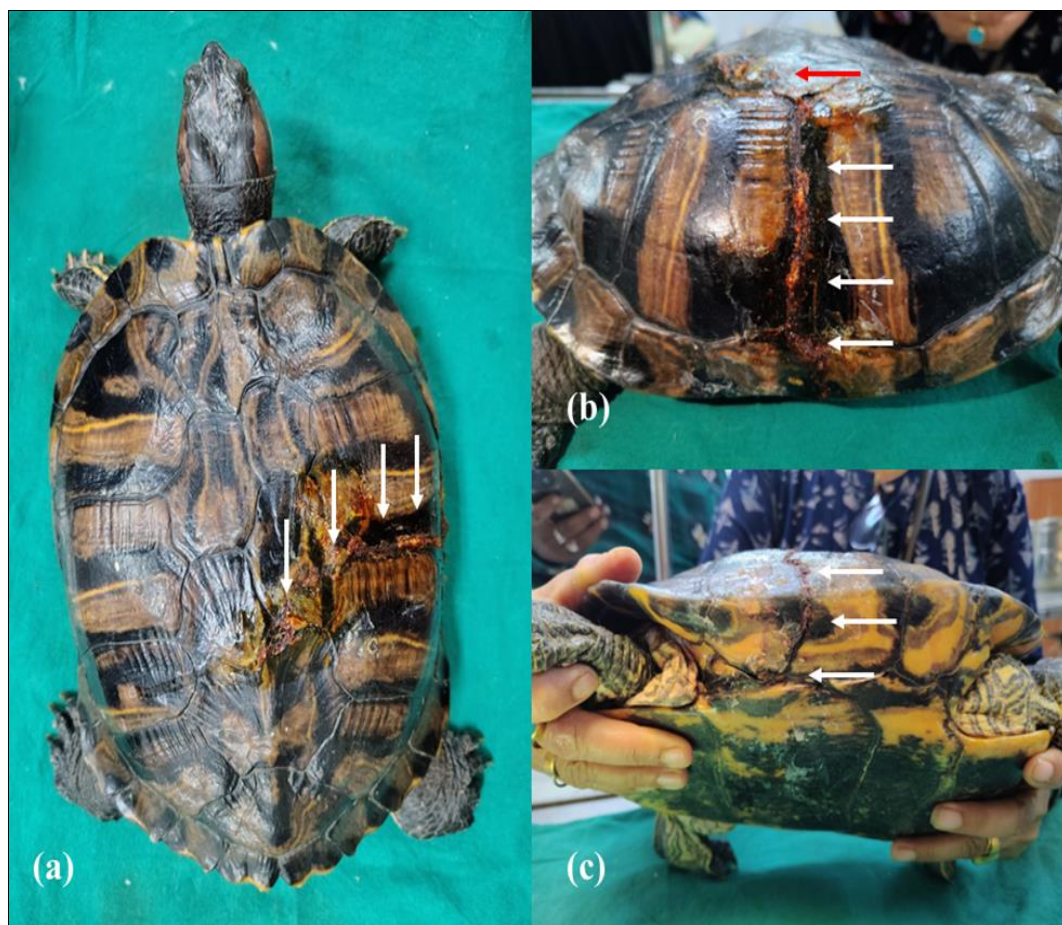


Fig 1: (a) Showing a single fracture line on the shell of red-eared slider turtle (*Trachemys scripta elegans*) (white arrows) extending from the right dorsolateral aspect of the carapace (b) to the ventrolateral aspect of the plastron (c)



Fig 2: Shell fracture segments were relatively aligned, reduction and immobilization using cloth hooks, super glue, orthopaedic cerclage wire, fracture line was sealed using topical tissue adhesives



Fig 3: Complete fracture healing and recovery of shell fracture

Discussion

Red eared slider turtle is the most common turtle kept as a pet. The shell is divided into the upper carapace & lower plastron, which are connected laterally by bridges formed by the fusion of lateral extensions of carapacial & plastral bones. Shell fractures in chelonians are frequently encountered in both captive and wild populations. Shell fracture takes between 4-8 weeks to heal, hence require timely intervention to restore shell integrity, prevent infection, and ensure survival [1, 2, 7]. Traditionally, invasive fixation techniques such as orthopaedic plates, screws, wires, and resin composites have been employed, offering strong stabilization but with notable drawbacks. These include the risk of coelomic penetration, infection, difficulty in wound monitoring, and the need for advanced surgical facilities. Furthermore, resin-based methods that permanently seal shell fractures have largely

fallen out of favour because they may entrap debris and microorganisms beneath the repair site, delaying healing [1, 3-6]. Recent literature emphasizes a shift toward non-invasive and cost-effective approaches. Bogard and Innis [7] described a simple adhesive-based repair method that proved effective in field and clinical practice without specialized equipment. Horvath-Pereira *et al.* [8] reported a novel technique using cyanoacrylate combined with sodium bicarbonate, which provided strong stabilization, antimicrobial effects, and excellent long-term outcomes in *Chelonoidis carbonarius*. Similarly, the Top Closure tension-relief system adapted for chelonian shell repair demonstrated a minimally invasive option with promising results [9].

In the present case, the use of clothing hooks, stainless steel orthopaedic cerclage wire, and commercially available super glue adhesives offered an innovative, non-invasive, and

economical solution for managing a severe carapace fracture in a red-eared slider turtle. The method was effective in achieving fracture reduction and immobilization without the need for chemical restraint or complex instrumentation, making it suitable for small animal practice and wildlife rehabilitation settings where resources may be limited. Comparable outcomes have been reported in retrospective reviews: Patson *et al.* [5] demonstrated successful healing of partial carapace avulsions in *Chelydra serpentina* using topical antiseptics and wound care, while Carpenter *et al.* [10] found that hook-and-wire and other minimally invasive methods were effective in large series of turtle cases in concomitant with earlier reports [1, 5].

Postoperative care also played a crucial role in recovery. The use of silver nanoparticle sprays, povidone-iodine cleansing, systemic antibiotics, analgesics, nutritional supplementation and restriction to water supported wound healing and minimized complications. Similar supportive measures have been emphasized as integral to shell repair in chelonians [1-4]. The present case healed uneventfully within weeks, consistent with earlier reports that conservative fracture stabilization can achieve rapid recovery in uncomplicated cases [1, 3-5].

Overall, this case highlights that non-invasive and low-cost repair techniques can provide outcomes comparable to more invasive surgical approaches while avoiding their inherent risks. Wider adoption of such methods may improve clinical outcomes in both pet and wildlife turtles, especially in regions with limited access to advanced veterinary infrastructure.

Conclusion

The present case demonstrates that carapace fractures in chelonians can be successfully managed using a simple, innovative, and economical technique involving cloth hooks, super glue, orthopaedic cerclage wire, and topical adhesives. This method provided effective stabilization, promoted rapid healing, and avoided the risks associated with invasive fixation procedures. Importantly, the entire repair was performed under physical restraint without the need for general anesthesia or specialized surgical equipment, making it a practical option in general veterinary practice and wildlife rehabilitation. Supportive care with antibiotics, analgesics, topical antiseptic, and nutritional supplementation further enhanced recovery. The favorable outcome in this case suggests that non-invasive approaches can serve as reliable alternatives to conventional surgical methods, particularly in resource-limited settings, while ensuring animal welfare and functional restoration.

Conflict of Interest

Not available

Financial Support

Not available

Reference

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