



ISSN: 2456-2912

NAAS Rating (2025): 4.61

VET 2025; 10(10): 459-462

© 2025 VET

www.veterinarypaper.com

Received: 20-09-2025

Accepted: 18-10-2025

Ankush Kumar

Senior Veterinary Consultant
cum Surgeon, Pet Life Care
Animal Hospital by Sarvodaya
Foundation, Faridabad,
Haryana, India

Shivani Rohilla

M.V.Sc. Scholar, Department of
Veterinary Medicine,
LalaLajpatRai University of
Veterinary and Animal Sciences,
Hisar, Haryana, India

Surgical repair of dual hindlimb fractures using orthogonal titanium veterinary cuttable plates and t-plate in a pediatric canine

Ankush Kumar and Shivani Rohilla

DOI: <https://www.doi.org/10.22271/veterinary.2025.v10.i10g.2673>

Abstract

Fractures in young dogs, particularly those involving weight-bearing bones such as the femur and tibia, require precise and individualized management due to their unique anatomical and physiological considerations. This report details the successful surgical treatment of a 2-month-old female indie puppy with comminuted diaphyseal fracture of the right femur and proximal transverse fracture of tibia sustained from a vehicular accident. Open Reduction and Internal Fixation (ORIF) was performed using orthogonal titanium Veterinary Cuttable Plates (VCP) for the femur and a titanium T-plate for the tibia. The procedure aimed to achieve rigid fixation, promote biological healing, and restore limb function. Postoperative recovery was uneventful, with early weight-bearing observed within 24 hours and complete functional use by 8 weeks. This case highlights the advantages of orthogonal double plating in enhancing mechanical stability and promoting reliable healing in pediatric orthopedic patients. It underscores the critical role of tailored surgical planning and execution in achieving successful outcomes in complex juvenile fractures.

Keywords: T-Plate fixation, Veterinary Cuttable Plate (VCP), comminuted fracture, double plating technique, juvenile dog fracture repair, orthogonal plating, pediatric orthopedics, titanium bone plates

Introduction

Fractures in young dogs, particularly those resulting from trauma, present unique challenges in veterinary orthopedics due to the anatomical and physiological characteristics of their developing skeletal systems (Reddy *et al.*, 2016) ^[6]. Among these, the femur and tibia being primary weight-bearing bones are commonly affected. Effective management is essential to ensure proper healing and restore functional mobility (Sai Bhavani *et al.*, 2024) ^[7].

Open reduction and internal fixation (ORIF) using bone plates is a widely employed surgical approach that involves direct visualization of the fracture site, anatomical realignment of bone fragments, and stabilization using appropriate implants. This technique offers rigid fixation, allowing early weight-bearing; however, its invasive nature may impact biological healing (Sarrau *et al.*, 2007) ^[8]. ORIF is especially suited for fractures requiring accurate reconstruction, such as transverse, oblique (short or long), segmental, minimally comminuted (with butterfly fragments), and intra-articular fractures (Castaldo *et al.*, 2021) ^[1].

This report describes the successful surgical management of a 2-month-old female indie puppy diagnosed with comminuted diaphyseal fracture of the right femur and proximal transverse fracture of tibia following a vehicular accident. Due to the complexity of the fractures and the age of the patient, ORIF using orthogonal titanium Veterinary Cuttable Plate (VCP) and a titanium T-plate was selected. The objective was to achieve stable fixation, promote biological healing, and restore limb function. This case emphasizes the effectiveness of orthogonal double plating in managing complex pediatric fractures and highlights the importance of individualized surgical planning for young animals.

Case History and Clinical Observations

A 2-month-old female indie puppy weighing 2.3 kg was presented with a history of a vehicular accident that had occurred one day prior.

Corresponding Author:

Ankush Kumar

Senior Veterinary Consultant
cum Surgeon, Pet Life Care
Animal Hospital by Sarvodaya
Foundation, Faridabad,
Haryana, India

The primary complaint was the inability to bear weight on right hind limb. Clinical examination revealed significant swelling of the right hind limb, along with bony crepitus and

marked pain on palpation. The limb was completely non-weight-bearing, and abnormal medial rotation at the level of the stifle joint was noted (Figure 1).

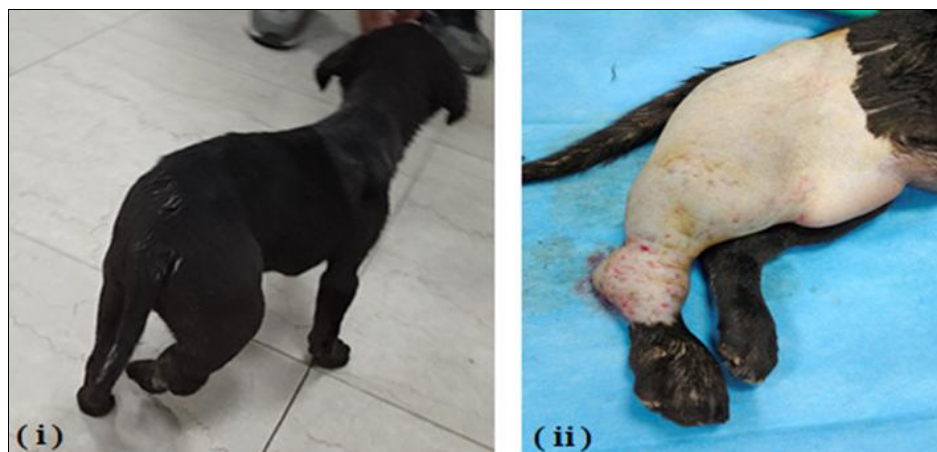


Fig 1: Photographs showing (i) non-weight bearing and (ii) severe swelling of right hindlimb in the puppy

Radiographic evaluation confirmed a comminuted diaphyseal fracture of the right femur, characterized by two spiral fissures and a completely separated bony fragment (butterfly fragment) at the distal end. The proximal and distal fragments exhibited cranio-caudal angulation and traumatic edges. Additionally, a complete transverse fracture of the right tibia at the proximal metaphyseal region was observed, along with

medial rotation of the stifle joint and patellar displacement from the trochlear groove (Figure 2).

Given the complexity and the deformity, surgical management with ORIF was chosen. An orthogonal titanium VCP was used for the femoral fracture repair, and a titanium T-plate was applied to repair the tibial fracture.



Fig 2: Pre-operative radiographic views of the right femur and tibia in (i) lateral and (ii) anteroposterior projections

Procedure

Pre-operative Preparation

Pre-operative blood work showed mildly elevated total leukocyte count with other values within normal limits. The puppy was premedicated intramuscularly with butorphanol (0.2 mg/kg), glycopyrrolate (0.01 mg/kg), and midazolam (0.2 mg/kg). Intravenous isotonic crystalloid fluid was administered perioperatively, along with intramuscular ceftriaxone (20 mg/kg) as antibiotic prophylaxis and tramadol (2 mg/kg) for analgesia.

The surgical site was clipped and prepared aseptically using 7% povidone-iodine scrub followed by 5% povidone-iodine solution. Anesthesia was induced with intravenous propofol (2 mg/kg) and maintained with isoflurane in oxygen.

Surgical Technique

After aseptic draping, a skin incision was made along the cranio-lateral aspect of the right thigh, extending from the greater trochanter to the distal femoral condyle. Blunt dissection was carried out through the subcutaneous tissues. The fascia lata was incised along the cranial border of the

biceps femoris muscle, followed by retraction of the biceps femoris muscle caudally, while the vastus lateralis was retracted cranially to expose the femoral diaphysis.

Reduction of bone fragments was achieved using pointed reduction forceps to minimize periosteal trauma. The butterfly fragment at the distal femoral fracture site was stabilized using a 1.5 mm titanium lag screw (8 mm in length). Once the main fragments were aligned, stabilization was accomplished using two 2.0 mm titanium Veterinary Cuttable Plates (VCPs): a 13-hole plate laterally and a 9-hole plate cranially (Figure 3, i). Both plates were fixed with 2.0 mm titanium cortical screws ranging from 8-12 mm in length (Figure 4).

After the implants were secured in position, the fascia lata was closed using 3-0 polydioxanone (PDS) in a simple continuous pattern. Subcutaneous tissues were similarly apposed with PDS, and the skin was closed using 2-0 nylon in a simple interrupted pattern. The proximal tibial fracture was accessed through a standard medial approach. Following reduction with pointed forceps, a 2.0 mm titanium T-plate was secured using 2.0 mm titanium cortical screws (8-10 mm) to achieve stable fixation (Figure 3, II).

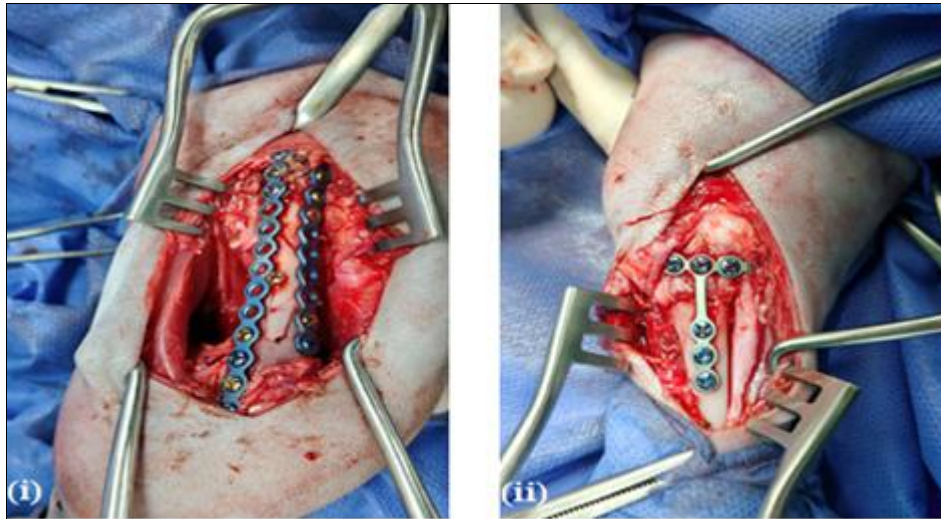


Fig 3: Photographs depicting: (i) orthogonal titanium VCPs along with a lag screw fixation for the femur fracture repair, (ii) stabilization of the tibial fracture with titanium T-Plate



Fig 4: Lateral (i) and anteroposterior (ii) radiographic views of the right femur and tibia after ORIF using orthogonal titanium VCPs and T-Plate

Post-operative Care

The puppy recovered uneventfully from anesthesia and was discharged the same day with instructions for strict cage rest for one week, followed by restricted activity for two additional weeks. Post-operative medications included: Syrup Cefpodoxime (10 mg/kg, once daily, orally) for 7 days, Syrup Meloxicam (0.2 mg/kg, once daily, orally) for 5 days as an antibiotic and analgesic support respectively along with daily antiseptic dressing of the surgical site for 10 days until skin

suture removal.

Results and Discussion

The patient began partial weight-bearing on the operated limb within 24 hours of surgery, with noticeable reduction in limb swelling (Figure 5). Recovery progressed smoothly, and by 8 weeks post-surgery, the puppy demonstrated complete functional use of the limb with no significant signs of discomfort or lameness.



Fig 5: Photograph illustrating puppy with partial weight-bearing on the operated limb within 24 hours of surgery, with noticeable reduction in the limb swelling

Orthogonal plating is particularly advantageous in cases where delayed healing or insufficient post-operative immobilization is anticipated, as it enhances mechanical stability. Plates are typically applied on the tension side of the bone and can serve various functions including compression, neutralization, buttress, or bridging, depending on the fracture type and location (El Haj *et al.*, 2013) [3].

Comminuted fractures, particularly in juvenile patients, are challenging due to the complexity of fragment alignment and associated soft tissue injury. Strategic planning of the surgical approach is crucial. Orthogonal plating offers increased resistance to mediolateral bending and greater load-bearing capacity under axial stress. However, it may necessitate additional screws in smaller bones, posing a logistical limitation (Gokarn *et al.*, 2025) [4].

Double plating significantly improves both axial and rotational stability, making it an ideal choice for initial fracture repair and revision surgeries. Compared to single plating, dual plate constructs provide superior mechanical distribution of load across the fracture site, lowering the risk of implant failure and promoting consistent healing. This approach is especially beneficial for young, active animals, allowing earlier return to mobility. Nevertheless, the technique demands precision; improper dissection or plate positioning can lead to soft tissue damage and potentially delay bone healing (Craig *et al.*, 2017; Meeson, 2017) [2, 5].

Conclusion

This case demonstrates the effectiveness of ORIF using orthogonal titanium VCP and T-plate in managing complex, comminuted fractures in young dogs. The surgical approach provided stable fixation, allowed early weight-bearing, and resulted in full functional recovery. The case underscores the importance of individualized treatment strategies and meticulous surgical execution in pediatric orthopedic patients to ensure optimal outcomes.

Acknowledgments

Thanks to the Managing Director and the team of Pet Life Care Animal Hospital by Sarvodaya Foundation, Faridabad, Haryana for providing support and facilities required for the surgical intervention and perioperative procedures.

Conflict of Interest

There is no conflict of interest

Financial Support

Not available

Reference

1. Castaldo S, Syrcle J, Elder S, Wills RW. Biomechanical comparison of external fixation and double plating for stabilization of a canine cadaveric supracondylar humeral fracture gap model. *Vet Comp Orthop Traumatol.* 2021;34(3):171-177.
2. Craig A, Witte PG, Moody T, Harris K, Scott HW. Management of feline tibial diaphyseal fractures using orthogonal plates performed via minimally invasive plate osteosynthesis. *J Feline Med Surg.* 2017;20(1):6-14.
3. El Haj M, Khoury A, Mosheiff R, Liebergall M, Weil YA. Orthogonal double plate fixation for long bone fracture nonunion. *Acta Chir Orthop Traumatol Cech.* 2013;80(2):131-137.
4. Gokarn N, Khatal D, Karve S, Pal R, Rathod H.

Successful management of a femur fracture with double plating in an 8-month-old domestic short hair cat: enhancing stability and rigidity in implant constructs. *Acta Sci Vet Sci.* 2025;7(3):1-5.

5. Meeson R. Making internal fixation work with limited bone stock. In *Pract.* 2017;39(3):98-106.
6. Reddy KS, Lakshmi ND, Veena P, Raju NKB. Repair of femoral shaft fractures by elastic plate osteosynthesis using veterinary cuttable plates in young dogs. *Indian J Anim Sci.* 2016;86(11):1246-9.
7. Bhavani SD, Krishna HNVV, Sreenu M, Naidu VG. Elastic plate osteosynthesis of long bone fractures using veterinary cuttable plates in young dogs. *Indian J Vet Sci Biotechnol.* 2024;20(5):15-20.
8. Sarrau S, Meige F, Autefage A. Treatment of femoral and tibial fractures in puppies by elastic plate osteosynthesis: a review of 17 cases. *Vet Comp Orthop Traumatol.* 2007;20(1):51-58.

How to Cite This Article

Kumar A, Rohilla S. Surgical repair of dual hindlimb fractures using orthogonal titanium veterinary cuttable plates and t-plate in a pediatric canine. *International Journal of Veterinary Sciences and Animal Husbandry.* 2025;10(10):459-462.

Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.