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CASE REPORT: TREATMENT OF OBLIQUE DIAPHYSIS FEMUR FRACTURE IN A 3-MONTH-OLD LOCAL DOG

Laporan Kasus: Penanganan Fraktur Oblique Diafisis Femur Pada Anjing Lokal Berumur Tiga Bulan

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Abstract

Femoral fracture is damage or loss of continuity of femoral bone tissue with or without displacement of bone fragments. Femoral fractures are often caused by mechanical trauma. A 3-month-old crossbreed dog, weighing 4 kg and male, complained of swelling, unable to walk and the right leg could not support. Based on owner information, the case dog was hit by a vehicle two days earlier. The results of the radiographic examination, the dog had an *oblique* fracture of the right femoral diaphysis with a prognosis of *fausta*. Treatment was carried out by surgery using internal fixation of intramedullary pins using general anaesthesia, a combination of xylazine and ketamine. Postoperatively, the antibiotic cefotaxime was given at a dose of 20 mg/kg/q12h (IV), followed by cefadroxil syrup at a dose of 25 mg/kg/q12h analgesic meloxicam tablets at a dose of 0.1 mg/kg/q24h. One week after surgery, a radiographic examination was carried out, the results showed that the pin was pushed up. The second operation was performed to correct the installation of the first pin. After the second operation, the antibiotic amoxicillin syrup ($^{R/}$Amoxsan) was given at a dose of 20 mg/kgq8h, analgesic mefenamic acid tablets at a dose of 30 mg/kg/q12h and calcium carbonate ($^{R/}$Osteocal) at a dose of 66 mg/kg/q24h to accelerate the callus formation process. Thirteen days after the operation, the wound had dried well and the dog was able to set its legs and run although it was still limping. The results of the X-Ray radiography thirty-four days after the operation showed that callus had formed on the fracture fragment of the *femur* bone. It is recommended that surgery be performed immediately to avoid the formation of callus at the end of the fracture and after the installation of the intramedullary pin, periodic radiographic examinations are carried out to determine the position of the pin in the bone marrow.

Keywords: Dog, femoral diaphysis, oblique fracture, intramedullary pin.

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Abstrak

Fraktur *femur* merupakan kerusakan atau hilangnya kesinambungan jaringan tulang *femur* dengan atau tanpa perpindahan fragmen tulang. Fraktur *femur* sering disebabkan oleh trauma mekanik. Seekor anjing ras lokal berumur tiga bulan, bobot badan 4 kg dan berjenis kelamin jantan dengan keluhan mengalami bengkak, tidak bisa berjalan dan kaki kanan yang tidak bisa menumpu. Berdasarkan informasi dari pemilik, anjing kasus tertabrak kendaraan dua hari sebelumnya. Hasil pemeriksaan radiografi, anjing mengalami fraktur *oblique* pada *diafisis femur* kanan dengan prognosis *fausta*. Penanganan dilakukan dengan pembedahan menggunakan fiksasi internal pin intrameduler dengan menggunakan anestesi umum kombinasi xilazin dan ketamin. Pascaoperasi diberikan antibiotik cefotaxime dosis 20 mg/kg/q12h (IV), dilanjutkan dengan cefadroxil sirup dosis 25 mg/kg/q12h analgesik meloxicam tablet dosis 0,1 mg/kg/q24h. Satu minggu pascaoperasi dilakukan pemeriksaan radiografi, didapatkan hasil pin terdorong naik keatas. Operasi kedua dilakukan memperbaiki pemasangan pin yang pertama. Pascaoperasi kedua diberikan antibiotik amoxicillin sirup ($^{R/}$Amoxsan) dosis 20 mg/kg/q8h, analgesik asam mefenamat tablet dosis 30 mg/kg/q12h serta kalsium karbonat ($^{R/}$Osteocal) dosis 66 mg/kg/q24h untuk mempercepat proses pembentukkan kalus. Tiga belas hari pascaoperasi, luka sudah mengering dengan baik dan anjing sudah bisa menapakkan kakinya serta berlari kecil meskipun masih pincang. Hasil radiografi X-Ray pada tiga puluh empat hari pascaoperasi menunjukkan kalus sudah terbentuk pada fragmen patahan tulang *femur*. Disarankan segera dilakukan tindakan pembedahan untuk menghindari terbentuknya kalus pada ujung patahan tulang dan setelah pemasangan pin intrameduler dilakukan pemeriksaan radiografi secara berkala untuk mengetahui posisi pin yang ada pada sumsum tulang.

Kata kunci: Anjing lokal, *diafisis femur*, fraktur *oblique*, pin intrameduler

INTRODUCTION

Fractures are among the most common conditions encountered in companion animals, particularly dogs. Animals that are allowed to roam freely are at a higher risk of sustaining fractures. A fracture is defined as a disruption in the continuity of bone, with or without displacement of bone fragments (Tonks *et al.*, 2008). Fractures are generally accompanied by varying degrees of soft tissue damage, including blood vessel rupture, muscle contusion, periosteal tearing, nerve injury, and in some cases, damage to internal organs and skin laceration (Dewi & Pemayun, 2020). In animals, fractures are most commonly caused by trauma such as impact with hard objects, vehicular accidents, or falls from a height.

A femoral fracture refers to damage or loss of continuity of the femoral bone, with or without displacement of bone fragments. Femoral fractures are most frequently caused by mechanical trauma and may occur in the metaphysis, diaphysis, epiphysis, or condylar region of the femur (Tercanlioglu & Sarierler, 2009). According to DeCamp *et al.* (2016), fractures can be classified based on the orientation of the fracture line into several types, including transverse fractures, in which the fracture line crosses the bone at an angle not exceeding 30° to the longitudinal axis; oblique fractures, characterized by a fracture line forming an angle greater than 30° to the long axis of the bone; spiral fractures, in which the fracture line encircles the diaphysis; and longitudinal fractures, in which the fracture line runs parallel to the long axis of the bone.

The primary principle in fracture management is to restore the fractured bone to its original anatomical position (reduction) and maintain this position during the healing process (immobilization) to ensure proper and effective bone union. Animals with femoral fractures typically exhibit clinical signs such as lameness, swelling, crepitation, and pain. The

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fundamental objectives of fracture management are to preserve the patient's life, achieve bone healing, and restore the function of the affected bone and surrounding soft tissues damaged by the fracture. The basic principles of fracture treatment are based on the 4R concept: recognition, reduction, retention, and rehabilitation (Erwin *et al.*, 2019).

Fracture management may be performed using closed or open fixation techniques. Commonly used internal fixation devices include intramedullary pins, bone plates, screws, and orthopedic wires. Fractures constitute an emergency condition and therefore require prompt intervention to prevent further damage to the surrounding tissues.

The aim of this article is to describe the diagnostic approach and management of an oblique femoral fracture in a three-month-old local dog, covering the preoperative, intraoperative, and postoperative phases.

RESEARCH METHODS

Signalment and Anamnesis

A three-month-old male local dog with black-and-brown hair coat and a body weight of 4 kg, originating from Dalung, was presented for examination. According to the owner, two days prior to presentation the dog had been struck by a motorcycle in the vicinity of the owner's residence. Following the incident, the dog developed swelling of the limb and was unable to walk.

The dog had a vaccination history limited to rabies and had received routine anthelmintic treatment. The diet provided by the owner consisted of commercial wet food, occasionally supplemented with boiled chicken meat. Drinking water was supplied ad libitum from tap water (municipal water supply). The dog was managed under a semi-free-roaming system, allowed to roam around the household yard together with one other dog, and occasionally allowed to leave the house in the afternoon.

Physical Examination

The physical examination findings of the dog were as follows: heart rate 120 beats/min, pulse rate 112 beats/min, respiratory rate 32 breaths/min, and capillary refill time (CRT) of less than two seconds. General physical examination including inspection, palpation, and auscultation revealed normal respiratory, digestive, and circulatory systems.

The observed clinical signs included inability to walk, swelling in the thigh region, and marked pain upon palpation, accompanied by audible crepitation.

Hematological Examination / Complete Blood Count (CBC)

A complete blood count was performed prior to surgical intervention to assess the general health status of the dog. The hematological profile included erythrocyte count, total and differential leukocyte count, hemoglobin concentration, hematocrit value, and platelet count (Erwin *et al.*, 2019). The hematological examination indicated the presence of infection, as evidenced by an increased white blood cell count (leukocytosis), elevated neutrophil count (neutrophilia), and increased Platelet Distribution Width Standard Deviation. In contrast, red blood cell count, hemoglobin concentration, hematocrit value, and mean corpuscular hemoglobin (MCH) were decreased, as presented in Table 1.

Radiographic (X-ray) Examination

Radiographic examination was performed at the Universitas Udayana Veterinary Teaching Hospital using ventrodorsal and right lateral recumbency positions to determine the fracture location, fracture type, and orientation of the fracture line, thereby facilitating appropriate

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fracture management. In addition, postoperative radiographic evaluation was conducted to assess the placement of the internal fixation device, which in this case was an intramedullary pin. The radiographic findings revealed an oblique fracture of the diaphysis of the right femur (os femur dexter) (Figure 2).

Diagnosis and Prognosis

Based on the anamnesis, physical examination, clinical signs, and radiographic findings, the dog was diagnosed with an oblique fracture of the femur. The prognosis was determined to be favorable (*fausta*).

Treatment

Management of the canine case was performed by placing an intramedullary pin in the right femur using a retrograde technique. The surgical procedure was divided into three stages: preoperative, operative, and postoperative.

The animal was fasted from food for 12 hours and water for 4 hours prior to surgery. The dog was then positioned in left lateral recumbency, and the surgical area on the right lateral femoral region was shaved. Atropine sulfate was administered as premedication at a dose of 0.02 mg/kg body weight subcutaneously (SC), followed by placement of a 0.9% NaCl intravenous infusion. After 10 minutes, general anesthesia was induced using a combination of xylazine at a dose of 2 mg/kg and ketamine at a dose of 10 mg/kg administered intravenously (IV). The animal remained in left lateral recumbency, and the surgical site on the right lateral femoral region was disinfected using 70% alcohol and chlorhexidine.

Prior to incision, the surgical area was covered with sterile drapes. A skin incision approximately 12 cm in length was made over the fracture site (Figure 4A). After opening the skin, the biceps femoris muscle and the vastus lateralis muscle, connected by the fascia lata, were incised (Figures 5B and 5C). Exploration was continued until the fractured femoral diaphysis was identified, and the proximal femoral fragment was gently elevated (Figure 4D).

Intramedullary pinning (IMP) of the femoral diaphyseal fracture in this case was performed using a retrograde method. The intramedullary pin was inserted through the medullary canal of the proximal femoral fragment and advanced until it penetrated the femoral tubercle using an electric drill (Figure 4E). The distal fragment was slightly elevated using a lever (Figure 4F). The proximal and distal fragments were then realigned, and the pin was driven in the opposite direction using an electric drill until it filled the medullary canal of the distal femoral fragment, allowing proper apposition of the fracture fragments (Figure 4G). The intramedullary pin was measured according to the length of the femur (Figure 4H) and cut to the appropriate length (Figure 4I).

After completion of IMP placement, the biceps femoris and vastus lateralis muscles were sutured individually using 3/0 chromic catgut with a simple continuous pattern (Figure 4J). The subcutaneous tissue was closed using a subcuticular suture pattern with 3/0 chromic catgut (Figure 4K), and the skin was sutured using 3/0 silk with a simple interrupted pattern (Figure 4L).

The surgery was performed twice, with the second operation conducted one week after the first to correct the intramedullary pin placement. This was necessary because the pin had migrated proximally, resulting in inadequate alignment of the fractured femoral diaphysis, as observed on postoperative radiographic examination after the first surgery (Figure 2). The surgical procedure performed during the second operation was identical to that of the first.

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During surgery, the animal received cefotaxime at a dose of 20 mg/kg every 12 hours intravenously (IV), followed by intramuscular (IM) administration at the same dosage. This was continued with oral administration of cefadroxil syrup at a dose of 25 mg/kg every 12 hours for five consecutive days. To prevent bleeding, tranexamic acid was administered intravenously at a dose of 10 mg/kg, followed by oral tranexamic acid tablets at a dose of 30 mg/kg every 12 hours for two days. Analgesic therapy included meloxicam at a dose of 0.2 mg/kg every 24 hours intravenously, followed by oral meloxicam tablets at a dose of 0.1 mg/kg every 24 hours for five days.

After the second surgery, the animal was further treated with amoxicillin syrup ($^{R/}$Amoxsan) at a dose of 20 mg/kg every 8 hours for five days. Oral analgesic mefenamic acid was administered at a dose of 30 mg/kg every 12 hours for seven days. To accelerate callus formation, calcium carbonate ($^{R/}$Osteocal) was given at a dose of 66 mg/kg every 24 hours for 36 days.

Wound care was performed using povidone-iodine, followed by application of bacitracin zinc and neomycin sulfate ($^{R/}$Enbatic), and the wound was covered with sterile gauze and hypafix during the healing process. An Elizabethan collar was applied to prevent the animal from licking or biting the surgical wound. The dog was housed in a clean and dry cage measuring 1.5 × 1 meter, lined with an underpad. The animal was provided with nutritious food rich in calcium, including supplemental meat and chicken bone broth, to help accelerate the healing process.

RESULTS AND DISCUSSION

Results

Postoperative observations were conducted over a two-week period (Table 2). On postoperative day 1, the surgical wound was still moist. The dog had begun eating and drinking but appeared weak. Urination was normal.

On postoperative day 5, the sutured wound had dried but remained swollen. The dog was active and able to walk; however, the limb showed inward deviation (abnormal weight bearing) and the animal was still lame. Eating, drinking, urination, and defecation were normal. On day 5 postoperatively, radiographic (X-ray) examination was performed. The radiographs revealed proximal migration of the intramedullary pin, resulting in inadequate fixation of the fractured femoral diaphysis (Figure 2). Based on these findings, a second surgery was decided upon.

On postoperative day 8, the wound was still moist. The dog was eating and drinking but remained weak, and urination was normal. By postoperative day 10, the surgical wound had begun to dry. The dog was active and able to walk but remained lame. Eating, drinking, urination, and defecation were all normal.

On postoperative day 15, the sutured wound had completely dried, and partial removal of the silk sutures was performed at 1-cm intervals. The dog's condition had improved compared to previous observations; it was active and able to walk and run, although lameness was still present. Urination was normal, but no defecation was observed on that day. Eating and drinking were normal.

On postoperative day 20, the wound had fully healed, and all remaining sutures were removed. The dog's condition continued to improve; it was active and able to walk and run despite mild lameness. Urination and defecation were normal, and appetite and water intake were normal. The dog was then returned to its owner.

Radiographic examination on postoperative day 34 showed callus formation at the femoral

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fracture fragments, as shown in Figure 6. The intramedullary pin was no longer visible on the femur. This was presumed to be due to the dog's active movement, which caused the intramedullary pin to migrate proximally and exit through the femoral tubercle.

Discussion

Soft tissues undergo inflammation and swelling following a fracture, and the severity of these changes largely depends on the extent of the injury. The femoral muscles often become swollen, and in cases such as this, hematoma and seroma formation are commonly observed (Fossum, 2012). Management of femoral fractures can be performed through reduction and immobilization. Reduction refers to a surgical procedure aimed at repositioning the fractured bone fragments to their original anatomical alignment. Immobilization is performed after reduction to stabilize the fractured bone fragments, thereby facilitating rapid callus formation.

Intramedullary pins are commonly used fixators in the management of diaphyseal fractures of the femur, tibia, ulna, humerus, metacarpal, and metatarsal bones. The placement of an intramedullary pin aims to fixate, immobilize, and stabilize the fracture fragments (Fossum, 2012).

In this case, the intramedullary pin placement procedure did not proceed optimally, necessitating a second surgery. Five days after the first operation, proximal migration of the intramedullary pin was observed. This pin migration was likely caused by the dog's highly active movements. In addition, although the fracture was located precisely in the mid-diaphysis of the femur, the fracture type was oblique. If reduction is not perfectly aligned with the fracture configuration, excessive pressure from the intramedullary pin may cause further bone damage, as occurred in this case. Therefore, during the second surgery, minor trimming (reshaping) of the oblique fracture edges was performed to convert the fracture into a transverse configuration.

Postoperatively, no cast or bandage was applied. Altunatmaz *et al.* (2017) stated that when treating fractures using intramedullary pin fixation, external fixation is not recommended due to the presence of dense soft tissue mass in the region. During postoperative days 1 to 3, swelling was observed around the surgical incision site. This swelling is a sign of inflammation, which represents one of the phases of wound healing.

Bone healing occurs through several phases, including the hematoma phase, proliferative phase, callus formation phase, consolidation phase, and finally the remodeling phase (Dewi & Pemayun, 2020). The inflammatory phase occurs during postoperative days 1–4, the proliferative and callus formation phases occur between days 5 and 20 postoperatively, and the callus maturation phase occurs from day 21 up to one month or even several years postoperatively (Purwoastuti & Walyani, 2015). Inflammatory reaction is a normal physiological response of the body to injury and is characterized by rubor (redness), tumor (swelling), calor (heat), and dolor (pain).

Bone healing is influenced by multiple factors, including the animal's age, fracture configuration, fracture line type, and fracture location. Evaluation results over an eight-day period showed evidence of wound healing by postoperative day 13, characterized by complete wound dryness and improved agility during walking, although mild lameness persisted. From postoperative days 14 to 18, the dog's ability to walk normally continued to improve, despite occasional lameness. Overall, the dog showed progressive clinical improvement following surgery, which likely contributed to accelerated postoperative recovery.

Antibiotic administration aimed to reduce the risk of secondary postoperative infection. Cefotaxime is a third-generation cephalosporin antibiotic with bactericidal properties that acts by inhibiting mucopeptide synthesis in the bacterial cell wall. Cefotaxime is highly stable

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against beta-lactamase hydrolysis and is therefore used as a first-line alternative for bacteria resistant to penicillin (Dewi & Pemayun, 2020). Cefotaxime exhibits broad-spectrum activity against both Gram-positive and Gram-negative organisms (Hadi, 2009).

Cefadroxil is a broad-spectrum bactericidal antibiotic belonging to the first-generation cephalosporin group, derived from *Cephalosporium acremonium*. Cefadroxil is used to treat infections caused by Gram-positive and Gram-negative bacteria and is commonly indicated for skin infections, pharyngitis, tonsillitis, gonorrhea, otitis, urinary tract infections, and postoperative infections. Amoxicillin is a semi-synthetic aminopenicillin β-lactam antibiotic effective against both Gram-positive and Gram-negative bacteria (Pratiwi *et al.*, 2023). It is widely used in veterinary medicine due to its broad spectrum of activity. As a penicillin derivative, amoxicillin works by inhibiting bacterial cell wall synthesis, leading to bacterial weakening and death (Simanjuntak *et al.*, 2022).

Meloxicam is a nonsteroidal anti-inflammatory drug (NSAID) that acts by inhibiting prostaglandin synthesis through cyclooxygenase enzyme inhibition, thereby exerting analgesic, anti-inflammatory, and antipyretic effects. Meloxicam was administered during the inflammatory phase, from postoperative days 1 to 5 after the first surgery, to reduce inflammatory responses (Pinandita *et al.*, 2018). Mefenamic acid is also an NSAID used to relieve mild to moderate pain and inflammation and is indicated for rheumatic conditions, soft tissue injuries, and musculoskeletal pain.

Supportive therapy included administration of calcium carbonate (Osteocal®) as a calcium source required during postoperative bone formation and repair. Amling *et al.* (1999) and Li *et al.* (1997) reported that cal

cium is the primary mineral component of bone structure and plays a crucial role as a reservoir for maintaining normal physiological blood calcium levels. Calcium is also essential for homeostasis, renal calcium reabsorption, regulation of intestinal calcium absorption, and bone remodeling. Claes *et al.* (2012) further stated that calcium plays a central role in bone mineralization, which is an integral part of the fracture healing process.

Healing of femoral fractures begins with fibroblast proliferation by periosteal and endosteal cells. Osteoblasts secrete an intercellular matrix composed of collagen and polysaccharides that combine with calcium ions to form a young callus. The young callus appears as a palpable mass and is visible on radiographic images. The presence of callus on radiographs indicates that fracture union is in progress (Sudisma *et al.*, 2006). The young callus subsequently undergoes further maturation through osteoblastic activity, developing into mature bone with lamellar structure formation. Callus formation begins in the first week and continues for up to four weeks post-fracture; however, in young animals, this process may occur more rapidly (Erwin *et al.*, 2018).

CONCLUSION AND SUGGESTIONS

Conclusion

The dog in this case was diagnosed with a diaphyseal femoral fracture with an oblique fracture line and was treated using intramedullary pin fixation of the femur. By postoperative day 20, the surgical wound had dried, all sutures had been removed, and the dog was able to walk, although mild lameness was still present. On postoperative day 34, radiographic examination showed callus formation at the femoral fracture site, the intramedullary pin had migrated and was no longer present, and the dog's gait had improved compared to earlier observations.

Suggestions

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Early surgical intervention is recommended to prevent premature callus formation at the fracture ends. Following intramedullary pin placement, regular radiographic examinations should be performed to monitor the position of the pin within the medullary cavity. In addition, postoperative activity restriction is strongly advised to minimize excessive movement and reduce the risk of pin migration in cases of femoral fractures.

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REFERENCES

Altunatmaz, K., Karabağli, M., Aydin Kaya, D., Güzel, Ö., Eravci Yalin, E., Uğurlu, Ü., Şadalak, D. J., & Ekici, H. (2017). The treatment of supracondylar and diaphyseal femoral fractures in cats using intramedullary two-way stacked Kirschner wire application. *Turkish Journal of Veterinary and Animal Sciences*, *41*(2), 282–287. https://doi.org/10.3906/vet-1606-12

Amling, M., Priemel, M., Holzmann, T., Chapin, K., Rueger, J. M., Baron, R., & Demay, M. B. (1999). Rescue of the skeletal phenotype of vitamin D receptor-ablated mice in the setting of normal mineral ion homeostasis: Formal histomorphometric and biomechanical analyses. *Endocrinology*, *140*(11), 4982–4987. https://doi.org/10.1210/endo.140.11.7110

Claes, L., Recknagel, S., & Ignatius, A. (2012). Fracture healing under healthy and inflammatory conditions. *Nature Reviews Rheumatology*, *8*(3), 133–143. https://doi.org/10.1038/nrrheum.2012.1

DeCamp, C. E., Johnston, S. A., Déjardin, L. M., Schaefer, S. L., & Brinker, P. (2016). *Flo's Handbook of Small Animal Orthopedics and Fracture Repair*.

Dewi, A. A. R. I., & Pemayun, I. G. A. G. P. (2020). Laporan Kasus: Penanganan Patah Miring pada Tulang Kering dan Tulang Betis Kanan pada Anjing Persilangan. *Indonesia Medicus Veterinus*, *9*(2), 206–218. https://doi.org/10.19087/imv.2020.9.2.206

Erwin, Rusli, Etriwati, Imanda, D. R., & Fadli, H. (2018). Fiksasi fraktur kominutif os femur menggunakan intramedullary pin dan wire pada kucing domestik (Felis domestica). *ARSHI Veterinary Letters*, *2*(4), 73–74. https://doi.org/10.29244/avl.2.4.73-74

Erwin, Amiruddin, Rusli, Etriwati, Sabri, M., Adam, M., Ramadhana, C. E., & Kusuma, A. Y. (2019). Fiksasi Internal secara Terbuka Fraktur Bilateral Pelvis pada Anjing. *Acta VETERINARIA Indonesiana*, *7*(1), 23–28. https://doi.org/10.29244/avi.7.1.23-28

Fossum, T. W. (2012). *Small Animal Surgery Textbook-E-Book: Small Animal Surgery Textbook-E-Book*. Elsevier Health Sciences.

Hadi, U. (2009). *Antibiotic usage and antimicrobial resistance in indonesia*. 181–194.

Li, Y. C., Pirro, A. E., Amling, M., Delling, G., Baron, R., Bronson, R., & Demay, M. B. (1997). Targeted ablation of the vitamin D receptor: An animal model of vitamin D-dependent rickets type II with alopecia. *Proceedings of the National Academy of Sciences of the United States of America*, *94*(18), 9831–9835. https://doi.org/10.1073/pnas.94.18.9831

Pinandita, T., Ismono, D., Ismiarto, Y. D., & Chaidir, M. R. (2018). Efek Pemberian Meloxicam Yang Diberikan Selama Fase Inflamasi Terhadap Proses Penyembuhan Tulang

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https://doi.org/10.24843/bulvet.2026.v18.i01.p27

Tikus Paska Open Reduction Internal Fixation K-Wire Dinilai Secara Radiologis. *Jurnal Sistem Kesehatan*, *3*(3), 135–141. https://doi.org/10.24198/jsk.v3i3.16989

Pratiwi, M., Nabila, N. A., & Sutomo, A. (2023). Literatur Riview: Efektivitas Penggunaan Obat Antibiotik Pada Pasien ISPA. *JURNAL FARMASI Universitas Aisyah Pringsewu*, *2*(1), 19–26.

Simanjuntak, H. A., Simanjuntak, H., Maimunah, S., Rahmiati, R., & Situmorang, T. S. (2022). Diameter Zona Hambat Antibiotik Amoxicillin dan Tetracycline terhadap Escherichia coli. *Herbal Medicine Journal*, *5*(2), 55–59. https://doi.org/10.58996/hmj.v5i2.52

Sudisma, I. G. N., Pemayun, I. G. A. G. P. Warditha, A. A. G. J., & Gorda, I. W. (2006). *Ilmu Bedah Veteriner Dan Teknik Operasi* (Denpasar, Ed.). Universitas Udayana.

Tercanlioglu, H., & Sarierler, M. (2009). Femur Fracture and Treatment Options in Dogs Which Brought Our Clinics. *Lucrări Ştiinlifice Medicină Veterinară*, *XLII*(2), 98–101.

Tonks, C. A., Tomlinson, J. L., & Cook, J. L. (2008). Evaluation of closed reduction and screw fixation in lag fashion of sacroiliac fracture-luxations. *Veterinary Surgery*, *37*(7), 603–607. https://doi.org/10.1111/j.1532-950X.2008.00414.x

Tables

Table 1. Hematological Examination Results

Parameter	Results	Reference range	Remarks
WBC	20.85	6.0 - 17.0	.High
NEU #	16.43	3.62 - 12.30	.High
LYMPH #	2.69	0.83 – 4.91	Normal
LYMPH %	0.129	0.120 – 0.330	Normal
NEU %	0.788	0.520 – 0.810	Normal
RBC (10^6/uL)	4.49	5.10 - 8.50	Low
HGB (g/dL)	8.9	11.0 -19.0	Low
HCT (%)	27.3	33.0 - 56.0	Low
MCV (fL)	60.9	60.0 -76.0	Normal
MCH (pg)	19.7	20.0 - 27.0	Low
MCHC (fL)	324	300.0 - 380.0	Normal
RDW-CV	0.141	0.125 – 0.172	Normal
RDW-SD (fL)	34.2	33.2 - 46.3	Normal
PLT (10^3/uL)	235	117 - 490	Normal
MPV (fL)	11.2	8.0 - 14.1	Normal
PDW-SD(fL)	20.7	12.0 - 17.5	.High
PCT (mL/L)	2.60	0.90 – 5.80	Normal
P-LCC (10^3/uL)	98	45 - 170	Normal
P-LCR %	0.415	0.200 – 0.600	Normal
EOS %	0.035	0.005 – 0.100	Normal

Notes: WBC: White Blood Cell; NEU: Neutrophil; LYM: Lymphocyte; MON: Monocyte; EOS: Eosinophil; BAS: Basophil; RBC: Red Blood Cell; HGB: Hemoglobin; HCT: Hematocrit; MCV: Mean

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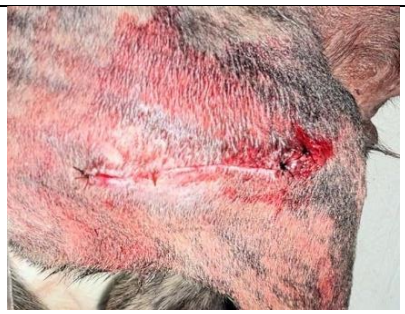
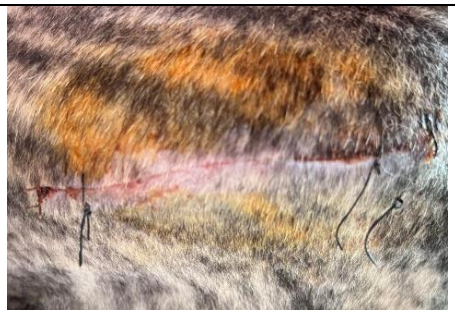
Corpuscular Volume; MCH: Mean Corpuscular Hemoglobin; MCHC: Mean Corpuscular Hemoglobin Concentration; PLT: Platelet; MPV: Mean Platelet Volume; PCT: Plateletcrit.

Table 2. Postoperative Observations After the First and Second Surgeries

Postoperative period	Clinical observations	Treatment
Day 1 (After the first surgery)	 • The surgical wound was still moist • The dog was conscious but appeared weak • Urination was normal with yellow-colored urine • The dog began eating and drinking in the evening	• Intravenous fluid therapy with 0.9% NaCl • Antibiotic: cefotaxime sodium at a dose of 20 mg/kg BW IV every 12 hours (IV and IM) • Tranexamic acid at a dose of 10 mg/kg IV • Antipyretic/analgesic: meloxicam at a dose of 0.2 mg/kg IV • The area surrounding the wound was cleaned with povidone-iodine, Enbatic powder was applied, and the wound was covered with sterile gauze and hypafix
Day 5	 • The sutured wound had dried but remained swollen • The dog was active and able to walk; however, the affected limb showed inward weight bearing • Urination and defecation were normal • Appetite and water intake were normal	• Antibiotic: cefadroxil syrup at a dose of 25 mg/kg orally (PO) every 12 hours • Meloxicam tablets at a dose of 0.1 mg/kg PO every 24 hours • The area around the wound was cleaned with povidone-iodine, Enbatic powder was applied as needed, and the wound was covered with sterile gauze and hypafix

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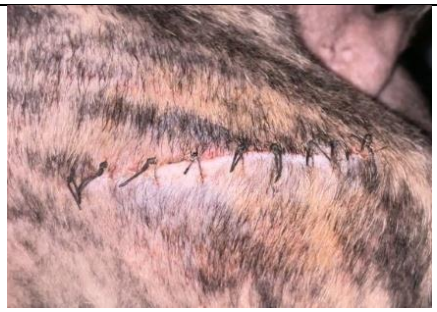
Day 8 (After the second surgery)	 • The surgical wound was still moist and swollen • Urination was normal with yellow-colored urine • The dog began eating and drinking in the evening	• Intravenous fluid therapy with 0.9% NaCl • Tranexamic acid at a dose of 10 mg/kg IV • Antipyretic/analgesic: meloxicam at a dose of 0.2 mg/kg IV • The area surrounding the wound was cleaned with povidone-iodine, Enbatic powder was applied, and the wound was covered with sterile gauze and hypafix •
Day 10	 • The surgical wound had begun to dry but remained swollen • The dog was active and able to walk but was still lame • Urination and defecation were normal • Appetite and water intake were normal	• Amoxicillin at a dose of 20 mg/kg orally (PO) every 8 hours • Mefenamic acid at a dose of 30 mg/kg PO every 12 hours • Calcium carbonate (Osteocal®) at a dose of 66 mg/kg PO every 24 hours • The area around the wound was cleaned with povidone-iodine, Enbatic powder was applied as needed, and the wound was covered with sterile gauze and hypafix
Day 15	 • The surgical wound had completely dried, and partial removal of silk sutures was performed at 1-cm	• Mefenamic acid at a dose of 30 mg/kg PO every 12 hours • Calcium carbonate (Osteocal®) at a dose of 66 mg/kg PO every 24 hours • The area surrounding the wound was cleaned with povidone-iodine, Enbatic powder was

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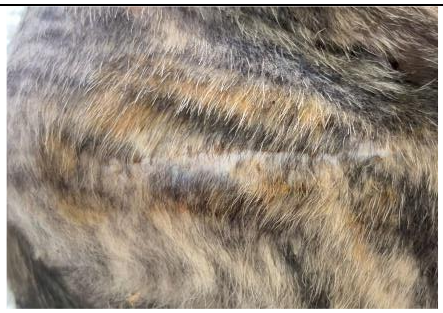
	intervals • The dog was active and able to walk and run, although lameness was still present • Urination and defecation were normal • Appetite and water intake were normal	applied, and the wound was covered with sterile gauze and hypafix
Day 20	 • Complete removal of all remaining sutures was performed • The dog's condition had improved compared to previous observations; it was active and able to walk and run despite persistent mild lameness • Urination and defecation were normal • Appetite and water intake were normal • The dog was returned to its owner	• Calcium carbonate (Osteocal®) at a dose of 66 mg/kg PO every 24 hours

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Figures

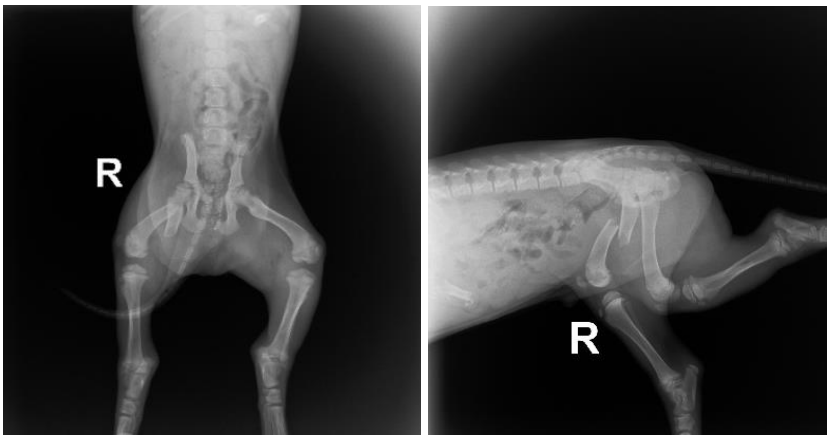

Figure 1. Preoperative radiographic examination showing ventrodorsal (left) and lateral (right) views, revealing an oblique fracture of the right femur.

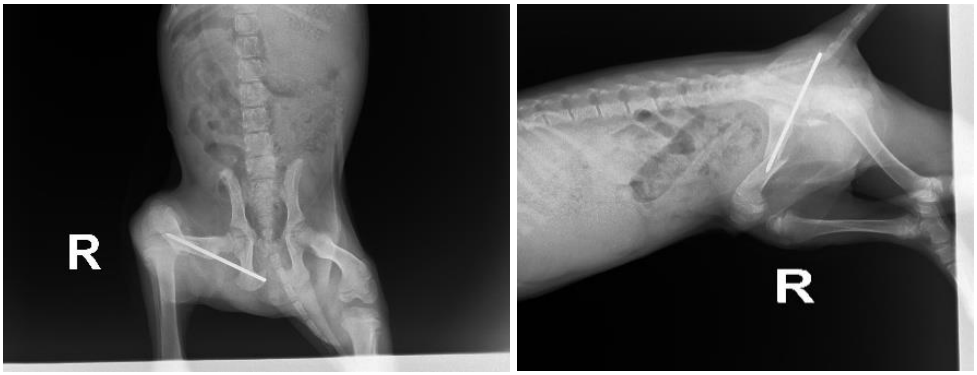

Figure 2. Postoperative I radiographic examination showing ventrodorsal (left) and lateral (right) views. Proximal migration of the intramedullary pin is observed, resulting in failure of union of the femoral diaphyseal fracture.

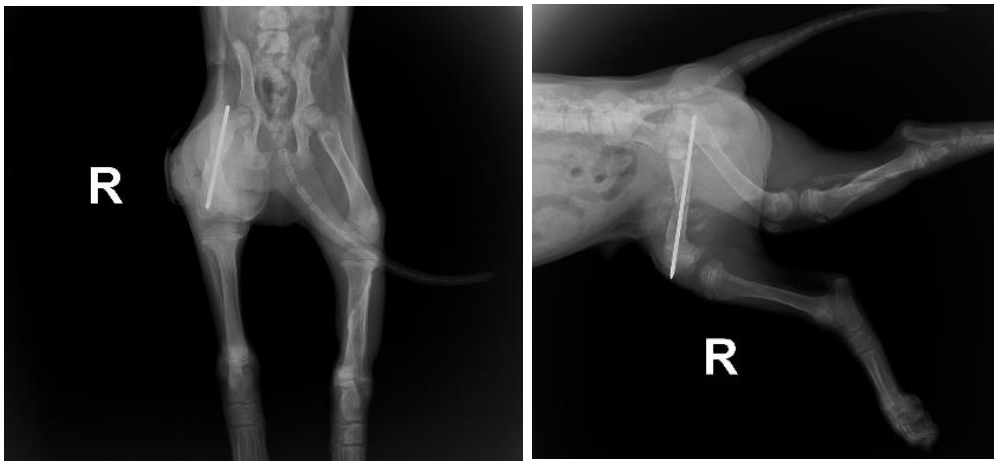

Figure 3. Postoperative II radiographic examination showing ventrodorsal (left) and lateral (right) views. The intramedullary pin is properly positioned, allowing adequate alignment and union of the femoral diaphyseal fracture.

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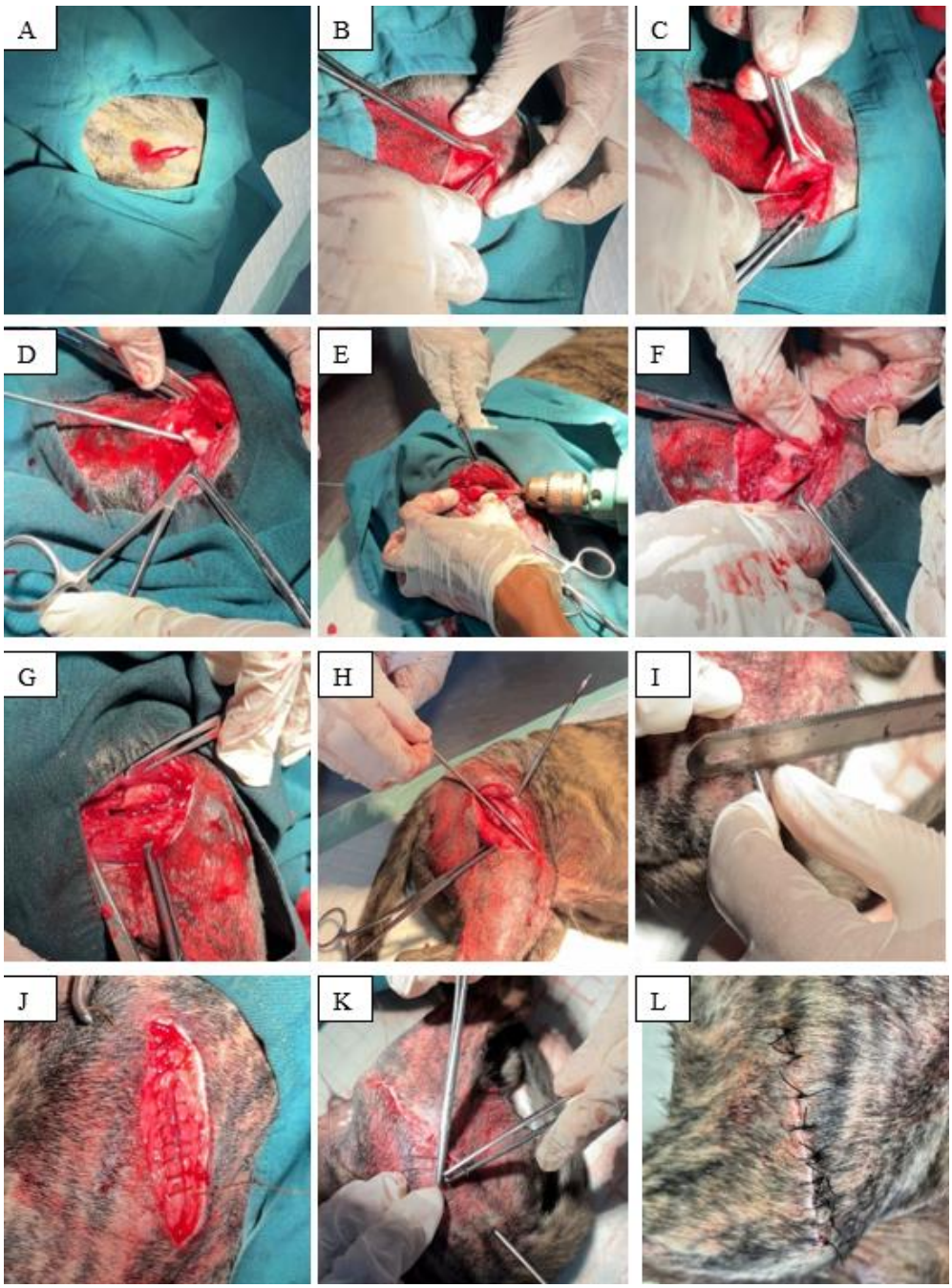

Figure 4. Surgical procedure: skin incision made along the fracture site (A); incision of the biceps femoris muscle and vastus lateralis muscle (B and C); the proximal femoral fragment slightly elevated using a lever (D); retrograde intramedullary pin (IMP) placement, with the pin inserted through the medullary canal of the proximal femoral fragment until it penetrated the femoral tubercle (E); the distal fragment slightly elevated using a lever (F); repositioning of the proximal and distal fragments to achieve proper alignment, followed by advancement of the intramedullary pin in the opposite direction using an electric drill until it filled the medullary canal of the distal fragment, allowing fracture apposition (G); measurement of the intramedullary pin according to femoral length (H); cutting of the intramedullary pin (I); suturing of the biceps femoris and vastus lateralis muscles using 3/0 chromic catgut with a simple continuous pattern (J); subcutaneous closure using 3/0 chromic catgut with a subcuticular suture pattern (K); and skin closure using 3/0 silk with a simple interrupted pattern (L).

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Figure 5. Clinical condition of the dog on postoperative day 34.

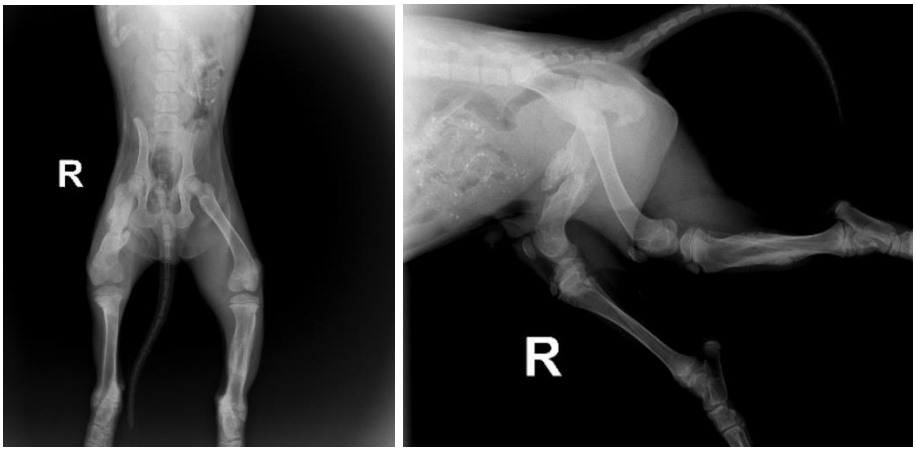

Figure 6. Radiographic examination on postoperative day 34 showing ventrodorsal (left) and lateral (right) views. Callus formation is evident at the femoral fracture site, and the intramedullary pin is no longer present.