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Short communication

MANAGEMENT OF DISTAL FEMUR FRACTURE USING TYPE-I ELLIS-PIN FIXATOR IN A PERSIAN TOM CAT

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ABSTRACT: A male Persian cat, 16 months old, with a fractured left femur, was brought to the veterinary clinical complex in Navania, Rajasthan, India. Under general anesthesia, the fracture was operated with a type-I Ellis pin fixator combined with a supplementary intra-medullary pinning technique. Bone healing was accomplished without significant complications.

Keywords: Tom cat, Ellis-pins, Fracture, Femur, General anesthesia.

In India, keeping cats and dogs as pets has become a common hobby, so pet owners are now aware of any health concerns. Thus, in recent years, there has been a surge in the diagnosis and treatment of diseases by pets. [1, 2, 3]. Appendicular fractures are comparatively common in the domesticated pet population [4]. Trauma is considered as most common cause of femur fractures in cats and can occur in the metaphyseal, diaphyseal, and or epiphyseal region of long bones [5, 6]. Moreover, in cats, femur fractures are relatively common and data from earlier studies revealed that 20-26% of all fracture cases [7].

Rudy in the year of 1975 reported that only selected fractures can be managed using a simple intramedullary pinning (IMP) technique alone [8]. Sometimes many complicated fractures or fracture cases that cannot be managed through simple orthopaedic techniques like IMP or external coaptation are presented to the surgeon and for such purpose, other satisfactory techniques should be approached.

External skeletal fixation (ESF) or Ellis-pin fixator provides versatile rigid fixation of the bone fragments and avoids metal implants at the fracture site and this technique is useful in the management of comminuted, open, or infected fracture [9].

In the present case, a slightly compound distal femur fracture was presented and successfully managed using an external skeletal fixator in the form of an Ellis-pin fixator with an ancillary retrograde intramedullary pinning (IMP) technique under balanced anesthesia.

Anamnesis and diagnosis

A 16-month-old cat weighing 3.2 kg with a history of falls from a height that happened 12 hours before reporting to the clinic was presented to the Veterinary clinical complex, Navania, Rajasthan, India. The lateral radiograph was taken and it revealed a short, oblique, distal 1/3rd configuration with well-demarcated overriding of proximal and distal fractured fragments (Fig.1). Fracture was slightly contaminated and became compound.

The animal was anesthetized by administration of a Xylazine - Ketamine combination in which induction was done using Xylazine, 1mg/kg, and Ketamine, 15 mg/kg body weight intramuscularly. However, for maintenance included only Ketamine was used intravenously.

For IMP, an incision (approx.7 to 8 cm) was made at the lateral aspect of the femur starting from mid-diaphysis to the lateral surface of the stifle. The stifle was opened and bone fragments were exposed carefully including aseptic anatomical dissection. An intramedullary pin (IM-pin) was driven using a Jacobs drill-chuck through a retrograde manner.

After placement of the IM-pin, external fixation (with Ellis pins) was done (Fig. 3) in which first most distal, and most proximal Ellis pins as trans-cortical

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pins were drilled through both the bone cortices and all the four "Jess-clamps" (Table 1) were placed along with one connecting bar and assembly was tightened using Allen-key (L-key). Afterward, each Ellis pin as a trans-cortical pin was placed similarly in the proximal and distal portion; the assembly was slightly loosened and further, all the jess-clamps were tightened after a complete reduction of overriding (Fig. 4).

After implant-placement fascia and subcutaneous tissue were sutured using Vicryl No. 2-0 (absorbable suture material) continuously. Skin sutures were placed using Non-absorbable Silk No. 2-0 as an interrupted suture pattern.

Results and discussion

A lateral radiograph taken immediately after surgery showed that both the fractured fragments had been fully reduced and aligned, with no overriding (Fig. 2). The IMP was positioned without excessive drilling. Denny stated that the majority of feline femoral shaft fractures can be successfully treated with an IM pin with or without cerclage wires; nonetheless, it has biomechanical limits for sole fixation [10]. Torsion, shear, compression, and bending forces can cause femur fractures, yet the IM pin only offers effective support against angular deformity. In the postoperative radiograph of this case, the fixator was also placed correctly as planned pre-operatively. No far drilling of transcortical pins was reported. Although the external fixator has inadequate stability against bending, it counteracts rotation, shear, and compression adequately [11, 12]. All fracture stresses, however, can be sufficiently stabilized if the ESF is utilized in conjunction with IM pins, as it was in this instance. For this reason, an additional IMP and an Ellis-pin fixator were applied in the present case. Similarly, Langley and coworkers in their study mentioned that the external fixator was used in the majority of cases (71 percent) with supplementary IM pin fixation [13]. It is possible to prevent unstable configurations like the distal fracture in this example by adhering to fundamental fixator application principles [7, 12, 14]. Because inserting an IM pin into an open fracture could expose the entire medullary canal to infection, it may not be recommended; however, in a study, seven open fractures out of the 35 fractures (grade I or grade II) and in six of these IM pins were used as part of the fixation without an associated complication and similarly, in this case, such complications were not reported [13,15]. Each fragment should have a minimum of two pins inserted, and two or more of the pins in the ESF should ideally have a positive profile and be threaded to improve bone purchase and lessen the chance of pullout [16]. However, in this instance, 2-negative profile pins were used in each fragment

Table 1. Various implants used for stabilization of fracture.

Type of technique	Material used	Purpose	Size
Ellis-pin fixator (External skeletal fixation system)	Ellis-pins fragment	As trans-cortical pins	2.5 mm in proximal (Total 2 pins were used)
			2 mm in distal fragment (Total 2 pins were used)
	Jess-clamps	As connecting clamps to connect Ellis-pins with connecting bar	3 mm in proximal fragments (Total 2 clamps were used)
			3 mm in proximal fragments (Total 2 clamps were used)
	Connecting-bar	To connect all trans-cortical pins with jess-clamps	2 mm
Intramedullary pinning (IMP)	End-threaded, negative profile, trochar pointed pin	As an intramedullary pin (IM-pin)	2 mm

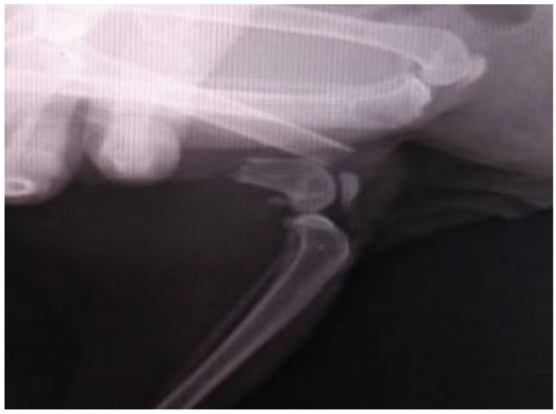

Fig. 1. Pre-operative radiograph (lateral view).

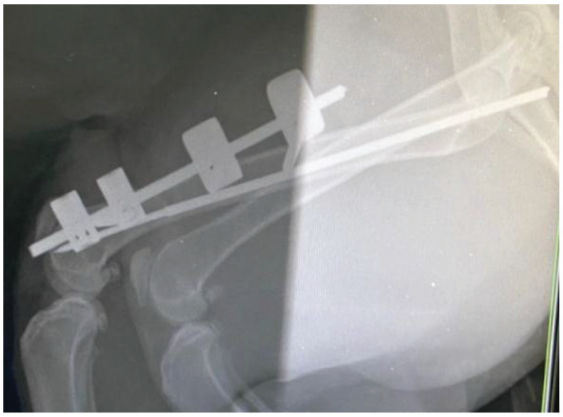

Fig. 2. Immediate post-operative radiograph (lateral view).

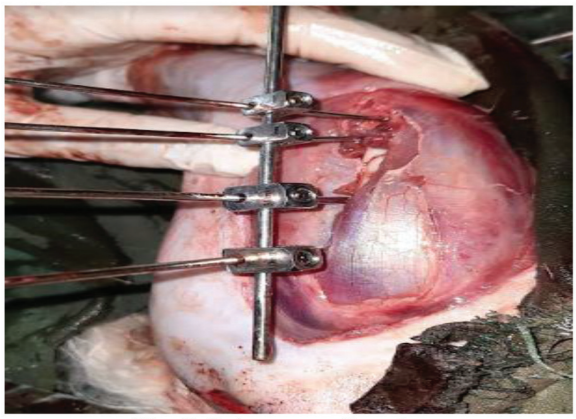

Fig. 3. Intra-operative view.

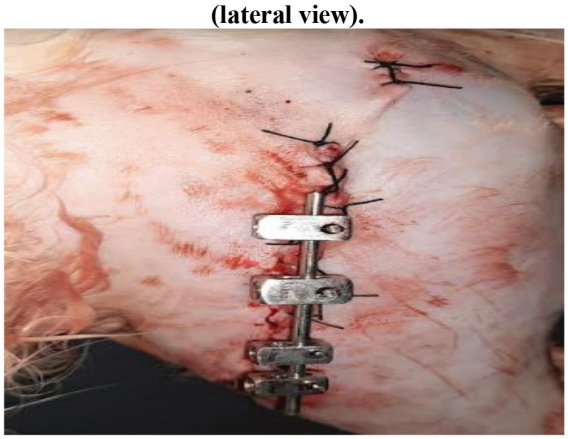

Fig. 4. Complete placement of Ellis-pin fixator.

Fig. 5. Post-operative weight bearing on operated limb. The ESF-construct was well tolerated by patient.

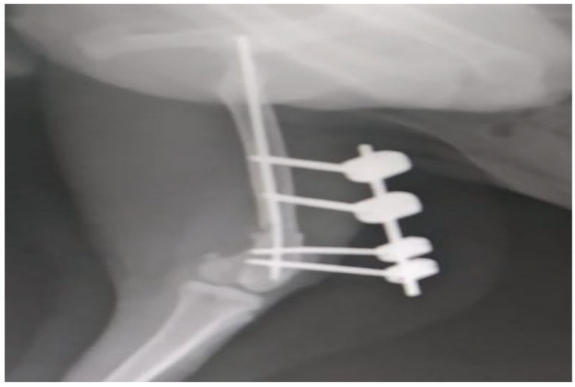

Fig. 6. Radiograph taken after 38-days of surgery revealed bridging callus formation. Fracture line is still visible.

and were found to have good bone purchase, with no pin loosening during the postoperative phase.

In the postoperative follow-up period, the suture line revealed minor serous discharge but didn't correct fixator stability. In one study researcher observed that a lot of cats first experienced a very mild serous discharge from the area surrounding the pin tracts but in the present case, there was generally not a problem and owners warned at the time of surgery that it is likely to occur [13]. Because the animal was young and the fracture healed earlier, more substantial discharge is caused by the pin loosening in the bone or ongoing damage to the soft tissue surrounding the pin. However, it has been reported that placing pins through areas where the bone is easily palpable subcutaneously, at the most proximal and distal ends

of the bone, should limit this to a minimum [7]. The pins that are most likely to loosen are those that are subject to the greatest biomechanical strain [14]. The animal showed partial weight-bearing capacity just the next day of surgery with complete weight-bearing without any further limping around eight weeks of surgery. However complete healing was achieved and the ESF implant was removed 42 days after its placement but IMP was retained in position (Fig. 6). Here note that the animal started weight-bearing just the next day of surgery (Fig.5). The stability of the fixator was maintained till the removal of the implant. Complete fixator removal is typically performed following radiographic union evidence, though removal has occasionally been based on clinical union [8,15] and similarly in the present case clinical weight bearing was used as a basis for its removal.

Conclusion

The current case study demonstrated that using Ellis pins instead of smooth pins gave the external skeletal fixator greater stability and allowed the implant to be kept in place for the entire fracture healing period. Cats with compound femur fractures can benefit from the effective treatment of type-I external skeletal fixators, such as Ellis-pin fixators. To completely reduce fracture fragments, intramedullary pinning is an ancillary fixation technique that negates bending forces.

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