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Evaluation of stainless steel positive profile end threaded intramedullary pins for management of long bones fractures in dogs

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Abstract
Six clients owned dogs (n=6) with fracture of long bones were included in the present study. Physical examination and radiography aided in the diagnosis of the condition. Steps were taken to stabilize the animal hemodynamically on the day of its presentation and stabilized the affected limb with application of modified Robert jones bandage. Aseptic surgery was planned once the edema of the limb was reduced and open reduction and stabilization was performed under general anesthesia in all the dogs. All the fractures were stabilized with stainless steel positive profile end threaded intramedullary pins followed by application of modified Robert jones bandage. Pin migration was noticed in two cases and the migrated pins were removed under general anesthesia. Mild osteomyelitis was noticed in one case and was resolved after administering antibiotics. Normal ambulation of the affected limb was seen in all the animals. Complications like malunion, non-union, limb shortening were not noticed in any of the case.

Keywords: Positive profile, end threaded, intramedullary pinning, long bone fractures, robert jones bandage

Introduction
Management of long bone fractures with intramedullary pinning technique is a regularly followed technique in veterinary orthopaedics. Unthreaded intramedullary pins could only resist bending forces and cannot counteract shearing and rotational forces which act at the fracture site (Kumar & Gahlot, 2013) [1]. Stack pin application can partially overcome these disadvantages by opposing the horizontal crossing and bending forces (Lidbetter and Glyde, 2000) [2], whereas; combine plate-intramedullary pin application can overcome all the disadvantages by bringing increased axial and rotational stability at the fracture site (Hulse *et al*., 2000) [3]. Intramedullary interlocking nailing is one of the fracture fixation techniques which can counteract all the forces acting at the fracture site and achieve rigid repair (Kapler, 2015) [4]. End threaded intramedullary negative profile pins are the pins which can penetrate into the cancellous part of distal fragment and provide stability against the bending forces and also prevents migration of the pin, but the strength of this implant at the pin- thread junction is weak and prone to breakage if the junction is at the fracture site. This type of weak pin-thread junctions will not be seen in Positive profile end threaded intramedullary pins as the threads are raised above the core diameter of the pin (Chanana *et al*., 2018) [5]. The aim of the present study was to evaluate the stainless steel positive profile end threaded intramedullary pins for fixation of long bone fractures in dogs.

Materials and Methods
The study was conducted over six clients owned dogs (n=6) which were presented to the clinics of SVVU Super Speciality Veterinary Hospital, Visakhapatnam, with fracture of their long bones (Fig-1). The etiology and signalment of the animals were mentioned in Table No-1. Physical examination and radiography has been carried to diagnose the type of fracture. The bone involved and AO/AISF classification of the fracture were shown in Table No-2. All the dogs were stabilized hemodynamically by administration of intravenous fluids besides analgesics and antibiotics. The fracture site was temporarily immobilized with application of modified Robert jones bandage and planned for aseptic surgery. All the dogs were given intramuscular injection of Butorphanaol at the dose rate of 0.2mg per kg body weight, Acepromazine at the dose rate of 0.05mg per Kg body weight and Glycopyrollate at the dose

rate of 0.05mg per Kg body weight as preanesthetic medication. Anesthesia was induced by intravenous administration of Propofol at the dose rate of 4mg per kg body weight (Till effect). Anesthesia was maintained with the help of Isoflurane inhalant anesthesia using Boyel's apparatus. The fracture site was approached from cranio-lateral aspect of the limb for humerus and femur fractures; and medial aspect of the limb for tibial fractures. Open reduction was performed and the fracture fragments were stabilized with retrograde application of stainless steel positive profile end threaded intramedullary pins (Fig-2). Ancillary support with cerclage wiring with orthopaedic wire was given in long oblique fractures. Mild bone loss at the fracture site with minimal cortex to cortex contact was noticed at the fracture site in all the animals after the reduction and stabilization of fracture. The fracture gap at the area of bone loss was left as such and the fracture site was closed as per the standard procedure. Postoperatively, the limb was supported with a modified Robert jones bandage. Postoperatively, the dogs were given intramuscular injections of ceftriaxone sodium at the dose rate of 25mg per Kg bodyweight for seven days and meloxicam at the dose rate of 0.2mg per Kg bodyweight for 5 days. Oral administration of calcium syrup was advised for one month in all the operated dogs. All the operated dogs were evaluated on 0^{th}, 7^{th}, 15^{th}, 30^{th}, 60^{th} and 90^{th} postoperative days. In case5 and 6 migration of the intramedullary pin was noticed on 30^{th} postoperative day and the pins was removed on the same day under general anesthesia and provided support with modified Robert jones for one week.

Results

The dogs presented with the fracture of long bones in the present study belong to non-descriptive breed. The mean age of the dogs in the present study was 23.33±16.9 months and the mean weight of them was 10.27 ± 1.15 Kg. The etiology responsible for fracture is fall from height in three cases, automobile accident in two cases, dog bite in one case and sudden blow with a wood in one case. In the present study the fracture was noticed in femur in three cases, tibia in 2 cases and humerus in one case. Immediate postoperative radiographs showed good reduction in all the animals with minor fracture gaps (Fig-3). Partial weight bearing of the affected limb was noticed on 7^{th} postoperative day (Fig-4). Normal function of the limb was restored by 30^{th} postoperative day in cases 1, 2, 3 and 4 (Fig-5) whereas; in cases 5 and 6 mild lameness was noticed which was due to migration of the pin. By 90^{th} postoperative day all the animals showed normal ambulation of the affected limb. Radiographic evaluation of the fractured limb on 7^{th} postoperative day revealed initiation of callus at the fracture site in two dogs (case-1 & 3) (Fig-6), whereas; in the remaining dogs it is not evident. On 14^{th} postoperative day, all the dogs showed periosteal calls at the fracture site. Complete bridging periosteal callus was noticed in case 1, 2, 3 and 4; on 30^{th} postoperative day, by which time the complete function of the limb, was appeared to be restored. whereas; In case 4 and 5 migration of intramedullary pin was noticed in addition to exuberant callus at the fracture site (Fig-7), resulting in mild lameness. Mild osteomyelitis was noticed in case 4 during 30^{th} postoperative day and was subsided by administration of antibiotics for one week. Complete radiographic healing was noticed in all the cases by 60^{th} postoperative day. Lamellar bone formation with medullary canal continuity was noticed in cases 1, 2, 3 and 4 by 90^{th} postoperative day (Fig-8). Whereas; in the remaining two cases excessive bridging callus was noticed at the site of fracture Complications like non-union, mal union, bone shortening etc., were not noticed in any of the case under study.

Discussion

In the present study, the incidence of fractures was noticed in dogs belonging to non-descriptive breed which could be attributed to their higher population in the surrounding localities. Similarly, Aithal *et al*., (1999) [6]; Thilagar and Balasubhramanian (1988) [7]; and Manjunatha and Ranganath (2012) [9] also reported the higher incidence of fractures in non-descriptive breeds. In contrary to this Balagopalan *et al.* (1995) [8] reported higher incidence of fractures in German shepherd dogs and Kushwaha *et al*. (2011) [10] reported higher incidence of fractures in Spitz dogs. Manjunatha and Ranganath (2012) [9] opined that, the higher incidence of fractures in non-descript dogs might be due to higher population of non-descript breed in and around the area, over the streets where they are more likely to come across external trauma. The mean age of the animals in the present study was less than 2 years, suggesting that, the fracture incidence was more in young animals. Similar findings were also reported by Aithal *et al*., (1999) [6]; Thilagar and Balasubhramanian (1988) [7], Kushwaha *et al*. (2011) [10].

In the present study, the etiological factor responsible for the fracture was Fall from height in three animals, Automobile accident in one animal, Trauma due to blow by a log in one animal and dog bite in one animal. The present findings were in concomitance with Kumar *et al*., (2007) [11]; and Kushwaha *et al*. (2011) [10] who reported fall from height as a major etiological factor responsible for fracture in dogs, but Priyanka *et al*., (2019) [12] reported Automobile accidents as a major etiological factor responsible for fracture in dogs. Libardoni *et al.* (2018) [13] reported both automobile accidents and fall from height as the frequent causes of fractures in dogs.

In the present study, the fracture fixation was done with intramedullary pinning technique using positive profile end threaded stainless steel intramedullary pins. Chanana *et al*., (2018) [5] used similar type of intramedullary pins for management of long bone fractures in dogs. Ozsoy (2004); and Altunatmaz *et al*., (2012) [15] used negative, fully threaded stainless steel implants for management of long bone fractures. The pin migration noticed in the present study was due to sudden fall of the dogs from height during the postoperative period. Hence, this could not be attributed to the implant failure and it was resulted from poor management of the pet owner and aggressive temperament of the pet. Ozsoy (2004) stated that, the threaded pins prevent migration by gripping the cancellous bone and this statement was strengthened by the findings of Altunatmaz *et al*. (2012) [15] and Chanana *et al*., (2018) [5]. Pin removal was performed in two cases where pin migration was observed, to prevent soft tissue damage due to migrated pin. Large amount of external callus was noticed in only two animals and this could be attributed to lack of rigid fixation at the fracture site due to pin migration. Piermattei *et al*. (2006) [16] stated that, the amount of callus formed at the fracture site is inversely proportional to degree of stability at the fracture site. However, young animals show excess callus at the fracture site though the fracture fixation was rigid. In the present study, early fracture healing was noticed in majority of the

cases, and this could be attributed to rigid fixation achieved with the implant. Chanana *et al*. (2018) [5] opined that, use of positive profile end threaded pins provide 30-40% unoccupied medullary cavity at the fracture site, which allow the medullary circulation to regenerate and might aid in early healing.

Table 1: Table showing the signalment of the dogs included in the present study

Dog no	Age	Sex	Breed	Weight(kg)	Etiology	Limb invovled
1	5M	Male	ND	7.4	Blow injury by a log	LHL
2	8M	Female	ND	13	Fall from height	RHL
3	6M	Male	ND	12	Fall from height	RHL
4	5M	Male	ND	9	Fall from height	RHL
5	9Y	Female	ND	7.2	Dog bite	LFL
6	8M	Female	ND	13	Automobile accident	RHL

M: Months, Y: Years, ND: Non-descript, LFL: Left fore limb, RHL: Right hind limb, LHL- Left hind limb

Table 2: Table showing the bone involved and AO/AISF classification of the fracture

S. No	Bone involved	Type of fracture	AO/ASIF classification
1.	Tibia	Closed, Complete, Distal, Simple, Oblique fracture with displaced fragments.	43A1
2.	Tibia	Closed, complete, Diaphyseal, Simple, long oblique fracture with displaced fragments	42A2
3.	Femur	Closed, Complete, Diaphyseal, Simple, Oblique fracture with displaced fragments	32A2
4.	Femur	Closed, Complete, Diaphyseal, Simple, Transverse fracture with displaced fragments	32A3
5.	Humerus	Closed, Complete, Diaphyseal, Simple, Oblique fracture with displaced fragments	12A2
6.	Femur	Closed, complete, Diaphyseal, wedge fracture with a reducible wedge and displaced fragments.	32B1

Fig 1: Photograph showing non-weight bearing lameness on left hind leg in case-1

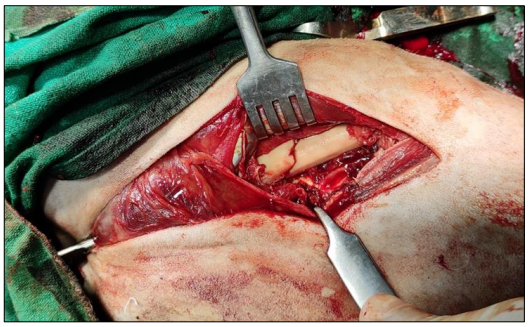

Fig 2: Intraoperative photograph showing open reduction and stabilization with intramedullary pinning in case-4

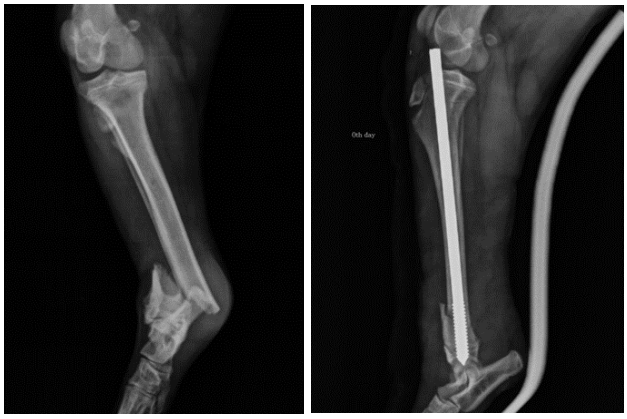

Fig 3: Photograph showing the preoperative and immediate postoperative radiographs in case-1

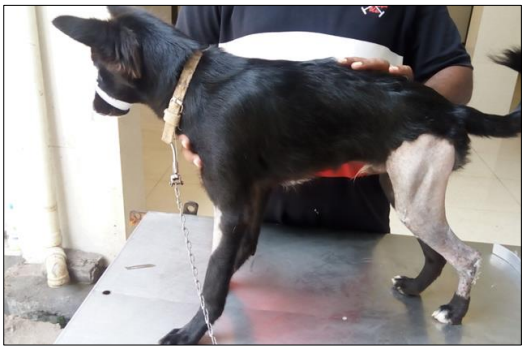

Fig 4: Photograph showing partial weight bearing on 7th postoperative day in case-1

Fig 5: Photograph showing complete weight bearing of the affected limb on 30th pstoperative day in case-1

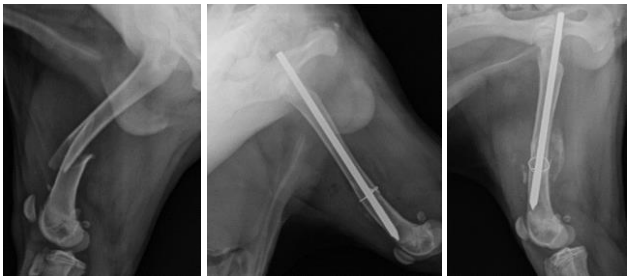

Fig 6: Photograph showing preoperative, immediate postoperative and 7th postoperative day radiographs of case-3

Fig 7: Photograph showing 30th postoperative radiograph of case-6; Note the migration of intramedullary pi and priosteal callus at the site of fracture

Fig 8: Photograph showing 90th postoperative radiograph of case-1; Note complete union of the fracture fragments with continuity of medullary cavity.

Conclusion

The positive profile end threaded stainless steel intramedullary pin used in the present study provided rigid fixation and early fracture healing in majority of the cases with an exception in two cases where it was failed due to improper management by the pet owners.

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References

1. Kumar P, Gahlot TK. Clinical evaluation of intramedullary pinning and interlocking nailing technique for stabilization of femoral fractures in dogs. J Anim. Sci. Adv. 2013; 3(6):310-313.
2. Lidbetter AD, Glyde MR. Supracondylar femoral fractures in adult animals. *Compend. Contin.* Educ. Practising. Vet. 2000; 22:1041-1054.
3. Hulse D, Ferry K, Fawcet A, Gentry D, Hyman W, Geller S *et al*. Effect of intramedullary pin size on reducing bone plate strain. Vet. Comp. Orthop. Traumatol. 2000; 13:185-190.
4. Kapler M. A practitioner's guide to fracture management Part 3: Selection of internal fixation Technique. Tod. Vet. Pract. 2015; 5:6.
5. Chanana M, Kumar A, Tyagi SP, Singla AK, Sharma A, Farooq UB. End-threaded intramedullary positive profile screw ended self-tapping pin (Admit pin) - A cost-effective novel implant for fixing canine long bone fractures, Veterinary World. 2018; 11(2):181-185.
6. Aithal HP, Singh GR, Bisht GS. Fractures in dogs: A survey of 402 cases. Indian J Vet. Surg. 1999; 20:15-21.
7. Thilagar S, Balasubramanian NN. A retrospective study on the incidence and anatomical locations in 204 cases of fracture in dogs. Cheiron. 1988; 17:68-71.
8. Balagopalan TP, Devanand CB, Rajnkutty K, Amma TS, Nayar SR, Varkey CA *et al*. Fracture in dogs- A review of 208 cases. Indian J Vet. Surg. 1995; 16:41-43.
9. Manjunatha DR, Ranganath L. Occurrence of femur fracture in dog. Indian Veterinary Journal. 2012; 89:116-117.
10. Kushwaha RB, Gupta AK, Bhadwal MS, Kumar S, Tripathi AK. Incidence of fractures and their management in animals: a clinical study of 77 cases. Indian J Vet. Surg. 2011; 32(1):54-56.
11. Kumar K, Mogha IV, Aithal HP, Kinjavdekar P, Amarpal Singh GR, Pawde AM *et al*. Occurrence and pattern of long bone fractures in growing dogs with normal and osteopenic bones. J Vet. Med. 2007A; 54:484-490.
12. Priyanka Singh T, Mohindroo J, Verma P, Udheiya R, Umeshwori N. Evaluation of intramedullary pinning technique for management of tibia fractures in dogs. The Pharma Innovation Journal. 2019; 8(2):291-297.
13. Libardoni RN, Costa D, Menezes FB, Cavalli LG, Pedrotti LF, Kohlrausch PR *et al*. Classification, fixation techniques, complications and outcomes of femur fractures in dogs and cats: 61 cases (2015-2016). Ciência Rural. 2018; 48(6):2018.
14. Ozsoy S. Fixation of femur, humerus and tibia in cats using intramedullary threaded Steinmann pins. Vet. Rec. 2015; 155:152-153.
15. Altunatmaz K, Ozsoy S, Mutlu Z, Devecioglu Y, Guzel

O. Use of intramedullary fullythreaded pins in the fixation of feline and canine humeral, femoral and tibial fractures. Vet Comp Orthop Traumatol. 2012; 25:321-325.
16. Piermattei DL, Flo GL, DeCamp CE. Brinker, Piermattei and Flo's Handbook of Small Animal Orthopaedics and Fracture Repair. 4th ed. WB Saunders Company, Phlapdeiphia. 2015; 512:633-660.