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Titanium elastic nail used for repair of radius-ulna fracture in dogs

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Abstract
Two young dogs with history of traumatic injury were presented with primary complaint of not bearing weight on one forelimb. Radiographic examinations of the limb had revealed complete transverse diaphyseal fracture of distal third of radius-ulna in both the cases. The fracture in both the cases was repaired under general anesthesia by introduction of titanium elastic nail through the pre-drilled hole in the metaphyseal cortex followed by passing the nail through the medullary canal into the other fracture fragment after reducing both the fracture fragments by open reduction technique. Both the dogs had shown uneventful recovery with partial weight bearing on the operated limb in between 5^{th}-7^{th} and complete weight bearing at 60^{th} post-operative day. The nail in both the cases was removed at 60^{th} post-operative day after radiographic examinations which had shown callus formation along with bridging of both the cortices at the fractured site. All the physiological and haemato-biochemical parameters were found within the normal clinical range at different time intervals of examination. Overall both the cases had shown good clinical outcome without any local or systemic adverse effect.

Keywords: Dogs, haemato-biochemical parameters, radius-ulna, titanium elastic nail

Introduction
Fractures of radius-ulna commonly occur in the distal third diaphysis in small animals (Haas *et al.*, 2003) [2]. In survey of 284 cases of fracture in dogs, Phillips (1979) [5] reported that radius-ulna was the most commonly affected bone (17.3%) followed by pelvis (15.8%) then femur and tibia (14.8% each), out of which the major cause of radius-ulna fracture was road accidents followed by falls from height. Although several other authors have been found that incidence of fracture of radius-ulna was comparatively less as compare to femur and tibia in dogs (Kushwaha *et al.*, 2011; Ali, 2013; Minar *et al.*, 2013; Jain *et al.*, 2018) [3, 1, 4]. Fractures of radius-ulna in dogs have been previously treated with casts, splints, and bone plates with varying success.

Materials and methods
Two medium sized mix-breed dogs having age and body weight of 9months, 14.5kg and 11months, 12.6kg were presented to the Veterinary Clinical Complex of LUVAS, Hisar, with primary complaint of not bearing weight on right forelimb after vehicular accident and left forelimb after fall from height respectively (Fig. 1). Both the animals were active and alert with normal defecation and urination. Clinical examination in both the cases revealed mild soft tissue swelling with pain in the distal radius-ulnar region along with prominent crepitation on palpation of the bone, without any laceration or open wound. Radiographs of the affected forelimbs had shown complete transverse diaphyseal fracture of distal third of right radius-ulna in one case and the other case had also shown the same for the left radius-ulna with isthmus diameter ranges from 2.3-2.6 mm in both the cases (Fig. 2).

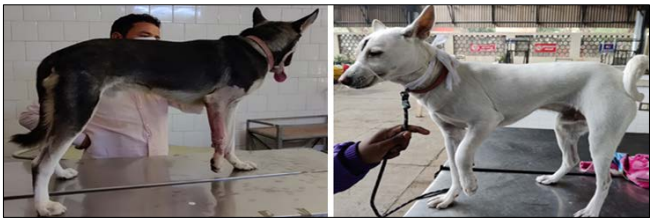

Fig 1: The dogs showing non-weight bearing on the affected forelimb at the time of presentatio

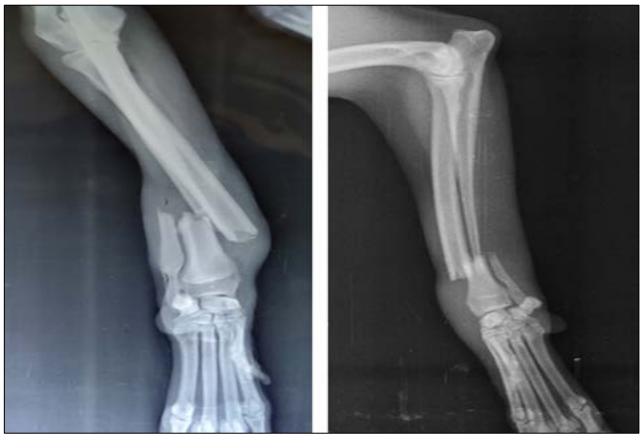

Fig 2: Pre-operative radiographs of right and left radius-ulna of the two dogs respectively (Anterio-posterior views)

Both the fractures were repaired under general anesthesia by insertion of single titanium elastic nail of diameter 1.5mm via a hole drilled in the metaphyseal region of the radius in each case (Fig. 3). For induction of anesthesia, propofol @ 4mg/kg b.wt. I/v was used after giving butorphanol @0.2mg/kg b.wt and atropine sulphate @0.02m/kg b.wt. Intramuscularly as pre-anesthetic agents and the maintenance of anesthesia was done with isoflurane. The fracture fragments were reduced by open reduction method followed by giving a stab skin incision and drilling a hole with bone awl after dissection of the muscles at the metaphyseal region of the radius. In the dog having right radius-ulna fracture the nail was inserted through the hole drilled at cranio-medial surface of the metaphyseal region of the distal fracture fragment of the radius followed by passing the nail into the proximal fracture fragment in an ascending manner through the bone marrow cavity with the help of cannulated T-handle Jacob's chuck and key. In the dog having left radius-ulna fracture, the nail was inserted through the pre-drilled hole at the cranio-lateral surface of the metaphyseal region of proximal fracture fragment followed by passing the nail into the distal fracture fragment of the radius in descending manner through the bone marrow cavity with the help of cannulated T-handle Jacob's chuck and key. The remaining extra length of the nail was cut with 0.5-1cm length of the nail left outside the bone after bending the nail slightly away from the bone followed by application of single simple interrupted skin suture with non-absorbable suture material or stainless steel staple suture at the nail insertion site in both the cases.

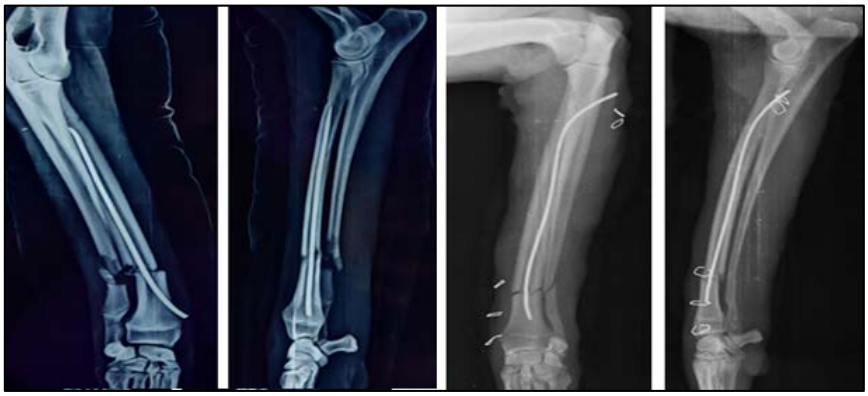

Fig 3: Immediate post-operative radiographs (Anterio-posterior and medio-lateral views) of right and left radius-ulna of the two dogs respectively

Both the cases were treated post-operatively with application of Modified Robert Jones bandage with two splints (one on the lateral and other on the medial surface of the bone) and antiseptic dressing of the suture site daily with 0.2% povidone iodine solution for 10 days. Inj. Cefotaxim @ 25mg/kg and inj. Meloxicam @ 0.2mg/kg b.wt. sid intramuscularly were given for 5 days post-operatively.

Results and Discussion

Both the animals had shown partial weight bearing on the operated limb in between 5-7th post-operative day while standing and complete weight bearing while standing and moving at 60th post-operative day (Fig. 4 & 5). Skin sutures were removed on 14th post-operative day after the complete healing of the wound. Clinical and radiographic examinations of the affected limb at different time intervals had shown gradual improvement in weight bearing and lameness of the affected limb and formation of callus at the site of fracture and union of both the fracture ends respectively (Fig. 6). The nail was removed on 60th post-operative day when there was complete bridging of both the cortices along with callus formation at the fractured site on radiographic examination in both the cases. The removal of the nail was performed under general anesthesia by giving stab skin incision aseptically at the nail insertion site followed by exposing the nail by blunt dissection of muscles and then the nail was pulled out with the help of nail extraction plier. The nail extraction site was closed by application of single skin suture followed by antiseptic dressing of the site with 0.2% povidone iodine solution. The recovery was uneventful in both the cases. The physiological and haemato-biochemical parameters of both the cases were found within the normal clinical ranges at different time intervals of examination (Table 1, 2 & 3).

Conclusion

The clinical and radiographic evaluations of both the cases of distal diaphyseal fracture of radius-ulna, repaired with titanium elastic nail had shown good clinical outcome without showing any significant adverse effect on physiological and haemato-biochemical parameters observed at different time intervals of examination during the post-operative period.

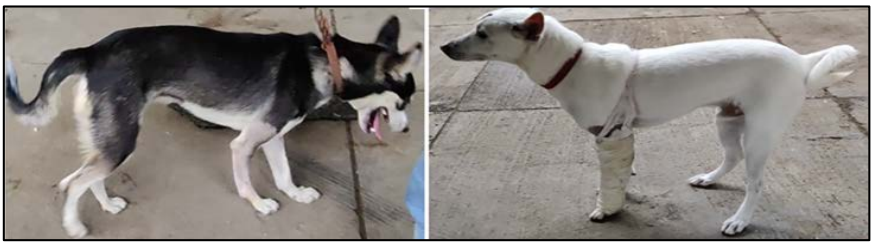

Fig 4: Photographs showing the two dogs with initial weight bearing on the operated limb (right forelimb in the first and left forelimb in the second picture) at 7th and 5th post-operative day respectively

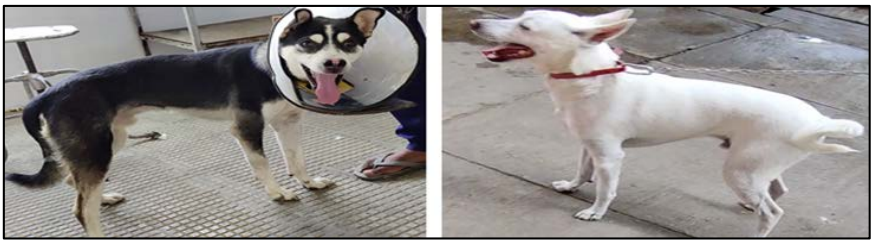

Fig 5: Photographs showing the two dogs with complete weight bearing on the operated limb (right forelimb in the first and left forelimb in the second picture) at 60th post-operative day

Fig 6: Radiographs showing gradual healing of fracture site at 15th, 30th and 60th (after removal of the nail) post-operative day respectively

Table 1: Different physiological parameters of the two cases at different time intervals of examination

Time interval		Pre-operative	Immediate post-operative	15th day	30th day	60th day
Rectal temperature (˚F)	Case 1	101.7	101.1	101.4	101.3	101.4
	Case 2	102.8	102.1	102.3	102.2	102.4
Heart rate (beats per minute)	Case 1	114.0	92.0	102.0	98.0	100.0
	Case 2	118.0	102.0	106.0	106.0	104.0
Respiratory rate (breaths per minute)	Case 1	39.0	32.0	35.0	33.0	34.0
	Case 2	40.0	34.0	35.0	34.0	32.0

Table 2: Different haematological parameters of the two cases at different time intervals of examination

Time interval		Pre-operative	Immediate post-operative	15th day	30th day	60th day
Haemoglobin (mg/dl)	Case 1	14.40	13.60	14.00	13.90	14.80
	Case 2	11.10	10.40	10.80	12.40	13.20
TEC (x10^6/ µl)	Case 1	6.21	6.78	6.94	6.91	6.93
	Case 2	6.23	6.56	6.59	6.61	7.52
TLC (x10^3/µl)	Case 1	15.34	15.57	8.89	9.89	9.37
	Case 2	16.48	16.96	11.90	12.15	9.84
Neutrophils (%)	Case 1	71.00	73.20	66.70	67.00	65.40
	Case 2	79.00	80.70	66.30	66.60	67.70
Lymphocytes (%)	Case 1	22.00	21.00	27.00	27.00	29.60
	Case 2	15.00	12.40	26.30	25.60	27.10
Monocytes (%)	Case 1	7.00	5.80	5.30	6.00	5.00
	Case 2	5.00	5.30	5.50	5.80	4.20
Eosinophils (%)	Case 1	0.00	0.00	0.60	0.00	0.00
	Case 2	1.00	0.90	1.40	1.60	1.00
Basophils (%)	Case 1	0.00	0.00	0.40	0.00	0.00
	Case 2	0.00	0.70	0.50	0.40	0.00

Table 3: Different serum biochemical parameters of the two cases at different time intervals of examination

Time interval		Pre-operative	Immediate post-operative	15th day	30th day	60th day
ALT (IU/L)	Case 1	26.20	23.60	26.50	22.00	29.50
	Case 2	28.10	27.50	24.20	23.40	23.10
AST (IU/L)	Case 1	25.30	24.10	18.60	31.20	32.00
	Case 2	33.70	41.20	45.10	34.50	47.10
ALP (IU/L)	Case 1	45.00	40.00	52.00	30.00	30.00
	Case 2	37.00	32.00	29.00	26.00	27.00
Creatinine (mg/dl)	Case 1	0.22	0.23	0.48	0.29	0.60
	Case 2	0.66	0.50	0.48	0.35	0.37
BUN (mg/dl)	Case 1	7.85	9.44	10.56	9.53	7.94
	Case 2	11.67	10.98	9.91	11.73	10.05
Total protein (g/dl)	Case 1	5.98	4.29	5.88	5.94	6.00
	Case 2	5.59	5.54	4.87	4.97	4.20
Albumin (g/dl)	Case 1	3.71	2.67	3.31	3.54	4.19
	Case 2	2.85	2.72	2.72	3.10	3.09
Globulin (g/dl)	Case 1	2.27	1.62	2.57	2.40	1.81
	Case 2	2.74	2.82	2.15	1.87	1.11
A:G ratio	Case 1	1.63	1.65	1.29	1.48	2.31
	Case 2	1.04	0.96	1.27	1.66	2.78
Calcium (mg/dl)	Case 1	7.90	8.50	11.10	9.00	10.10
	Case 2	8.60	9.40	8.50	10.20	8.30
Phosphorus (mg/dl)	Case 1	2.85	2.25	4.83	4.60	2.71
	Case 2	6.58	7.56	6.45	6.66	6.20
Sodium (mEq/L)	Case 1	141.60	125.30	144.00	143.63	143.20
	Case 2	148.60	134.20	143.30	142.30	144.20
Potassium (mEq/L)	Case 1	5.30	5.60	5.08	5.51	4.31
	Case 2	5.23	4.67	5.05	5.07	5.01
Chloride (mEq/L)	Case 1	143.50	161.10	117.60	132.80	129.90
	Case 2	117.40	129.30	113.30	114.20	112.20

References

1. Ali L. Incidence, occurrence, classification and outcome of small animal fractures: A retrospective study (2005-2010). International Journal of Animal and Veterinary Sciences. 2013;7(3):191-196.
2. Haas B, Reichler IM, Montavon PM. Use of the tubular external fixator in the treatment of distal radial and ulnar fractures in small dogs and cats. Veterinary and Comparative Orthopaedics and Traumatology. 2003;16(03):132-137.
3. Kushwaha R, Gupta A, Bhadwal Kumar S, Tripathi A. Incidence of fractures and their management in animals: a clinical study of 77 cases. Indian Journal of Veterinary Surgery. 2011;32:54-56.
4. Minar M, Hwang Y, Park M, Kim S, Oh C, Choi SH. Retrospective study on fractures in dogs. Journal of Biomedical Research. 2013;14:140-144.
5. Phillips IR. A survey of bone fractures in the dog and cat. The Journal of Small Animal Practice. 1979;20(11):661-674.