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Evaluation of Serum Biochemical Parameters for Assessment of Long Bone Fracture Healing in Dogs Subjected to Intramedullary Pinning

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A B S T R A C T

The efficacy of multi-ion doped nano-hydroxyapatite coated titanium intramedullary pins for long bone fracture repair in dogs was studied clinically. The present study was conducted on twenty-four dogs, accommodating six dogs in each group and were subjected to open reduction and internal immobilization with titanium intramedullary pins. Blood samples were collected on 0 day, at 3,6, and 9thweeks post operatively in all the groups to evaluate the levels of serum calcium, phosphorus and alkaline phosphatase. The data collected were statistically analysed using S P S S-ANOVA Post Hoc test in Tukey H S D.

Introduction

The intramedullary pinning is a simple and economic method of immobilization of the diaphyseal fractures (Kumar and Gahlot, 2013) that have unique biomechanical advantage of resisting bending forces applied from any direction because of their round structure and due to their position close to neutral axis of the bone (Shales, 2008).The efficacy of multi-ion doped nano-hydroxyapatite coated titanium intramedullary pins for long bone fracture repair in dogs was studied clinically by recording the changes in serum biochemical parameters before, during and after fracture repair in dogs.

Materials and Methods

The present study was conducted on twenty-four dogs, accommodating six dogs in each group with a history of lameness and clinical symptoms suggestive of long bone fractures. All the dogs were subjected to open reduction and internal immobilization with uncoated titanium intramedullary pins in group I, plasma spray nanohydroxyapatite coated titanium intramedullary pins in group II,

plasma spray multi-ion doped (5% Zinc, 2.5% Strontium, and 2.5% Fluorine) nano-hydroxyapatite coated titanium intramedullary pins in group III and plasma spray multi-ion doped (5% Zinc, 5% Strontium and 2.5% Silver) nano-hydroxyapatite coated titanium intramedullary pins in group IV.

Blood samples were collected in vacutainer tubes on 0 day, at 3,6, and 9thweeks post operatively in all the groups to evaluate the levels of serum calcium, phosphorus and alkaline phosphatase. Serum calcium (mg/dl) was estimated by ARSENAZO 111 method, manufactured in India by Proton Biologicals India Pvt Ltd. Serum inorganic phosphorus (mg/dl) was estimated by Ammonium Molybdate Method, manufactured by Transasia, Bio-Medicals, Ltd and serum alkaline phosphatase (IU) by pNPP-AMP (IFCC), Kinetic Assay method, manufactured by ARKRAY Healthcare, Pvt, Ltd.

Results and Discussion

A non significant increase in serum calcium values were observed in groups I, III and IV and a significant increase was observed in group II. However, the calcium values differed significantly among the groups throughout the study. This was in concurrence with the findings of Paskalev *et al.,* (2005), Hegade *et al.,* (2007), Dwivedi *et al.,* (2009), Singh *et al.,* (2015) Jain *et al.,* (2018) and Farooq *et al.,* (2019) who have observed non significant increase in calcium levels during fracture healing in dogs which could be attributed to the ongoing rapid calcification of fracture site. However, this was in contrary with the findings of Rani *et al.,* (2012) who have reported non significant changes in calcium values.

In the present study, a significant difference in phosphorus values was observed within the groups and between the groups. There was a significant increase in phosphorus values up to 6th post- operative week and thereafter a significant decrease in phosphorus values up to 9th week in all the groups. Similar findings were observed by Komnenou *et al.,* (2005), Paskalev *et al.,* (2005), Hegade *et al.,* (2007) and Rani *et al.,* (2012) and Farooq *et al.,* (2019). The increase in the serum calcium could be due to mineralization process and that of phosphorus could be due to necrotic disintegration of the cells at fracture site (Nagaraju *et al.,* 2014). However, Dwivedi *et al.,* (2009), and Jain *et al.,* (2018) observed non significant changes in phosphorus during the fracture healing in dogs.

The serum alkaline phosphatase values were assessed during fracture healing after rigid stabilization. A significant difference in ALP values were recorded within the groups and between the groups in our study. Elevation in the serum ALP values was observed up to 6th week with a gradual return to normal base value on 9th week in all the groups.

This was in accordance with the findings of Singh *et al.,* (1976), Aithal *et al.,* (1999), Maiti *et al.,* (1999), Manjubala *et al.,* (2001), Hegade *et al.,* (2007) and Phaneendra *et al.,* (2018) who have observed an increase in the alkaline phosphatase levels following fracture immobilization in dogs. Increase in the ALP levels was observed during osteoblastic activity with high increase in most of compression methods of internal fixation (Mahendra *et al.,* 2007). Increase in serum alkaline phosphatase levels might be attributed to increased chondroblastic proliferation to cause bone formation during fractured bone repair and formation of bone matrix (Maiti *et al.,* 1999, Rani *et al.,* 2012 and Singh *et al.,* 2017.

The calcium, phosphorus and ALP values differed significantly between the groups throughout the study.

Table.1 Mean ± SE values of biochemical parameters at different time during the study.

S.No	Parameters	Groups	Time intervals				Overall mean
			0 Day	3 Weeks	6 Weeks	9 Weeks	
1	Calcium (mg %)	Gr I	11.76±0.62^{a}	11.44±0.36 ^{a}	11.78 ±0.58 ^{a}	11.37±0.48 ^{a}	11.58±0.24^{A}
		GrII	11.37±0.27^{a}	11.79±0.11^{a}	13.29± 0.65^{b}	12.77 ±0.69^{b}	12.30±0.28^{B}
		GrIII	11.84±0.40^{a}	12.54±0.34^{a}	12.79± 0.44^{a}	13.15 ±0.94^{a}	12.59±0.29^{C}
		GrIV	11.09 ±0.25^{a}	11.49± 0.81^{ab}	12.21± 0.69^{ab}	12.98± 0.39^{b}	11.94±0.31^{D}
2	Phosphorus (mg %)	GrI	4.23±0.01^{a}	4.40±0.03^{b}	4.45±0.05^{b}	4.42±0.09^{b}	4.38±0.03^{A}
		Gr II	4.25±0.01^{a}	4.53±0.07^{b}	4.82±0.01^{c}	4.37±0.02^{d}	4.49±0.05^{B}
		Gr III	4.29±0.02^{a}	4.84±0.02^{b}	4.73±0.02^{c}	4.58±0.01^{d}	4.61±0.04^{C}
		Gr IV	4.26±0.01^{a}	4.94±0.03^{b}	4.81±0.01^{c}	4.67±0.02^{d}	4.67±0.05^{D}
A	ALP (I.U)	Gr I	75.55±0.72^{a}	83.55±2.05^{a}	87.51± 2.41^{a}	92.44 ±6.95^{b}	84.76± 2.20^{A}
		Gr II	82.96± 1.63^{a}	86.85 ±3.10^{a}	100.15± 5.37^{b}	84.70 ±5.14^{ac}	88.66± 2.38^{A}
		Gr III	78.11± 1.31^{a}	115.9± 2.65^{b}	106.10 ±1.69^{c}	85.88 ±5.60^{d}	96.98 ±3.55^{B}
		Gr IV	85.9 ±1.10^{a}	122.34 ±1.00^{b}	107.71± 3.22^{c}	96.74 ±5.77^{d}	103.17±3.22^{C}

Means bearing different superscripts (a,b,c,d) within a column differ significantly $P \leq 0.05$
Means bearing different superscripts (A, B, C, D) within a row differ significantly $P \leq 0.05$

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References

Aithal, H. P., Singh, G. R., Amarpal, Kinjavdekar, P. and Hoque, M. 1999. Modified pin fixation for distal metaphyseal - epiphyseal fractures of femur in the dog: A review of 7 cases. *Indian Veterinary Journal.*,76:220-224.

Dwivedi, D. K., Ganesh, T. N., Ameerjan, K. and Geetha, R. 2009. Management of compound fracture of radius-ulna and tibia-fibula using llizarov's ring fixator in dogs. *Indian Journal of Veterinary Surgery*., 30:98-100.

Farooq, F., Kumar, A., Dwivedi, D. K, Zama, M. M. S., Sharma, A., Gupta, P. and Bhardawaj, H. R. 2019. Clinical evaluation of demineralised bone matrix allograft in femur fracture in dogs. *Journal of Animal Research*.,9(2):269-273.

Hegade, Y., Dilipkumar, D. and Usturge, I. S. M., 2007. Comparative evaluation of biological parameters during fracture healing in dogs. *Karnataka Journal of Agricultural Science*.,20(3):694–695.

Jain, R., Shukla, B. P., Nema, S. P., Shukla, S., Chabbra, D. and Karmore, S. S. 2018. Management of long bone fracture using titanium elastic pinincanines.

International Journal of Livestock Research., 8 (12):270-278.

Komnenou, A., Karayannopoulou, M., Polizopoulou, Z. S., Constantinidis, T. C. and Dessiris, A. 2005. Correlation of serum alkaline phosphatase activity with the healing process of long bone fractures in dog. *Veterinary Clinical Pathology*,34(1): 35-8.

Kumar, P. and Gahlot, T. K., 2013. Clinical evaluation of intramedullary pinning and interlocking nailing technique for stabilization of flexural francoise in dogs. *Journal of Animal Science Advances.*, 3(6):310-313.

Mahendra, A. M., Ranganath, L. and Vasanth, M. S. 2007. Effect of polymethylmethacrylate in femoral fracture repair on hemato-biochemical parameters in dogs. *Indian Veterinary Journal*., 84: 587- 589.

Maiti, B. K., Sen, T. B. and Sanki, S.1999. Haemato-biochemical changes following application of Ilizarov technique in treatment of femur fractures in dogs. *Indian Journal of AnimalHealth*.,38:133-134.

Manjubala, R., Kumar, S. R. V. and Sastry, T. P., 2001. Biocompatibility evaluation of biphasic calcium phosphate ceramics; an in vivo study. *Trends in Biomaterials and ArtificialOrgans.*,14:27-29.

Nagaraju, N., Nagaraja, B. N., Vasanth, M. S. and Ranganath, L. 2014. Comparision of stainless steel versus acrylic connecting bar for type I b external skeletal fixation for tibial fracture repair in dogs. *Indian Journal of Veterinary Surgery*.,35(1):43-46.

Paskalev, M., Krastev, S. and Filipov, J. 2005. Changes in some serum bone markers after experimental fracture and intramedullary osteosynthesis in dogs. *Trakia Journal of Sciences*.,3(5):46-50.

Phaneendra, M. S. S. V., Dhana Lakshmi, N., Raghunath, M., Raju, N. K. B. and Adilaxmamma, K. 2018. Evaluation of biochemical and haematological parameters for assessment of compound fracture healing in dogs with local antibiotic treatment. *International Journal of Livestock Research*,8(4):139.

Rani, R. U., Rajendran, N. and Vairavasamy, K., 2012. Immobilisation and treatment of femoral diaphyseal oblique fractures in dogs using double intramedullary pinning and cerclage wiring: A study in twelve patients. *Intas Polivet.*,13(2): 411-415.

Shales, C. 2008. A Fracture management in small animal practice1-Triage and stabilization. *In practice*,30(6):314-320.

Singh, C. K, *Sarma*, K. K., Kalita, D., Tamuly, S., Hussain, J., Deuri, B. and Nath, P. J., 2017.Haemato-biochemical, radiographic and clinical outcome in healing of femoral fracture with retrograde intramedullary pin in conjunction with demineralized bone matrix in dogs. *Journal of Experimental Biology and Agricultural Sciences*, 5(2): 201- 207.

Singh, R., Chandrapuria, V. P, Shahi, A., Bhargava, M. K, Swamy, M. and Shukla, P. C. 2015. Fracture occurrence pattern in animals. *Journal of Animal Research*.,5(3):611-616.

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