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Studies on Physiological, hematological and biochemical changes during tibial fracture repair by intramedullary pinning in bovines

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Abstract
In six bovines which underwent percutaneous intramedullary pinning for the repair of tibial fracture, physiological and haematobiochemical changes were evaluated before surgery and on 1st, 3rd, 5th, 7th, 15th, 30th, 45th, 60th post-operative days. The changes in the physiological and hematological values were within normal range and statistically non-significant throughout the study period due to less surgical stress. The biochemical parameters like serum calcium, pshosphorus showed statistically non-significant variations. Whereas, serum alkaline phosphatase levels were elevated upto 30th postoperative day and returned to normalcy by the end of the study period.

Keywords: Bovines, tibia, hematological, biochemical and serum alkaline phosphatase

Introduction
Managing fracture poses a challenge in the field. Cattle are excellent Orthopaedic patients, they have great bone healing properties, most tolerate limb immobilization well and they rarely suffer from contra lateral limb disorders (Mulon, 2013) [4]. Pin track infection or osteomyelitis was one of the most common post-operative complications in any Orthopaedic surgery and could be expected more in bovines due to poor post operative management Various physiological, hematological and biochemical changes will vary due to surgical stress and post-operative healing mechanism. The present study was carried out to evaluate physiological, hematological and biochemical parameters in bovines that underwent percutaneous tibial fracture repair by intramedullary pinning technique.

Materials and Methods
Six bovines with closed tibial fractures presented to the Department of Veterinary Surgery and Radiology, Veterinary College Hospital, Hebbal, Bengaluru were selected for the study. The animals were sedated with Inj. Xylazine hydrochloride @ 0.1 mg/kg BW IM and after 10 minutes, Intra Venous Regional Anesthesia was induced by the administration of 10 ml of 2% Lignocaine hydrochloride into the lateral superficial vein just below the stifle joint, after application of a tourniquet above the stifle joint. These tibial fractures were stabilized by using percutaneous intramedullary pinning technique. Physiological parameters were assessed at regular intervals to check health status of animal. Blood samples were collected in EDTA and serum vials before the surgery and on 1st, 3rd, 5th, 7th, 15th, 30th, 45th, 60th post-operative days for evaluation of both hematological and biochemical parameters, and were statistically analyzed using one way Analysis of variance (ANOVA) using computer based statistical programme, Graph Pad Prism and interpreted as per the procedure described by Snedecor and Cochran (1996) [6] to arrive at a conclusion.

Results and Discussion
The mean rectal temperature, respiratory rate and heart rate varied from 101.86 ± 0.49 ^{0}F to 103.11 ± 0.58 ^{0}F, 66.33 ± 0.80 breaths/min to 69.00 ± 1.53 breaths/min, 100.33 ± 2.28 beats/min to 108.66 ± 3.26 beats/min respectively. There was a statistically non-significant increase in all the physiological parameters on 1st post-operative day in all the animals and reduced from 3rd day onwards during the period of the study. This could be due to inflammatory conditions and excitmemt of animal during handling and surgery. Similar observations were also reported by Balappanavar and Anil (2012), Syed (2013) and Varalakshmi (2016) [1, 7, 8].

The mean hemoglobin concentration (Hb), total erythrocyte count (TEC) and total leukocyte count (TLC) varied from 8.63 ± 0.07 g% to 9.23 ± 0.41 g%, 6.00 ± 0.11 $x10^6$ cells/cmm to 6.81 ± 0.29 $x10^6$ cells/cmm and 9.33 ± 0.24 $x10^3$ cells/cmm to 9.83 ± 0.18 $x10^3$ cells/cmm respectively. The variations observed were within the normal physiological range and were statistically non-significant. This might be due to minimum blood loss during the surgical procedure. The results were in concurrence with the findings of Patel *et al.* (2012) [5], Syed (2013) [7] and Varalakshmi (2016) [8].

The DLC (%) i.e., neutrophills, lymphocytes, monocytes, eosinophils varied from 55.16 ± 2.36% to 64.00 ± 1.29%, 29.33 ± 1.08% to 34.83 ± 1.89%, 4.83 ± 0.91% to 9.00 ± 2.25%, 1.33 ± 0.61% to 3.33 ± 0.84% respectively. There was a non-significant increase in neutrophils percentage between 1st to 3rd post-operative day, and returned back to normal value. This initial transient non-significant increase could be attributed to trauma, surgical stress and subsequent acute inflammation as stated by Syed (2013) [7]. Statistically, non-significant variation in mean value of lymphocytes, monocytes, eosinophils was observed. The findings were in concurrence with that of Syed (2013) [7] and Varalakshmi (2016) [8].

The mean serum calcium, serum phosphorous and serum alkaline phosphatase values ranged from 8.90 ± 0.20 mg/dl to 9.53 ± 0.31 mg/dl, 5.18 ± 0.16 mg/dl to 5.42 ± 0.82 mg/dl, 135.66 ± 1.45 IU/L to 311.16 ± 1.60 IU/L respectively. Statistically non-significant variation in serum serum calcium, serum phosphorus levels was observed in the present study and the values were within the normal physiological range in all the animals. Similar findinds were also recorded by Syed (2013) and Varalakshmi (2016) [7, 8]. Significant increase in the peak value of serum alkaline phosphatase was observed on the 15th to 30th post-operative day and receded to normalcy by 60th post-operative day. This finding in the present study was in accordance with Mohamed (2003) and Manojkumar (2018) [3, 2] who also documented similar observation.

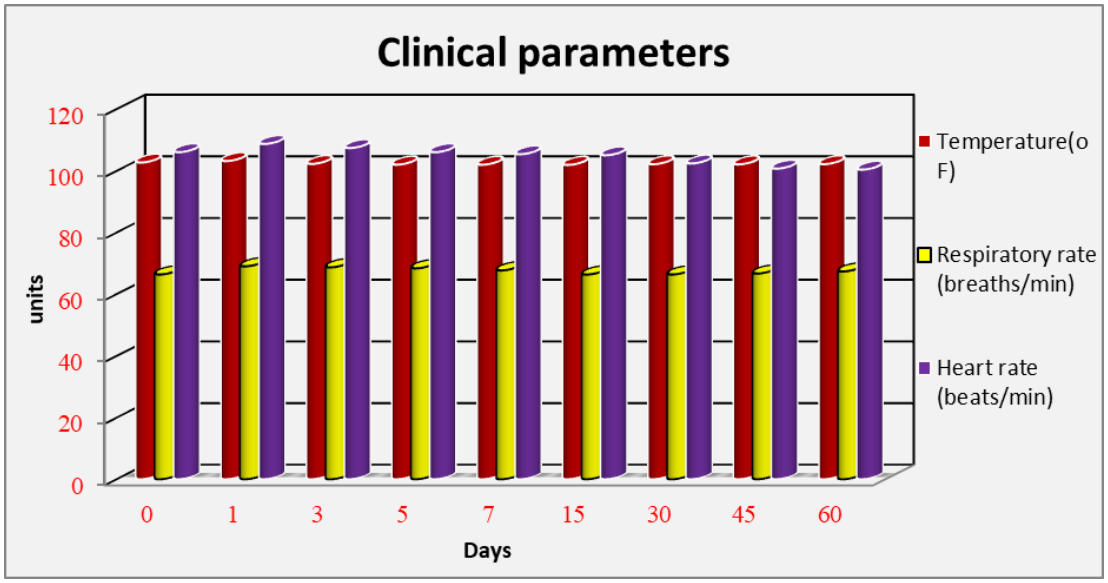

Fig 1: Variations in temperature, respiratory rate and heart rate.

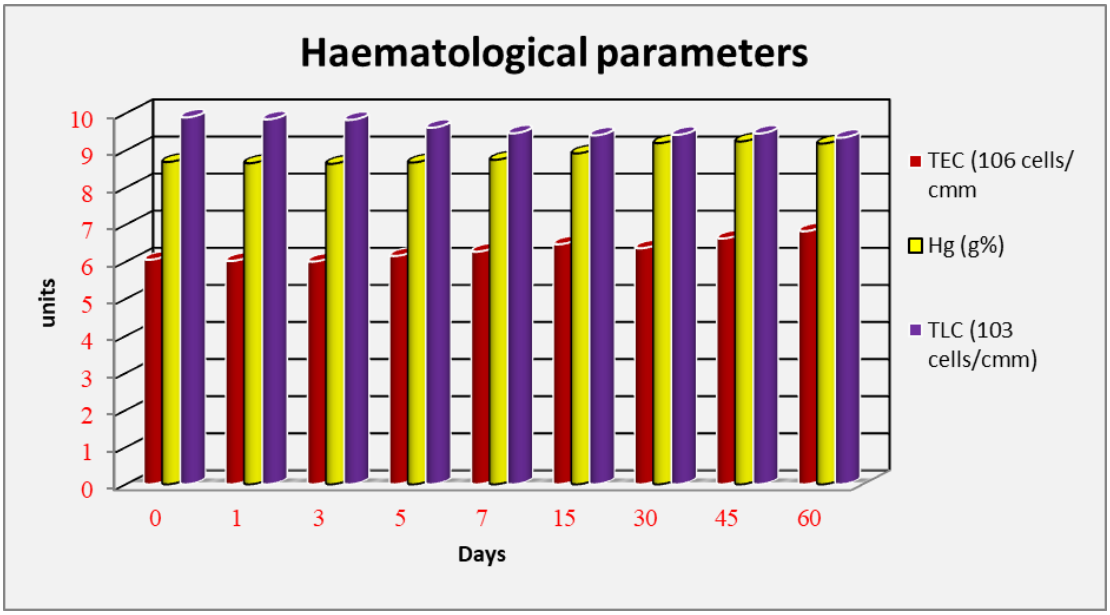

Fig 2: Variations in TEC, Hb and TLC.

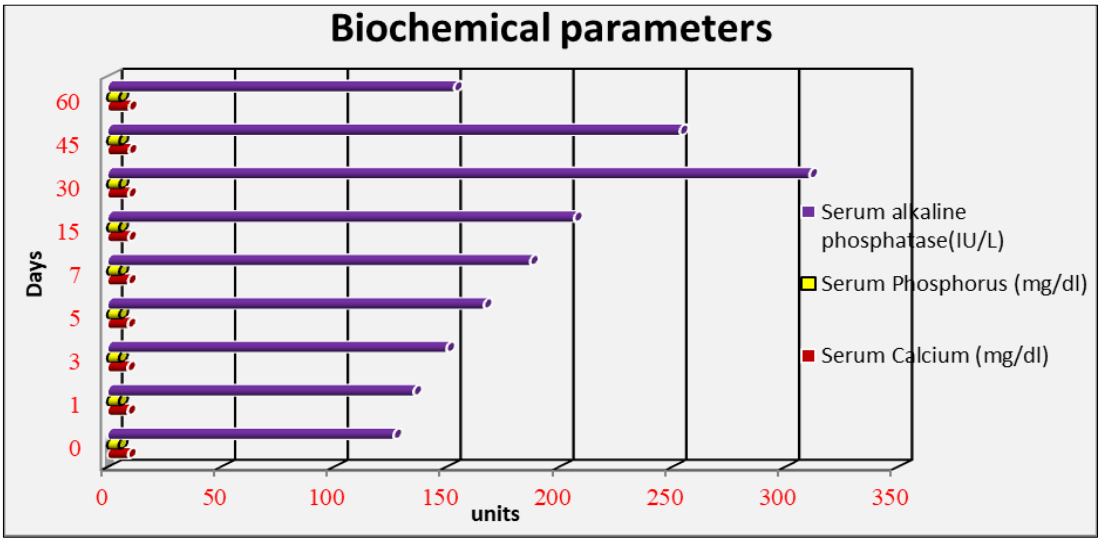

Fig 3: Variations in serum calcium, serum phosphorus and serum alkaline phosphatase.

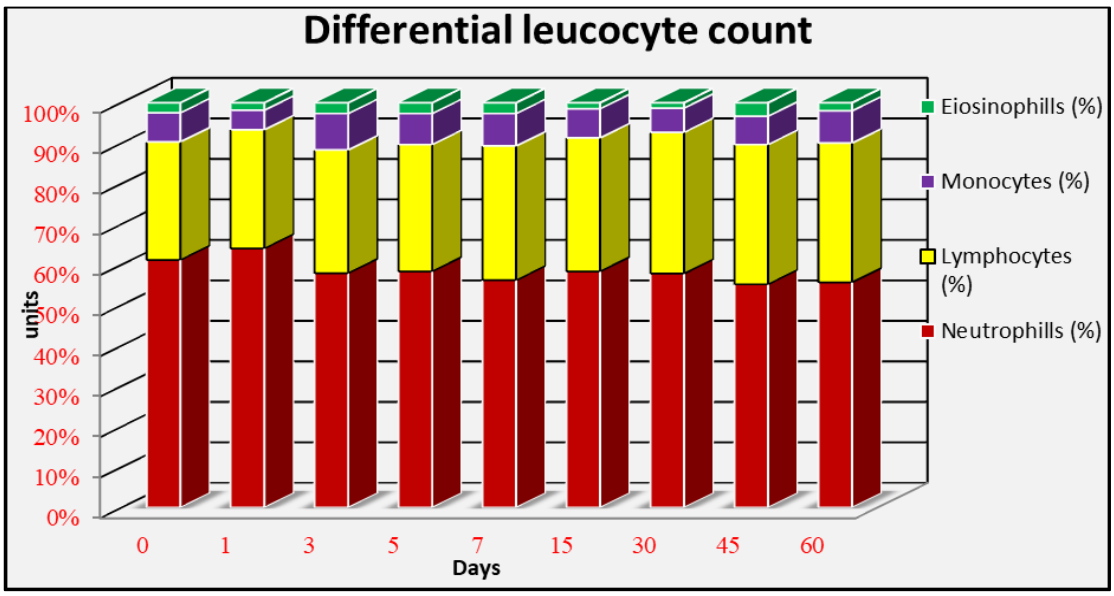

Fig 4: Vatiations in DLC

Summary and Conclusion

In all the six animals which undergone percutaneous tibial fracture repair by intramedullary pinning, physiological, haematological and biochemical parameters were assessed at regular intervals. Physiological and haematological parameters varied non-significantly throughout the study period due to less surgical stress and minimal bleeding during the surgery. In biochemical parameters, serum Calcium and serum Phosphorous varied non-significantly but serum alkaline phosphatase increased significantly from 15th to 30th post-operative day and returned to normalcy by the end of study period. This technique induces minimal stress on animals, minimal bleeding and minimally invasive technique and it can be used easily under field conditions.

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