

HAEMATO-BIOCHEMICAL OBSERVATIONS ON TREATMENT OF LONG BONE FRACTURE USING UNIPLANAR BILATERAL ACRYLIC EXTERNAL SKELETAL FIXATORS IN GOATS

V.P. Athira¹, C.B. Devanand², M.K. Narayanan³, Laiju, M. Philip⁴
and Usha Narayana Pillai⁵

¹MVSc Student, ²Professor and Head, ³Associate Professor, ⁴Assistant Professor,
Department of Veterinary Surgery and Radiology, ⁵Professor and Head, Department of
Veterinary Clinical Medicine, College of Veterinary and Animal Sciences, Mannuthy,
Kerala Veterinary and Animal Sciences University, Thrissur – 680651

Abstract: Six apparently healthy goats of either sex, aged 2 to 7 months with fracture of long bone were selected for the treatment. All the six goats were treated by uniplanar bilateral external skeletal fixation using acrylic connecting bar under general anaesthesia. Haematological and biochemical evaluations were conducted preoperatively, on the day of surgery, postoperatively on second, fourth and eighth week. From the study, it could be concluded that surgical treatment of long bone fractures using uniplanar bilateral acrylic external skeletal fixator did not affect significantly the haemato-biochemical parameters in goats.

Keywords: Fracture, Haematology, Serum biochemistry, External skeletal fixator.

Introduction

Fracture of long bones is one of the major common orthopaedic condition encountered in goats. External skeletal fixation devices had been widely used for the treatment of long bone fractures and limb lengthening procedures. It provided an optimal environment for osteosynthesis and wound healing without need for an implant at the fracture site (Singh *et al.*, 2007). Application of external skeletal fixator using light weight polymethylmethacrylate connecting bar for fracture repair has become popular in veterinary orthopedics and also reported that acrylic connecting bars cost less and they have equivalent or superior mechanical strength when compared to contemporary stainless steel connecting bar (Martinez *et al.*, 1997). The treatment of long bone fracture in goats using uniplanar external skeletal fixator and acrylic connecting bar and its effect on haemato-biochemical parameters are placed on record.

Materials and Methods

Six clinical cases of long bone fractures in goats presented to the Surgery unit of University Veterinary Hospital, Mannuthy and Kokkalai during the period from August 2017 to April

2018 were included in the study. Apparently healthy goats of either sex, aged 2 to 7 months were selected. All the animals were treated by uniplanar bilateral external skeletal fixation and acrylic connecting bar under general anaesthesia after reducing the fractured ends to normal alignment and apposition. Postoperatively animal was administered with analgesic, meloxicam at a dose rate of 0.2 mg/kg body weight intramuscularly and ceftriaxone sodium as antibiotics at a dose rate of 20 mg/kg body weight intravenously for five days. The operated limb was immobilised with Robert-Jones bandage in the postoperative period. Haematological and biochemical evaluations were conducted preoperatively, on the day of surgery, postoperatively on second, fourth and eighth week. Blood sample was collected from jugular vein in an EDTA vacutainer tube for the evaluation of haematological parameters *viz.* haemoglobin concentration (Hb), volume of packed red cell (VPRC), total leukocyte count (TLC), total erythrocyte count (TEC) and differential leukocyte count (DLC) and platelet count and in serum vacutainer tube to evaluate the serum levels of calcium, phosphorus and alkaline phosphatase.

The data obtained during the study were subjected to statistical analysis by using SPSS 24.0 version.

Results and Discussion

The data on mean \pm SE of haematological and serum biochemical parameters at different time intervals are presented in table.1 and table.2 respectively.

There was a variation in haemoglobin concentration in the postoperative period within normal range which was returned to preoperative value by eight week. Bini (2013) also reported a decrease in the haemoglobin concentration during the first two week after surgery. The variation may be due to trauma associated systemic changes. Volume of packed red cells, total erythrocytes, platelet count and total leukocytes count were elevated on 2nd week after surgery followed by fluctuation of the values within normal physiological range. Non significant increase in the granulocyte count was observed on the day of surgery followed by a decrease, after which it fluctuated within normal reference range. Non significant decrease of lymphocyte count was noticed on the day of surgery followed by an increase thereafter and it remained within the normal physiological range. The observations were in agreement with the findings of Gupta (2015) in goats.

TABLE.1: Observations on haematological evaluation of the patient
Mean \pm SE (n=6)

| Sl No | Parameters and unit | Preoperative | Day of surgery | 2 nd week | 4 th week | 8 th week |
|-------|--|------------------|------------------|----------------------|----------------------|----------------------|
| 1 | Haemoglobin (Hb) g/dl | 9.82 \pm 0.84 | 8.52 \pm 0.44 | 9.60 \pm 0.38 | 9.12 \pm 0.56 | 9.66 \pm 0.54 |
| 2 | Volume of packed red cells % | 36.32 \pm 0.61 | 35.07 \pm 0.34 | 37.18 \pm 0.92 | 36.42 \pm 0.72 | 36.98 \pm 0.69 |
| 3 | Granulocyte (%) | 22.40 \pm 3.99 | 23.92 \pm 4.77 | 17.87 \pm 3.63 | 19.53 \pm 4.02 | 20.38 \pm 3.93 |
| 4 | Lymphocyte (%) | 74.87 \pm 4.39 | 72.82 \pm 5.40 | 79.08 \pm 4.26 | 77.05 \pm 4.24 | 76.54 \pm 4.48 |
| 5 | Monocyte (%) | 2.73 \pm 0.58 | 3.27 \pm 0.77 | 3.03 \pm 0.78 | 3.42 \pm 0.67 | 3.08 \pm 0.65 |
| 6 | Total Leukocyte count (10 ³ /cu mm) | 10.28 \pm 2.46 | 9.18 \pm 1.70 | 12.9 \pm 1.43 | 11.58 \pm 1.66 | 11.96 \pm 1.75 |
| 7 | Total Erythrocyte count (10 ⁶ /ul) | 7.16 \pm 0.54 | 6.78 \pm 0.43 | 7.55 \pm 0.71 | 7.07 \pm 0.68 | 7.62 \pm 0.67 |
| 8 | Platelet count (Lakhs) | 2.58 \pm 0.34 | 3.08 \pm 0.31 | 4.50 \pm 0.55 | 4.17 \pm 0.61 | 3.59 \pm 0.81 |

The serum calcium level on fourth postoperative week was elevated when compared to preoperative day of surgery. However, serum calcium level on 8th week was within the normal physiological limits. The variations noted were not significant. These findings were in accordance with Lauren and Kelly (1969), Pandey and Udapa (1981), Rao (1991) and Vasantha (1991). The serum phosphorus level was elevated on the day of surgery and variations were noticed upto 8th postoperative week. The above finding was in accordance with the finding of Henderson and Nobel (1926). The serum phosphorus level has no correlation with fracture healing as reported by Singh *et al.* (1976). The alkaline phosphatase level was high at the time of presentation and continued to increase significantly ($P < 0.01$) during the day of surgery and second postoperative week. Thereafter it decreased significantly ($P < 0.01$) on fourth and eighth postoperative week and found within normal physiological range.

TABLE 2: Observations on serum biochemical evaluation of the patient

| Sl No | Parameters and unit | Mean \pm SE (n=6) | | | | |
|-------|----------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | | Preoperative | Day of surgery | 2 nd week | 4 th week | 8 th week |
| 1 | Calcium (mg/dl) | 9.32 \pm 0.46 | 9.01 \pm 0.50 | 8.92 \pm 0.47 | 10.12 \pm 0.46 | 9.72 \pm 0.44 |
| 2 | Alkaline phosphatase (U/L) | 207.33 ^b \pm 5.22 | 245.73 ^c \pm 5.89 | 268.92 ^d \pm 3.43 | 217.88 ^b \pm 1.58 | 176.44 ^a \pm 4.37 |
| 3 | Phosphorus (mg/dl) | 6.07 \pm 0.43 | 6.47 \pm 0.59 | 6.00 \pm 0.58 | 6.15 \pm 0.39 | 6.16 \pm 0.52 |

Mean with different superscript differ significantly (P<0.01) (n=6)

The results of the study revealed that use of uniplanar bilateral acrylic external skeletal fixator for treatment of long bone fracture did not affect the haematobiochemical parameters in goats.

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References

- [1] Bini, J. 2013. *Uniplanar external skeletal fixation for the management of long bone fractures in goats*, MVSc Thesis submitted to Kerala Veterinary and Animal Sciences University: 101p.
- [2] Gupta, S. 2015. *Fracture healing using biphasic calcium phosphate with dynamic compression plating in goats*, MVSc Thesis submitted to Nanaji Deshmukh Veterinary Science University, Jabalpur: 116p.
- [3] Henderson, M.S. and Noble, T.P. 1926. Serum calcium levels in humans following fractures. *J. of bone and joint Surg.* **8**: 803-826.
- [4] Lauren, E.L. and Kelly, P.J. 1969. Serum calcium in dogs during fracture healing. *J. of bone and joint Surg.* **51**: 298-301.
- [5] Martinez, S.A., Arnoezky, S.P., Flo, G.L. and Brinker, W.O. 1997. Dissipation of heat during polymerization of acrylics used for external skeletal fixator connecting bars. *Vet. Surg.* **26**:290-294.
- [6] Pandey, S.K. and Udapa, K.N. 1981. Effect of anabolic hormone on certain metabolic response after fracture in dogs. *Indian Vet. J.* **58**: 37-41.

- [7] Rao, N.V. 1991. *Studies on acetabular fractures in dogs*. Ph.D. Thesis. Andhrapradesh Agricultural University, Hyderabad, India: 148p.
- [8] Singh, H., Lovell, J.E., Schiller, A.G. and Kenner, G.H. 1976. Serum calcium, phosphorus, alkaline phosphatase levels in dogs during repair of experimental ulnar defects. *Indian Vet. J.* **53**: 862-865.
- [9] Singh, R.G., Aithal, H.P., Saxena, R.K., Kinjavdekar, P. and Amarpal, A. 2007. In Vitro Biomechanical Properties of Linear, Circular, and Hybrid External Skeletal Fixation Devices for Use in Large Ruminants. *Vet. Surg.* 36:80–87
- [10] Vasantha, M.S. 1991. *Studies on effect of ultrasonic therapy and short wave diathermy on femoral fracture healing in canines*. Ph.D. Thesis. Andhrapradesh Agricultural University, Hyderabad, India: 151p.