

Management of femoral fracture with the use of horn peg in canine

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Abstract

The present investigation was carried on six clinical cases of femur fracture presented to the N.V.C. Hospital. Immobilization of femur fracture was done with the use of horn -peg prepared from bovine horn. The healing of femur fracture was evaluated on the basis of clinical, radiographic, hematological & biochemical observation. The clinical observations such as rectal temperature, heart rate and respiration rate recorded for 7 consequent days were within normal range in all dogs. The surgical wound healed by primary intention in all the dogs. The partial weight bearing by operated limb was seen in 7.66 ± 0.84 post-operative days and the complete weight bearing was seen in 37.00 ± 2.94 post-operative days. The radiograph taken on 45th post-operative days showed a well organized external bridging of fracture gap by a firm callus in all dogs. The hematological studies revealed lymphocytopenia on 10th day. The haemoglobin level, total erythrocyte count, total leucocyte count, PCV, eosinophils, monocytes and basophils count were within normal range. Biochemical studies revealed significant increase in the serum alkaline phosphatase activity, however serum calcium, serum creatinine, SGOT and SGPT levels were within normal ranges. The horn-peg did not elicit any untoward reaction at the site of fracture during period of healing process.

Keywords: Horn peg, Immobilization, Femur, Fracture, Canine.

Introduction

The femur fracture in canine was more frequently recorded as compare to other long bone fractures. Steinmann-pin, Kirschner-wire, Rush-pin and Kuntscher nail are same of the devices which we generally used in veterinary orthopaedics surgery. But prolonged use of such devices may resulted in osteopenia and weakening of bone rendering it liable to re-fracture (Paavolainen et al., 1978).

The ideal immobilization of fracture is one which offers security to the extent that the normal use of the limb is possible and sufficient flexibility to allow same degree of movement at fracture site and provides rapid bony union by the development of external bridging callus (Mickibbin, 1978). There are suggestions to explore the possibilities of using heterogeneous biological implants for repair of fractures in canines (Singh et al. 1987).

Biological implants such as horn plate and horn pegs, prepared from buffalo horn have been used for the repair of femoral fracture (Singh and Singh 1990 (b), Dubey, 1991) in canines and metatarsal fractures

in bovines respectively (Sakate et al. 1993). Horn is an inert, economical, cheap and easily available material for fixation of femoral fracture. The present study was undertaken to evaluate the horn-peg for the treatment of femoral fracture in dogs.

Materials and Methods

The study was undertaken on six dogs of either sex about 2 months to 7 years of age weighing 9-12 kg. All the dogs were hold to food and water for 12 hours and 6 hours respectively before operation. The site of operation was prepared aseptically. Pre-anesthetic medicines like inj. xylazine hydrochloride, atropine sulphate and Betamethazone sodium phosphate were administer intra muscularly @ 1mg/kg, 0.04mg/kg and 2mg/kg body weight respectively. After 15 minutes, inj ketamine hydrochloride @ 5-10mg/kg body weight and Dizepam @ 1 mg/kg body weight were given intravenously for induction and maintenance anesthesia during the surgical procedure.

The dogs were placed in lateral recumbence with the affected leg upward. A long skin incision was made along the line extending from the greater

trochanter to the lateral surface of the patella over the midshaft of femur to exteriorize the femoral shaft. The horn-peg prepared from the bovine horn was used for the internal immobilization of femoral fracture. Sterilization of the horn pegs were done in autoclave for 15 minutes at 120°C under 15 lbs pressure before use. After correct reduction and alignment of fracture fragment the horn peg of appropriate size and shape was inserted in a retrograde fashion. The surgical wound was closed in a routine manner and sealed with Tincture Benzoin and the affected limb was covered using soft cotton rolled bandage.

Postoperatively, all the dogs were given injections Reflin-250mg intramuscularly daily for five consecutive days, injection Diclofenac Sodium was given @ 2mg/kg body weight intramuscular daily for 3 days and the surgical wound was dressed with betadine solution. The skin sutures were removed on 10th postoperative day.

The plane latero-medial radiographs of the affected limb were taken immediately after internal immobilization and subsequently on 10th, 20th and 45th postoperative day to note the status of horn-peg, status of alignment, progress of healing process and reaction of horn peg to host bone.

The clinical observations viz. rectal temperature, heart rate and respiration rate were recorded daily for the first seven consecutive days. Walking and weight bearing by the operated leg and wound healing was also recorded in each dog.

The hematological parameters viz. Hb%, TEC, TLC, PCV% and DLC were recorded on 0 day and on 1st, 10th, 20th and 45th post operative day. The biochemical parameters viz. creatinine, serum SGOT and serum SGPT were recorded on 0 day and on 1st, 10th, 20th and 45th day of observation. The data recorded during the present study was analyzed as described by Snedecor and Cochran(1967).

Results and Discussion

The present study was conducted on six clinical cases of dog with history of femur fracture. Evaluation of the horn peg in the treatment of the femoral fracture was done on the basis of clinical, hematological, biochemical alterations and radiographic observations during the healing period.

The surgery was under taken under dissociative anaesthesia with ketamine and diazepam combination. The duration of anaesthesia was found satisfactory and the muscle relaxation was excellent hence the entire orthopedic procedure was performed smoothly in all the dogs.

A conventional method of sterilization with autoclave seems to be effective way of sterilization of

horn pegs and did not affect the physical nature and properties of the horn peg. These findings are in agreement with Singh and Singh (1990) and Dubey et al. (1993). The intramedullary fixation technique was found easy and no difficulty was encountered during retrograde fixation of horn peg in all the dogs. The observations of present findings are in concurrence with Dubey (1991) and Shinde (1994) during the repair of femoral fracture with horn peg in canines.

Clinical observations

The clinical observations such as rectal temperature, heart rate and respiratory rate recorded for 7 post-operative days were within normal range and did not show any significant change at different interval. It indicated that internal implant horn peg used for the repair of femoral fracture did not affect the physiological function of the body. These observation confirms the findings reported by Dubey (1991), Shinde (1994) and Pawar (1999) following repair of the fractures in canines.

The surgical wound healed in 8-10 days by primary intention. Clinically the dogs did not show any sign of infection at the operative site except two dogs, where in D2 seroma developed at the level of trochanteric fossa on 8th post-operative day and in D6 wound was distracted due to self mutilation. Local dressing with betadine solution and administration of antibiotics daily for five days resulted in satisfactory recovery.

The partial weight bearing on the affected limb during standing was seen from 5th -8th post-operative day (mean value 7.66 ± 0.84 days) except in two dogs which show partial weight bearing on 10th day onwards.

The complete weight bearing on the limb during standing was seen from 30th-45th post-operative day (37.00 ± 2.94 days) except in two dogs which started complete weight bearing from 45th and 40th post-operative day respectively. The delay in weight bearing by these dogs could be due to the pain and presence of sepsis at the upper third of peg at trochanteric fossa. Dubey et al. (1992) reported weight bearing by operated limb on 7-10 post-operative day days, which suggested desired degree of movement of fragments permitted by the implanted horn plate and proper securing of fractured fragments in position.

Radiographic Observations

The horn pegs used for fracture fixation being radiolucent could not be visualized on radiographs and allowed good visualization of fracture site hence the evaluation of fracture healing was easy. These findings are in agreement Wandhare (1989), Dubey, (1991) Shinde, (1994) and Pawar (1999). The

Table-1. Showing mean values of haemogram in canines

| Parameters | N | Days of interval | | | | |
|--------------------------------------|---|------------------|---------------------|----------------------|----------------------|----------------------|
| | | 0 Day | 1 st Day | 10 th Day | 20 th Day | 45 th Day |
| Hb gm/100ml | 6 | 11.41±0.68 | 11.33±0.66 | 11.38 ±0.48 | 11.53±0.59 | 12.05±0.59 |
| TEC 10 ⁶ /mm ³ | 6 | 6.76±0.13 | 6.62±0.04 | 6.69±0.09 | 6.82±0.07 | 6.96±0.09 |
| TLC 10 ⁶ /mm ³ | 6 | 14±0.49 | 14.74±1.70 | 14.34±2.21 | 14.65±2.27 | 15.25 ±2.17 |
| PCV % | 6 | 32.33 ±2.73 | 31.5 ±2.49 | 33.93±2.01 | 36.22 ±2.33 | 37.22±2.32 |
| Neutrophils % | 6 | 74.33±0.88 | 80.33±1.90 | 82.33±1.05 | 82.33±1.56 | 84.33±2.06 |
| Lymphocytes % | 6 | 23 ± 0.73 | 17.33 ±2.04 | 15.16 ±0.87 | 16.16 ±1.90 | 13.33 ±1.97 |
| Eosinophils % | 6 | 1.33 ±0.33 | 0.5 ±0.33 | 0.83 ±0.16 | 0.6 ±0.49 | 1.16 ±0.3 |
| Monocytes % | 6 | 0.83 ±0.40 | 1.33±0.33 | 1.16 ±0.30 | 0.83 ±0.65 | 0.83 ±0.37 |
| Basophils % | 6 | 0.5 ±0.33 | 0.5 ±0.28 | 0.5 ±0.22 | 0.00 | 0.3±0.21 |

radiograph taken soon after surgery showed excellent reduction and good alignment of fractured fragments and the fracture line was clearly visible on radiograph. Soon after surgery radiographs revealed excellent alignment. Singh and Singh (1990b) and Dubey et al.(1993) observed perfect alignment of fracture ends by using horn plates for femoral fracture. On 45th day radiographs revealed complete bridging of fracture gap by a well organized and distinct callus. Singh and Singh (1990)observed of gap by periosteal callus on day 45th.Dubey et al. (1993) observed bridging callus at 6th week while at 9th week Radio graph revealed complete obliteration of fracture line with well organized osseous callus. The intramedullary horn peg fixation did not show any untoward reaction at the site of contact with endosteal surface during healing of femoral fracture. These findings are in agreement with Singh and Singh (1990), Ashtekar and Deshpande(1981) ,Dubey et al.(1992) and Dubey et al.(1993) reduction and good alignment of fractured fragments and the fracture line was clearly visible on radiograph. Soon after surgery radiographs revealed excellent alignment. Singh and Singh (1990b) and Dubey et al.(1993) observed perfect alignment of fracture ends by using horn plates for femoral fracture. On 45th day radiographs revealed complete bridging of fracture gap by a well organized and distinct callus.Singh and Singh (1990)observed of gap by periosteal callus on day 45th.Dubey et al. (1993) observed bridging callus at 6th week while at 9th week Radio graph revealed complete obliteration of fracture line with well organized osseous callus. The intramedullary horn peg fixation did not show any untoward reaction at the site of contact with endosteal surface during healing of femoral fracture. These findings are in agreement with Singh and Singh (1990) Ashtekar and Deshpande(1981),Dubey et al.(1992) and Dubey et al.(1993).

Haematological Observations

The Hematological parameter viz Hb%, TEC, TLC, PCV, eosinophils, monocytes and basophils were within normal physiological range. However the mean values of neutrophil percentage on '0' day was 74 ± 0.88 while on 1st , 10th , 20th and 45th day it was 80.33 ± 1.90, 82.33 ± 1.05, 82.33 ± 1.56 and 84.33 ± 2.06 % respectively. There was constant and increasing trend of neutrophil and the values were not statistically significant. The rise in neutrophil percentage might be due to the response to inflammatory condition during healing of surgical wound and stress during post-operative period. Neutrophil are the first line of defense and therefore there number got increased after the onset of inflammation (Sastry, 1983). Aithal (1996) observed significant increase in neutrophil count on 1st and 3rd post-operative day. Marked increase in neutrophil was reported following traumatic and post surgical wound (Mahajan, 1992). The mean lymphocyte percentage decreased from 23 ± 0.73 on "0" day to 15.16 ± 0.87 on 10th day and it was found highly statistically significant. The decrease in lymphocyte count was due to tissue injury during surgery or inflammation elicited production of immuno-regulatory cytokines. These cytokines activate the pituitary adrenal axes and increase in glucocorticoid concentration. It results to increased level of lymphoid tissue and reduction in circulating lymphocytes (Kaneko et al.. 1997).

Biochemical Observations

The Biochemical studies revealed significant increase in the concentration of alkaline phosphatase from 3.15± 0.53 KA unit on 0 day to 6.94 ± 0.38 KA unit on 20th day while on 45th day, level reached toward normal range. The increased level level of alkaline phosphatase on 1st, 10th and 20th post operative day were highly statistically significant. Similar observations were noticed by Shifrin (1970) and Pawar (1999). Singh et al. (1976) reported a significant increase in the serum alkaline phosphate

Table-2. Showing mean values of biochemical in canines

| Parameters | No. | Days in interval | | | | |
|--------------------------------------|-----|------------------|---------------------|----------------------|----------------------|----------------------|
| | | 0 Day | 1 st Day | 10 th Day | 20 th Day | 45 th Day |
| Serum calcium (mg/dl) | 6 | 6.96± 0.29 | 6.83± 0.31 | 6.92± 0.34 | 6.95± 0.37 | 6.91± 0.3 |
| Serum Alkaline Phosphatase (KA unit) | 6 | 3.15 ± 0.53 | 4.79± 0.53 | 7.52± 0.48 | 6.94± 0.38 | 5.74± 0.89 |
| Serum Creatinine (mg/dl) | 6 | 0.95± 0.14 | 1.11± 0.2 | 1.05± 0.2 | 1.13± 0.16 | 1.25 ± 0.21 |
| SGOT (units/litre) | 6 | 22.82 ±2.45 | 23.62 ±2.83 | 24.57 ±2.52 | 26.67±2.06 | 27.21±2.96 |
| SGPT (units/ litre) | 6 | 24.26 ±2.40 | 23.34 ±2.18 | 24.10 ±2.31 | 24.81±2.28 | 25.39± 2.43 |

concentration at 7th and 14th post-operative day in experimentally created gap in right ulnae and filled with ceramic implants held in position by an intramedullary pin. Uma Rani and Ganesh (2003) observed significant elevation of serum alkaline phosphatase levels up to 15th post operative day during femoral fracture healing in goats. However, Aithal et al. (1998) reported a significant increase in serum alkaline phosphatase activity from 7th day onward in dogs treated with cross-intramedullary pin fixation technique. In the present study the increase level of serum alkaline phosphatase could be due to an enzyme phosphatase secreted by proliferating cartilage cells and increased osteoblasts in the fracture haematoma. These findings are in accordance Amresh Kumar (1996). The significant increase in the level of alkaline phosphatase during fracture healing could be attributed to the accelerated osteoblastic activity at the fracture site as stated by Guyton (1986).

The mean values of serum calcium on 0 day was 6.96 ± 0.29 mg/dl while on 1st, 20th, and 45th day it was 6.83 ± 0.31 , 6.92 ± 0.34 , 6.95 ± 0.37 and 6.91 ± 0.3 mg/dl respectively. This observation showed the declining trend up to 20th day was statistically non-significant. The observations revealed a non-significant variation in the level of calcium as also observed by Singh et al. (1976) and Sahkar et al. (1998). The decline in the serum calcium was possibly due to increased urinary excretion after traumatic bone injury as stated by Kumar et al. (1992). The serum creatinine, SGOT and SGPT values did not show any significant change during the period of fracture.

Conclusion

The following conclusions could be drawn from the present investigations,

1. The horn peg of appropriate shape and size could be easily prepared for the intramedullary fixation of femoral fracture in canines.
2. The radiological assessment of fracture healing

was quite easy due to the radiolucency of the horn peg.

3. Fracture immobilized with horn peg revealed good healing supported by distinct periosteal callus.
4. The horn peg did not elicit any reaction at the site of contact with host bone throughout the period of observation which indicated that horn has very poor antigenic potential.

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