CASE REPORT

Surgical Stabilization of Coxofemoral Luxation and Bilateral Femur Fracture in a Pug by a Combination of Three Techniques

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Coxofemoral luxation is separation of the femoral head from the acetabulum. About 40 to 90% of all luxations in dogs and cats are coxofemoral luxations (Venzin and Montavon, 2007; Smitha, 2014). The amount of soft tissue damage caused by luxation depends on the luxation's traumatic forces, direction and duration before therapy (Trostel and Fox, 2020). The relationship of the femoral head to the acetabulum after dislocation is typically used to categorize coxofemoral luxations. They are the craniodorsal, caudodorsal, cranioventral, caudoventral and intrapelvic dislocation. The most frequent kind of dislocation is craniodorsal coxofemoral luxation, which occurs in 90% of cases (Shivakumar, 2015). The majority of canine coxofemoral luxations have responded to external manipulation, closed reduction and external fixation with bandages and splints (Anoop *et al*., 2012). Coxofemoral luxation in dogs has been treated with double sided toggle pin technique (Ergin *et al*., 2016). Open surgical reduction enhances stability and lessens the possibility of reluxation when compared to closed reduction.

Femur fracture is one among the common orthopedic affections encountered in dogs (Raghunath *et al*., 2007). Fractures of shaft of femur are due to high energy trauma and therefore can result in both life threatening injuries and severe permanent disability. Intramedullary pinning using various pins is the most common method of internal fixation in the treatment of femoral fractures (Das *et al*., 2020). Plates have been developed to minimize interference with blood supply. The locking plate acts as an internal fixator and therefore does not displace the fracture segments during locking screw tightening, regardless of the precision of contouring (Wagner, 2003). Present case describes the management of craniodorsal coxofemoral luxation and bilateral femur fracture using toggle pin technique, intramedullary pinning and locking compression plating in a dog.

Case History and Observations

A two year old Pug weighing about 7.3 kg was presented to the department of Veterinary Surgery and Radiology, Veterinary College, Hassan (Karnataka, India) with the history of fall from the height. The dog was not bearing weight on its hindlimbs. Upon clinical and orthopaedic examination lameness, abnormal mobility and crepitation of femur and hip region were observed. Upon radiographic examination craniodorsal coxofemoral luxation of left hip joint and bilateral mid diaphyseal femur fracture were confirmed (Fig. 1). With the consent of owner, it was decided to surgically treat the patient with double sided toggle pin technique, intramedullary pinning and locking compression plating.

Surgical Treatment and Discission

After stabilization with fluid therapy, dog was pre-medicated with inj. Amoxicillin + Clavunate @ 12.5 mg/kg b.wt. and inj. Meloxicam @ 0.2 mg/kg b.wt., intravenously. It was pre-anaesthetised with intravenous inj. Butorphanol @ 0.2 mg/kg b.wt. and inj. Midazolam @ 0.2 mg/kg b.wt. Inj. Propofol was administered @ 4 mg/kg b.wt. intravenously for induction of anaesthesia that was maintained with 2% isoflurane.

A cranio-lateral approach was used to expose the femoral (right) shaft fracture and reduced the fragments anatomically by traction and manipulation with scalpel. Fracture stabilization was done by retrograde intramedullary pinning by 2.5 mm Steinman pin. After fracture fixation, the surgical site was routinely closed.

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Dog was positioned in lateral recumbency with the luxated limb upwards and coxofemoral luxation was treated with double sided toggle pin technique using handmade toggle pins and nylon. Craniodorsal approach to coxofemoral joint exposed the dislocated femur head from the acetabulum and torn joint capsule. A 1 mm hole in the femoral neck at the third trochanter level was drilled towards the fovea capitis using a pointed drill guide. 2 mm hole was created on dorsal acetabular fossa using drill bit, enough to pass the toggle pin (14 mm, 1 mm K-wire) which was attached with single strands of nonabsorbable nylon thread (0.6 mm diameter). Nylon thread was pulled while rotating the toggle pin to anchor it against the medial acetabular wall. Nylon thread was passed through the femoral tunnel and tightened the nylon threads. Nylon threads were secured using another toggle pin (14 mm, 1 mm K-wire) at third trochanter of the femur. Knot was tied securely enough to maintain routine movement. After coxofemoral joint reduction and stabilisation, the surgical site was routinely closed (Fig. 2).

A cranio-lateral approach was used to expose the femoral shaft fracture and reduced by application of traction and manipulation with scalpel to bring fractured fragments in normal anatomical alignment. The reduced fracture fragments were stabilized by using 2.7 mm 6 hole LCP with self-tapping locking head screws. The plate was pre-contoured according to the shape of bone using plate bender. The plate holes were drilled using drill bit. Size of the screw was measured using depth gauze and appropriate screws were fixed to the plate using hexagonal screw driver. After fracture fixation, the surgical site was routinely closed (Fig. 3). Dog received pelvic bandage and Robert Jones bandage to support the operated limb for 10 days. Post-operatively Tab. Carprofen @ 4.4 mg/kg b.wt., PO OD, Tab. Amoxicillin + Clavunate @ 12.5 mg/kg b.wt., PO BID, Trypsin tablets PO BID for five days along with oral calcium supplement were prescribed. Owner was instructed to limit the dog's activities with short leash walks for four weeks.

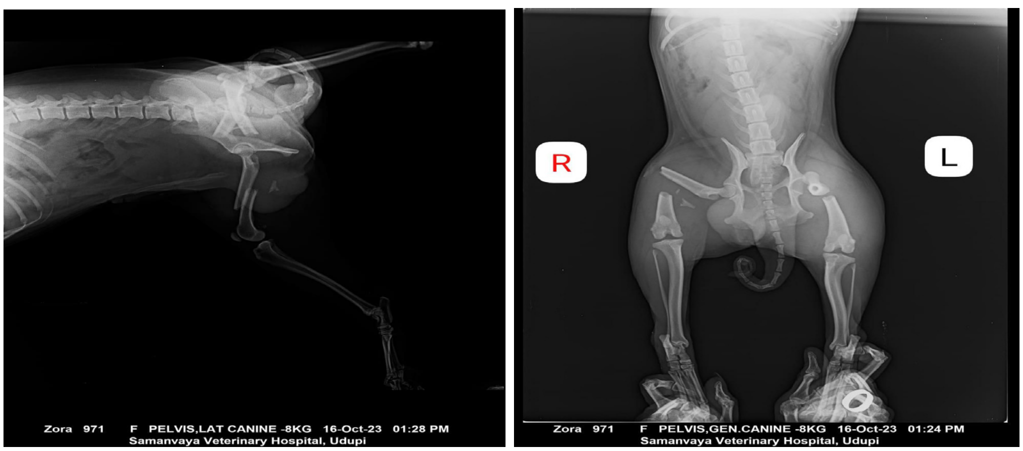

Fig. 1: Preoperative orthogonal views *i.e.,* lateral and ventro-dorsal pelvis radiograph.

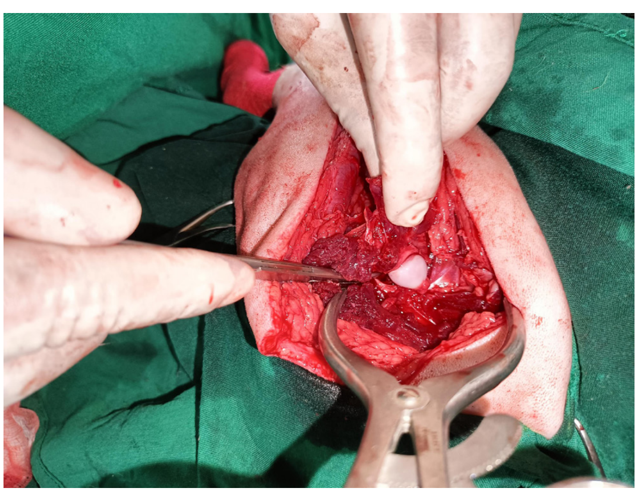

Fig. 2: Exposed luxated femur head

Fig. 3: Locking compression plating for left femur fracture

In the present case, the 1 mm K-wire was used for making toggle pins (Fig. 4). Coxofemoral luxation was easily reduced and toggle pins were placed via craniodorsal approach to hip joint. The cranio-lateral approach to femur provided sufficient exposure of fracture fragments for reduction and stabilization with 2.5 mm Steinman pin for right femur and 6 hole 2.7 mm LCP for left femur. Minimum of two bicortical screws were used on proximal fracture fragment and three on distal fracture fragment. Immediate post-operative radiography revealed reduction of the luxated femur head into acetabulum, proper placement of toggle pins along with proper reduction of femur (Fig. 5).

Pre-operatively the dog showed poor weight bearing and on 15th post-operative day onwards it showed excellent weight bearing and limb usage. Post-operative 15th day radiography revealed proper alignment and configuration of coxofemoral joint, toggle pins were in position, no arthritic changes were observed in the acetabulum and femoral head along with adequate apposition of femur. Reluxation, toggle pin breakage and nylon thread breakage were not observed post-operative period (Fig. 6, 7).

In the present case study, fracture fixation was performed by 2.5 mm Steinmann pin. Selection of the appropriate pin depends on the size of the intramedullary cavity, the bone being repaired, the fracture configuration and whether ancillary methods of fixation are to be used. Pin diameters should be big enough to fill at least 60 to 70% of the medullary cavity at its narrowest point. Larger pins provide greater resistance to bending forces and are preferred in straighter bone (Scott and McLaughlin, 2007). In the present case, femoral fracture repaired by intramedullary pinning with bigger size of Steinman pin showed gradual weight bearing and secondary callus formation.

The cranio-dorsal approach facilitated reaching the coxofemoral joint and acetabulum (Ergin *et al.,* 2016). Coxofemoral luxation was easily reduced and toggle pins were placed. This could be due to adequate exposure from cranio-dorsal approach to the hip joint in lateral recumbency with the luxated limb upside. Placement of toggle pins was quicker due to removal of debris, blood clots and remnants of ligamentum teres in the acetabulum and femoral head.

LCP system functions as internal fixate for fractures with a wider gap and provides optimal stability conducive for secondary bone healing through endochondral ossification (Egol *et al.,* 2004). The cranio-lateral approach to tibia facilitated reaching the fracture site and provided sufficient exposure of fracture fragments for reduction and stabilization with 6 hole 2.7 mm LCP implant (Sirin *et al.,* 2013). Haaland

Fig. 4: Toggle pin used by measuring length

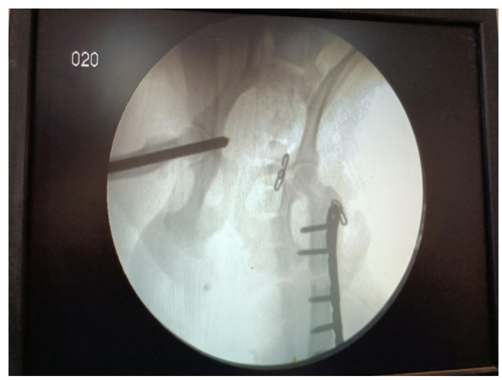

Fig. 5: Intra operative C-arm radiography of toggle pin placement

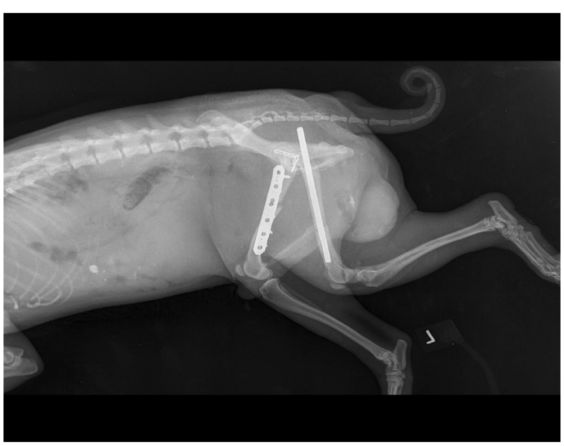

Fig. 6: 15th day post-operative lateral radiograph

Fig. 7: 15th day post-operative Ventrodorsal radiograph

et al. (2009) suggested that minimum of two screws should be fixed on either side of the fragments to provide stable fixation. The most common complication is reluxation due to breakage of used material in the toggle pin technique (Ergin *et al.,* 2016). In the present case, there was no complication in postoperative period and the dog was walking with full weight bearing after 15th postoperative day.

In conclusion, intramedullary pinning, locking compression plating and toggle pin techniques were found to be simple and practical method for Veterinary Surgeons in cases of concurrent bilateral femur fracture and coxofemoral luxation in the hindlimbs with excellent clinical outcome in postoperative period.

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