

# Evaluation of Handmade Toggle Pin Technique for the Repair of Coxofemoral Luxation in Dogs

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## ABSTRACT

The clinical study was conducted to evaluate the handmade toggle pin technique for the repair of coxofemoral luxation in six clinical cases of dogs of either sex. Dogs were brought with a history of limping and non-weight bearing lameness due to automobile trauma and jump from height. Orthopaedic and radiographic examinations confirmed craniodorsal coxofemoral luxation in all dogs. Under general anaesthesia luxation was stabilised with toggle pin technique using toggle pins via craniodorsal approach. Post-operatively a pelvic bandage, Amoxicillin @ 12.5 mg/kg, Carprofen 4.4 mg/kg and tablet Deep TBR for five days was followed, and limited activity with short leash walk was advised. Intra-operative and post-operative complications were not observed with respect to relaxation, toggle pin breakage and nylon thread breakage. Post-operative radiographic evaluation revealed proper alignment and anatomical configuration of coxofemoral joint, toggle pins were in position, no arthritic changes were observed in the acetabulum and femoral head. All dogs showed excellent weight bearing and limb usage on 30<sup>th</sup> post-operative day onward. In conclusion clinical results were excellent in dogs and handmade toggle pin technique was found to be easy, simple, economical and practical method for the repair of coxofemoral luxation in dogs.

**Key words:** Coxofemoral luxation, Craniodorsal, Dog, Hip joint, Relaxation, Toggle pin.

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## INTRODUCTION

Hip dislocation, coxofemoral luxation, is the 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; Shivakumar, 2015). Road traffic accidents and less serious events like jumping, getting struck or being kicked were the main causes of coxofemoral luxation in dogs (Kilic *et al.*, 2002). The most frequent kind of dislocation is a craniodorsal coxofemoral luxation, which occurs in 90% of cases. Caudoventral coxofemoral luxations are rather infrequent and frequently entail a fracture of the greater trochanter (Cetinkaya and Olcay, 2010).

Open reduction and closed reduction are two techniques that have been used to stabilise the coxofemoral luxation in dogs and cats (Anoop *et al.*, 2012). However, according to Cetinkaya and Olcay (2010), closed reduction is linked to a 50-70% probability of re-luxation. Intra-articular fractures, muscle contracture, intra-articular haemorrhage and inflammation of ligament are the factors for ineffective stabilisation of hip in closed reduction (Demko *et al.*, 2006). Coxofemoral luxation in dogs and cats has been treated with a variety of open surgical procedures, including Capsulorrhaphy, Modified Toggle Pinning (Hoim *et al.*, 2003), Tenodesis of the deep gluteal muscle (Rochereau and Bernarde, 2012) and Modified Knowels Toggle pin method (Cetinkaya and Olcay, 2010; Ash *et al.*, 2012; Ergin *et al.*, 2016). Open surgical reduction enhances initial stability and lessens the possibility

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of relaxation when compared to closed reduction. This work was aimed at evaluating handmade toggle pin technique for the repair of coxofemoral luxation in dogs.

## MATERIAL AND METHODS

The study was conducted on six clinical cases of dogs of either sex, aged 1-6 years, with coxofemoral luxation following varied aetiology presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Hassan with IAEC approval number: HVC/IAEC/03/2023. Dogs were fasted for 12 h and water was withheld for 6 h before surgery, and inj. Ceftriaxone @ 25 mg/kg b.wt. and inj. Meloxicam @ 0.2 mg/kg b.wt. were administered intravenously. All dogs were pre-anaesthetised with intravenous inj. Butorphanol @ 0.2 mg/kg b.wt. and inj. Midazolam @ 0.3 mg/kg b.wt. Inj. Propofol 4 mg/kg b.wt. was administered intravenously for induction of anaesthesia which was maintained with 1-3% Isoflurane.

Dogs were positioned in lateral recumbency with the affected limb upwards and coxofemoral luxations were treated with handmade toggle pin technique using handmade toggle pins and nylon. In all the cases craniodorsal approach to coxofemoral joint exposed the dislocated femur head and torn joint capsule. A 1.5 to 2.5 mm hole in the femoral neck starting at the third trochanter level was drilled ending at the fovea capitis using a pointed drill guide (2.5/4.5 mm). A 3-5 mm hole was created on dorsal acetabular fossa using drill bit enough to pass the toggle pin which was attached with single strands of large nonabsorbable nylon thread. Nylon thread was pulled while rotating the toggle pin to anchor it against the medial acetabular wall after inserting it through the pre-drilled acetabular hole. Nylon thread passed through the femoral tunnel reduced the hip and tightened the nylon threads. Sutures secured via passing another toggle pin through the nylon thread and placed perpendicularly to the pre-drilled hole near third trochanter of the femur. Knot tied securely enough to maintain hip reduction but not so securely that it may break during routine movement or ambulation. After coxofemoral joint reduction and stabilisation, the surgical site was routinely closed. All dogs received pelvic bandaging 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 and Trypsin tablets, PO BID were administered for 5 days. Owners were instructed to limit the dog's activities with short leash walks for a period of four to eight weeks.

Clinical, physical and radiological evaluation was done pre-operatively and after stabilisation with handmade toggle pin technique immediate post-operatively, 15<sup>th</sup> day, 30<sup>th</sup> day and 60<sup>th</sup> day after surgery. The radiographs were obtained

with a computed radiography system (CR12-X digitizer) on an X-ray machine (Allengers Mars®) with a capacity of 150 mA and 120 kV. The obtained data was statistically evaluated using one-way ANOVA.

## RESULTS AND DISCUSSION

Anaesthetic protocol provided adequate analgesia, muscle relaxation and unconsciousness without any complications throughout the surgical procedure. Similar anaesthetic protocol was also followed by McCartney *et al.* (2011) and Kieves *et al.* (2014).

The cranio-dorsal approach facilitated reaching the coxofemoral joint and acetabulum. All dogs had mild soft tissue damage and craniodorsal luxation. Similar approach was followed by Ash *et al.* (2012), Altug *et al.* (2019), Darrow *et al.* (2020) and Tamburro *et al.* (2022). The size of the K-wire used for making toggle pins in present study was 1.50 mm in all cases, except 1 mm in case 3 and case 5. The size of the Nylon thread used in present study was 1 mm in all cases, except in case 5 we used 0.60 mm nylon. Length of Toggle pins was varied from 14 mm to 28 mm according to the requirement of the case.

All the dogs had mild soft tissue damage and craniodorsal luxation. Traction and manipulation helped in bringing the luxated femur head into acetabulum, normal anatomical alignment was easy in all the cases. All the coxofemoral luxations were 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 affected 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.

Pre- and post-operative analgesic and antibiotic helped in preventing infection and pain management during post-operative period. Application of pelvic bandage post-operatively with limited activity of the dog was beneficial in preventing post-operative complications and helped animals to bear weight and use of the operated limb.

The clinical and physical examination including rectal temperature, heart rate and respiratory rate assessed pre-operatively, immediate post-operatively, 15<sup>th</sup>, 30<sup>th</sup> and 60<sup>th</sup> day after surgery did not reveal statistically significant differences (Table 1).

The grading of weight bearing and limb usage was assessed pre-operatively, immediate post-operatively, 15<sup>th</sup> day, 30<sup>th</sup> day and 60<sup>th</sup> day after surgery (McCartney *et al.*,

**Table 1:** The mean  $\pm$  SE of various clinical and physiological parameters recorded at different intervals in dogs

Parameters	Pre-operative	Days post-operative			
		Immediate	15 <sup>th</sup> day	30 <sup>th</sup> day	60 <sup>th</sup> day
Body weight (kg)	20.65 $\pm$ 4.26	20.58 $\pm$ 4.24	21.05 $\pm$ 4.61	21.22 $\pm$ 4.73	22.08 $\pm$ 5.32
Temperature (°F)	101.82 $\pm$ 0.57	101.60 $\pm$ 0.27	100.83 $\pm$ 0.35	101.55 $\pm$ 0.24	101.62 $\pm$ 0.24
Heart rate (Beats/min)	103.50 $\pm$ 7.36	107.67 $\pm$ 4.57	106.67 $\pm$ 6.36	109.67 $\pm$ 5.57	101.33 $\pm$ 3.33
Respiratory rate (Breaths/min)	35.33 $\pm$ 2.35	36.00 $\pm$ 0.73	32.67 $\pm$ 0.84	31.33 $\pm$ 1.12	32.00 $\pm$ 1.03



2011). Pre-operatively all the dogs showed fair weight bearing and limb usage in most of the cases, except case 1 and case 5 which showed poor weight bearing. Most of the dogs showed excellent weight bearing and limb usage on post-operative 15<sup>th</sup> day, except in 5<sup>th</sup> case which showed good weight bearing. All dogs showed excellent weight bearing and limb usage on 30<sup>th</sup> day onwards.

Immediate post-operative radiographic evaluation revealed anatomical reduction of the luxated femur head into acetabulum, proper placement of toggle pins (Fig. 1, 2). Radiographic evaluation on post-operative days (Fig. 3,4,5) revealed proper alignment and anatomical configuration of coxofemoral joint, handmade toggle pins were in position, no arthritic changes were observed in the acetabulum and femoral head. Similar observations were recorded by Ash *et al.* (2012), Altug *et al.* (2019) and Tamburro *et al.* (2022). Relaxation, toggle pin breakage and nylon thread breakage were also not observed in any of the dogs.



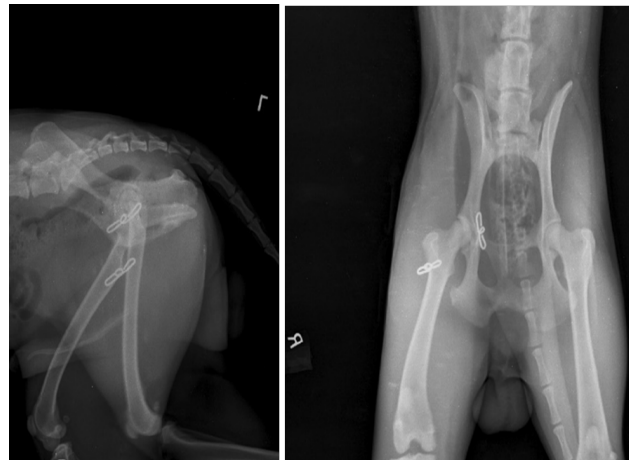
**Fig. 1:** Pre-operative radiographs with coxofemoral luxation of right hip joint in dog.



**Fig. 2:** Immediate post-operative radiographs with appropriate placement of toggle pin and normal configuration of right coxofemoral joint in dog.



**Fig. 3:** 15<sup>th</sup> day post-operative radiographs showing appropriate alignment and configuration of coxofemoral joint without any arthritic changes at coxofemoral joint in dog.



**Fig. 4:** 30<sup>th</sup> day post-operative radiographs showing proper placement of femur head in acetabulum without any arthritic changes in right coxofemoral joint in dog.



**Fig. 5:** 60<sup>th</sup> day post-operative radiographs showing no relaxation, normal coxofemoral joint with no arthritic changes in dog.

Intra-operative and post-operative complications associated with relaxation, toggle pin breakage and nylon thread breakage were not observed in coxofemoral luxation

repair with handmade toggle pin technique, which had excellent outcomes and animals were able to ambulate limb excellently in post-operative recovery period. This was in accordance with Hoim *et al.* (2003), Ash *et al.* (2012), Altug *et al.* (2019) and Tamburro *et al.* (2022).

## CONCLUSION

The clinical results of the present study were excellent in dogs treated with toggle pin for the repair of coxofemoral luxation. Handmade toggle pin technique was found to be simple, economical and practical method for the repair of coxofemoral luxation in dogs.

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