SHORT COMMUNICATION

Comparative Evaluation of Toggle Rod Technique and Toggle Pin Technique for the Repair of Coxofemoral Luxation in Dogs

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Abstract

The clinical study was conducted to evaluate the toggle rod technique and toggle pin technique for the repair of coxofemoral luxation in ten clinical cases of dogs of either sex, aged 1 to 8 years, and of different breeds. Dogs were brought with a history of limping and non-weight bearing lameness mostly following automobile accidents. Orthopaedic and radiographic examination confirmed coxofemoral luxation in all dogs. Under inhalant anaesthesia luxation was stabilised with toggle rod technique in three cases and toggle pin technique in seven cases via craniodorsal approach. Post-operatively an Ehmer's sling and pelvic bandage was applied and limited activity with short leash walk was advised. Intra-operative complications were not observed in any of the operative techniques. Post-operative radiographic evaluation revealed proper alignment and anatomical configuration of coxofemoral joint in both, toggle rod and toggle pin techniques. All dogs with toggle pin technique showed excellent weight bearing and limb usage on 30th post-operative day onwards. Toggle rod technique had reluxation as a complication. All the dogs with toggle pin technique recovered uneventfully and reluxation in toggle rod technique was treated with femoral head and neck excision. In conclusion clinical results were excellent with toggle pin technique than toggle rod technique in dogs for the repair of coxofemoral luxations.

Key Words: Coxofemoral luxation, Craniodorsal, Dog, Reluxation, Toggle pin, Toggle rod.

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Introduction

Today, dogs are beloved companions and pets, providing unconditional love, companionship and support to millions of people around the world. Dog skeletal issues include a variety of conditions that affect the bones and joints. Hip dysplasia, elbow dysplasia, patellar luxation, osteoarthritis, cruciate ligament injuries and fractures are among the skeletal issues that are frequently observed on dogs. 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, which are a common injury in small animals (Shivakumar, 2015; Jekinakatti *et al.*, 2024). 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). Road traffic accidents are the main cause 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 coxofemoral luxation in dogs and cats. The majority of canine coxofemoral luxations have responded to external manipulation, closed reduction and external fixation with bandages and splints (Anoop *et al.*, 2012). Closed methods of treatment frequently led to reluxation of the joint with significant soft tissue damage (Schlag *et al.*, 2019). Intraarticular fractures, muscle

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contracture, intraarticular 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 De vita pinning (Trostel *et al*., 2000), Capsulorrhaphy (Ozaydin *et al*., 2003), Toggle rod stabilisation (Pratesi *et al*., 2012; Trostel and Fox, 2020), Modified Knowels Toggle pin method (Ergin *et al*., 2016) and Handmade toggle pin technique (Jekinakatti *et al*., 2024). Open surgical reduction enhances initial stability and decreases the possibility of reluxation when compared to closed reduction. The present study was conducted to evaluate the efficacy of toggle rod technique and toggle pin technique for management of coxofemoral luxation in dogs.

Materials and Methods

The study was conducted on ten clinical cases of dogs, aged 1 to 8 years, and of different breeds, presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Hassan (Karnataka, India) with a history of limping and non-weight bearing lameness mostly following automobile accidents or fall from the height. The fixation techniques were evaluated in dogs affected with coxofemoral luxations. The dogs were randomly selected for both toggle rod (n=3) and toggle pin (n=7) techniques. Lameness, pain, abnormal mobility and crepitation were noted on physical, clinical and orthopaedic examination. Upon orthogonal radiographic examination craniodorsal coxofemoral luxations were confirmed.

Dogs were fasted for 12 h and withheld water for 6 h prior to surgery. On the day of surgery, the cephalic vein was cannulated using an intravenous cannula of suitable size. The affected limb was prepared aseptically by clipping the hair. Aseptic preparation of skin was done with 7.5% povidone-iodine solution followed by surgical spirit. Pre-operatively, inj. Ceftriaxone @ 25 mg/kg b.wt and inj. Meloxicam @ 0.2 mg/kg b.wt were administered intravenously 30 min before the surgery for pain management. All dogs were pre-anaesthetised with intravenous inj. Butorphanol @ 0.2 mg/kg b.wt and inj. Midazolam @ 0.3 mg/kg b.wt. Anaesthesia was induced with inj. Propofol 4 mg/kg b.wt intravenously. Endotracheal intubation was done with an endotracheal tube of appropriate size. Anaesthesia was maintained with 1-3% isoflurane with oxygen.

In all the cases dogs were positioned on lateral recumbency with the affected limb upwards for both techniques. Toggle rod technique and toggle pin technique for coxofemoral luxation was done using toggle rods and pins toggle with nylon (Fig. 1). In all the cases coxofemoral joint was craniodorsally approached to expose the dislocated femur head and torn joint capsule.

In case of toggle rod technique toggle rods made from the 2.5 mm Steinman pin were used. A 3 mm hole was made in dorsal acetabular fossa using drill bit, enough to pass the toggle rod which was attached with single strands of 1 mm nonabsorbable nylon thread. Nylon thread was pulled while rotating the toggle rod to anchor against the medial acetabular wall after inserting it through the pre-drilled acetabular hole (Fig. 2). 1.5-2 mm diameter hole in the femoral neck starting at the fovea capitis was drilled and ending at the third trochanter level. Nylon thread passed through the femoral tunnel, reduced the hip and tightened the nylon threads. A 1.5 mm tunnel was drilled in a cranio-caudal direction through the lateral femur just above the exit point of the femoral neck tunnel. Two strands of sutures were passed through this tunnel and secured with knot tied securely enough to maintain hip reduction.

In case of toggle pin technique, 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 2.5 mm pointed drill guide. 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 (Fig. 3). Nylon thread passed through the femoral tunnel and tightened, reduced the hip. 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 BW PO OD, Tab. Amoxicillin + clavunate @ 12.5 mg/kg BW PO BID and Tab. Trypsin PO BID were administered for five days. Owners were instructed to limit the dog's activities with short leash walks for a period of four to eight weeks.

Results and Discussion

Anaesthetic procedure provided adequate muscle relaxation, analgesia and unconsciousness without any difficulties during the repair of coxofemoral luxation in all the dogs. Similar anaesthetic protocols were followed by Kieves *et al.* (2014) and Jekinakatti *et al*. (2024). Lateral recumbency and cranio-dorsal approach enabled reaching the acetabulum in both techniques. Similar procedures were followed by Anoop *et al.* (2012), Ergin *et al.* (2016) and Altug *et al.* (2019).

Toggle rod technique and toggle pin technique for coxofemoral luxation was done using toggle rods with nylon and toggle pins with nylon, respectively. The size of the Steinman pin used for making toggle rods in present study was 2.5 mm. The size of the Nylon thread used in present study was 1 mm in all toggle rod cases. 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 third, fourth and sixth case of toggle pin technique. The size of the Nylon thread used in present

study was 1 mm in all cases, except fourth and sixth case of toggle pin technique, which used 0.60 mm nylon thread.

All the coxofemoral luxations were reduced, toggle rods and toggle pins were easily placed. This could be due to satisfactory revelation from cranio-dorsal approach to the hip joint in lateral recumbency. Placement of toggle rods and toggle pins were quicker due to removal of debris, blood clots and remnants of ligamentum teres in the acetabulum and femoral head. Pre-operative and post-operative analgesic with antibiotic helped in preventing infection and pain management during post-operative period. Application of pelvic bandage post-operatively with restricted activity of the dogs was helpful in avoiding post-operative complications and helped animals to bear weight and use the operated limb.

Intra-operative complications were not observed in any of the operational techniques. Immediate post-operative radiographic evaluation revealed proper alignment and anatomical configuration of coxofemoral joint in both, toggle rod and toggle pin technique. This was in accordance with Tamburro *et al.* (2022) and Jekinakatti *et al.* (2024).

Post-operative complication associated with reluxation was observed in coxofemoral luxation repair with toggle rod technique in second case and reluxation was treated with femoral head and neck excision. This was in accordance with Demko *et al.* (2006), Pratesi *et al.* (2012) and Trostel and Fox (2020). Reluxation, toggle pin breakage and nylon thread breakage were not observed in any of the dogs treated with the toggle pin technique. All dogs with toggle pin technique showed excellent weight bearing and limb usage on 30th post-operative day onward and recovered uneventfully. This was in accordance with Ash *et al.* (2012), Altug *et al.* (2019) and Jekinakatti *et al.* (2024).

In conclusion, clinical results were excellent in dogs treated with toggle pin technique than toggle rod technique, and toggle pin technique was found to be simple and

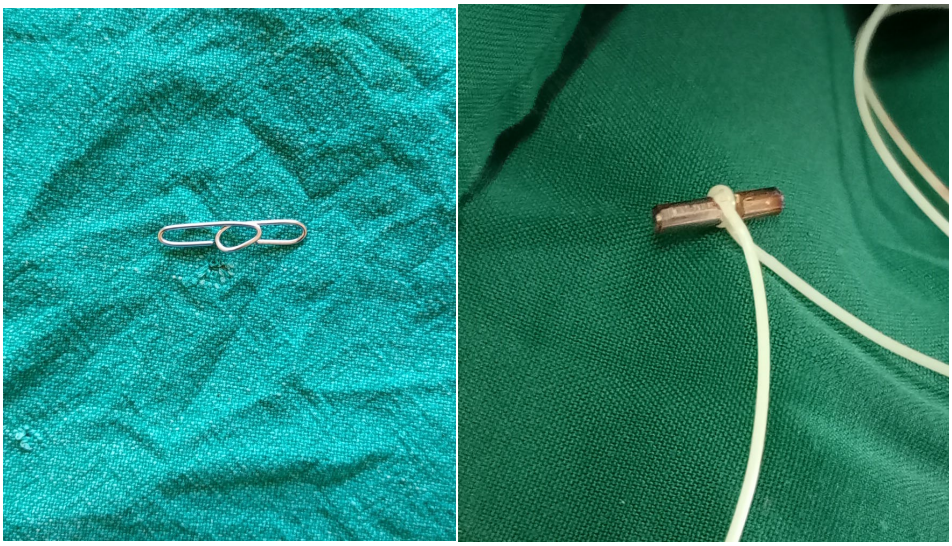

Fig. 1: Toggle pin and toggle rod with nylon

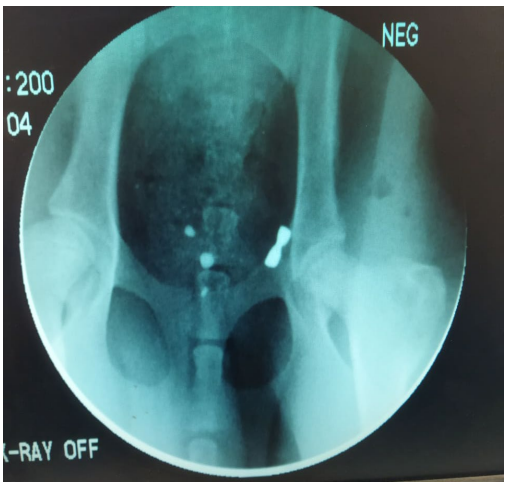

Fig. 2: Intra-operative C-arm radiograph showing toggle rod in medial acetabular wall

Fig. 3: Intra-operative C-arm radiograph showing toggle pin in medial acetabular wall

economical method for the repair of coxofemoral luxation in dogs.

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