# Legg-Calvé-Perthes Disease in the Dog: A Case-Based Review

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## Introduction

Legg Calvé Perthes disease is a developmental disorder affecting the femoral head in small breed dogs weighing less than 12kg (Thak et al., 2013), between 4 and 12 months old (Warren and Dingwall, 1972). Synonyms for this disease include avascular necrosis of the femoral head, aseptic necrosis of the femoral head, Perthes disease, Legg-Perthes disease, osteochondritis, coxae juvenilis, coxa plana, and idiopathic osteosis (Scott and Witte, 2012; Warren and Dingwall, 1972). Characteristic clinical symptoms include non-weight-bearing lameness, pain on extension of the affected joint, decreased coxo-femoral joint range of motion, and disuse atrophy of muscles in the affected limb (Thak et al., 2013). In 1909, Waldenström described avascular necrosis of the femoral head in children, which he attributed to tuberculosis (Yotsuyanagi et al., 2009). In 1910 Arthur Legg in the USA, Jacques Calvé in France, and Georg Perthes in Germany independently described a condition characterised by deformation of the femoral head and muscle atrophy in the hip of skeletally immature children. Legg suggested the cause as disruption of blood supply to the proximal femur, while Calvé suggested rickets as the cause. Perthes suggested the changes were caused by infectious osteomyelitis (Craveiro-Lopes, 2011; Scotte and Witte, 2012; Yotsuyanagi et al., 2009). It is now generally accepted that the aetiology of the disease is associated with the disruption of blood supply to the femoral capital epiphysis as initially described by Legg (Craveiro-Lopes, 2011; Scott and Witte, 2012). Theories attempting to explain the disruption in femoral capital epiphyseal circulation include hormonal influences, hereditary factors, anatomic conformation (Fossum et al., 2007, cited in Yotsuyanagi et al., 2009), and a rise in intrasynovial pressure due to trauma or inflammation, especially in dogs with an abnormal blood supply (Warren and Dingwall, 1972). The incidence of Legg-Calvé-Perthes disease varies with location from 1:1200 to 1:12500 (Kealey et al., 2000, cited in Yotsuyanagi et al., 2009). Warren and Dingwall, 1972 reported that according to studies, only 25% of patients would respond to conservative treatment, albeit with an increased risk of developing arthritis and a degree of functional impairment in the long term. Femoral head and neck ostectomy (FHNO) is the recommended treatment to manage Legg-Calvé-Perthes disease. FHNO is a relatively straightforward and inexpensive surgical procedure (Off and Matis, 2010; Warren and Dingwall, 1972). It affords relief of pain with early and satisfactory return to function (Warren and Dingwall, 1972). In one study, the most frequent indication for FHNO in dogs was Legg-Calvé-Perthes disease (Off and Matis, 2010). This case-based review highlights Legg-Calvé-Perthes disease's importance as a differential diagnosis for pelvic limb lameness in skeletally immature, small-breed dogs. It further aims to highlight important aspects of diagnosis and surgical management of the disease and how owner finances can affect diagnosis and management of a case in a clinical setting.

## Case Description

A 7-month-old, 7.4kg, spayed female Border Collie cross canine was presented for grade 3/5 weight-bearing lameness of the right pelvic limb of 2 weeks' duration. There was no history of trauma, and vaccinations were up to date. A physical examination revealed pain on extension and abduction of the right hip. The rest of the physical examination was otherwise unremarkable. The main differential diagnoses were femoral capital fracture, pelvic fracture, patella luxation, Legg-Calvé-Perthes disease, coxo-femoral subluxation or luxation, osteochondritis dissecans, cruciate ligament disease, nerve root signature and soft tissue injury.

Further examination and radiographs under sedation were recommended but declined by the owner citing financial constraints. Conservative and symptomatic treatment with meloxicam for 14 days was instituted. Strict exercise restriction for a minimum period of 2 weeks was also advised. Despite the treatment, the dog presented again 18 days after the initial presentation with progressive non-weight bearing lameness of the right pelvic limb. Physical examination revealed pain on the extension of the right hip, and the rest of the examination was otherwise unremarkable. Orthogonal radiographic views of the hips and stifles were recommended but could not be obtained due to the owner's financial constraints. Only a lateral radiograph of the right stifle was obtained and was unremarkable. A ventro-dorsal pelvic radiograph was also obtained under light anaesthesia. The radiograph revealed deformation of the right femoral head, the right coxo-femoral joint space widening, and a distinct radiolucent area in the right femoral head. Legg-Calvé-Perthes disease was diagnosed based on characteristic history, signalment, clinical signs and radiographic findings.

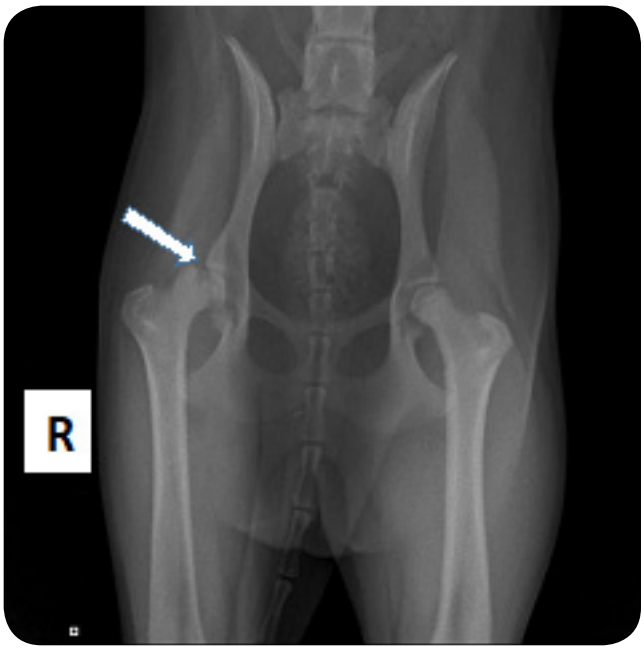


*Fig. 1. Ventrodorsal pelvic radiograph showing deformation of the right femoral head, widening of the right coxo-femoral joint space, and radiolucency in the right femoral head (white arrow).*

The dog was initiated on oral carprofen, paracetamol, and tramadol. A washout period of 4 days was observed from the last meloxicam dose to the first carprofen dose. Surgery was scheduled for the following day. On the day of surgery, amoxycillin was administered

preoperatively subcutaneously. Premedication was achieved with intramuscular buprenorphine, medetomidine and ketamine, followed by induction of anaesthesia with propofol intravenously to effect. Isofluorane was administered intratracheally as needed for the maintenance of anaesthesia. Surgical treatment with FHNO using a cranio-lateral approach to the right coxo-femoral joint, as described by Piermattei, was performed. The ostectomy was carried out with an oscillating saw. Intra-operatively, deformation and necrosis of the femoral head were confirmed, with osteophyte formation on the caudo-dorsal acetabular rim.

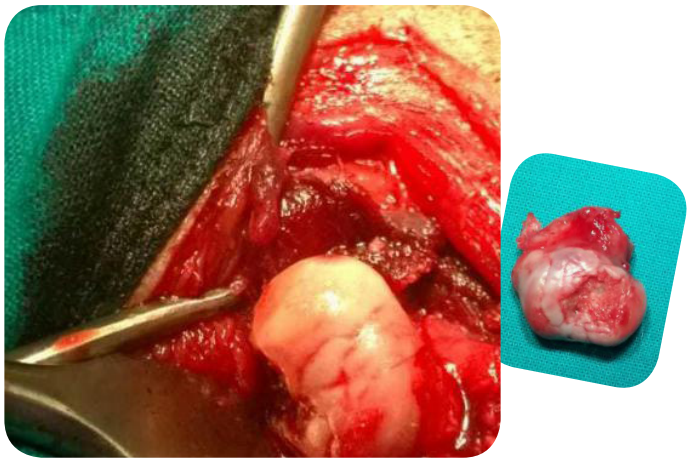

*Fig. 2. Intraoperative view of femur head and neck (left) and appearance of excised femur head and neck (right). Deformation and necrosis of the femur head are evident.*


*Fig. 3 Immediate postoperative physical (left) and radiographic appearance (right).*

Buprenorphine was administered intravenously every 6 hours thereafter until the dog was discharged a day after surgery. The dog was discharged on oral cephalexin, tramadol, and paracetamol for seven days and oral carprofen for two weeks. The dog made an uneventful recovery, and sutures were removed at two postoperative weeks.

There was near normal return to function in the affected limb at two weeks postoperatively, and follow-up radiographs were scheduled at eight postoperative weeks.

Although these scheduled follow-up radiographs were not obtained due to financial constraints on the owner's part, the dog had a normal return to function with no signs of pain in the affected limb at three postoperative months.

**Discussion**

The case described had the typical history, signalment, clinical signs, and radiographic findings of Legg-Calvé-Perthes disease as described in literature. The dog also responded favourably to the recommended surgical treatment of FHNO, as noted in literature. Thak et al., 2013 described the resolution of clinical signs in a dog after FHNO, which was consistent with the case described. The authors also described successfully using computed tomography (CT) to diagnose early Legg-Calvé-Perthes disease in a dog. Radiography lacks sensitivity in early Legg-Calvé-Perthes disease. In a 2016 study, Purdoiu et al. investigated the use of ultrasonography to detect changes in the femoral head due to Legg-Calvé-Perthes disease in dogs.

The authors found that ultrasonography had acceptable sensitivity and specificity for diagnosing Legg-Calvé-Perthes, albeit lower than radiography. Radiography remains a practical, reliable and accessible diagnostic modality for this condition. In 2012, Jankovits et al. described using micro total hip replacement to manage Legg-Calvé-Perthes disease in dogs. Micro total hip replacement has the advantages of preserving coxo-femoral joint biomechanics, not resulting in limb length discrepancy and providing reliable relief from pain. However, the procedure is technically demanding and relatively expensive to perform.

A 2013 study by Crovace described an experimental novel regenerative therapy for Legg-Calvé-Perthes disease in dogs using bone marrow mononuclear cell (BMMC) and bone marrow stromal cell (cBMSC) therapy. The author reported favourable outcomes with these therapies and suggested that with further research, such therapies can potentially provide viable alternatives as conservative treatment of Legg-Calvé-Perthes disease.

Femoral neck metaphyseal osteopathy in cats is a condition similar to Legg-Calvé-Perthes in dogs. However, unlike Legg-Calvé-Perthes disease in the dog, the condition affects the femoral neck, as the name suggests. FHNO has also successfully managed femoral neck metaphyseal osteopathy in cats (Queen et al., 1998).

Although financial constraints played a major role in the delay in reaching the initial diagnosis and later in providing optimal follow-up care in this case, the diagnosis and treatment of Legg-Calvé-Perthes disease in dogs remain straightforward, and surgical outcomes following FHNO are generally favourable, as demonstrated in this case.

**References:**


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# MULTIPLE-CHOICE QUESTIONS

**QUESTION 1**

**What is the typical age and breed of a Legg-Calve-Perthes disease canine patient?**

a) Skeletally immature, large-breed dog
b) Skeletally mature, large-breed dog
c) Skeletally immature, small-breed dog
d) Skeletally mature, small-breed dog
e) Skeletally immature, medium-breed dog

**QUESTION 2**

**What is the cause of Legg-Calve-Perthes disease?**

a) Tubeculosis affecting the femoral head
b) Femoral capital physeal fracture
c) Osteomyelitis of the femoral head
d) Rickets
e) Poor blood supply to the femoral physis

**QUESTION 3**

**Pain in the affected hip joint is elicited on**

a) Extension of the ipsilateral hip joint
b) Flexion of the ipsilateral stifle
c) Extension of the ipsilateral stifle
d) Palpation of the lumbar spine
e) Abduction of the contralateral hip joint

**QUESTION 4**

**The most practical and accessible diagnostic modality for diagnosing Legg Calve Perthes disease is**

a) Ultrasonography
b) CT scan
c) MRI
d) Radiography
e) Arthroscopy

**QUESTION 5**

**According to one study, what percentage of LCP cases respond to conservative treatment?**

a) 10%
b) 25%
c) 50%
d) 75%
e) Almost 100%

**QUESTION 6**

**The treatment of choice for Legg Calve Perthes disease is**

a) Conservative treatment
b) Femoral head and neck ostectomy
c) Leg amputation
d) Physiotherapy
e) Arthrodesis

**QUESTION 7**

**What are the disadvantages of micro total hip replacement when managing Legg Calve Perthes disease?**

a) Development of arthritis in the long term
b) Limb length discrepancy
c) Technically challenging and relatively expensive
d) Long recovery period
e) Normal joint biomechanics are lost

**QUESTION 8**

**A similar condition to Legg Calve Perthes in cats is**

a) Femoral head and neck dysplasia
b) Femoral head osteomyelitis complex
c) Femoral neck metaphyseal osteopathy
d) Feline avascular necrosis of the femoral head
e) Slipped capital femoral epiphysis

**QUESTION 9**

**One experimental study by Crovace looked at the following therapy as a possible conservative treatment alternative**

a) Hyperimmune serum therapy
b) Clotting factor therapy
c) Bone marrow mononuclear cell therapy
d) Autogenous bone graft
e) Interferon therapy

**QUESTION 10**

**The reported incidence of Legg Calve Perthes in dog populations is**

a) 1:100-1:200
b) 1:500-1:1000
c) 1:1200-1:12500
d) 1:15000-1:25000
e) 1:20000-1:50000

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