Simultaneous epiphyseal separations and fractures of the neck and greater trochanter of the femur in the dog

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ABSTRACT

The history, clinical signs and treatment of six dogs with simultaneous epiphyseal separations or fractures of the neck and greater trochanter of the femur are described.

INTRODUCTION

Simultaneous epiphyseal separations or fractures of the neck and greater trochanter of the femur are an uncommon injury in the dog and only Brinker (1965) has described it.

Since 1968 six dogs with this condition have been referred to the Department of Veterinary Surgery in the University of Bristol and the details of these cases are summarized in Table 1. In every case the cause of the injury was a road traffic accident.

HISTORY

Four cross-bred dogs, one Springer Spaniel and a Dachshund were presented for treatment. Their ages ranged from 5 to 7 months.

CLINICAL SIGNS

The dogs carried the affected leg in slight adduction; there was swelling in the region of the hip and pain on manipulation of the joint. Under general anaesthesia, examination and manipulation of the joint revealed crepitus and displacement of the greater trochanter.
Table 1.

<table>
<thead>
<tr>
<th>Case</th>
<th>Breed, age and sex</th>
<th>Separation</th>
<th>Fracture</th>
<th>Other injuries</th>
<th>Treatment</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Proximal epiphysis</td>
<td>Greater trochanter epiphysis</td>
<td>Femoral neck</td>
<td>Greater trochanter</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Collie x Retriever, 7 months, male</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>Springer Spaniel, 5 months, male</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>Cross-bred, 6 months, male (10 kg)</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Avulsion tibial crest separation proximal epiphysis tibia in other leg</td>
</tr>
<tr>
<td>4</td>
<td>Cross-bred, 6 months, female (10 kg)</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Midshaft fracture femur in other leg. Fractures pubis, ischium, ilium on same side</td>
</tr>
<tr>
<td>5</td>
<td>Cross-bred, 7 months, male (15 kg)</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>None</td>
</tr>
<tr>
<td>6</td>
<td>Dachshund, 6 months, female</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>Fractured ischium</td>
</tr>
</tbody>
</table>
VENTRO-DORSAL AND LATERAL RADIOGRAPHS OF THE HIPS WERE NECESSARY TO CONFIRM THE DIAGNOSIS.

In Cases 1, 2, 3 and 4 aged 7, 5, 6 and 6 months respectively, the proximal, greater and lesser trochanteric epiphyses of the femur were still open. Trauma to the proximal end of the femur had resulted in simultaneous separation of the proximal and trochanteric epiphyses (Figs. 1–4). In Case 5 which was 7 months
old, the proximal epiphysis had fused but the two trochanteric epiphyses were still open. In this animal, trauma had produced simultaneous fractures of the femoral neck and greater trochanter (Figs. 5 and 6). In Case 6, aged 6 months, with the epiphyses still open, trauma caused a simultaneous fracture of the femoral neck and separation of the greater trochanteric epiphysis (Fig. 7).

**COMPLICATIONS**

Case 3 also had an avulsion of the tibial crest and the proximal tibial epiphysis in the other hind leg. Case 4 had fractures of the pubis, ischium and ilium on
FEMUR FRACTURES IN THE DOG

FIGS. 5 and 6. Case 5—7-month-old cross-bred. Fig. 5. Ventro-dorsal radiograph of the hips showing simultaneous fractures of the femoral neck and the greater trochanter. The greater trochanteric epiphysis is still open. Fig. 6. Lateral radiograph of the hips showing the greater trochanter more clearly.

the same side and an oblique midshaft fracture of the other femur. Case 6 had a fractured ischium on the same side as the femoral injuries.

TREATMENT

With two exceptions, all cases were treated surgically. In Case 4 as there was little displacement of the greater trochanter and proximal epiphysis of the femur, conservative treatment for this and the pelvic fractures was chosen. The midshaft fracture of the femur was treated by open reduction and fixation with an intra-medullary pin. Case 6 was treated conservatively as there was also very little displacement at the fracture sites and the dog had already begun to use the affected leg at the time of examination.
Surgical treatment consisted of an excision arthroplasty (Spreull, 1961) and internal fixation of the greater trochanter to the shaft of the femur using an intramedullary screw (Brinker, 1965).

ANAESTHESIA

Following acetylpromazine premedication, anaesthesia was induced with thiopentone sodium, and maintained, following endotracheal intubation, with methoxyflurane, nitrous oxide and oxygen administered with a Magill semi-closed apparatus.

SURGICAL PROCEDURE

The dogs were placed in lateral recumbency and the operation site prepared for surgery. The hip joint was exposed from the dorso-lateral aspect, the skin incision 2–6 cm in length was made over the greater trochanter and the underlying fat was separated to expose the tensor fascia lata which was severed along its attachment to the biceps femoris. The greater trochanter was identified and in each case it had been displaced caudal to the shaft of the femur. The trochanter was grasped with bone holding forceps and reflected cranially—together with its muscle insertions—to reveal the joint capsule and the proximal epiphysis or femoral head lying within the acetabulum. The shaft of the femur was retracted
caudally to increase exposure of the hip joint. After section of the teres ligament, the femoral head or proximal epiphysis was grasped with forceps and removed. The femoral neck was then trimmed level with the shaft of the femur.

The greater trochanter was reduced and fixation obtained by passing a Sherman screw (9/64 in. diameter) through the trochanter into the medullary cavity of the femur (Fig. 8). (A 1/8 in. bit was used to drill the greater trochanter and a 7/64 in. to extend the hole into the shaft of the femur.) In Case 2, the screw passed obliquely through the greater trochanter and the cranial cortex of the shaft of the femur.

![Figure 8](image.png)

**Fig. 8.** Case 5—7-month-old cross-bred. Ventro-dorsal radiograph of the hips 4 months post-operatively showing formation of pseudoarthrosis, and fixation of the greater trochanter with an intramedullary screw.

The tensor fascia lata was re-attached to the biceps femoris muscle using interrupted 2/0 chromic catgut sutures. The subcutaneous fat was closed with 2/0 interrupted catgut stitches. A continuous sub-cuticular 2/0 catgut suture was inserted and the skin closed with interrupted 2/0 monofilament nylon sutures.

Post-operatively, streptomycin and penicillin* were injected daily for 5 days and the skin sutures were removed at 7 days. The owner was advised to restrict the dog to walking exercise on a leash for at least 1 month.

**POST-OPERATIVE PROGRESS**

*Case 1* began to put weight on the affected leg 1 week after surgery and 7 months later, was reported to have only a very slight limp.

*Case 2* was slightly lame on the affected leg at 3 months, and 1 year afterwards, was completely sound.

* Streptopen—Glaxo.
Case 3 was putting weight on the affected leg within 10 days but its subsequent progress is not known.

Case 4 was putting weight on the affected leg within 7 days.

Case 5 had a marked limp at 6 weeks; at 4 months it used the leg well when walking but tended to carry it when running.

Case 6 made a complete recovery within a month.

DISCUSSION

Simultaneous epiphyseal separations or fractures of the femoral neck and the greater trochanter occurred in six dogs. Their ages ranged from 5-7 months. The state of fusion of the epiphyses appears to be the critical factor in determining the type of injury that occurs following trauma in the region of the hip joint.

Smith (1960) recorded that fusion of the proximal epiphysis and the greater trochanter of the femur occurred at the eleventh month of age in the Greyhound; the lesser trochanter had fused by 12 months. Further studies (Sumner-Smith, 1964) showed that there were variations in the time of epiphyseal closure in different breeds of dog, between animals of the same breed, and even between members of the same litter.

It seems likely that trauma produces epiphyseal separation if the epiphyses are still open and fracture if they are closed but Cases 5 and 6 did not conform to this pattern.

A ventro-dorsal radiograph of the hips will usually reveal a separation of the proximal epiphysis or fracture of the femoral neck, but it will not always show fracture or epiphyseal separation of the greater trochanter, a lateral radiograph being necessary for this.

With two exceptions all the cases reviewed in this paper were treated by excision arthroplasty and internal fixation of the greater trochanter to the shaft of the femur. Excision arthroplasty was performed firstly because of the difficulty in obtaining satisfactory reduction and fixation of the femoral head, and secondly because of the high risk of avascular necrosis in those cases with separation of the proximal epiphysis or an intracapsular fracture of the femoral head. Internal fixation of the greater trochanter to the shaft of the femur is important because of its muscular attachments. A screw was used for fixation. The results of this treatment appear to justify its continued use for this type of injury.

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REFERENCES


Résumé. L'historique, les signes cliniques et le traitement de six chiens ayant des décollements épiphysaires simultanés ou des fractures du col et du grand trochanter du fémur sont décrits.