Canine humeral intracondylar fissure: a review

Humeral intra-condylar fissure (HIF), also known as incomplete ossification of the humeral condyle, is characterised by the presence of a mid-sagittal fissure in the humeral condyle, which has been shown to predispose affected dogs to condylar fractures. Studies have shown that spaniel breeds are over-represented, although other breeds may also be affected. Severity of clinical signs is variable, ranging from no apparent lameness (silent) to cases of severe lameness on presentation or, ultimately, condylar fracture. The condition can be bilateral. Mean age at presentation is between three and four years, although, dogs up to seven years of age have been diagnosed with the condition. Diagnosis is achieved by means of observing a radiolucent line within the humeral condyle, usually by either radiography or computed tomography. Prophylactic treatment relies on the placement of a transcondylar screw to stabilise and strengthen the humeral condyle and thus mitigate the risk of fracture.

Key words: dog, elbow, humeral intracondylar fissure, HIF, incomplete ossification of the humeral condyle, IOHC

Introduction

The elbow joint is a complex joint, comprising three articulations: humero-radial, humero-ulnar and radio-ulnar (Box 1). This article focuses on a condition, localized to the elbow joint, that should be considered when evaluating dogs with forelimb lameness.

The high incidence of condylar fractures observed in spaniel breeds (Denny 1983; Anderson et al. 1990), often caused by minor trauma, led to the suspicion that some developmental or conformational abnormality could predispose these breeds to humeral condylar fractures (HCF). It was only in 1989 that Meutstege first described “incomplete condylar fractures” as a cause of lameness in dogs, whereas in 1994 Marcellin-Little et al. described the condition and introduced the name “incomplete ossification of the humeral condyle” (IOHC). This condition is characterised by the presence of a radiolucent line within the humeral condyle, which reduces humeral condyle stability, and in some dogs can lead to fracture of the humeral condyle and one or both epicondylar crests.

The exact aetiology of this process is debatable, and some insight on that discussion, as well as on diagnostic and treatment options will be given under specific sections of this article.

Signalment

Historically, retrospective studies on humeral condylar fractures (Denny 1983; Anderson et al. 1990) showed a high prevalence amongst spaniel breeds, with some studies reporting a prevalence as high as 35% (Denny 1983). This led to the suspicion that some degree of conformational abnormality of the elbow could predispose to fracture in these breeds. Marcellin-Little et al. (1994) further observed that spaniel breeds constituted 77% of cases with condylar fractures sustained due to minor trauma. Furthermore, in the same study, radiographs taken from the intact contralateral elbow (when present) of these dogs, revealed that 86% of these had a mid-sagittal radiolucent line within the humeral condyle. The linear lucency extended proximally from the trochlear articular surface and was located in the region of the cartilaginous plate that separates the two main secondary centres of ossification of the humeral condyle, giving rise to the suspicion that this condition was due to a failure of ossification.

In the United States, the American Cocker Spaniel seems to be over-represented whereas in the United Kingdom (UK) the English Springer Spaniel seems to be the most prevalent breed (Butterworth and Innes, 2001). Prevalence of humeral intracondylar fissure (HIF) in a population of 50 English springer spaniels was reported at 14% in one study (Moores et al. 2012). Apart from Spaniels, HIF has also been reported in the Labrador Retriever, Rottweiler, English Pointer, and other...
breeds (Rowesti et al. 1998; Butterworth and Innes 2001; Robin and Marcellin-Little 2001; Meyer-Linderberg et al. 2002; Gnudi et al. 2005; Pfeil et al. 2010; Piola et al. 2012). Age at presentation seems to be most commonly between three and four years old, but has been reported from four months to seven years (Butterworth and Innes 2001; Carrera et al. 2008).

Some gender predisposition has been reported, with some studies reporting males to be affected twice as often as females (Meyer-Linderberg et al. 2002; Carrera et al. 2008). Other authors, however, report the same proportion of males and females (Butterworth and Innes 2001; Moores et al. 2012).

**Clinical signs**

HIF can often be a subclinical condition. Moores et al. (2012) reported a 14% HIF prevalence in English Springer Spaniels with no history of lameness. In this study, all the fissures diagnosed were incomplete.

HIF is often bilateral; up to 30% of cases in one study (Meyer-Lindenberg et al. 2002). For this reason, it is advisable to evaluate the contralateral elbow joint, when a patient is presented with unilateral lameness associated with HIF, or with HCF (Figure 1).

![Figure 1: Dorsal plane of both humeri in a dog after sustaining a lateral condylar fracture of the right humerus (yellow arrows). Note the presence of a fissure line on the left humeral condyle (green arrows)](https://via.placeholder.com/150)

Lameness severity, when present, can vary from mild and intermittent to non-weight-bearing lameness (Butterworth and Innes 2001), and is usually poorly responsive to non-steroidal anti-inflammatory medication (Moores 2006).

It has been proposed that the source of pain in lame dogs arises from the stress created in the lateral epicondylar ridge, although some dogs with epicondylar remodelling do not present with any lameness (Butterworth and Innes 2001). Lameness can also be seen as a prodromal sign, and may be reported as part of the history for dogs presenting with HCFs. Physical examination may reveal resentment of elbow extension and in some cases also of lateral epicondylar ridge palpation (Butterworth and Innes 2001). No range of motion reduction, joint effusion, peri-articular thickening, or obvious crepitus would be expected primarily due to HIF; although osteoarthritis and concomitant conditions may alter the physical examination.

**Pathophysiology**

As stated above, the current aetiology of this disease process is not fully understood and is currently under debate. Two theories are hypothesised: the incomplete ossification of the humeral condyle (IOHC) theory, and the fatigue fracture/fissure theory.