

# FOUR LEG NEWS

JULY – AUGUST 2015

VOLUME 4, ISSUE 4

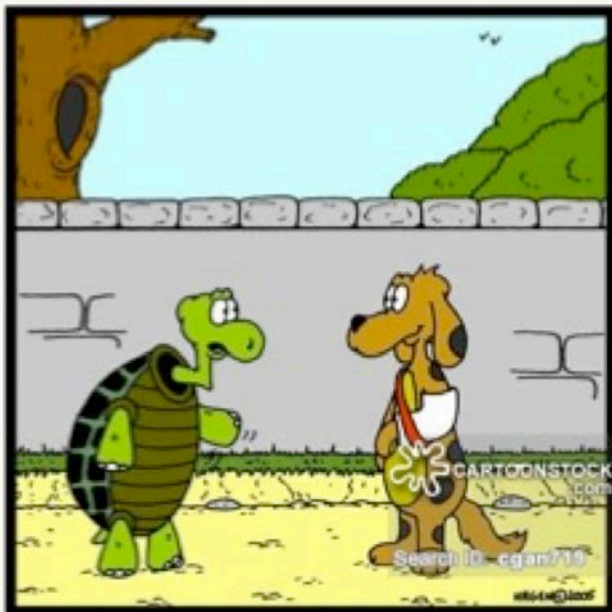
## SOMETHING NEW TO ADD TO YOUR KNOWLEDGE BASE!

Hey everyone,

So here is a newsletter all about a newly recognized elbow condition - elbow enthesopathy. You'll find this newsletter to include info from 6 research papers, great pictures from the articles to make things make sense, and my thoughts on clinical relevance.

Read and enjoy folks!

Cheers, Laurie



Don't talk to me about  
having an itch you can't scratch...



"IT'S NOTHING SERIOUS. YOU JUST HAVE  
POSTMAN'S ELBOW."

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## ELBOW ENTHESOPATHY

### WHAT ARE WE EVEN TALKING ABOUT?

The elbow joint is a frequent origin of forelimb lameness in medium and large breed dogs. The most common disorder affecting the canine elbow joint is elbow dysplasia, a disorder including medial coronoid disease, ununited anconeal process, osteochondritis dissecans of the humeral condyle, and incongruity. Diagnosis is based on radiographic changes, or sclerosis and osteoarthritis, often combined with the findings of computed tomography or arthroscopy.

Elbow enthesopathy is defined as an abnormality of the medial humeral epicondyle and the attaching flexor muscles, radiographically seen as a calcified body or a spur. Most cases of flexor enthesopathy are described concomitantly with other elbow disorders, mainly medial coronoid disease. Synonyms previously reported in the veterinary literature have included “ununited medial epicondyle.” Ununited medial epicondyle has been reported as a rare problem and is often considered a clinically insignificant finding.

Clinical signs of primary flexor enthesopathy are non-specific: elbow lameness, distension of the elbow joint, limited range-of-motion and elbow pain, although in some cases a firm swelling in the caudodistal region of the medial epicondyle can be palpated. Findings are comparable to the abnormalities present in joints affected by medial coronoid disease.

Radiographic signs are a spur on the medial humeral epicondyle or soft tissue calcification in the region of the medial humeral epicondyle. Some forms have minimal or even absent radiographic changes, the diagnosis being missed or confusion with discrete forms of medial coronoid disease. Additionally it is difficult to distinguish primary from concomitant flexor enthesopathy based on the radiographic findings making diagnosis of flexor enthesopathy challenging.

Reports describe as a separate bony fragment, an avulsed fragment, or a calcification of the flexor muscles. It is no longer considered as a disorder belonging to the elbow dysplasia complex because of its low prevalence and low clinical impact.

The challenge in these cases is to define the cause of the elbow pain in order to perform the correct treatment.

So what's in the literature ...?

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van Ryssen B, De Bakker E, Beaumlin Y, Samoy YCA, van Vynct D Gielen I, Ducatelle R, van Bree H., Primary flexor enthesopathy of the canine elbow: imaging and arthroscopic findings in eight dogs with discrete radiographic changes. *Vet Comp Orthop Traumatol* 2012; 25: 239–245.

## **OBJECTIVE**

To describe the radiographic, ultrasonographic, computed tomography (CT), magnetic resonance imaging (MRI), and arthroscopic findings in eight dogs with elbow lameness caused by primary flexor enthesopathy.

## **METHODS**

Eight client-owned dogs were enrolled in the study. All had lameness localized to the elbow upon clinical examination. Radiographic examination, ultrasound, CT and MRI were performed prior to arthroscopy. In seven dogs, surgical treatment and subsequent histopathology were performed.

## **RESULTS/DISCUSSION:**

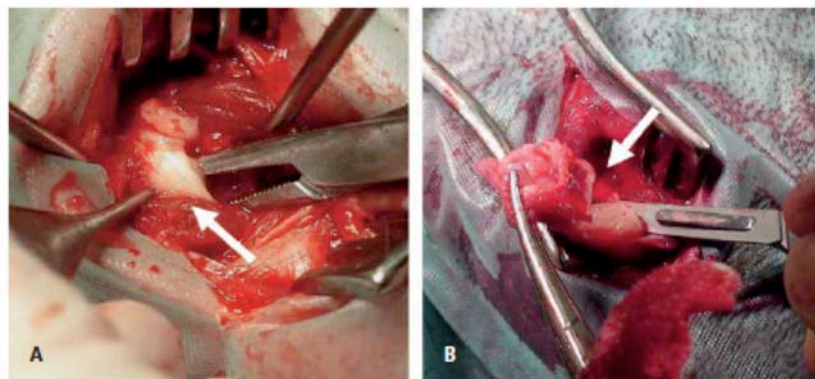
Histopathology of the affected tissue revealed degeneration and metaplasia in the flexor muscles.

Primary flexor enthesopathy at the medial epicondyle is an unrecognized condition and is a possible cause of elbow lameness in the dog, with diagnosis based on specific imaging and arthroscopic findings.

In cases with minimal or unclear radiographic and arthroscopic changes, primary enthesopathy of the medial epicondyle should be considered as a differential diagnosis.

## **CONCLUSION**

Primary flexor enthesopathy is an infrequent but important option in the differential diagnosis of elbow problems in medium and large breed dogs. A correct diagnosis of flexor enthesopathy can only be obtained by combining the radiographic findings with other imaging techniques and arthroscopy to confirm suspected lesions of the medial epicondyle and the attaching flexors and to exclude medial coronoid disease.



**Fig. 6** Aspect of the affected tissue during open surgery. A) White, thickened proximal part of the flexor carpi ulnaris muscle. B) Transection shows the thickened fibrous tissue.

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De Bakker E, Saunders JH, Gielen I, van Bree H, Coppieters E, van Ryssen B. Radiographic findings of the medial humeral epicondyle in 200 canine elbow joints. *Vet Comp Orthop Traumatol* 2012; 25: 359–365.

## **OBJECTIVE/INTRODUCTION**

The purpose of this study was to inventory radiographic changes of the medial epicondyle to determine the frequency of medial humeral epicondylar lesions and to evaluate the radiographic aspect as a primary finding or concomitant to other elbow diseases and its association with osteoarthritis.

## **METHODS**

Medical records of dogs diagnosed with elbow lameness were reviewed. Inclusion criteria for this study were a complete clinical examination, a complete set of digital radiographs and a final diagnosis made by computed tomography or magnetic resonance imaging and arthroscopy. Changes of the medial humeral epicondyle were recorded and correlated with the radiographic osteoarthritis and final diagnosis.

Following evaluation of the radiographic images and the data obtained by further diagnostic methods (CT, MRI, and arthroscopy), the elbow joints were divided into three groups: joints without lesions of the medial humeral epicondyle, joints with only lesions of the medial humeral epicondyle or surrounding soft tissues ('primary flexor enthesopathy') and joints with lesions of the medial humeral epicondyle associated with other elbow disorders ('concomitant flexor enthesopathy').

## **RESULTS/DISCUSSION:**

Two hundred elbows met the inclusion criteria for the study. Eighty of these showed changes of the medial humeral epicondyle. In 12 of these 80 elbows, changes of the medial epicondyle were the only findings within the joint (primary flexor enthesopathy). In the remaining 68 elbows, other concomitant elbow pathologies were found. High grades of osteoarthritis were recorded in elbows with concomitant flexor enthesopathy, while most elbows with primary flexor enthesopathy showed a low grade of osteoarthritis.

Lesions of the medial humeral epicondyle have not been well documented in literature. Changes such as osteophytosis are often considered clinically unimportant and are regarded as an expression of osteoarthritis. This study showed the relatively frequent presence of medial humeral epicondylar changes of which the majority were considered concomitant to a primary elbow problem. If changes of the medial humeral epicondyle are the only pathologic finding (primary flexor enthesopathy) they should be considered as the cause of lameness and not as a sign of osteoarthritis.

This specific area of the joint should be evaluated carefully to detect the lesions in the first place and to interpret them correctly in order to make the right treatment decision.

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**Fig. 4** A-C) Radiographic (extended and flexed mediolateral and cranio-caudal projection), (D-F) computed tomographic (CT) and (G-I) arthroscopic images of a three-year-old Great Swiss Mountain Dog diagnosed with primary flexor enthesopathy. A – C) On radiography, primary flexor enthesopathy is visible as a calcified body (white arrowhead), spur formation (black arrow), and an irregular outline of the medial humeral epicondyle (white arrow). A mild degree of osteoarthritis is visible (black arrowhead). D – I) The absence of a coronoid lesion in this dog is shown on the CT images and arthroscopic views. D-F) On the CT images (bone window, D-E) the medial humeral epicondyle is sclerotic with an irregular outline (black arrow). A clear

calcification is visible within the flexor muscle group (white arrowhead). A small osteophyte is seen on the medial coronoid process (black arrowhead). After intravenous injection of a contrast medium (2 mg/kg Iopromid, Ultravist 300; N.V. Shering S.A.), clear contrast captation within the flexor muscles is visible (soft tissue window, F) (black arrow). G-I) Arthroscopy shows a normal coronoid process (white arrow), an erosion at the attachment side of the flexor muscles to the medial humeral epicondyle (black arrow) and ruptured fibres of the flexor tendons near their attachment to the medial humeral epicondyle (white arrowhead).

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## An interesting GROUPING of literature... What's the best way to diagnose?

1. De Bakker E, Samoy YCA, Coppieters E, Mosselmans L, van Ryssen B,. Arthroscopic features of primary and concomitant flexor enthesopathy in the canine elbow. Vet Comp Orthop Traumatol 2013; 26: 340–347.
2. De Bakker E, Peremans K, Vermeire S, Vandermeulen E, Dobbeleir A, Dik KJ, Gielen I, Saunders JH, van Ryssen B. The use of planar bone scintigraphy and HiSPECT for diagnosis of primary and concomitant flexor enthesopathy in the canine elbow. Vet Comp Orthop Traumatol 2013; 26: 348–355.
3. De Bakker E, Gielen I, Van Caeleberg A, van Bree H, van Ryssen B. Computed Tomography of Canine Elbow Joints Affected by Primary and Concomitant Flexor Enthesopathy. Vet Radiol Ultrasound, Vol. 55, No. 1, 2014, pp 44–55.
4. De Bakker E, Gielen I, Kromhout K, van Bree H, van Ryssen B. Magnetic Resonance Imaging of Primary and

So these researchers conducted a number of similar studies (and/or evaluated a grouping of dogs in different ways).

- *The aim of study number one was to examine the possibilities and limitations of arthroscopy to detect flexor enthesopathy and to distinguish primary flexor enthesopathy from the concomitant form. This was a prospective study performed on 50 dogs. All (except for normal control dogs) presented with a complaint of thoracic limb lameness, and all dogs underwent an arthroscopic examination together with additional radiographic, ultrasonographic, scintigraphic, CT, and MRI examinations. The elbow joints of the 50 dogs were divided in four groups based on the final diagnosis obtained with the different imaging modalities.*
- *The second prospective study investigated the possibilities and limitations of planar bone scintigraphy and high-resolution single photon emission computed tomography (HiSPECT) to diagnose flexor enthesopathy and to distinguish primary flexor enthesopathy from the concomitant form. Forty-six dogs were included in the study, all, except for the normal control dogs, presenting with a complaint of thoracic limb lameness. All dogs underwent planar bone scintigraphy and HiSPECT imaging of one or both elbows. Furthermore, radiographic, ultrasonographic, computed tomographic (CT) and magnetic resonance imaging (MRI) together with arthroscopic examinations of the elbows were performed.*

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- *The third study must have used the same animals as in study number two, however the aim of this study was to describe computed tomographic (CT) characteristics of the flexor muscles and their attachment to the medial epicondyle in elbows diagnosed with flexor enthesopathy, and determine whether CT could be used to distinguish primary vs. concomitant forms of flexor enthesopathy in dogs.*
- *The goal of study four was to determine whether MRI can be used to diagnose flexor enthesopathy and differentiate between primary and concomitant forms of flexor enthesopathy in dogs. Forty-nine dogs were included in analyses for this study. All dogs, except for the normal control dogs, were presented with unilateral or bilateral thoracic limb lameness. All dogs underwent low-field MRI of both elbow joints after radiographic, ultrasonographic, scintigraphic, computed tomographic, and arthroscopic examinations. The elbow joints were divided in four groups based on the final diagnosis obtained with clinical examination and at least three other imaging modalities. [This study may have used the same animals & info garnered from studies 2 & 3, I believe. – LEH]*

Based on the findings, animals were grouped as follows:

- Group 1 (primary flexor enthesopathy) dogs demonstrated lesions compatible with flexor enthesopathy but no other elbow lesions.
- Group 2 (concomitant flexor enthesopathy) dogs had flexor lesions and the additional presence of medial coronoid disease, osteochondritis dissecans, and medial coronoid disease + osteochondritis dissecans, detected using CT and arthroscopy.
- Group 3 (elbow dysplasia) dogs had flexor enthesopathy excluded but the presence of medial coronoid process disease confirmed based on CT and arthroscopy.
- Group 4 (sound joints) dogs had no flexor enthesopathy or elbow dysplasia lesions using radiography, ultrasonography, scintigraphy, MRI, or arthroscopy.

And the answers ...

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## ARTHROSCOPY

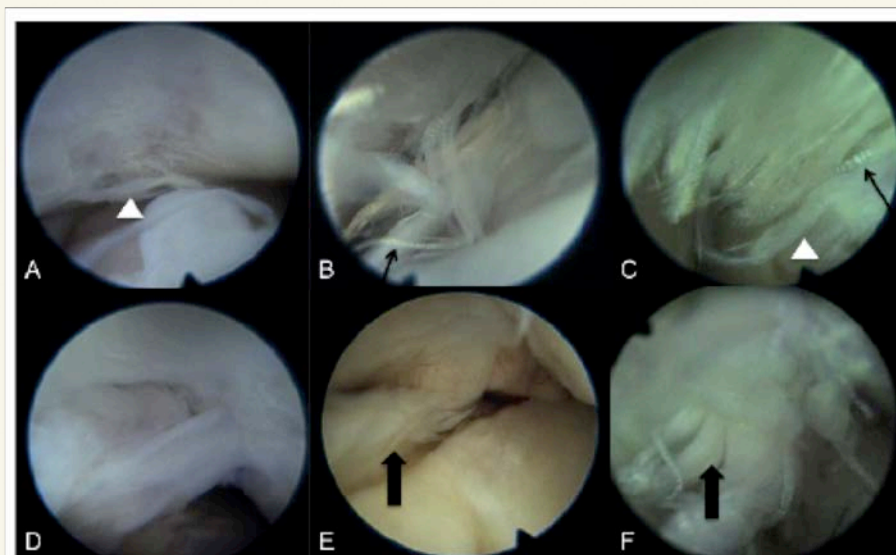
Elbow joints were arthroscopically inspected via a medial approach. Intra-articular structures were inspected and specific regions within the elbow joint were visually assessed. The flexor muscles and their entheses were visually assessed. The presence or absence of the following arthroscopic characteristics of flexor enthesopathy were recorded: fibrillated or ruptured insertion of the flexor muscles, local synovitis and a cartilage erosion near the insertion site, and a thickened and yellow discolored appearance of the flexor muscles. Arthroscopic characteristics of the medial coronoid process, appearance of the medial part of the humeral condyle, and presence or absence of incongruity were also recorded

With arthroscopy, pathological changes of the enthesis were observed in 100% of the joints of both flexor enthesopathy groups (clinically and subclinically affected), 72% of the joints with elbow dysplasia and 25% of the normal joints. No clear differences were seen between both flexor enthesopathy groups.

The flexor muscles are located extra-articularly, however arthroscopic visualization of flexor pathology is possible because the entheses (the tendon-to-bone origin) is damaged in those joints and the covering synovial membrane is disrupted consequently.

Arthroscopy found abnormalities of the flexor muscles and their attachment site in all joints with primary flexor enthesopathy and in all joints with concomitant flexor enthesopathy. However, the same characteristics were also found in a large percentage of joints in the elbow dysplasia group and even in some of the normal elbows. Therefore we can conclude that arthroscopy is very sensitive for the detection of flexor lesions, but some of the findings are not specific for flexor enthesopathy.

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**Figure 2** Arthroscopic images illustrating a fibrillated (A-C) and ruptured (D-F) insertion of the flexor muscles to the medial humeral epicondyle. A-C: Minimal (A) – clear (B, C) fibrillation visible, characterized by loose, shiny (black arrow), undulated fibres (white arrowhead). D-F: Ruptured insertion characterized by a cleaved appearance of the flexor muscles (D) and ruptured pieces of flexor muscles (E, F) (black arrow).



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Arthroscopic characteristics of flexor enthesopathy were also observed in all subclinically affected joints of both forms of flexor enthesopathy, indicating that some lesions may occur before the onset of lameness or without the development of a clinical problem.

In conclusion, arthroscopy can easily allow visual inspection of lesions of the flexor muscle entheses. However, not all findings are specific for flexor enthesopathy. The distinction between forms of flexor enthesopathy is difficult, not only because of the similar flexor pathology in both forms but also because of the presence of mild irregularities of the medial coronoid process in joints with primary flexor enthesopathy. Therefore the authors suggest the using additional diagnostic techniques to ensure a correct diagnosis.

## **SCINTIGRAPHY & and High Resolution Single Photon Emission Computed Tomography (HiSPECT)**

Planar bone scintigraphy allows the attribution of lameness to the elbow joint in cases of primary flexor enthesopathy with minimal or even absent radiographic changes. The more detailed HiSPECT enables the localization of pathology within the elbow joint and is a sensitive technique to detect flexor enthesopathy. However HiSPECT is insufficient to distinguish primary from concomitant flexor enthesopathy.

Planar bone scintigraphy demonstrated increased radiopharmaceutical uptake in all diseased elbow joints, except for one. This joint with primary flexor enthesopathy, which was clinically not apparent and therefore considered subclinically affected, did not show radiopharmaceutical uptake while all other applied imaging modalities demonstrated flexor pathology. HiSPECT demonstrated increased radiopharmaceutical uptake of the medial humeral epicondyle in nearly all clinically affected joints with primary and concomitant flexor enthesopathy. Additional uptake of the medial coronoid process was recorded in all clinically affected joints with concomitant flexor enthesopathy and in six out of 18 with primary flexor enthesopathy. No difference in intensity of the uptake was noticed.

Furthermore the presence of increased uptake in the medial coronoid process cannot be used to differentiate between primary flexor enthesopathy and the concomitant form as some elbows diagnosed with primary flexor enthesopathy show increased uptake in the coronoid region as well. Therefore the use of multiple imaging modalities remains necessary to make the distinction between primary and concomitant flexor enthesopathy.

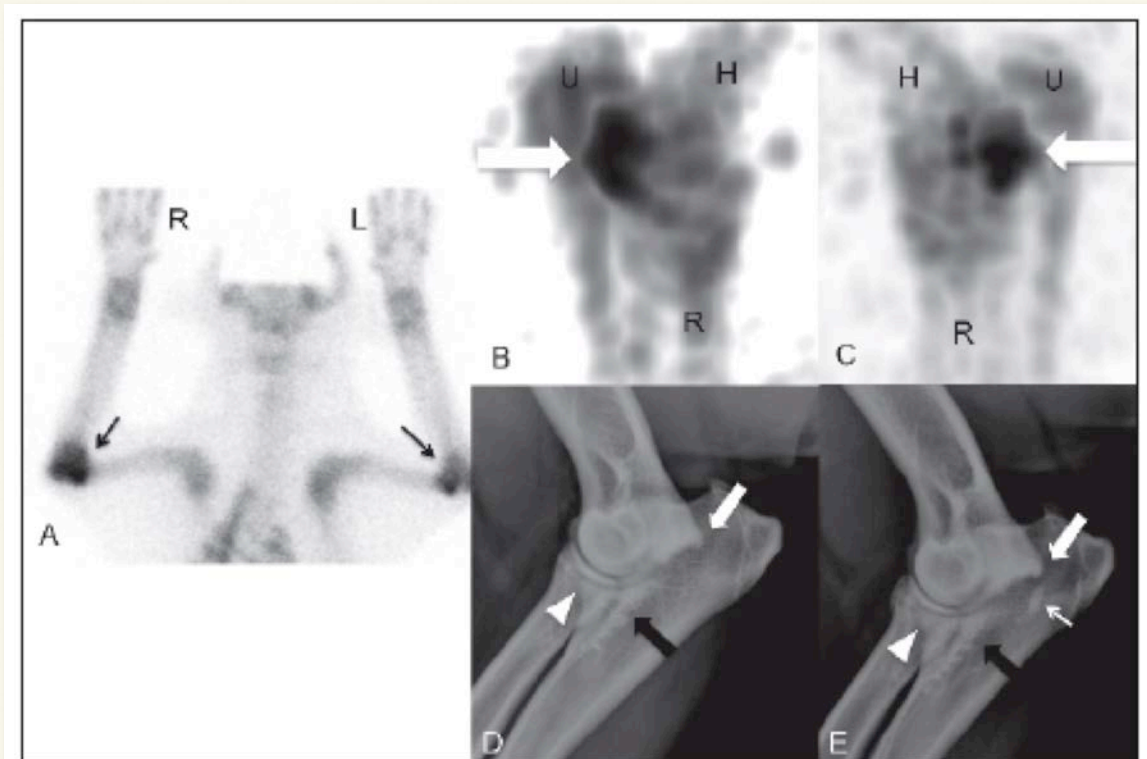
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**Figure 2** A) Planar static bone scintigraphy, B-C) HiSPECT images, and D-E) corresponding radiographs of a 3.5-year-old female Rottweiler diagnosed with bilateral primary flexor enthesopathy. A) Ventral view with increased radiopharmaceutical uptake in the region of the right (R) and left (L) elbow joints (black arrows). B-C) Latero-medial HiSPECT images with focal uptake in the medial humeral epicondylar region, indicating flexor enthesopathy (white arrow) in the right (B) and left (C) elbows (H: Humerus, U: Ulna, R: Radius). D) Medio-lateral extended projection of the left elbow showing a spur (white arrow), normal medial coronoid process (white arrowhead) and no subtrochlear sclerosis (black arrow). E) Medio-lateral extended projection of the right elbow showing a small spur (broad white arrow), a calcified body adjacent to the medial humeral epicondyle (small white arrow), normal medial coronoid process (white arrowhead), and no subtrochlear sclerosis (black arrow).

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## COMPUTED TOMOGRAPHY (CT) SCAN

CT lesions consistent with flexor enthesopathy were found in all clinically affected joints with primary flexor enthesopathy and in 29 of the 30 clinically affected joints with concomitant flexor enthesopathy. Those lesions were not found in sound elbows or joints affected by elbow dysplasia. Flexor lesions detected in dogs with primary flexor enthesopathy were not significantly different from those detected in dogs with the concomitant form. Findings indicated that CT can be applied to detect flexor enthesopathy, but a distinction between the primary and concomitant forms was not always possible. Authors recommend the use of multiple diagnostic techniques for treatment planning in affected dogs.

*And a note about signalment of the affected animals...*

The mean age of the dogs with primary flexor enthesopathy in the study was 4.7 years, comparable to previous reports on medial epicondylar lesions. Concomitant flexor enthesopathy was seen in dogs with a mean age of 4.2 years. Many joints were chronically affected or had been treated arthroscopically several years before, so the mean age was higher than would be expected for medial coronoid disease, the main concomitant disorder. The mean age of dogs affected by elbow dysplasia was 2.9 years, which is consistent with literature on elbow dysplasia describing both young and older dogs.

In both flexor enthesopathy groups, male were more frequently affected than females and lesions were mainly seen in medium and large breed dogs.



FIG. 1. Computed tomography images of the left elbow joint from a 4.5-year-old female Rottweiler with primary flexor enthesopathy. (A–C) Lateromedial extended (A), flexed (B) and 15° oblique craniolateral-caudomedial (C) radiographic images showing a clear spur (black arrow), mild osteoarthritis (small white arrow), an irregularly outlined medial coronoid process (broad white arrow), and a mild, patchy sclerotic aspect (white arrowhead). On the transverse CT images in bone algorithm (D–F), an irregularly delineated medial humeral epicondyle with a sclerotic and thickened cortex is visible (broad white arrow) with a small calcified body located close to the medial humeral epicondyle within thickened flexor muscles (small white arrow). The medial coronoid process shows hypo-attenuating new bone formation at the tip of the medial coronoid process representing an osteophyte (white arrowhead). Transverse CT images in soft tissue algorithm before (G) and after (H) IV injection of contrast demonstrate thickening of the flexor muscles with heterogeneous contrast enhancement (black arrows). The reconstructed image in dorsal plane after IV contrast (I) shows thickening of the flexor muscles (black arrow) and contrast enhancement within the flexor muscles (white arrow).

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## MAGNETIC RESONANCE IMAGING (MRI)

Magnetic resonance imaging lesions involving flexor tendons were found in 100% of clinically affected joints with primary flexor enthesopathy and 96% of clinically affected joints with concomitant flexor enthesopathy. Thickened flexor muscles were the most common lesions, followed by hyperintense tendon signal and contrast enhancement. Irregular, thickened medial humeral epicondyle, edema, and calcified body lesions were less frequently observed. Magnetic resonance imaging characteristics of flexor enthesopathy were not found in normal joints or those affected by elbow dysplasia alone. No significant differences in frequencies and details of individual MRI characteristics were found between primary and concomitant flexor enthesopathy groups.

The results of this study support the hypothesis that MRI is an excellent technique for the evaluation of the flexor muscles in the canine elbow joint and can be used for the detection of flexor pathology. However, the study results reject the hypothesis that MRI can differentiate between primary and concomitant forms of flexor enthesopathy in dogs, given a detailed analysis of the MRI signs of flexor enthesopathy did not reveal significant differences between primary and concomitant forms of flexor enthesopathy. These findings illustrate the need for multiple diagnostic techniques to obtain a definitive diagnosis and distinguish primary from concomitant forms of flexor enthesopathy in dogs.

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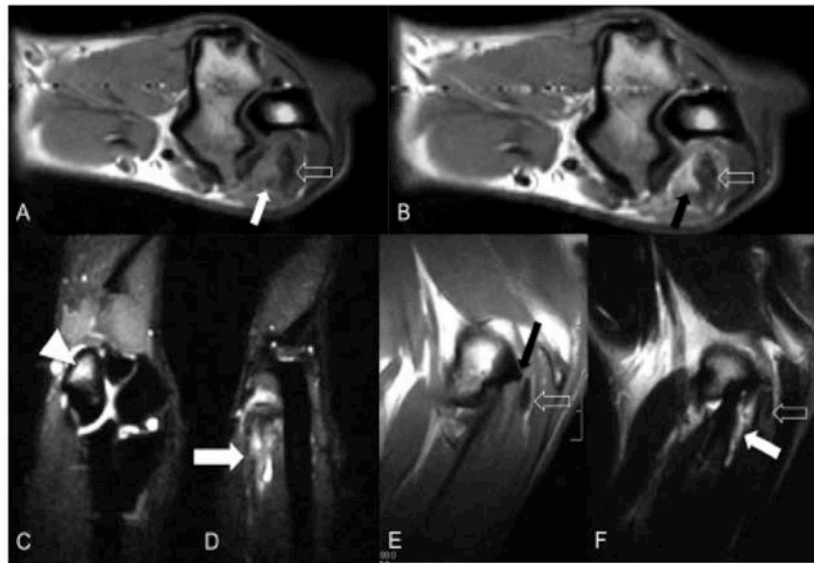


FIG. 1. Magnetic resonance images of the elbow from a 1.4-year-old male mixed-breed dog diagnosed with primary flexor enthesopathy. Transverse pre and postcontrast T1-weighted sequences at the level of the humeral epicondyles (A, B), dorsal STIR ((C) at the level of the humeral epicondyles; (D) more caudally at the level of the ulna) and sagittal precontrast T1-weighted (E) and T2-weighted (F) sequences. (A, B) A thickened aspect of the flexor carpi ulnaris muscle (white arrow) with contrast enhancement is present within the flexor muscle (black arrow). A large calcified body is also visible (white open arrow). (C) A hyperintense signal is evident within the medial humeral epicondyle, indicating bone edema (white arrowhead). (D) The flexor carpi ulnaris muscle shows a hyperintense signal (white arrow). (E, F) New bone formation is present at the caudodistal border of the medial humeral epicondyle (black arrow). A large calcified body is visible within the flexor muscles (white open arrow) with hyperintense signal in the surrounding muscles (white arrow).

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## CLINICAL RELEVANCE:

*As you might guess, I have a few thoughts based on all of these studies...*

- *Manual evaluation for medial enthesopathy could include direct palpation to detect pain at the medial humeral epicondyle, and also pain to stretch the carpal & digit flexors.*
- *Conservative treatment (if it's a primary problem) could include modalities to the flexor origin, stretches, and eccentric strengthening (push ups, downhill walking, and eventually trotting).*
- *It could be assumed that the majority of dogs with elbow dysplasia have concomitant enthesopathy, and as such rehab treatments should also be targeted to this region (as described above).*



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