FLEXURAL DEFORMITY OF THE DOG
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Definition:
Carpal flexural deformity is a musculotendinous disease affecting young puppies of several medium, large and giant breeds. This condition is caused by a contracture of the flexor carpi ulnaris muscle but its etiology is still unknown. Canine Flexural deformity has also been referred to as contracture of the flexor tendons, carpal instability, flexural syndrome, carpal hyperflexion, carpal laxity syndrome, and hyperflexion syndrome. Congenital/juvenile flexural limb deformities are well recognized in foals, calves, lambs, piglets, Alpaca, llama, miniature horse and miniature donkey. Carpal flexural deformity has been intermittently reported in dogs and recently in kittens. In addition to the juvenile form, carpal flexural deformity has also been reported as an acquired deformity in adult horses and ponies following desmitis of the accessory ligament of the deep and superficial digital flexor tendons.

Anatomy:
The flexor carpi ulnaris muscle courses along the caudomedial portion of the forearm. It is consists of two bellies, an ulnar head and a humeral head, converging in a single tendon which inserts distally on the caudodorsal surface of the accessory bone of the carpus. The smaller ulnar head originates from the medial surface of the proximal metaphysis of the ulna and, at the level of the middle third of the forearm, it becomes a flattened tendon. On the contrary, the larger humeral head, originates from the medial epicondyle of the humerus and maintains a muscular structure for a great part of its length. The functions of both muscular heads are of carpal flexion and abduction.

Etiopathogenesis:
Etiopathogenesis of this syndrome is still matter of debate. Uterine fetal malpositioning, genetic factors, teratogenic insult during early stage of the pregnancy (toxins, hyperthermia and viral diseases) and developmental abnormalities of bones have been implicated as possible causes in horses and in south America Camelids (Llama and Alpaca). In dogs, it is believed that the acute onset of clinical signs occur at the start of a growth spurt and that the development of the deformity is due to an unequal rate of bone growth relative to soft tissues thereby causing relative shortening of the tendons and resultant hyperflexion of the carpus. Overnutrition or excessive dietary energy intake may support a growth rate that is too rapid for proper skeletal development.

Epidemiology:
Carpal hyperflexion was documented affecting several breeds including: Jack Russell Terrier, Beagle, Shar-pei, Dalmatian, Dobermann Pinscher, Dogo Argentino, Dogue de Bordeaux, American Staffordshire Terrier, Golden Retriever, Neapolitan Mastiff, Pitbull, Rottweiler, Boxer, Bulldog, Italian Corso Dog, Irish Setter, Greyhound, Great Dane, Italian Segugio, Basenji and mixed breed. Onset of clinical signs is typically observed between 6 and 16 weeks of age.
Clinical signs:

Patients show, depending on the severity of the disease, different degrees of hyperflexion and varus deviation of the carpus, which can be dramatic. (Fig 1,2,3). The disease is usually bilateral, even though the thoracic limbs might be involved in different times and with different severity. Very seldom, only one limb is affected. Usually no obvious trauma is reported in the recent history and the lameness onset is sudden. Puppies are usually in good general condition, well nourished with a normal skeletal development. The most common clinical manifestations are: weight-bearing on the lateropalmar surfaces of the digits, different degrees of varus deviation of the carpus and eventually variable degree of carpal hyperflexion. The aforementioned clinical signs are reported to worsen after physical exercise. The diagnosis is straightforward and based upon clinical signs. The flexor carpi ulnaris tendon is usually palpably taut. In cases of very mild or early stages of the disease, the symptoms could be evoked or exacerbated by having the puppy walk on his thoracic limbs holding the pelvic limbs lifted (wheelbarrow test). In the most severe cases, there is a very marked deviation and the dog can actually stumble when walking.

On palpation of the carpus, no joint effusion is evident, no crepitis is perceived and the puppy does not exhibit arthralgia upon manipulations of the radiocarpal, intercarpal and carpometacarpal joints. In most cases, the joint can be extended, even though with some difficulty and with a different degree of tension.

Figure 1: Dogue de Bordeaux, male, 15 weeks. Varus deviation of the left carpus and mild hyperflexion.

Figure 2 and 3: American Staffordshire Terrier, female, 7 weeks old. Bilateral severe varus deviation and hyperflexion.
at the level of the flexor tendons. In some cases, the manual articular extension cannot be attained. No neurological deficits are usually detected and radiographs of the antebrachium, carpus and pes do not reveal any abnormalities. Distal growth plates of radius and ulna and bony mineralization are also unaffected.

Treatment:

The disease is mostly self-limiting, thus benefiting almost exclusively from a conservative management consisting of nutritional and exercise adjustments, avoiding excessive energy intake, mineral and vitamin over supplementation and controlled physical activities (strict confinement or cage rest and short leash walking) and physical therapy (range of motion exercises walking in soft soils, inclines, etc). Generally, in those cases characterized by mild symptoms, improvement is dramatic (from a few days up to few weeks). Puppies refractory to this therapeutic approach might benefit from a bandage extending from the elbow to the toes, for one to several weeks. The affected carpi of these puppies, after bandage removal, can show transient signs of carpal hyperextension and joint laxity that resolved within a few day of the bandage removal (Fig 4). In the most severe cases Vaughan et al, suggested a surgical treatment by tenotomy of both heads (ulnar and humeral) of the tendon of the flexor carpi ulnaris.

Figure 4: American Staffordshire Terrier, female, 9 weeks. Hyperextension after 10 days of bandage.

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15. McDiarmid Acquired flexural deformity of the metacarpophalangeal joint in five horses associated with tendonous damage in the palmar metacarpus. Veterinary Record: 144:475-478 1999