Simultaneous bilateral contracture of the infraspinatus muscle
Clinical case in a five-year-old Belgian Shepherd Dog

J. Franch; J. Bertrán; G. Remolins; P. Fontecha; M.C. Diaz-Bertrana; I. Durall
Surgery Department, Veterinary School, Universitat Autònoma de Barcelona, Spain

Keywords
Infraspinatus muscle, contracture, bilateral involvement, dog, tenectomy

Summary
A case of bilateral fibrotic contracture of the infraspinatus muscles in a five-year-old Belgian Shepherd dog is described. The dog was presented with progressive forelimb lameness with postural and gait abnormalities three months after an episode of overexertion. When walking, the lower part of both forelimbs swung in a lateral arc causing a circumduction movement and in the standing position, the dog showed elbow adduction with external rotation of the distal part of both front limbs. Orthopaedic examination revealed bilateral atrophy of both infraspinatus and supraspinatus muscles and restriction in the range of motion of both shoulders, especially when attempting abduction and flexion. No specific findings were observed in the shoulder or elbow radiographs but hyperechogenic areas were evident in the ultrasonographic examination of both infraspinatus muscles. A diagnosis of fibrotic contracture of both infraspinatus muscles was established and bilateral tenectomy of the insertion tendons of the infraspinatus muscles was performed. Complete recovery of the animal was achieved after the surgery, which was confirmed in a long-term follow-up (10 months). In conclusion, physical examination and ultrasonography allowed a proper diagnosis of the condition, and tenectomy of the infraspinatus muscles resulted in a complete recovery of the patient even with bilateral involvement.

Introduction
Fibrotic contracture of the infraspinatus muscle is an uncommon cause of shoulder lameness that may involve dogs of any breed or age; however, most cases are in medium-sized working or hunting dogs (1), or particularly active or sportive pets (2, 3). Affected animals show typical postural and gait abnormalities. When sitting, the dog adopts a posture with elbow adduction and external rotation of the distal forelimb and when walking, it shows obvious circumduction of the affected limb (4). Usually there are not any signs of pain or discomfort detected during shoulder examination.

Atrophy of the suprascapular muscles and reduction in the range of shoulder flexion are frequently observed (1, 4). Postural and gait abnormalities usually develop one to two months following a previous episode of acute trauma with forelimb lameness that disappeared after a few days (1, 5). Trauma seems to be involved in the aetiology, since histological examination of the infraspinatus muscle biopsies show evidence of haemorrhage, degeneration, atrophy and fibrosis (4). In most cases of infraspinatus contracture, the condition is unilateral; bilateral cases are extremely rare (6). This paper describes simultaneous bilateral infraspinatus muscle contracture in an adult, non-hunting, non-working dog.

Case report
The patient was a five-year-old male Belgian Shepherd dog weighing 40 kg. The dog had suffered from an episode of tetanus at five months of age and had apparently recovered completely. A positive serology for Leishmania was detected at four years of age, but the dog was currently asymptomatic.

The dog was presented with the complaint of forelimb lameness, and the owner noted a progressively worsening gait abnormality of both forelimbs as the main problem. Upon questioning, the owner also revealed that three months beforehand the dog had suffered a severe over-exercise episode after going down a steeply sloping mountain for several hours. Suddenly the dog had collapsed, without recovering any degree of forelimb locomotion for several minutes, and subsequently showed severe left forelimb lameness.

During the following days, the intensity of the left forelimb lameness decreased but the dog started to show moderate right forelimb lameness as well. The hindlimbs seemed to be unaffected at all times and no additional abnormalities were detected by the owner. The dog was treated with rest and carprofen for ten days, and progressive improvement was observed during the following two weeks. Nevertheless, the owner reported that a complete recovery of the lameness was never observed and that the gait abnormalities started to be clearly noticeable approximately one month after the initial trauma. The lameness became progressively more evident during...

Correspondence to
Jordi Franch, DVM, PhD
Surgery Dept. Veterinary School
Universitat Autònoma de Barcelona
08193 Bellaterra (Barcelona)
Spain
Phone: +34 935 811 092
Fax: +34 935 812 006
E-mail: jordi.franch@uab.es

doi:10.3415/VCOT-08-09-0086
Received: September 19, 2008
Accepted: January 7, 2009
Prepublished online: March 25, 2009

© Schattauer 2009
J. Franch et al.: Simultaneous bilateral contracture of the infraspinatus muscle

the two months prior to the present consultation.

Physical examination of the animal showed that, when walking, the distal part of both forelimbs swung in a lateral arc, drawing a circumduction movement as the foot advanced during the stride and showing a flip-like movement of the paw when placing the foot. In the standing position, the dog exhibited elbow adduction with external rotation of the distal part of both forelimbs (Fig. 1). Severe bilateral atrophy of the supraspinatus muscles, and moderate atrophy of the infraspinatus muscles were detected during limb palpation. When the dog was examined in lateral recumbency, reduced shoulder flexion was evident if the limb was kept in axial alignment. However, if the antebrachium was slightly abducted and externally rotated, the shoulder could be flexed almost completely. There were no signs of pain or crepitation detected on examination of the forelimbs, especially the shoulder joints. The rest of the physical examination did not reveal any other abnormalities, including those potentially related to Leishmaniosis, such as lymphadenopathy or skin pathology.

Cranio-caudal and mediolateral radiographs of both forelimbs with special emphasis on elbow and shoulder joints did not reveal any abnormalities. An ultrasonographic study revealed disorganised hyperechogenic areas in both infraspinatus muscles (Fig. 2). A normal echogenic pattern was observed in both supraspinatus muscles, despite their atrophy.

Based on the history, physical examination and ultrasound findings, a diagnosis of bilateral contracture of infraspinatus muscles was made. Surgical treatment consisting of bilateral infraspinatus tenectomy was recommended and accepted by the owner.

A lateral approach to the greater tubercle of the right humerus was performed, and after proximal displacement of the acromial part of the deltoid muscle, excellent exposure of the infraspinatus tendon was obtained. A 1 cm long tenectomy was performed close to the insertion of the infraspinatus muscle on the greater tubercle (Fig. 3), followed by manual retraction of the proximal tendon end. At the same time, all of the fibrotic adhesions between the tendon and the joint capsule were broken down.

As a result, normal movement of the shoulder joint was obtained immediately. Several forced flexions of the shoulder and elbow joints were performed to ensure a complete range of motion. Subcutaneous tissue and skin were sutured according to the standard protocol. The dog was discharged from the hospital 24 hours later with a prescription of cefalexin (30 mg/kg BID 7d), meloxicam (0.1 mg/kg/24h 10d) and tramadol (5 mg/kg BID 4d). Three weeks later surgery was performed on the left forelimb in the same way. During this second procedure, biopsies of the infraspinatus and supraspinatus muscles were obtained.

Immediately after the right limb surgery, the dog showed a slight lameness although the previously observed gait abnormalities had disappeared completely. One week later the shoulder examination was totally normal in terms of pain, crepitus and range of motion, and the previously detected lameness had also resolved. One week after the left limb surgery, the paddle gait and rotational abnormalities had disappeared; however, the dog

---

**Fig. 1** Front view of the patient with bilateral adduction and external rotation of both forelimbs.

**Fig. 2** Ultrasonographic image of infraspinatus muscle (INFRA) showing hyperechogenic areas and loss of muscular fibres continuity comparing to the more normal pattern of the supraspinatus muscle (SUPRA).

**Fig. 3** Detail of the right infraspinatus tendon surgical transection. The arrow shows the tip of the mosquito forceps underneath the tendon.
still had a residual lameness and a degree of pain upon shoulder manipulation. The range of motion in shoulder and elbow joints was normal. In this case, full recovery of left limb function was not achieved until three weeks after the surgical procedure (Fig. 4).

The histopathology results showed a degenerative myopathy with an active fibrillar degeneration, necrosis and fibrous tissue infiltration of the infraspinatus muscle, and a slightly atrophic myopathy, with a decrease of the fibrillar diameter in the supraspinatus muscle (Fig. 5).

When re-examined two months after surgery, the dog still had normal flexion and extension of both shoulders without any deviation of the distal limbs, pain, crepitus or lameness, despite a progressive increase in the amount of exercise. At this time, the infraspinatus muscles appeared to be still atrophic but the supraspinatus muscles had recovered dramatically from the initial atrophy. Ten months after left limb surgery, the owner confirmed complete recovery of the dog even with active exercise.

**Discussion**

Contracture of the infraspinatus muscle is an uncommon condition in dogs (5). Even though this disease can affect dogs of any breed, it is mainly described in mature hunting, sporting and working dogs (3, 5). It is considered to be one of the two most frequent muscle contractures described in dogs, along with quadriceps muscle contracture (5).

Gait abnormalities usually consist of a weight-bearing lameness and lateral circumduction of the affected forelimb, with a characteristic flip-like movement of the paw when placing the foot. When the patient is placed in lateral recumbency with the affected limb up, a true infraspinatus contracture will cause the distal forelimb to remain in an abducted and cotyly rotated position (2, 5).

While there are quite a few reports in the literature about unilateral contracture of infraspinatus muscle (3, 7, 8), bilateral involvement was briefly mentioned in one report (3) and described in detail in another (2). One author proposed that bilateral involvement can add some additional information to our understanding of the etiology of the condition (3). It was proposed that the infraspinatus muscle is partially ruptured by forceful stretching during contraction. Such an injury could result from a fall onto the affected leg, causing abrupt adduction, inward rotation and flexion of the shoulder joint, and leading to rupture and haemorrhage followed by degeneration and fibrotic contracture. The description of bilateral cases suggests that the injury may not be precipitated by a single, violent event, but that it could be caused by overextension or overexertion, perhaps in the face of inadequate training or warm-up (3), as in our case. More recently it was postulated that the infraspinatus muscle is more susceptible to acute compartment syndrome, increased compartmental pressure and cellular swelling during heavy exercise, than the other shoulder muscles (9).

In our case, it was originally thought that the fibrotic muscles could be the supraspinatus muscles due to their obvious atrophy in comparison to that observed in the infraspinatus muscles. Supraspinatus muscle contracture has been described in the literature (1–3, 5) as causing similar symptoms to infraspinatus contracture. Bennett and Campbell described one case of supraspinatus contracture in detail, after observing a complete lack of abnormalities of the infraspinatus muscle or its tendon of insertion, but marked fibrosis of the distal end of the supraspinatus muscle that was firmly attached on its deep surface to the joint capsule. The clinical signs disappeared after transecting the supraspinatus tendon and leaving the infraspinatus intact. In our clinical case, the degenerative muscular changes observed by ultrasonography in both infraspinatus muscles, but not the supraspinatus muscles despite their higher degree of atrophy, was critical in achieving an accurate diagnosis of infraspinatus contracture. At this time, the supraspinatus atrophy was attributed to disuse and this was confirmed after noting the recovery of bilateral supraspinatus muscular mass in the two-month follow-up. In fact, another author also stated that disuse atrophy can occur in the supraspinatus muscle and in the scapular portion of the deltoideus muscle as a consequence of an infraspinatus contracture (3).

According to some authors, reduction in the joint space between the greater tubercl

---

**Fig. 4** Front view of the patient three weeks after the second surgery showing resolution of postural abnormalities shown in Fig. 1.

**Fig. 5** Histological image of a longitudinal section of infraspinatus muscle (a) with muscular fibres degeneration and fibrous tissue infiltration (arrows) compared to a normal pattern in the supraspinatus muscle (b) (Haematoyxin and eosin x 10).
and the rim of the glenoid cavity in the caudo-cranial radiographic view of the shoulder could confirm the diagnosis of infraspinatus muscle contracture (4). Also, evidence of tendon mineralization in tangential radiographic views taken of the intertubercular groove of the shoulder joint (5) may help in the diagnosis of the affected muscle. In our case, we could not identify those radiographic changes, possibly because bilateral involvement made comparison between shoulders invalid. Unless tendon mineralization is obvious, we do not consider such radiographic findings to be entirely useful, due to their subtlety and the susceptibility of changes in joint space to postural changes during radiographic positioning.

In conclusion, we agree with other authors (7, 10), that the ultrasonographic findings are the crucial diagnostic tool not only for the diagnosis of the infraspinatus contracture, but also for differentiating simple disuse atrophy from contracture of the supraspinatus muscle. In our case, we also found a close relationship between the ultrasonography and histopathology findings in the contractured (infraspinatus) and atrophic (supraspinatus) muscles, which agrees with the histological findings described by other authors (3, 4). Bilateral infraspinatus muscle tenectomy via craniolateral approach was completely curative, without any apparent adverse effects from loss of collateral support in our case.

References