Diagnostic and Treatment Modalities of Shoulder Joint Diseases at Dog. Arthroscopy Versus Arthrotyomy, Review

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Summary

Forelimb lameness can be one of the most difficult orthopedic problems for clinicians to diagnose. Arthroscopy is preferable to arthrotomy for the diagnosis and treatment of intraarticular diseases due to superior visualization and lower morbidity. Canine arthroscopy has made significant advancements in recent years and has revolutionized the treatment of intraarticular diseases in small animals. The arthroscopy cannot exclude others methods for the diagnosis and the treatment of shoulder disorders.

Key words: shoulder joint diseases, arthroscopy, arthrotomy

The shoulder joint is a highly mobile diarthrodial joint connecting the scapular glenoid and the humeral head (17). Normal motion includes extension and flexion, abduction rotation. Passive stabilization of the joint is provided by both medial and lateral glenohumeral ligaments, the shape of the humeral head and glenoid cavity. Active stabilization of the shoulder is maintained by the musculotendinous units of the rotator cuff: the supraspinatus, infraspinatus, teres minor, and subscapularis (3, 6).

The scapulohumeral joint is a common site of forelimb lameness in the dog. Establishing a definitive diagnosis may be difficult because of the limitations of orthopedic examination and radiographs and the inherent elusiveness of the associated conditions (3, 14, 17).

Osteochondritis Dissecans, or OCD, is a problem with the cartilage of young’s dogs; a piece of the articular cartilage will tear away from the epiphysis and form a flap. It can occur in almost any joint (hock, stifle, and elbow); most commonly occurs in the shoulder. The flap may reattach to the bone on its own, or it may tear away, becoming a joint mouse in the joint cavity. The flap may remain unchanged, causing pain and arthritic changes to the cartilage resulting OCD. The affected joint can stiffen after resting, and the limping is aggravated by exercise, arthritic changes in the joint may cause permanent lameness if is left untreated, the signs of OCD are usually noticed in a dog as early as 4 months or as late as 18 months. Genetics are thought to predispose a dog to OCD. It occurs more frequently in males. OCD mainly strikes large dog breeds. Not all big breeds are vulnerable: OCD is less likely to affect Doberman Pinschers, Collies, and Siberian...
Huskies. Diet for the growing dog is also thought to be a factor. Excessive weight gain, calcium supplementation, and an overly nutritious diet are all to be avoided (8, 14, 15, 16, 17).

Bicipital tenosynovitis is an inflammatory and degenerative process of the biceps brachii tendon and its surrounding synovial sheath. The etiology of bicipital tenosynovitis is either direct or indirect trauma to the bicipital tendon or tendon sheath. Direct trauma due to repetitive injury may be an inciting factor and result in partial or complete tearing of the tendon. Indirect trauma secondary to proliferative fibrous connective tissue, osteophytes or adhesions between the tendon and sheath limit motion and cause pain. Many patients may actually have an incomplete tear in the origin of the biceps tendon rather than true bicipital tenosynovitis. The disease may occur with intraarticular disease and joint mice entrapment, mineralization of the supraspinatus tendon, or acute trauma that causes partial or complete tearing of the tendon. Possible causes include irritation from frequent use, acute injury, chronic repetitive injury, or a sedentary lifestyle. It is common in adult, medium to large dogs and presents clinically as chronic weight-bearing lameness that worsens after exercise. Pain during palpation of the bicipital tendon within the intertubercular groove occurs occasionally, but weight-bearing lameness and shoulder pain during flexion and extension are more common (2, 3, 6, 7, 8, 17, 18).

**Diagnosis**

As with orthopedic conditions of the dog involving other structures, sources of pain can depend on the age of the animal. Young dogs with shoulder pain should be examined closely for osteochondritis dissecans, whereas in the adult dog common sources of lameness localized to the shoulder can include degenerative joint disease, biceps tenosynovitis, shoulder instability or luxations, mineralization of the supraspinatus, infraspinatus contracture, ununited caudal accessory process of the glenoid, articular fractures, and other causes of suppurative arthropathies (6,14,16).

On physical examination, the shoulder should be palpated and moved through a complete range of motion. Crepitation or palpable swelling of the joint is seldom evident, but affected animals usually exhibit pain when the shoulder is moved into hyper-extension or extreme flexion (6).

Clinical signs of OCD include intermittent weight bearing lameness with pain on shoulder extension and flexion and atrophy of shoulder muscle with a prominence of the scapular spine. Radiography is a commonly used diagnostic tool and the mediolateral view classically shows the deficit in the caudal aspect of the humeral head. A “stressed view” with external and internal rotation of the shoulder can be performed if OCD is suspected but not seen on the mediolateral view. The lesion can be off midline and a stressed view can allow visualization of the lesion (14, 15, 16).
The earliest radiographic sign of OCD is flattening of the caudal humeral head. This is due to thickening of the articular cartilage and deviation of the subchondral bone line. As the disease progresses, a saucer-shaped radiolucent area in the caudal humeral head may be visualized. Calcification of the flap may allow visualization of the flap either in situ or within the joint if it has detached from the underlying bone. In chronic cases, large calcified joint mice are often observed in the caudoventral joint pouch or cranially within the bicipital groove (15, 16).

The arthroscopy may be performed if the radiography cannot overtake the OCD signs (1, 3, 5).

A presumptive diagnosis of bicipital tenosynovitis is made by taking a thorough history, performing a comprehensive physical exam, and by reviewing x-rays.

The biceps tendon should be palpated as it originates on the supraglenoid tuberosity and courses down the intertubercular groove for evidence of inflammation. Deep digital pressure is applied to the biceps tendon while flexing the shoulder and extending the elbow in an attempt to elicit pain as supportive evidence for biceps tenosynovitis (6, 7).

Radiographs usually aid diagnosis, but manipulation of the joint will generally cause a pain response. Radiography should include lateral, ventrodorsal, and skyline views to see the bicipital groove. In case of complete or partial rupture of the biceps tendon, bone proliferation or resorption of the supraglenoid tuberosity at the origin of the biceps tendon may occur. Other findings are calcification of the biceps tendon sheath or osteophytes in the intertubercular groove (3, 7, 18).

Arthroscope is a useful tool in evaluating the tendon and its condition. The biceps tendon commonly appears inflamed in patients with OCD because of a generalized inflammatory response of the joint. The arthroscopist should not confuse this with bicipital tenosynovitis and cut the tendon unnecessarily (2, 5).

Despite apparent lameness in only one limb, both shoulders should be radiographed because this condition is often bilateral. Sedation may be required for quality radiographs particularly in large hyper-active dogs (3, 5).

**Treatment**

Conservative therapy of OCD may be indicated in dogs younger than 7 months of age with small lesions evident radiographically and no clinical pain or joint mice. The therapy consists of strict rest for up to 6 weeks, restricted diet, NSAIDs, disease-modifying osteoarthritics (DMOAs), and analgesics. Alterations of the diet include decreasing caloric intake and stopping calcium supplementation. Appropriate nutrition and breeding programs are essential for minimizing the occurrence of disease. If lameness resolves with medical therapy, surgery may not be required. However, if lameness persists for more than 4 to 6 weeks, surgery should be performed (10, 14, 15).

In the past, authors have recommended analgesics, antiinflammatories, and forced exercise with the intention of dislodging the cartilage flap and thus
facilitating healing. The hope was that the flap would fall into the caudal, cul-de-sac of the joint and be resorbed. Unfortunately, flaps are often not resorbed but instead remain in the joint and incite an inflammatory response (14).

Surgical arthrotomy with a caudolateral, craniolateral or a caudal arthrotomy generally provides an excellent outcome. The surgical procedure consists of cutting away the cartilage flap, removing any loose unattached cartilage, and searching the joint in order to remove any fragments that have already torn away. Activity is restricted for 1-2 weeks after surgery, after which time normal activity may resume. Within a month the dog's shoulder should be as sound as it was at the time of the surgery, and should continue to improve thereafter. There may be some arthritis in the joint eventually, but it will not always become symptomatic (15).

Shoulder arthroscopy, however, has become the treatment of choice as it allows a minimally invasive approach to flap removal as well as evaluation for joint mice, particularly in the bicipital tendon sheath which are not accessible via a standard arthrotomy approach. OCD lesions can be easily visualized and the cartilage flap removed via a caudal instrument portal (1, 11, 12, 13).

The procedure begins with injection of the shoulder joint with 10–20 ml of Bupivacaine. Once the joint is successfully distended, a stab incision is made in the skin using a #15 scalpel blade approximately 1 cm cranial and 1 cm distal to the acromion process, for introduction of the scope cannula. The scope cannula is then introduced through this incision into the joint. The irrigation fluids are hooked up to the cannula and the irrigation fluid is run into the joint at a moderate rate. The joint is explored starting with the cranial aspect checking the biceps tendon area and moving back along the humeral head until the caudal aspect is reached. The OCD flap is generally found here. The instrument portal is made approximately 2–3 cm caudal and 1–2 cm distal to the scope portal with a second cannula and sharp trocar. The exact location varies, but can be checked using a 1 1/2-inch needle to ensure that the portal enters the joint at an appropriate spot. The instrument cannula should be visible with the scope. The instrument cannula also serves as an egress portal for irrigation fluid. Typically, the majority of the flap is removed with instruments that will fit through the instrument cannula such as the suction punch and the small graspers. After the majority of the flap is removed, the cannula is removed being careful not to move the limb causing tissue plane shifts. A 3.5 or 4.5 mm razorcut instrument or full radius cutter attached to the small power head is introduced into the joint through the same portal and the remainder of the loose cartilage is removed and the edges of the lesion are smoothed using the power instrument. After all loose cartilage is removed, the joint is thoroughly flushed with Ringer Lactate Solution and the joint is simultaneously drained through the cannulated shaver head of the power tool. The small remaining fragments of cartilage floating around the joint are removed in this way. The instruments are all removed and the stab incisions are closed with 1–2 sutures apiece. The animal can
be repositioned and the other shoulder can be operated at the same time (1, 5, 8, 11, 12).

Medical management of bicipital tenosynovitis including controlled exercise, physical therapy, weight loss, and anti-inflammatory medications is the first course of action. A steroid can also be injected into the tendon sheath to locally reduce inflammation. The patient must be strictly rested (leash walks only) for 4-6 weeks with no jumping or rough play allowed. If there is no improvement with medical management, then surgical management is considered (2, 3, 7, 10, 18).

Surgery consists of completely cutting the biceps tendon after arthroscopic joint evaluation. After the tendon is cut and released out of the degenerative biceps groove, it will adhere to the humerus over time affording normal biceps muscle function. Non-steroidal anti-inflammatory medications can be used to reduce inflammation and discomfort associated with existing shoulder arthritis. As with most orthopedic conditions, weight management is one of the pillars to successful long-term management (3, 7, 10, 18).

Biceps tendon abnormalities are more commonly diagnosed today due to the availability of arthroscopy. Arthroscopy provides a quick and non-invasive method of diagnosing tenosynovitis, partial biceps tendon tears, complete biceps tendon tears, supraglenoid tuberosity fractures and labral injury (1, 2, 5, 11).

The procedure begins as for the OCD procedure above. The shoulder is explored and the biceps tendon is examined, normal biceps tendon has a smooth white surface with a small amount of vascularity at its origin. For treatment, a portal is established under direct arthroscopic visualization just lateral or medial to the tendon. Once the portal is established, the tendon is simply severed using a #15 blade, a small osteotome, or the motorized shaver. The stab incisions are closed and the dog is restricted from heavy activity for a period of 6–8 weeks. Arthroscopic-assisted biceps tenodesis is also possible, but is technically more demanding. The surgeon must be cautious not to over-interpret changes seen as generalized inflammation within the joint, such as occurs with OCD, and may lead to hypervascularity and synovial proliferation at the origin of the biceps tendon. Removal of the OCD flap leads to resolution of these changes in the tendon (5, 8, 11, 12).

Arthroscopy offer more than the arthrotomy:
- Decreased patient morbidity (decreased hospitalization and postoperative costs);
- Simultaneous treatment of two joints;
- Arthroscopy is minimally invasive, resulting in less surgical morbidity, less postoperative pain, and a faster recovery compared with arthrotomy;
- Quick patient recovery and return to function;
- Less scarring;
- Periodic reevaluation of the joint is possible;
- Arthroscopy allows better visualization of intraarticular surfaces and structures than does arthrotomy;
- Reduced surgical risk of infections and complications;
- Video connection allows visualization and is useful for teaching;
- The arthroscopy cannot exclude the radiography, they are complementary (1, 5).

Disadvantages of the arthroscopy:
- The equipment is expensive and fragile;
- Training is required;
- The arthroscope and instruments are difficult to manipulate in small joint spaces;
- The equipment must be sterilized with glutaraldehyde;
- Extravasation of fluid in the surrounding soft tissues;
- Iatrogenic damage to the articular cartilage; to avoid iatrogenic damage to the articular cartilage during arthroscopy, surgeons have to use an appropriately sized instrument, adequate joint distention and positioning, and gentle manipulation within the joint;
- Obstruction of view by hemorrhage, hyperplastic villi, or the fat pad (1, 5).

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