Medial shoulder instability and surgical options

The shoulder is heavily reliant upon capsuloligamentous structures in order to maintain stability because the bony conformation does not provide a stable socket (Bardet 1998). Injury to one or more of these structures may result in pain and dysfunction of the shoulder. Diagnosis of shoulder lameness can be frustrating and concurrent elbow pathology often clouds an already confused picture. Current diagnostic modalities available to the clinician include computed tomography, MRI, ultrasound and arthroscopy. Each has limitations but the gold standard remains arthroscopy. This allows for direct observation of the intraarticular structures as well as a dynamic evaluation through palpation and range of motion tests.

The most common form of shoulder instability is due to pathology of the medial glenohumeral ligament and/or tendon of insertion of the subscapularis muscle (Bardet 1998, Pettitt and others 2007). Preoperative diagnosis of medial shoulder instability has historically been difficult. More recently two studies have demonstrated an increased angle of abduction of the glenohumeral ligament as being consistent with increased instability (Cook and others 2005a, Pettitt and others 2007). When performing the test it is important to ensure that the elbow and shoulder are in full extension and no inward rotation is applied to the antebrachium. An abduction angle of 50° or greater (normal = 32° ± 2°) is consistent with medial shoulder instability (MSI).

The indications for different treatment options for medial shoulder instability are not fully characterised. Previously reported treatment options for MSI included conservative management (Butterworth 2003), placement of prosthetic devices either using bone tunnels or suture anchors (Fitch and others 2001, Ringwood and others 2001), tendon transposition (Vasseur 1983), thermal capsulorrhaphy (Cook and others 2005b, O’Neill and Innes 2004) and imbrication of the subscapularis tendon of insertion(Pettitt and others 2007).

Conservative management involves the use of slings and hobbles, combined with a physiotherapy programme, and is often used as the first treatment option in cases of shoulder lameness. The use of intraarticular steroid injections can also be used simultaneously in order to relieve the
inflammation and pain associated with the pathology. It should be noted that this approach may take anything up to a few months to resolve the lameness.

In cases where conservative management has failed to resolve the lameness or in high activity dogs (where the author prefers to be more aggressive in his approach) then surgical options are undertaken. Surgical options can be broadly classified into two main categories – open or arthroscopic. Open surgeries tend be extraarticular but all surgeries, with the exception of tendon transposition, probably rely on periarticular fibrosis to stabilise the joint.

Delegates are referred to further texts on performing some of these techniques. The notes and lectures will concentrate on one open (imbrication of the subscapularis muscle tendon of insertion) and arthroscopic techniques.

**Imbrication of the subscapularis muscle tendon of insertion**

Previously described open techniques for stabilising the medial aspect of the shoulder are technically challenging due to the restricted access from the craniomedial approach. Imbrication of the subscapularis is technically simple and both clinical and cadaveric studies have been shown to stabilise cases of MSI.

A craniomedial approach to the shoulder joint is performed (Piermattei 2004) which allows easy identification of the subscapularis tendon of insertion (SSTOI) (fig 1). Two 4 or 5 metric polydixonone (PDS II, Ethicon) are placed in a horizontal mattress suture pattern in the proximal to distal extremities of the tendon of insertion of the subscapularis muscle and tightened in order to imbricate the tendon (fig 2).
Care needs to be taken when passing the proximal part of the suture to ensure that the suture remained superficially through the subscapularis tendon to avoid inadvertent entrapment of other structures. The distal end of the suture is passed through the centre of the body of tendon. As the suture is tightened, a shortening is observed in the tendon. At this point it is prudent to assess the angle of abduction; the author aims for approximately 25° angle of abduction (i.e. 5° less than normal) after imbrication. If the angle remains excessive then another suture can be placed of the original one removed and replaced. Closure is routine.

This surgery is appropriate for cases of shoulder instability but not complete luxations because it is unlikely that the imbrication is strong enough. In the reported case series it was interesting to note that this surgery is appropriate for treatment of tears to the cranial arm of the MGHL in isolation (i.e. normal subscapularis tendon).

**Arthroscopic techniques**

**Thermal capsulorrhaphy**

Thermal capsulorrhaphy has been commonly employed for treating human patients with glenohumeral instability (Frostick and others 2003). It is reported in dogs as a treatment for MSI (Cook and others 2005b, O’Neill and Innes 2004). The procedure involves the arthroscopically guided use of a radiofrequency probe (e.g. “Capsure” 3mm straight wand, ArthroCare (Fig 1)) to shrink the capsular and ligamentous structures of the medial aspect of the joint through thermal denaturation of collagen (see discussion in the instrumentation section of this chapter). Capsular
shrinkage provides a shrunken scaffold for fibrosis during repair. Tissue healing following shrinkage shows a rapid reduction in strength by 7-14 days before returning to normal pre-treated levels by 90 – 180 days (Fig 4).

![Figure 3: 3mm Capsure probe used to shrink capsular tissue](image)

![Figure 4: graph to demonstrate tissue strengths following thermal shrinkage](image)

A standard lateral arthroscope portal is used with the instrument portal established craniolaterally. After a thorough examination of the joint, the radiofrequency probe is introduced. This often needs to be through an open portal as the diameter of the probe (3.2mm) is too large for most instrument cannulae used in canine arthroscopy. The radiofrequency probe should be set on its lowest setting and the probe placed 1mm away from the tissue. A five second burst of energy is then applied to the probe and the capsule should be seen to shrink. This procedure should be repeated in a “spot welding” or “paintbrush” pattern across the medial aspect of the joint. Islands of viable tissue must be left to allow for repair. Fluid flow is essential when performing thermal capsulorrhaphy to prevent overheating of the tissues.

Postoperative care for these patients is different from other cases of shoulder disease because of the initial weakening of the tissues. In humans, careful rehabilitation is considered to be paramount to the success of capsular shrinkage. This is an area where veterinary surgeons are at a distinct disadvantage. The authors currently recommend the affected limb is placed in a custom-made, non-weightbearing sling (O’Neill and Innes 2004) for at least 6-8 weeks in order to protect the repair. Rehabilitation starts when the jacket is removed after this time. Unpublished evidence from the human field is that the capsules stretch with time resulting in an increased instability. There are also
some concerns that chondrocytes are very sensitive to the effects of thermal shrinkage with resulting significant losses in articular cartilage following treatment.

**Arthroscopic suturing**

There are no reports in the veterinary literature of arthroscopic suturing of the medial structures of the shoulder although there is one report of arthroscopic LGHL suturing (Pettitt and Innes 2008). In order to facilitate access to the medial aspect of the shoulder, a hanging limb surgery is required. A lateral portal is established for the arthroscope and a complete examination of the intraarticular structures is performed. A craniomedial instrument portal can be established in two ways, direct or indirect. (Fig 5)

**Arthroscopic tightrope (courtesy of Jimi Cook)**

Using a hanging limb technique the shoulder is arthroscopically explored to assess and identify the pathology via a lateral portal. A 1.5cm skin incision is made cranial to the pectoral muscles and the soft tissues are dissected to the level of the subscapularis muscle. Via this incision two guide wires are inserted one in the glenoid and one in the humerus. The glenoid tunnel should be started at centre of the Y of the MGHL just off the articular margin and exited just cranial to the scapula spine in the region of the neck. The humeral start point is dependent on the pathology observed. The drill hole should be adjacent to the affected structure (i.e. at the insertion of the MGHL or subscapularis. If both structures are affected then a midpoint should be used. Exit should be just distal to the greater tubercle and cranial to the acromial head of the deltoide. Once satisfied with the placement the humeral tunnel is drilled first using an appropriately sized cannulated drill, again from medial to lateral. The toggle pin is then inserted into the drill and the tightrope passed from lateral to medial. The drilling is then repeated in the glenoid except this time the tightrope is passed from medial to lateral. The tightrope is then toggled in order to tension it before a knot is tied over the humeral button. Again it is aimed to reduce the angle of abduction to approximately 25°.
Osteochondrosis (OC) and Osteochondritis dissecans (OCD)

- OC and OCD of the shoulder joint is reasonable common in the larger breeds of dog. Common breeds affected include the Great Dane, Pyrenean Mountain Dog, Irish Wolfhound, Labrador and Golden Retriever, Bernese Mountain Dog and Border Collie.
- OC is an idiopathic condition in which there is a disturbance of endochondral ossification, resulting in thickened articular cartilage, leading to cleft and flap formation of the cartilage causing OCD (see OC notes for more detail of aetiopathogenesis).

**History:**
- Affected animals usually present at 4-7 months but one third of dogs are over 1 year at the time of initial diagnosis. Males are more frequently affected than females. Dogs will show a weight-bearing lameness with a short, stilted gait if the condition is bilateral (about 50% of cases). Disuse atrophy of spinatus muscles will be a prominent feature after a few weeks duration.

**Diagnosis:**
- **Radiography:** (usually gives definitive diagnosis) should include both shoulders and a plain ML radiograph. The radiographic features are: a subchondral defect with flattening of caudal humeral head +/- a sclerotic margin, “joint mice” (only if mineralised), secondary OA (periosteal new bone (PNB) around the caudal humeral
head) and “vacuum” phenomenon - gas (NO) accumulates between cartilage and subchondral bone resembling a negative contrast arthrogram

- **Positive contrast arthrography:** A positive contrast arthrogram (low volume: 1-2ml of water soluble iodine contrast) may help to identify a non-mineralised flap and may delineate joint “mice” in caudal joint capsule or bicipital tendon sheath if these are not mineralised.

- **Arthroscopy:** Use 2.4/2.7mm scope to examine articular cartilage; can see, remove and curette OCD flaps. Becoming increasingly popular in practice

**Treatment:**

- In most cases, **conservative treatment** can be tried initially. This consists of 6-8 weeks of controlled lead exercise and tactical use of NSAIDs. Approximately 50% of cases respond to such a regime, if not then they are candidates for surgical treatment.

- **Surgical treatment** involves either arthrotomy or arthroscopy.

- **Arthrotomy** is performed by a caudal (or caudolateral) approach to the shoulder (see surgical texts). Removal of the cartilage flap is followed by curettage of the periphery of resultant defect (? Scientific evidence on benefit). Repeated joint lavage is performed to flush any loose cartilage fragments.

- **Arthroscopy** is performed using a caudal instrument portal to examine and remove the OCD flap.

- Post-op care is 4-6 weeks of rest. Most dogs are sound in 6-8 weeks or become lame on the other shoulder if the condition is bilateral. The second shoulder should only be treated if lameness ensues


