Tutorial Article

Ultrasonographic guided injection of the scapulohumeral joint in horses

D. CARNICER*, V. COUDRY AND J.-M. DE NOIX

CIRALE - École Nationale Vétérinaire de Maisons-Alfort, 14430 Goustranville, France.

Keywords: horse; ultrasonography; scapulohumeral joint; lameness; intrasynovial injection

Summary

Intra-articular injections of the scapulohumeral joint (SHJ) in horses are difficult to perform because of the thick muscles covering the area and a reduced articular space. Ultrasonographic guidance was demonstrated to be helpful to perform intra-articular injections. This technique applied to the SHJ can be performed in the field with a portable machine.

The joint space is firstly imaged in transverse and proximodistal scans. After aseptic preparation of the shoulder area, the probe is placed to image the SHJ space in transverse section and the needle is inserted cranially in the ultrasound beam. The progression of the needle is followed towards the SHJ space, limiting joint injuries and side effects.

Introduction

Lameness originating from the shoulder is not uncommon in young and adult horses (Dyson 1986a). Intra-articular (i.a.) injection of the scapulohumeral joint (SHJ) is useful for the diagnosis and treatment of conditions of the shoulder joint, but this procedure is difficult to perform in horses because of the thick surrounding muscles covering the joint and a narrow joint space.

Several blind techniques have been described (Dyson 1985, 1986b; De Noix 1993; Stashak 2002), but the success rate is variable. Failure of SHJ i.a. injections can be due to:

- Incorrectly identified anatomical landmarks leading to incorrect placement of the needle.
- Incorrect orientation of the needle.
- Inadequate length of the needle.
- Unusual conformation or periarticular bone fragments in pathological cases.
- Inexperience of the operator.

Ultrasonography has proved to be useful in real-time guiding of the needle during i.a. injections (De Noix 2006).

This paper describes an ultrasonographic guided technique of the i.a. injection of the SHJ in horses, using a craniolateral approach.

Anatomical review of the area

The articular surfaces of the SHJ are the humeral head and glenoid cavity of the scapula. The edge of glenoid cavity is surrounded by a fibrous pad called labrum glenoidale, which enlarges the contact between the opposing articular surfaces (Barone 2000).

The SHJ is enclosed by a complete capsule, enforced by 2 thin cranial glenohumeral ligaments. As no collateral ligaments are present, joint stability is carried out by the surrounding musculature (Fig 1).

Cranially, the tendon of the biceps brachii muscle inserts on the supraglenoid tubercle of the scapula between the medial and lateral distal parts of supraspinatus muscle (Fig 1). It slides down over the intertubercular groove of the humerus and is surrounded by the bicipital bursa.

The lateral aspect of the joint is covered by the infraspinatus muscle (Fig 2). The tendon of this muscle slides over the convexity of the greater tubercle and inserts on the crest of it. The lateral tendon of the supraspinatus muscle is inserted on the top of the greater tubercle. The brachiocephalic and omotransverse muscles cover superficially the cranial and lateral aspects of the joint. The caudal aspect of it is mainly covered by the triceps brachii muscle.

When synovial effusion of the SHJ is present, fluid can be imaged at the craniolateral and caudal aspects of the joint.

Materials and methods

A portable ultrasonographic machine (ALOKA 900)1 with a 5–7.5 Mhz microconvex probe is used to describe this technique.

The point of the shoulder is clipped and prepared for ultrasonographic evaluation. Before aseptic preparation of the
region, a first ultrasonographic examination of the cranial and lateral aspects of the joint is performed to determine the most suitable position of the probe and measure the distance from the skin to the joint space.

The first approach consists in placing the probe vertically between the supraspinatus and infraspinatus tendons (Fig 1), just proximally to the greater tubercle. The SHJ is observed on a proximodistal section (Fig 3). Once the joint space is placed in the middle of the image, the probe is rotated 90° to obtain a transverse image of the SHJ space. The bony surface of the edge of the glenoid cavity of the scapula is imaged first (Fig 4a). Then, the probe is slightly oriented distally and after visualisation of the labrum glenoidale (Fig 4b), synovial fluid in the SHJ is observed over the humeral head (Fig 4c). At this level, the distance between the skin and joint space is measured. It usually ranges from 40–70 mm, therefore the most frequently used needles are 50 or 90 mm long. Thin needles (0.8–1 mm diameter) are preferred.

During the procedure, the use of a twitch is recommended. A light sedation can be done for therapeutic i.a. injections. Needle placement is usually well tolerated by horses; nevertheless a local analgesia over the needle entrance can be helpful in sensitive horses.

The probe is covered by a sterile layer (e.g. sterile glove). Contact gel is put inside the glove and an alcoholic solution is applied on the skin to enhance ultrasound penetration.

For needle injection, the probe is placed to image the craniolateral aspect of the SHJ space on transverse section. The needle is inserted cranially to the probe, in the ultrasound beam, making a 45° angle with the median plane of the horse. The needle’s direction is controlled in real-time on the ultrasound screen, and guided towards the joint space (Fig 5).

In case the orientation of the needle is not correct, the operator can pull the needle back a few centimetres before redirection. Once the needle reaches the joint space, synovial fluid may not arise spontaneously. Nevertheless synovial fluid turbulence and capsular distension can be observed on the screen while the product is injected.

**Discussion**

Intra-articular injections are often required during the course of a lameness work-up (i.e., diagnostic analgesia, synovial fluid sampling) as well as for i.a. medication.

When synovial distension is present, i.a. injection can be relatively easy for the experienced operator. It becomes more

---

Fig 1: Transverse anatomical section of the scapulohumeral joint (SHJ) at the joint space level (cranial is to the top and medial is to the left). 1 = biceps brachii tendon; 2 = brachiocephalic muscle; 3 = supraspinatus muscle; 3a = medial part; 3b = lateral part; 3c = lateral tendon; 4 = infraspinatus muscle; 5 = humeral head; 6 = Scapula (rim of glenoid cavity); 7 = articular capsule; 8 = fat; Arrow = position of the probe.

Fig 2: Proximodistal anatomical section of the scapulohumeral joint (SHJ) (proximal is to the top and medial to the left). 1 = deltoideus muscle; 2 = triceps brachii muscle; 3 = infraspinatus muscle; 4 = scapula; 5 = humeral head; 6 = SHJ space; 7 = articular capsule.

Fig 3: Proximodistal ultrasound scan of the scapulohumeral joint (SHJ) (proximal is to the left – see Fig 2). 1 = skin; 2 = omotransverse muscle; 3 = infraspinatus muscle; 4 = scapula; 5 = humeral head; 6 = SHJ space; 7 = greater tubercle.
difficult if the joint space is narrowed, if bony structures are modified (e.g. osteoarthritis) or when the joint is surrounded by thick muscular layers (e.g. shoulder, hip joint). Access to the SHJ space is relatively difficult because of the thick muscles covering the joint and the narrow joint space.

By using blind conventional techniques the only way to ensure the adequate placement of the needle is the retrieval of synovial fluid. In our experience, having performed many injections with dye solutions on cadaver limbs and with contrast solution on live horses (J.-M. Denoix, personal communication) the needle can be placed in the joint cavity whereas no fluid can be aspirated. In clinical situations, this forces the practitioner to reposition the needle increasing the risk of soft tissue damage and cartilaginous lacerations. Lack of resistance while injecting the product is typically considered a sign of successful i.a. injection, but injection into the bicipital bursa or in periarticular fat tissue can lead to the same feeling (Stashak 2002). Consequences of periarticular injection of the drug are variable: from the absence of effect, to a severe inflammatory reaction with necrosis or mineralisation of the tissue with corticosteroids (Stashak 2002). When anaesthetic solution is injected outside the SHJ capsule, side effects can include temporary analgesia of suprascapular nerve with paralysis of the infraspinatus and supraspinatus muscles (Stashak 2002). Traumatic damage to the humeral head cartilage has also been reported after i.a. injections with a blind technique (Denoix and Heitzmann 2005).

During i.a. injections, ultrasonography is useful to ensure guidance of the needle towards the joint space (Denoix and Heitzmann 2005; Denoix 2006). Using real-time ultrasonographic guided techniques these complications can be reduced. Therefore, these techniques can be considered as minimally invasive procedures and improve several aspects of the procedure:

**Fig 4**: Transverse ultrasound scans of the cranialateral aspect of the scapulohumeral joint (SHJ) at 3 levels: distal extremity of the scapula (a), SHJ space (b) and humeral head (c) (cranial is to the left). 1 = skin; 2 = omotransverse muscle; 3 = infraspinatus muscle; 4 = scapula; 5 = humeral head; 6 = SHJ space; 7 = labrum glenoidale; 8 = SHJ capsule. The dotted line represents the pathway between the point of insertion of the needle and the joint space.

**Fig 5**: Transverse ultrasound scan of the cranialateral aspect of the scapulohumeral joint (SHJ) during needle insertion (cranial is to the left). Needle progression towards the joint space is controlled in real-time. 1 = skin; 2 = omotransverse muscle; 3 = infraspinatus muscle; 4 = humeral head; 5 = SHJ space; 6 = SHJ capsule (elevated by joint distension).
• Screening of the area allows the clinician to determine the most appropriate access to the synovial cavity.
• Distance from the skin to the joint cavity is objectively measured, so that the most suitable length of needle can be chosen.
• Secondary damage due to injection can be minimised; the needle’s position is controlled all the time, avoiding contact with the cartilaginous surfaces.
• The flow of the product into the synovial cavity and the subsequent capsular distension are visualised in real-time (Fig 5).

The ultrasound scans presented in this paper can be performed with a portable ultrasound machine, showing that this technique is possible in field practice. Linear probes can also be used in small horses, but they are not recommended as the geometry of the ultrasonographic beam does not allow a good topographic representation of the deep anatomical structures; moreover only a limited part of the needle can be seen. This technique is more comfortably performed with 2 operators, one holding the probe, the other placing the needle, but an experienced practitioner in guided injections can do the procedure alone.

Scapulohumeral joint fluid can also be imaged with a caudolateral approach, but this access is not suitable for i.a. injection in adult horses because of the thickness of the triceps brachii muscle covering the caudal aspect of the SHJ. Proximodistal ultrasound scan of the SHJ can also be used to perform i.a. injection, but the transverse section is preferred because of the wide latitude of possible needle placements.

In routine practice, preparation for guided injections is not much longer than for the blind technique. Additional time spent performing the initial screening and preparing the probe is compensated by the comfort and security of the procedure.

Intra-articular injections of the scapulohumeral joint are difficult to perform due to the thickness of surrounding muscles and the narrow joint space. Ultrasonographic guided technique ensures correct placement of the needle into the synovial cavity in a minimally invasive manner. The ultrasonographic guided technique described here is recommended to perform i.a. injections of the scapulohumeral joint in horses.

Manufacturer's address

1ALOKA 900, Aloka France, St Priest, France.

References