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JOINT INJECTIONS IN CAMELS: A REVIEW

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ABSTRACT

Joint injections in camels have several practical applications, from lameness localisation and administration of medications, to sampling of synovial fluid. With good technique and anatomical knowledge, the procedure can be effective with low risk of complications. Depending on the location and number of injections to be performed, camels may be injected standing or in recumbency. Preparation of the patient can include washing the animal with a mild-disinfectant shampoo to remove organic matter on the skin surface prior to injecting. Physical restraint methods are combined with low dose xylazine. Full aseptic technique is advised, including preparation of the skin, wearing of sterile gloves and proper aseptic technique. Whilst ultrasound-guidance is preferable for certain joints (e.g. vertebral articular process joints, sacroiliac and hip), others can be injected with good accuracy based on anatomical landmarks and thorough palpation (e.g. shoulder, elbow, radio- and inter-carpal joints, tarsal joints, fetlocks etc). Presence of burn scars and wounds at proposed injection sites can be challenging as needles should not be inserted through inflamed tissue due to risk of iatrogenic joint sepsis. This necessitates good anatomical knowledge and understanding of alternative injection locations. The sensitivity of the dromedary camel to alpha-2 agonists also presents a challenge. In the author's experience, complications associated with joint injections are mainly attributed to anaesthesia-related adverse effects and postinjection reactions to intra-articular medications.

Key words: Arthrocentesis, camel, intra-articular, joint injection

Joint injections in camels have several practical applications: from lameness localsation, administration of medications, sampling of synovial fluid and even injection of contrast for arthrograms. Despite its usefulness, the technique is often under-utilised in camel veterinary medicine. Complications of the procedure can include sepsis, drug reactions ('flares') and injury. However, with good technique and anatomical knowledge, the risk of complications is relatively low. In horses, the technique is widely performed and the risk of iatrogenic septic arthritis is <0.05% when proper aseptic technique is used (McIlwraith *et al,* 2015).

Given the environment that camels are housed in, it is beneficial to consider the working environment prior to embarking on joint injections. Depending on the location and number of injections to be performed, camels may be restrained in recumbency and a sand surface can make aseptic technique challenging. Therefore, ideally, injections are performed in an area with a surface that can be cleaned and disinfected. Other environmental considerations include fly control and a comfortable working temperature. Outdoor air-conditioning units can provide a more comfortable climate, with the added benefit of reducing fly activity due to moving air; however, the wind created can make sterility challenging if items are being blown around.

Preparation of Patient

Depending on the joints to be injected, it is beneficial to wash the camels prior to injections with a mild-disinfectant shampoo. This can help to remove any crusting on the skin surface and clean away any urine or faecal material to reduce the amount of organic matter on the skin surface. It is advisable to wash camels a few hours prior to injection so that the haircoat has dried fully prior to injection.

Although, evidence suggests that clipping the haircoat is not mandatory and doesn't appear to significantly reduce infection risk, provided that a thorough aseptic skin preparation is performed (Graham *et al,* 2007; Lucas *et al,* 2009). However, despite this, it is the author's preference to clip, mainly due to the camel's dense haircoat and the field conditions.

Restraint

Chemical restraint in camels presents a challenge due to their sensitivity to alpha-2 agonists. Achieving an adequate plane of standing sedation can be challenging. For this reason, low doses of

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xylazine are advised (0.1-0.2mg/kg IV) for standing procedures. Additional top-ups can be administered for sedation under recumbency. However, take caution with repeated top-ups under recumbency as it is easy to induce bradycardia, hypotension and respiratory depression with xylazine. Sedation protocols should be combined with physical restraint, including 'lip twitches', leg ties and hobbles.

Technique

Full aseptic technique is advised, including preparation of the skin, usage of sterile gloves and proper aseptic technique. The author's preference is for chlorhexidine scrub by 70% isopropyl alcohol rinse. Contact time is important for aseptic skin preparation, with recommended time ranging from 5-7 minutes for chlorhexidine (Wilson *et al,* 2015). As with all joint injections, use of both radiographic and ultrasonographic guidance may improve accuracy and ensure correct needle placement. Good anatomical knowledge is essential for increased accuracy and to avoid multiple injection attempts which can increase the risk of articular sepsis (Walmsley, 1995; Steel, 2008). Following joint injections, gauze swabs are applied over the injection sites with adhesive bandage dressings which are kept in place for 24 hours to prevent contamination.

Axial Skeleton

Injection of cervical and thoracolumbar articular process joints can be performed using ultrasound-guidance as in horses (Johnson *et al,* 2021; Fuglbjerg *et al,* 2010). Similarly, ultrasound-guided injection of the sacroiliac joint can be performed as in horses, with the cranial approach advised for safety (Stack *et al,* 2016).

Shoulder Joint

The author's preference is a 9 cm, 18G spinal needle. The procedure can be easily performed in the standing animal. Cranial and caudal portions of the lateral humeral tuberosity are easily palpable. The needle is inserted just proximally to this point, between the cranial and caudal portions, in a horizontal plane with the needle parallel to the ground, directed towards the opposite elbow (Moyer *et al,* 2011). The needle is advanced until bone contact is made and then withdrawn slightly. Depth is approximately 5 cm but is largely influenced by limb position. It is not unusual for joint fluid to extend up the spinal needle, particularly in camels in training. Joint fluid can be easily aspirated to confirm correct placement, if necessary. There should be no resistance to injection. Following injection and withdrawal of the needle, aluminium spray is applied over the injection site.

Elbow

The elbow joint can be injected similar to the horse with either lateral or caudal approach and can be injected either standing or in lateral recumbency. The author prefers a caudal approach, using a 9 cm, 18G spinal needle. A notch can be palpated between the caudal aspect of the lateral supracondylar crest and the olecranon of the ulnar. The needle is inserted into the olecranon fossa in a distomedial direction to a depth of approximately 2 inches (Moyer *et al,* 2011). It should be easy to aspirate fluid from the joint and there should be no resistance to injection. Alternatively, the cranial approach can be taken between the lateral humeral condyle and the radial tuberosity, just cranial to the lateral collateral ligament and directing the needle caudally (Alsobayil *et al,* 2015). However, this approach is more likely to induce articular cartilage damage. In the author's experience, camels do not tolerate elbow injections standing as well as the shoulder joint and are more likely to sit down into sternal recumbency. Therefore, the author's preference is to perform this injection in lateral recumbency with the limb in extension. Aluminium spray is applied to the injection site once completed.

Carpus

Joint anatomy of the camel carpus is similar to horses with 3 joints: radiocarpal, intercarpal and carpometacarpal joints. As in horses, the intercarpal and carpometacarpal joints communicate whereas the radiocarpal joint does not communicate (King *et al,* 2022). Radiocarpal and intercarpal joints can be easily accessed through dorsomedial and dorsolateral approaches with the limb in flexion (Moyer *et al,* 2011). The joint should be carefully palpated and the needle inserted either lateral or medial to the extensor carpi radialis tendon. The author preferred a 20G 1.5 inch needle for this procedure. Choice of location is often determined by presence of scarring or wounds due to burning. An alternative approach to the lateropalmar pouch of the radiocarpal joint has been reported with the benefit of avoiding inadvertent puncture of the tendon sheaths, as well damage to the articular cartilage. Puncture site can be palpated in the depression formed by the distal end of the ulna (lateral styloid process) and the accessory carpal bone (King *et al,* 2022). It is the author's subjective impression that the intercarpal/carpometacarpal joint capacity is less than that of the horse.

Fig 1. Clipping of haircoat at injection site for shoulder injection prior to aseptic preparation of scapulohumeral joint.

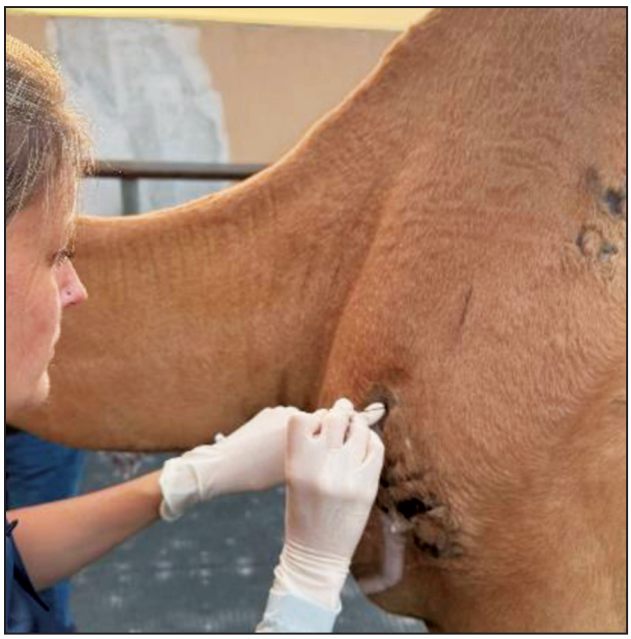

Fig 2. Palpation of anatomical landmarks (cranial and caudal heads of lateral humeral tuberosity) prior to insertion of 18G 9 cm spinal needle for injection of the scapulohumeral joint.

Fetlock

The medial and lateral digits of the fetlock must be injected separately as the joints do not communicate. A dorsal approach is described whereby the joint is flexed and the space for needle insertion is palpated between the distal end of the condyle of the metacarpus and the proximal aspect of P1 (Alsobayil *et al,* 2015). It is the author's preference to inject the dorsal fetlock with the joint in extension, either medial or lateral to the digital extensor tendon. A lateral arthrocentesis approach to the proximal palmar/plantar pouches of the fetlock joints has also been described which has reduced risk of articular cartilage damage as well as avoiding extensor tendons (Al Aiyan *et al,* 2023). The author's preference is a 20G 1.5 inch needle for this injection.

Fig 3. Dorsomedial injection site for tarsocrural joint, distal to medial malleolus of tibia and medial to saphenous vein, using aseptic technique and a 20G 1.5 in needle.

Phalanges

Both dorsal and lateral approaches to the proximal interphalangeal joints have been described. For the distal interphalangeal joint, a dorsal approach must be taken (Alsobayil *et al,* 2015; King *et al,* 2022; Moyer *et al,* 2011).

Hip

A blind approach to the dromedary hip joint has been described by Shawaf *et al* (2023). In this paper, the authors described inserting a needle above the palpable edge of the greater trochanter and directing the needle perpendicular to the vertebral column distomedially. This technique was most easily performed with the camel in lateral recumbency and the limb in flexion. It is the author's opinion that ultrasound-guidance would increase accuracy and the technique is well described in equine literature (David *et al,* 2007).

Stifle

The stifle joint is comprised of the femoropatellar, medial and lateral femorotibial joints. The technique in camels is described by Shawaf *et al* (2023). For femorotibial joints, it is the author's preference to perform using ultrasound-guidance. For this purpose, an 18G, 9cm spinal needle would be used.

Tarsus

The tarsus is comprised of four joints: the tarsocrural (tibiotarsal), proximal intertarsal, distal intertarsal and tarsometatarsal joints. The tarsocrural joint is a large volume, high motion joint. It is easily approached using a 20G 1.5 inch needle, through the dorsomedial pouch, distal to the medial malleolus of the tibia and medial to the saphenous vein (Moyer *et al,* 2011). However, burn scars and wounds may necessitate a dorsolateral approach, lateral to the saphenous vein. If joint effusion is present, plantar pouches (medial and lateral) are easily palpable and can also be utilised. The proximal intertarsal joint may be approached dorsolaterally (distal to the distal end of the calcaneus) or dorsomedially (proximal to the central tarsal bone), whilst the distal intertarsal joint may be accessed dorsomedially (between the central and 4th tarsal bones) (Shawaf *et al,* 2023). In some cases the distal intertarsal joint communicates directly with the tarsometatarsal joint (Shawaf *et al,* 2023). Finally, the tarsometatarsal joint can be accessed through 3 approaches viz. dorsal, caudolateral or caudomedial. Dorsally, it can be approached in the depression between the fused 2nd and 3rd tarsal bones and the 4th tarsal bone. Caudolateral and caudomedial approaches are taken just proximal to the 4th and 2nd metatarsal bones, respectively (Shawaf *et al,* 2023). For these distal tarsal joints in camels, the volume is small and the space is tight. Therefore, it is the author's preference to use smaller gauge needles, such as 23-25G, 1 inch needles. Radiographic guidance is advisable to confirm needle placement in these joints.

Challenges and Complications

Challenges unique to the dromedary camel include difficulties associated with injection sites, burn scars and wounds. Needles should not be inserted through inflamed tissue, as this risks introduction of subcutaneous infection into the joint. This necessitates good anatomical knowledge and understanding of alternative locations for each joint. Additionally, sensitivity of the dromedary camel to alpha-2 agonists presents a challenge which must be navigated. In the author's experience, complications associated with joint injections are mainly attributed to anaesthetic-related risks as well as postinjection reactions to intraarticular medications. Anaesthetic complications encountered include respiratory depression associated with additional top-ups of xylazine in a fractious camel, as well as development of a traumatic semitendinosus haematoma secondary to rolling a camel too vigorously into lateral recumbency. Several joint 'flares' were observed in camels injected intra-articularly with pentosan polysulfate which were managed conservatively. In addition, one case of a severe haemarthrosis was encountered following injection with pentosan polysulfate which responded to needle lavage.

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News

LAUDATIO FOR DR. JOERG KINNE AND HIS DISTINGUISHED CAREER IN VETERINARY PATHOLOGY

Dr. Joerg Kinne, CVRL Pathologist, necropsying a camel

The Central Veterinary Research Laboratory (CVRL) in Dubai, United Arab Emirates, announces the recent superannuation of Dr. Joerg Kinne, DVM, *Dr. med. vet.*, following thirty years of exemplary service in veterinary pathology.

Dr. Kinne's career is distinguished by his profound commitment to diagnostic excellence and research. He obtained both his veterinary diploma and his doctoral degree (*Dr. med. vet.*) from the University of Leipzig, Germany. Subsequently, he pursued specialised training in Veterinary Pathology and Tropical Veterinary Medicine. Before relocating to the UAE, Dr. Kinne held academic positions at the Institute of Veterinary Pathology at Leipzig University, where he cultivated extensive experience in diagnostic pathology, research, and disease investigation.

Dr. Kinne joined the CVRL in 1996, where he became a principal veterinary pathologist and a pivotal figure in regional animal health. Over the course of three decades, his extensive experience in diagnostic pathology was applied with particular focus and expertise to camel medicine and pathology.

His contributions have been instrumental in advancing the understanding and control of various pathological conditions affecting the *Camelus dromedarius* (dromedary camel). Through meticulous post-mortem and histopathological analyses, Dr. Kinne contributed significantly to the investigation of infectious and non-infectious diseases crucial to the welfare of racing and breeding camels in the UAE and neighboring countries. This work has been fundamental in supporting the CVRL's role as a leading global centre for camel health and research.

We trust that after thirty years in the lab, he is now enjoying life back in Germany, where no desert sand gets stuck between his books, where the weather will be cold and rainy, and the calls are entirely non-pathological.

From the entire CVRL we thank you, Dr. Kinne, for 30 years of friendship, fun and for almost always having the right answer to tough cases.