Ultrasound-guided Interventions for Core and Hip Injuries in Athletes

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KEYWORDS

• Core muscles • Hip • Ultrasonography guided • Athletic pubalgia • Percutaneous needle tenotomy • Platelet-rich plasma

KEY POINTS

- MR imaging remains the primary modality for imaging core muscle and hip injuries, but ultrasonography-guided diagnostic and therapeutic procedures play a substantial role in the management of these conditions.
- If properly performed and with the right indication, ultrasonography-guided procedures can get the athlete through the season. Surgery can often be performed in the off-season.
- In chronic tendinosis and mild, chronic rectus abdominis–adductor aponeurosis/plate injuries, ultrasonography-guided percutaneous tenotomy shows promising results, but studies are warranted to determine the clinical value. For acute or high-grade injuries, surgery is the treatment of choice at this point.

PART I: GENERAL CONCEPTS

General Procedure Steps and Needle Placement

Before any ultrasonography-guided musculoskeletal procedure, an ultrasonography examination is performed to determine the best approach for the intervention. Color images are used to identify and avoid vessels, such as the femoral artery in iliopsoas or hip joint injections, the inferior epigastric arteries in rectus abdominis trigger point injections, or superior/inferior gluteal arteries in piriformis injections. An in-plane approach should be used around the pelvis/hips to visualize the entire needle at all times. Once the correct probe position is found, a line is drawn with a surgical marker at the edge of the transducer indicating the skin entry site and the transducer orientation. Sterile gloves are worn and the skin at the procedure site is cleaned and prepped with chlorhexidine and sterile towels. The skin is then anesthetized with local anesthetic using a 25-G needle and while the anesthetic takes effect, a sterile cover is placed over the ultrasound probe and the medications are drawn up. The appropriate needle is subsequently advanced to the required position. In sensitive patients, instilling a small amount of local anesthetic while advancing the needle might reduce pain. However, a larger amount of anesthetic might be more painful then effective because of the burning sensation and

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local mass effect of the anesthetic. The needle should be kept as perpendicular as possible to the sound beam, meaning as parallel to the skin surface as possible. This orientation creates a strong reverberation artifact, making the needle echogenic and visible. In addition, manufactures have recognized the difficulties associated with sonographic guidance and have added echogenicity-enhancing features to their needles,[1–3] which might help when starting with ultrasonography-guided procedures. Jiggling the needle gently while slowly moving the transducer from side to side over the projected needle path helps to find the needle when lost.[4,5]

Corticosteroid and Local Anesthetic Injections

Indications

Tendinosis is initially treated conservatively with rest, physical therapy, and nonsteroidal antiinflammatory drugs (NSAIDs). About 60% to 80% of patients respond to conservative management. If these measures are unsuccessful, then more invasive treatment should be considered and a corticosteroid injection is often the initial step of the interventional therapy. Corticosteroid injections in inflammatory joints, bursitis, and tenosynovitis are well accepted and reduce the inflammatory response, including the local blood flow and local leukocytes.[6,7] This alleviates pain, albeit with often only temporary relief.[8] Corticosteroid treatment of tendon and muscular injuries is controversial. Although corticosteroid injections in muscles have been shown to reduce pain and facilitate return to preinjury activity in limited retrospective evaluations,[9,10] the long-term benefit from repeated corticosteroid injections in chronic tendinopathies is questionable.[11] There have been studies showing that the intratendinous injection of corticosteroids increases the risk of tendon rupture.[12–14] However, a study published in *The Lancet* by Coombes and colleagues[11] could not confirm this: only 1 of 991 patients receiving an intratendinous corticosteroid injection subsequently had a tendon rupture. The adductor longus is the only adductor that has a short intramuscular tendon at its origin, which is surrounded by muscle fibers. The other adductors (brevis, magnus, pectineus, gracilis) have muscular origins without tendons. In experienced hands and with the right indication, a small amount of corticosteroid injected around or in the adductor longus tendon occasionally helps with the tightness and has a similar effect to a surgical partial tendon release. A partial tear of some fibers of the tendon is a welcome side effect from the injection in that case and might help release the tightness without substantially impairing function. The risk of rupture is very low because the short adductor longus tendon is surrounded by the adductor longus muscle. However, studies are warranted to prove the clinical value of these ultrasonography-guided procedures. This concept can also be applied to snapping iliopsoas tendon disorder and to some degree to iliotibial band (ITB) syndrome. Instead of a surgical release of the iliopsoas tendon or ITB, a partial release with percutaneous tenotomy and small amount of corticosteroid in the thick iliopsoas tendon or ITB might be an alternative treatment option. Intratendinous corticosteroid injection should be used with caution in other tendons around the hips and pelvis, including hamstring, rectus femoris, sartorius, and gluteus medius and minimus tendons, in which a partial tendon release is contraindicated.

Corticosteroid agents

The corticosteroid agent most commonly used for musculoskeletal injections in the United States is triamcinolone acetonide (eg, Kenalog 10 mg/mL or 40 mg/mL) with duration of action of about 14 days, followed by methylprednisolone acetate (eg, Depo-Medrol 40 mg/mL or 80 mg/mL) with duration of action of about 8 days.[15,16] A typical dose for a hip joint injection is 40 mg for both Kenalog and Depo-Medrol.

Mixture with local anesthetic

In general, corticosteroids are mixed with local anesthetic agents to add volume to the injectate and to relieve procedure-related pain. Local anesthetics inhibit the sodium-specific ion channels of the nerve cell membranes, thus preventing the propagation of an action potential. The most frequently used local anesthetic preparations are the amide agents, including lidocaine, bupivacaine, and ropivacaine. Epinephrine, a vasoconstrictor, can be added to enhance the anesthetic and reduce the systemic effect by concentrating the agent in the vicinity of the neuron. Lidocaine comes in 1% (10 mg/mL) and 2% (20 mg/mL) preparations with a maximum dose recommendation of 4.5 mg/kg up to 300 mg in the United States (30 mL of 1%), onset of action in 1 to 2 min, and duration of action between 80 and 120 minutes. Using lidocaine and epinephrine mixtures increases the maximum dose to 7.5 mg/kg up to 500 mg. Bupivacaine comes in 0.25% (2.5 mg/mL) and 0.5% (5 mg/mL) preparations with a maximum dose recommendation for an average adult male patient of 150 mg. However, this is patient weight and dose dependent; for an average-weight male patient up to 50 mL of 0.25% and up to 25 mL of