Ultrasound guided musculoskeletal intervention: Off the beaten track

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Authors: J. Kavanagh, P. Hughes, C. Johnston; Dublin/IE
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Learning objectives

To demonstrate the use of ultrasound as a diagnostic and therapeutic tool in musculoskeletal intervention.

To illustrate this with particular attention to the more uncommon sites which have been traditionally performed using fluoroscopic or CT guidance.

To describe the technique and pitfalls involved in the injection of joints and bursa.
Background

Image guided joint injection has increased in popularity due to its significantly less procedural pain and superior pain response rates. Fluoroscopy has traditionally been the modality of choice for image guided injection of most joints and is still widely used. CT and MRI have largely replaced conventional arthrography due to their superior spatial and soft tissue resolution. Some joints such as lumbar zygapophysial joints still require CT or fluoroscopy for safe access but improvement in ultrasound technology over the last two decades has made most joints accessible using sonography in experienced hands. Ultrasound is ideally suited to musculoskeletal intervention as the depth of penetration required is typically several centimetres.

The main advantage of ultrasound imaging is its ability to perform real-time, multiplanar imaging without radiation. In comparison with fluoroscopy and CT ultrasound is relatively portable, inexpensive and allows comparison with the opposite side. The use of ultrasound for joint injection requires detailed knowledge of anatomy and often is associated with a long learning curve.

The shoulder, hip and ankle joint are the most commonly injected synovial joints having identifiable superficial landmarks on sonography. We describe the ultrasound technique in accessing the sacroiliac joint, the subtalar joint and pubic symphysis which are most commonly accessed using fluoroscopy or CT guidance. Ultrasound can also be useful in the setting of bursitis, the most common conditions being olecranon and trochanteric bursitis. The ischiogluteal bursa is a less commonly inflamed site but is readily accessible using ultrasound for therapeutic injection.
Findings and procedure details

Sacroiliac Joint

The patient is placed in a prone position. The skin is disinfected with antiseptic and draped. Using a medium frequency (8-10 MHz) linear transducer in a transverse orientation the sacral hiatus and sacral cornuae are identified in the midline. The transducer is then moved, maintaining a transverse orientation, laterally until the bony edge of the sacrum is identified. It is then moved cephalad until the edge of the ilium is seen. Between these two bony landmarks is the posterior sacroiliac joint. (Fig 2 and 3) Local anaesthetic (1% lignocaine) is infiltrated into the skin. A 23G spinal needle is then inserted along the line of the transducer (white arrow) in a medial-lateral direction into the joint under direct guidance. We use a mixture of 2mL of methylprednisolone acetate (80mg/ml) and 2mL of bupivacaine hydrochloride (0.5%).

Subtalar Joint

Acting as the primary articular surface of the subtalar joint and consequently the site of most degenerative disease the posterior facet is both the most commonly injected and most easily accessible. Pre procedure MRI or SPECT/CT is routine to establish an accurate diagnosis. (Fig 4) The patient is positioned supine. The posterior facet can either be accessed from the medial or lateral foot depending on the imaging findings and patient symptoms.

The skin is disinfected and patient draped. For the lateral approach a high frequency transducer (15-17mHz) is positioned in a longitudinal orientation below the lateral malleolus. The inferior surface of the talus, superior surface of the calcaneus and peroneal tendons are then identified. (Fig 5 and 6) Using a 21G needle and out of plane technique the joint is accessed under direct guidance and 1ml of methylprednisolone acetate (40mg/ml) and 1ml of bupivacaine (0.5%) is injected. The medial approach similarly identifies the talus and calcaneum medially. The tibialis posterior and flexor hallicis longus tendons are then identified and the joint is injected under direct guidance.

Pubic Symphysys

The patient is positioned in a supine position. Standard aseptic technique is employed. A high frequency (15-17MHz) probe is placed on the midline pubis in a transverse orientation and the medial margins of the pubic body are identified along with the adductor
Local anaesthetic is infiltrated into the skin superficially. Using an out of plane technique a 21G needle is advanced into the pubic symphysis under direct guidance and 1ml of methylprednisolone acetate (40mg/ml) and 1ml of bupivacaine (0.5%) is injected.

**Ischiogluteal bursa**

Ischiogluteal bursitis is often an overlooked cause of chronic buttock pain. To perform an injection the patient is positioned on their side with the affected side up. The hip is flexed to 90 degrees which acts to move the sciatic nerve away from the ischial tuberosity. A medium frequency linear probe (8-12 MHz) or a lower frequency curvilinear probe (3-5MHz) is positioned in a longitudinal orientation and the echogenic curved ischial tuberosity and hamstring origin is identified. (Fig 11 and 12). The bursa lies between the tendon and the ischial tuberosity and is accessed using a 22G spinal needle along the plane of the transducer. 2ml of methylprednisolone acetate (80mg/ml) and 2ml of bupivacaine hydrochloride (0.5%) is instilled.

The most common complications of joint injection are septic arthritis and chemical synovitis. Septic arthritis the most feared complication is estimated to occur in 1:30000 injections. The patient must be counselled regarding this before the procedure and strict aseptic technique should be adhered to. Chemical synovitis or "steroid flare" occurs 24-48hrs after the injection when there is an paradoxical acute increase in joint pain. This again should be discussed before the procedure and it should resolve within 48hours; standard anti-inflammatory analgesia can be taken for pain.
Images for this section:

**Fig. 1:** Coronal STIR image illustrating subchondral high signal in the inferior left sacroiliac joint

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Fig. 2: Prone T2 weighted image demonstrating the desired needle path (white arrow) and adjacent landmarks during sacroiliac joint injection.

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**Fig. 3:** Ultrasound image demonstrating desired needle path and landmarks immediately before sacroiliac joint injection.

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**Fig. 4:** Coronal STIR showing subchondral high signal and fluid in the subtalar joint secondary to osteoarthritis.

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**Fig. 5:** Reorientated coronal image to demonstrate relevant landmarks and path of needle during injection of the posterior facet of subtalar joint.

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Fig. 6: Ultrasound image during injection of subtalar joint showing desired path of needle and landmarks to correspond with previous MR image.

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Fig. 7: Axial T1 weighted image demonstrating cartilage irregularity and hypertrophic change with in the pubic symphysis.

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**Fig. 8:** Zoomed in axial T1 weighted image of the pubic symphysis showing desired path of needle (white arrow).

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**Fig. 9:** Ultrasound image showing desired path of the needle and adjacent landmarks during pubic symphysis injection.

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Fig. 10: Axial STIR image illustrating fluid in the left ischiogluteal bursa and high signal in the hamstring tendon.

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Fig. 11: Reorientated STIR coronal image to correspond to subsequent image demonstrating landmarks during injection of ischiogluteal bursa.

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Fig. 12: Ultrasound image showing path of needle (white arrow) and landmarks during injection of ischiogluteal bursa.

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Conclusion

Improvements in ultrasound technology over the past two decades have made joint landmarks easily visible and safely accessible. Most joints in the body are positioned within several centimetres from the skin surface and therefore make ultrasound the ideal modality for musculoskeletal intervention. Ultrasound is a safe, inexpensive and reliable technique in both diagnostic and therapeutic joint injection.
References

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