The Use of Ultrasound in Musculoskeletal Interventions

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KEYWORDS

• Musculoskeletal intervention • Joint aspiration • Iliopsoas bursa • Iliopsoas tendinopathy • Neuroma • Plantar fascia • Greater trochanteric bursa • Soft tissue mass biopsy

KEY POINTS

- Ultrasound is a readily available, cost-effective method to diagnose and treat many disorders of the musculoskeletal system.
- Uses include, but are not limited to, injection of medication, aspiration of bursae or cysts, biopsy, and treatment of calcific tendinosis.
- It is a safe modality for children and during pregnancy.

A video of ultrasound-guided barbotage of calcific tendinosis of the rotator cuff accompanies this article.

INTRODUCTION

Ultrasound (US) is a widely available, inexpensive modality for performing a variety of musculoskeletal-themed imaging-guided interventions that address common problems and concerns frequently encountered by patients seen in the orthopedic, physical medicine/rehabilitation, and podiatrist clinics. One of the major advantages of US is that it can be used for both diagnostic and interventional purposes. A diagnosis can be confirmed or obtained, and treatment can be provided, often on the same visit, with a minimum of inconvenience to both the patient and the referring clinician.

In addition to being a safe modality for pregnant women and children/adolescents, sonography has the added benefit in imaging of postsurgical patients, in whom magnetic resonance (MR) imaging or computed tomography may falter because of the presence of hardware. The ability to perform dynamic imaging is another benefit of sonography, and it can be used during procedures to optimize the approach and minimize the risk of complications.

US TECHNIQUE

To successfully perform US-guided procedures, the clinician must be familiar with the basics of US imaging, able to optimize sonographic technique to visualize the abnormality or joint space, and be thoroughly versed in the appropriate musculoskeletal anatomy, including surface anatomy. In general, linear probes with the highest frequency (7–12 MHz) to produce adequate penetration are preferred. For lesions situated deeper or in larger patients, a curvilinear low-frequency probe may need to be used.

US scale should be optimized for best visualization at the needed depth. Doppler US is useful for mapping out adjacent vessels to avoid vascular injury during the procedure or to determine the vascularity of a lesion before biopsy. It is important

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to avoid introduction of air into the tissues during the procedure, because air bubbles reduce visibility and may completely obscure the target.

Choices of steroid medications usually include methylprednisolone, triamcinolone, or betamethasone. Betamethasone is preferred for the more superficial injections, because it is less likely to produce skin discoloration. Dosage varies with physician preference and patient's condition, but, in general, 40 to 80 mg of triamcinolone or methylprednisolone or 6 to 12 mg of betamethasone are used.

Long acting local anesthetic such as bupivacaine (0.25% or 0.5%) may be administered in conjunction with the steroid.

INTERVENTIONS

US-guided musculoskeletal interventions include but are not limited to:

- Injection of medication to treat arthritis, tendinosis, neuromas, and overuse syndromes
- Identification and removal of foreign bodies
- Needle aspiration of calcific tendonitis
- Needle aspiration of bursae, ganglions, and cysts
- Diagnostic and/or therapeutic needle aspiration for crystalline arthropathy or septic arthritis
- Platelet-rich plasma (PRP) and autologous blood injection
- Soft tissue mass biopsy

PRP

PRP is derived from centrifuging whole blood, resulting in a highly cellular component of plasma containing numerous growth factors. Injecting PRP directly into the site of injury is a practice that is gaining popularity in the treatment of ligament and tendon tears.[1]

Soft Tissue Mass Biopsy

A request to biopsy a soft tissue mass of musculoskeletal origin using US is a common occurrence in clinical practice. The differential diagnosis varies from benign causes such as lipoma to malignant causes including metastases and soft tissue sarcoma. Before biopsy of the soft tissue mass, if it is most likely a sarcoma, the appropriate approach to biopsy should be discussed with the oncologic surgeon in case limb-sparing surgery is a surgical option.

Local anesthesia is achieved with 1% lidocaine before biopsy. US is used to evaluate the mass for viable tumor because many large masses have areas of central necrosis. Once a viable area of tumor has been localized, a spring-loaded core biopsy needle is used to obtain multiple samples that are delivered to pathology (**Fig. 1**).

UPPER EXTREMITY

Shoulder

US interventions in the shoulder are many, because the joint is commonly affected by injury, rotator cuff disorders, and arthropathies.

Subacromial/subdeltoid bursal injection

The subacromial-subdeltoid (SASD) bursa can be inflamed in conditions such as rheumatoid arthritis, gout, calcium pyrophosphate dihydrate deposition disease (CPPD), or pyogenic infection. More commonly, it is inflamed secondary to shoulder impingement syndrome.

When injecting the SASD bursa it is essential to first rule out septic bursitis and a rotator cuff tear, because local injection of corticosteroids is contraindicated in these conditions.

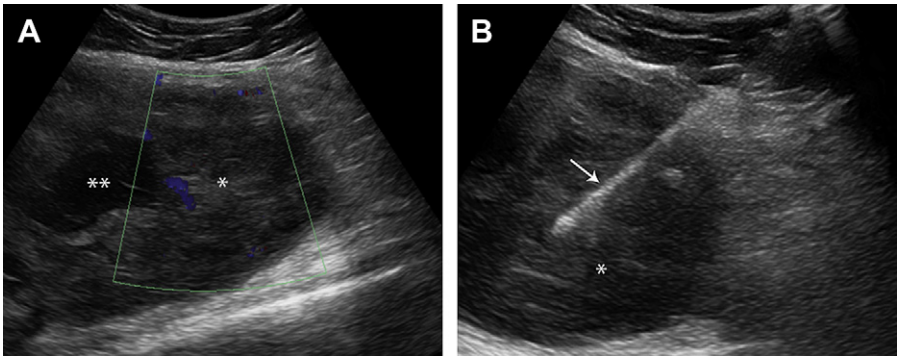

Fig. 1. A 52-year-old woman with painful posterior thigh mass most consistent with sarcoma. (*A*) A large posterior thigh mass containing both solid (*asterisk*) and necrotic areas (*double asterisk*). (*B*) The biopsy needle (*arrow*) within the solid (*asterisk*) component of the mass. This lesion at pathology is a myxofibrosarcoma.