Debate: Are Ultrasounds Necessary for Routine Knee and Shoulder Injections in the Office?

Two sports medicine physicians share their opinions

The use of ultrasound guidance for routine knee and shoulder injections in the office is increasing. There is no doubt that ultrasound can improve the accuracy of injections, yet questions remain. How much accuracy is gained and at what cost? Moreover, are patient outcomes negatively affected if ultrasound is not used for these injections? Two respected sports medicine physicians debate the issue.

PRO

Benefits Outweigh Disadvantages

● HOLLY J. DUCK, MD

Ultrasound for musculoskeletal diagnoses has rapidly gained popularity throughout the medical world. Accuracy of needle placement with ultrasound guidance has been proven throughout the body. Although orthopaedics is primed for the benefits of this imaging modality, particularly with the advent of improved transducers, our specialty has been slow to adopt the technology. As surgeons, we believe we know the anatomy and therefore can inject and aspirate accurately.

The benefits of ultrasound guidance far outweigh its disadvantages. In addition to aiding the precise placement of needles, ultrasound guidance enables surgeons to view adjacent pathology in real time without ionizing radiation. Blood vessels are apparent and can be easily avoided. Because fluids are readily distinguished from adjacent soft tissues, fluids and effusions can be quickly and effectively aspirated. Additionally, for joints such as hips that are not amenable to palpation for safe injection, or in patients with elevated body mass index, ultrasound can be used in lieu of fluoroscopy.

I first began using ultrasound-guided injections in private practice for routine hip and shoulder injections. At the time, I did not believe it was necessary for subacromial or intra-articular knee injections. But after having participated in an ultrasound-guided injection clinic for the past three years, my opinion has changed. I quickly realized that I could not only accurately place a needle in the subacromial space and avoid injecting the supraspinatus tendon, but that I could also specifically inject into the subacromial bursa. I also found that patients preferred the use of ultrasound because it is less painful. When I am injecting into the knee joint from the supralateral aspect, ultrasound guidance allows me to anesthetize the capsule before puncturing through. I can watch as I aspirate any effusion, ensure that the needle is within the joint, and avoid inadvertent damage to cartilage that can occur with the standard lateral mid-patella approach. For the rare plantar fascia injection, I can place the needle deep to the fascia and avoid injection into the fascia itself. Finally, I can routinely obtain fluid for analysis in patients with painful total hip arthroplasties. Ultrasound is an excellent adjunct to my knowledge of underlying anatomy that I obtained from years of surgical experience.

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> *Holly J. Duck, MD*

Multiple studies have demonstrated the superiority of ultrasound guidance versus palpation and fluoroscopically guided injections. For example, in a cadaver study of acromioclavicular injections, success rates for ultrasound-guided injections and palpation-guided injections were 90 percent and 70 percent, respectively. In another study, glenohumeral joint injections for magnetic resonance (MR) arthrography administered under ultrasound guidance were successful on the first attempt 94 percent of the time compared to 72 percent with fluoroscopy. Furthermore, a blinded, randomized study of patients with adhesive capsulitis found that ultrasound-guided injections into the glenohumeral joint using the posterior approach were 90 percent accurate, whereas palpation-guided injections were 76 percent accurate.


Holly J. Duck, MD


Alan M. Reznik, MD, MBA

Studies also have supported the benefits of ultrasound guidance in lower-extremity injections. A study comparing patient experience with ultrasound versus fluoroscopy for hip injections indicated significant preference (98 percent) for ultrasound. A prospective study from an orthopaedic clinic determined 96 percent accuracy with surgeons and/or physician assistants performing the hip joint injection with ultrasound guidance, with an average procedural time of 2.6 minutes. Similarly, in a review study of the clinical utility of ultrasound guidance for intra-articular knee injections, the accuracy rate for ultrasound was 95.8 percent compared to 77.8 percent for anatomic guidance. With respect to ankle injections, a cadaveric study that compared ultrasound versus palpation for tibiotalar injections in 40 ankles yielded 100 percent accuracy for ultrasound-guided injections and 85 percent accuracy for injections not guided by ultrasound. When injecting the sinus tarsi, ultrasound-guided injections were 90 percent accurate, whereas injections without ultrasound guidance were only 35 percent accurate.

From a cost standpoint, ultrasound machines are reasonably priced and can quickly prove profitable. Learning ultrasound-guided injection techniques does require time and practice. However, I have taught the techniques to orthopaedic residents in a cadaver lab who, within three hours, could accurately place needles into the major joints. The establishment of an injection clinic can further facilitate learning and utilization. A three-year analysis of an ultrasound-based orthopaedic injection clinic revealed that all the orthopaedists were performing ultrasound-guided injections by the second year. The number of injections performed increased four-fold. Another benefit is that adding ultrasound provides orthopaedic surgeons with a procedure option, should they pursue nonoperative orthopaedics prior to full retirement.

Accuracy of injection is paramount for diagnosing pain generators. Because many of the injections orthopaedists perform are both therapeutic and diagnostic, ultrasound guidance is essential. Palpation- and anatomic-based injections routinely yield only 75 percent to 80 percent accuracy, whereas ultrasound-guided injections are 90 percent to 100 percent accurate.

In summary, compared to palpation-guided and fluoroscopically guided injections, ultrasound-guided injections are more accurate, preferred by patients, and radiation-free. The increased time to perform these injections is negligible. The benefits of real-time imaging are fully worth the investment. N

Holly J. Duck, MD, is a senior consultant evaluating patients as a nonoperative orthopaedist at Mayo Clinic in Rochester, Minn. She has been performing ultrasound-guided injections for more than eight years.

CON

Ultrasound May Be Overkill

ALAN M. REZNIK, MD, MBA

I feel strongly that technology has advanced the practice of orthopaedic surgery. As an engineer, I love anything technical—the more precision, the better. Cobb angles, KT-1000 testing, tibial tubercle–trochlear groove measurements, MR arthrogram for labral tears, three-dimensional reconstruction of computed tomography scans of pelvic fractures—I cannot get enough good tech. Still, do we need to use ultrasound imaging for common injections?

In a number of studies, ultrasound has been shown to have clear advantages over other methods of injection. For example, a study from the American Institute of Ultrasound in Medicine showed that ultrasound is better than fluoroscopy for injecting the biceps sheath. The study found lower costs, less radiation exposure, and less time associated with ultrasound than with fluoroscopy.

We can agree that these improvements are a good thing. Still, does using fluoroscopy for a biceps sheath injection make sense in the first place? We have to ask: Is this a fair or useful comparison, or is the logic flawed? I think most orthopaedic surgeons would be surprised if fluoroscopy was the standard for injections of this type. Here, superiority of one method over the other translates to an implied patient benefit for a specific "alternative technology choice" that may not be real. The argument, even if sound, may have no practical implications.

A study by Cunnington et al. showed that ultrasound helped rheumatology fellows inject joints more accurately, and it was more important for them while training than for the attendings in practice. In fact, fellows using contrast dye to confirm injection "hit the joint" 66 percent of the time, whereas experienced attendings got it in the correct location 83 percent of the time without ultrasound. This outcome is awesome news—both groups improved with ultrasound. It follows that live imaging helps those in training who need to "see" the anatomy with which they don't engage regularly in the operating room.

At the same time, cadaveric studies have shown that skilled surgeons can inject the glenohumeral joint accurately in cadaveric joints 80 percent of the time without ultrasound. The Cunningham et al. study showed a small difference in visual analog scale (VAS) score, with or without ultrasound, which was not statistically significant. Even though control studies have shown that orthopaedic surgeon–administered subacromial injections are more accurate with ultrasound, a study by Cole et al. showed that the accuracy does not translate into better clinical outcomes. Of note, in a completely different setting, multiple clinical outcomes for plantar fasciitis also showed no difference according to patient-based VAS.

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It seems that most of us perform accurate injections at least 80 percent of the time. For the other 20 percent, like in the game of horseshoes and hand grenades, it may not make a significant difference in clinical outcomes. Close may indeed be good enough. I do like ultrasound at times for larger patients (for example, when you cannot feel the biceps groove on the humerus). Yet when the painful spot is palpable on the tendon, there is a positive speed test, and there is pain to resistance of supination, the injection may not be that difficult. Moreover, there is a limitation on the depth of tissue penetration of ultrasound, so in some of our larger patients, even ultrasound may be of little help.

Aspiration may be a separate issue. Again, small superficial cysts can be easily felt and aspirated. Small deep popliteal cysts near the neurovascular structures may present more of a challenge. Safety should come first, and a tool like ultrasound is great for such cases. Aspiration of a knee with significant synovitis and effusion may also be a challenge. I have observed the inflamed synovium trapping against the needle tip with ultrasound. In such cases, aspiration may be inadequate unless the needle is repositioned; here, ultrasound does help. This can be learned with experience as well. With some practice, we can see the fluid flow stop, palpate fluid still trapped, and reposition the needle. That is a learned skill, and ultrasound may help teach it.

As with all advances, when something is gained, other things are lost. For example, many non-orthopaedic providers have begun to prefer magnetic resonance imaging over a good patient history and careful physical exam. Many times, they happily skip over a plain radiograph that would have confirmed the diagnosis of advanced arthritis. After all, who has the time? Care providers are saving time in the name of greater accuracy—but at a significant cost. As a result, the routine use of many tests has created seemingly unreasonable pushback from payers. At the same time, payers place unreasonable hurdles in our path for reasonable testing, frustrating the rest of us. I feel the same way about ultrasound imaging and common in-office injections. Although ultrasound may be helpful in a good number of cases, it may be overkill in others, for the skilled surgeon. We are charged with knowing the difference.

As we watch orthopaedics move more from art to technology, we are tempted to overuse technologies that are a comfort to the less skilled and a bit sexy to patients, who love things that sound special. We, who "own the bone," have to push back a little and use the tools we have only when they help to improve our knowledge and skills or, in our own good judgment, when they are needed.

Alan M. Reznik, MD, MBA, specializes in sports medicine and is chief medical officer of Connecticut Orthopaedic Specialists. He is also the AAOS Council on Research and Quality liaison member to the AAOS Communications Cabinet and a member of the *AAOS Now* Editorial Board.

References for the studies cited and additional content provided by Dr. Reznik are available in the online version of this article, available at www.aaos.org/aaosnow/18062.