

Indications for Ultrasound Guidance in Intra-Articular Injections and those in Anatomically Related Locations

Introduction: Ultrasound guided injection provides accuracy as well as injury avoidance to a nerve, tendon, or even joints. It also provides comfort for the patient. It has these advantages because the needle is guided throughout the procedure which results in avoidance of adjacent anatomy and isolation of the therapeutic zone. Avoiding a nerve or tendon injury is essential when performing injections.

After making a diagnosis via ultrasound, it is important to use the ultrasound as a tool for guidance in terms of intervention. There are several joints that should be discussed, and the guidelines are as noted. Obviously, sterile technique should be carried out. In addition, the patient must be informed about the potential risk and benefit of the procedure. In current literature, blind injections (injections without the benefit of ultrasound guidance) are associated with less than 50% accuracy in terms of targeting the therapeutic zone, and are associated with a higher incidence of injuries, including those of the tendon and nerve. The existence of an advanced technological procedure such as high resolution ultrasonography provides the ability to direct a needle into an appropriate position.

Small joints, such as the metacarpal pharyngeal joints, MCP, proximal interphalangeal joints, or PIP can be tender and painful because of synovitis, tenosynovitis, or foreign body. Therefore, the ultrasound transducer can direct the needle towards the appropriate pathology. It is important after making a diagnosis of synovitis to approach a joint in a manner that avoids the bone since touching bone can sometimes result in periosteal injury. In addition, interdigital nerves should be avoided. Also, extensor tendons should be avoided in terms of injecting directly into the tendon. Even though these small joints may appear to require very simple procedures and have been treated blindly by many specialists in the past, including myself, increased risks associated with those blind procedures include the possibility of periostitis or neuromas in the areas that are injected. Only ultrasound guidance can provide the benefit of avoidance to such a degree. X-ray techniques or fluoroscopy can help in guiding the injection, but soft tissue such as the tendon or the nerve cannot be well visualized and, therefore, x-ray technique still carries a risk of causing injury to these structures. Other possibilities that warrant consideration in terms of performing injections

with guidance are CT guidance or MRI guidance, but these are highly expensive and cost-prohibitive in a normal routine rheumatology practice. Also, they require more preparation and longer visits on the part of the patient. Additionally, using ultrasound guidance instead of fluoroscopy avoids irradiating the patient and medical personnel involved in the procedure.

Ultrasound guidance for injection of medium joints and larger joints such as the knee or the shoulder is also important in terms of finding the appropriate depth and in guiding the needle. For example, injection of the knee itself can be difficult unless the needle is inserted specifically into the joint space inferior to the patella and at a depth that avoids injuring the meniscus. Meniscal injury is very common with such injections when performed blindly. When using steroids, and particularly with Hyalauronic acid type injections, the insertion of a needle into the meniscus resulting in injection of the medication into cartilage can cause damage. Unless one can visualize the needle, such mal-delivery is far more likely. The only way to inject in a safe, medically effective and cost effective mode is through ultrasound guidance. Similarly the knee joint can require other types of injections that should be directly assessed. For example infrapatellar bursitis or anserine bursitis or other types of bursitis including iliotibial bursitis, need to be identified. When injecting into the bursitis, it is important to avoid touching or inserting the needle directly into the bony surface which can also lead to periosteal injuries. Injections surrounding the medial or lateral collateral ligament should only be performed when the needle is visualized during the procedure. Aspiration of fluid from the knee can only be achieved accurately via ultrasound guidance because of the painful nature of this procedure and since blind aspiration can lead to traumatic fluid infiltration associated with bleeding. Such a side effect is not only uncomfortable for the patient, but the results of the fluid draw will be masked by the amount of blood mixed in the fluid. In other words, hemorrhagic fluid is much less common with ultrasound guided techniques than it is with blind aspiration. Guidance allows avoidance of aspirating the suprapatellar bursa rather than the knee joint itself, thus avoiding cartilage injury and injury to other structures such as the ligament based on the ultrasound diagnostic findings. This can only be achieved via ultrasound guidance since the depth of the suprapatellar bursa is never precisely known. Fluid can be aspirated with blind injection, but there is a higher risk of causing blood vessel injury leading to traumatic type fluid with hemorrhage in it, and invasion of other structures as noted above.

The hip can be approached via the trochanter, which is a very important structure, and should be approached while avoiding the joint surface itself. This can help in terms of long-term and short-term complications. Long-term complications from injecting steroids into the hip joint itself can cause either avascular necrosis or damage to the cartilage with secondary osteoarthritis. Therefore, proper injecting into the trochanteric bursa while avoiding injection into the hip can only be ensured when the needle is inserted knowing the depth and the location of the bursa. The trochanteric bursa is not uniform in position; therefore, it can be localized either supra laterally or infra laterally. It is important to localize it before injection and while guiding the needle into the dorsal space.

It is also indicated that injections into the sacroiliac joints should be given under ultrasound guidance because of the depth of the joint and the fact that nerve injury can be avoided through ultrasound visualization. The sacroiliac joint may be in close proximity to the sciatic nerve, and it can be avoided by not only localizing the needle away from the nerve, but also by knowing the depth and the location of the needle. The ankle joint is a more complex joint than most. Similarly the elbow joint is anatomically more complex. The ankle joint is associated with the subtalar joint as well as the ankle joint itself. Also, there are various tendons in this area, and the tarsal nerve also transverses this area; therefore, many different types of diseases or conditions can affect the ankle. The elbow joint can also be affected by multiple conditions including those of the lateral epicondyle, which can include epicondylitis involving the common extensor tendon as well as median epicondylitis leading to involvement of the common flexor tendon. Again, knowledge of the anatomy as well as important landmark identifications and localization of the pathology via ultrasound, along with directing the needle via ultrasound guidance, can help avoid nerve injuries and direct the needle around a tendon sheath, if needed, rather than into the tendon itself. Inadvertant injection of the tendon itself could lead to tendon injury and perhaps permanent damage.

Even the small toes or the MTPs should also be considered complex because of the nature of the MTP joint, and also because Morton's neuroma can develop in these areas. Injections surrounding nerves such as those for interdigital neuromas, or the carpal tunnel area surrounding the interdigital nerve or the median nerve, can only be achieved when the needle is inserted in the area surrounding the nerve rather than into the nerve itself.

Ultrasound technique can help in not only alleviating the patient's symptoms and giving the patient relief, but also can help in terms of avoiding permanent nerve injury.

Enclosed are references to help in your determination of the medical importance of the technique and indications that relate to the discussion above. Although all of the attached reference text is relevant to those performing these procedures, I have highlighted areas I feel are particularly relevant to quality of care as it relates to safety, efficacy, and longevity of therapeutic effect. Not least among the benefits is comparative cost efficacy due to the factors cited.

In summary, it is important to note that ultrasound guidance is a safe and effective method in terms of injecting the area of interest without causing damage, while maintaining accuracy and providing comfort for a patient receiving the injection. Blind insertion can lead to manipulation of the needle in different directions until the injection is performed. Even then, there is a near 50% chance it may be in the wrong place, and there is a higher chance of causing injury to different structures around the joints as noted above.