Joint injections are some of the most commonly performed procedures in the orthopedic clinic. With the potential to provide both therapeutic and diagnostic value to patients and providers, many surgeons consider joint injections a valuable clinical tool. The knee and various locations around the shoulder remain the most commonly injected joints due to frequently occurring pathology, relatively superficial anatomic location, and palpable landmarks facilitating accurate injections.

Hip pathology also is encountered frequently in the orthopedic clinic. Historically, hip pathology has been related mostly to degenerative joint disease, the incidence of which is expected to increase.1 Recent developments in hip arthroscopy have led to a significant increase in the number of hip arthroscopies performed annually, many of which are performed for the treatment of femoro-
acetabular impingement (FAI). As these numbers continue to increase, so will the number of patients evaluated in the orthopedic clinic for FAI.

Similar to injections in other joints, intra-articular hip injections have been shown to have both diagnostic and therapeutic value for hip degenerative joint disease and FAI. Unfortunately, “blind” intra-articular hip injections using anatomic landmarks are difficult, with success rates ranging from 60% to 80% in previously published studies. As a result, most hip injections are performed by the orthopedic surgeon in the operating room (OR) using fluoroscopic guidance or are referred to radiology for fluoroscopic or ultrasound-guided injections. This article describes the current authors’ technique and results for ultrasound-guided intra-articular hip injections performed in the orthopedic clinic by either a surgeon or a physician assistant.

**MATERIALS AND METHODS**

After receiving investigational review board approval, this prospective study included all patients who were indicated by orthopedic providers for a diagnostic or therapeutic intra-articular hip injection from March 2014 through May 2014. After patients were referred for an intra-articular hip injection, the study was explained and written consent was obtained. An ultrasound-guided injection then was performed by either a staff orthopedic surgeon or 1 of 2 orthopedic physician assistants. Injections were performed in the provider’s standard clinic or in 1 of the physician assistant’s weekly injection clinics. All injections were performed in the following standard fashion.

The patient was given disposable shorts to wear and instructed to lie in the supine position with both legs extended. The shorts then were cut to expose the inguinal crease. The provider was positioned on the affected side with the ultrasound machine on the contralateral side (Figure 1). A 10-mL syringe was drawn up with 8 mL of 1% lidocaine without epinephrine and was attached to an extension tubing line. A 22-gauge spinal needle then was attached and primed. A second 10-mL syringe was filled with 1% lidocaine without epinephrine, 0.5% bupivacaine, and 60 to 120 mg of triamcinolone for therapeutic injections.

The low-frequency curved transducer was positioned in long axis parallel to the femoral neck, lateral to the femoral neurovascular structures, and just distal to the inguinal crease (Figure 2). Visualization of the head-neck junction was obtained and held. Excess gel was removed, and the injection site was prepped approximately 2 to 3 cm distal to the transducer.

The 22-gauge spinal needle with extension tubing attached was inserted at an angle of approximately 45° to the horizontal skin plane, targeting the head-neck junction. The needle was visualized along its entire path, and 2 to 4 mL of 1% lidocaine was injected along the needle path by the assistant.

After the needle tip was identified within the joint capsule near the head-neck junction, 1 to 2 mL of lidocaine was injected to verify placement by visualizing inflation of the capsule (Figure 3). The assistant then switched syringes while the provider held the needle in place and in view on ultrasound. A mixture of 1 mL of 1% lidocaine and 1 mL of 0.5% bupivacaine was injected while visualizing capsular expansion and intra-articular flow.

If the planned injection was therapeutic, 1.5 to 3 mL of triamcinolone (40 mg/mL) was included. For the purpose of this study, 2 mL of iohexol (Omniopaque; GE Healthcare, Chicago, Illinois) also was included in the injection. This was later increased to 5 mL to improve the ability to clearly visualize the contrast radiographically to determine whether the injection was intra-articular.
Following the injections, a single anteroposterior pelvis radiograph was obtained for all patients. Patient diagnosis, body mass index (BMI), procedural time, and visual analog scale (VAS) score were recorded for each patient. This concluded the patient’s participation in the study.

A senior orthopedic resident, a staff orthopedic surgeon, and a musculoskeletal radiologist reviewed the postinjection radiographs to determine the accuracy of the injection. Each injection was independently classified as clearly intra-articular, clearly extra-articular, or indeterminate. A final determination was assigned to each injection based on collaboration among the 3 independent reviewers, and the results were compared.

RESULTS
Forty-three consecutive patients (25 men and 18 women) underwent ultrasound-guided hip injections. Seven patients underwent bilateral injections for a total of 50 hips injected. Average patient age was 47 years, and average BMI was 29.9 kg/m². Preinjection diagnoses included degenerative joint disease, FAI, labral tear, and hip pain of unknown origin. For 2 of the early study patients, there was no identifiable Omnipaque on their postinjection radiographs. Consequently, the amount of Omnipaque was increased for the remainder of the injections, and these 2 patients were discarded from further comparison, leaving 48 patients for final analysis.

In 46 of the 48 hips, the injections were confirmed to be intra-articular for an accuracy of 96% (Figure 4). One injection was clearly extra-articular with contrast extravasating up the iliopsoas tendon sheath. One injection was indeterminate with contrast surrounding the capsule but not clearly in the capsule; this patient previously had undergone a hip arthroscopy with capsulotomy. The average procedural time was 2.6 minutes, and the average VAS score during the procedure was 1.9. Visual analog scale scores were not recorded prior to or after the injection.

DISCUSSION
Hip pain is a common presentation in the orthopedic clinic and often is diagnosed as hip degenerative joint disease or FAI. The number of patients with these diagnoses can be expected to increase as the incidence and surgical treatment for both are predicted to steadily increase in the next decade. Although surgical intervention will continue to be the definitive treatment, clinic-based injections can aid in the diagnostic process and also provide some level of therapeutic relief.

Intra-articular hip injections have been shown to be of diagnostic value in hip degenerative joint disease and FAI, and of therapeutic value in degenerative joint disease. A retrospective review by Deshmukh et al included 204 patients with atypical hip pain who underwent an intra-articular hip injection for diagnostic purposes. The authors reported a specificity and positive predictive value of 100% along with a negative predictive value of 84.6% for response to subsequent total hip arthroplasty. Of note, a radiologist performed all injections using fluoroscopy.

A prospective study by Ziv et al included 52 patients under consideration for hip arthroscopy for FAI. All of the patients underwent an intra-articular hip injection performed by a radiologist, and patients’ relief after the injection was compared with functional scores recorded 6 months following surgery. The authors reported that a negative response to a hip injection may predict a higher likelihood of a negative result from surgery.

Several studies have shown a short-term benefit to intra-articular hip injections in regard to pain and function when performed in patients with hip degenerative joint disease, and these studies also have shown a limited side-effect profile. Krych et al performed a prospective study of 54 patients in which the therapeutic value of intra-articular hip injections was investigated in patients with FAI. The authors concluded that the injections provided little therapeutic value but did highlight the diagnostic value of hip injections in these patients. These studies indicate significant clinical value in intra-articular hip injections in patients presenting with hip pain.

Blind intra-articular hip injections have been studied with less-than-optimal results. A cadaver study by Leopold et al in 2001 tested both an anterior and lateral approach using palpable anatomic landmarks to guide the injections. The authors reported a 60% success rate using the anterior approach and an 80% success rate using the lateral approach. They also reported that the needle either pierced or was within 5 mm of the femoral nerve in 87% of the anterior injections.

Kurup and Ward used an anterolateral injection technique based on palpable anatomic landmarks in 40 consecutive patients. The authors injected radiographic dye and used fluoroscopy to judge intra-articular location. They reported a success rate of 65%. Ziv et al reported an intra-articular accuracy rate of 77.5% in 40 consecutive patients using a blind direct lateral approach. These studies indicate the requirement for some form of imaging assistance to improve the accuracy and safety of intra-articular hip injections.

Most recently, Masoud and Said reported a 95% success rate using a blind anterolateral injection technique based on palpable landmarks. No data were given.
Regarding patient BMI, and success was based on the anatomic location of the needle under fluoroscopy and not with the use of radiographic contrast. Although these authors had comparable success, the current authors recommend using some form of imaging assistance.

Historically, the use of ultrasound to guide intra-articular hip injections has been reported in the radiology literature. In a 2005 study performed by radiologists, computed tomography was used to determine the location of the needle tip for 30 consecutive ultrasound-guided hip injections; the authors reported a 100% accuracy rate with this technique. In a 2009 study also performed by radiologists, fluoroscopy was used to determine the accuracy of 30 consecutive intra-articular hip injections performed under ultrasound guidance; the authors reported a 97% accuracy rate. No complications were reported in either study.

In the current study, the accuracy rate of 96% is comparable with that reported in the radiology literature. One of the injections was clearly extra-articular, with contrast observed tracking up the iliopectos tendon sheath; it is believed that the needle may have been slightly withdrawn during the injection process. A second injection in a patient with a prior hip arthroscopy with capsulotomy was indeterminate. It is unknown whether the prior capsulotomy may have led to extravasation of injection contrast. However, even with this considered to be a “miss,” the accuracy rate of 96% for the current study is comparable with that reported in the radiology literature and supports the performance of these injections in the orthopedic clinic. The current study is the second study to report on the use of ultrasound-guided hip injections in the orthopedic clinic. Byrd et al recently reported on a large series of hip injections performed by a nurse practitioner. A total of 206 patients underwent hip injections, including a cohort of 50 patients who previously had undergone a fluoroscopic-guided hip injection. They reported a 98% accuracy rate, and 49 of the 50 patients in the previous fluoroscopic-guided injection cohort preferred the ultrasound-guided injection. The advantages of the current study include the use of radiographic contrast to determine accuracy versus visualization of capsular distension via ultrasound, independent evaluation of success by a musculoskeletal radiologist, and the use of multiple providers to perform the injections. However, both studies showed comparable accuracy of hip injections performed in the orthopedic clinic vs radiologist-performed injections and highlight the use of physician extenders to perform the injections.

There are multiple advantages to performing hip injections in the orthopedic clinic. A continuous relationship is maintained between the orthopedic provider and the patient without the requirement for an outside provider. Potential delays associated with referring a patient to a radiology department or scheduling a patient for an open OR date also are avoided. In the current study, 72% of patients had their injections performed either on the same day as the decision to perform an injection or within 6 days. Injections in the clinic allow the OR support staff and OR time to be used more efficaciously, which can help reduce cost as OR time has been estimated to cost approximately $62 per minute.

Performing injections in the clinic also allows immediate feedback to the orthopedic provider regarding symptom relief and facilitates communication for maintenance of a pain diary in the days and weeks following the injection. Finally, performing hip injections in the orthopedic clinic allows the clinic to capture the productivity and financial benefit associated with these procedures. The facility revenue value unit (RVU) in 2015 was 1.72 for an ultrasound-guided hip injection compared with 2.55 for the nonfacility RVU. These RVUs represent lost productivity when these injections are referred to a radiology department.

The current authors’ clinic has established a weekly physician assistant half-day injection clinic to which hip injections often are referred internally. This provides the patients with greater continuity as they do not have to see another provider at a different facility or from a different specialty. It also frees up additional clinical time for surgeons, provides quick referrals for injections, facilitates accurate and efficient injections as they are grouped together, and maintains both continuity and productivity within the orthopedic clinic.

Limitations of the current study include varying levels of experience with ultrasound-guided hip injections among the providers performing the injections. Although the purpose of the study was not to evaluate the number of injections necessary to determine procedural proficiency, provider experience could be considered a limitation. In addition, a single anteroposterior radiograph was obtained without additional views. Orthogonal radiographic views were deferred to limit radiation exposure; however, it is possible that they may have been beneficial for the indeterminate injections.

Conclusion

Intra-articular hip injections have been shown to have diagnostic and therapeutic value in the work-up and management of many patients presenting with hip pain. Either fluoroscopic or ultrasound guidance is recommended to improve accuracy and avoid neurovascular structures. As a result, many orthopedic surgeons either perform hip injections in the OR using fluoroscopic guidance or refer these patients to radiology for the injection. The findings of the current study demonstrate that ultrasound-guided intra-articular hip injections can be performed accurately and safely in the orthopedic clinic by a surgeon or physician assistant with minimal patient discomfort.

References


