

A Novel Approach for Fluoroscopic Guided Intra-articular Hip Injections

Technique Description and Case Series

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Abstract: Fluoroscopic guided intra-articular hip injections generally utilize a standard anterior-posterior view. However, this approach can expose patients to inadvertent femoral nerve or vessel infiltration owing to the proximity of the neurovascular bundle to the joint space. This case-series study describes a novel technique using fluoroscopic ipsilateral oblique angulation and caudal tilt of the image intensifier. With this view, the clinician can advance the needle in a lateral to medial trajectory to obtain intra-articular access and minimize the risk of complications. This method was performed in five patients with refractory chronic hip osteoarthritis, which resulted in notable pain improvements and no reported adverse events. The suggested technique could provide a safer alternative to the anterior-posterior imaging technique for intra-articular hip injections by avoiding the femoral neurovascular bundle, limiting needle repositioning, and offering a satisfactory postprocedural analgesic effect.

Key Words: Pain Medicine, Intra-articular Injections, Fluoroscopy Procedures, Hip Osteoarthritis

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The hip joint is the third most common body part affected by osteoarthritis (OA) after the hands and knees.¹ It is estimated that one in four persons will experience symptomatic hip OA by age 85 yrs.^{2,3} Both intrinsic and extrinsic factors increase the risk of hip OA. Intrinsic factors include joint incongruities such as dysplasia and excessive joint laxity, which cause an abnormal loading on the joint. Extrinsic risk factors include increased body mass index, heavy manual labor, and certain repetitive motions. These multifactorial factors lead to an accelerated rate of degeneration.^{4,5} In addition, hip OA can cause debilitating pain, which in many patients impairs gait and limits independence in activities of daily living.^{4,6}

Available treatment options include weight loss, physical therapy, nonsteroidal anti-inflammatory drugs, intra-articular hip injections, and hip arthroplasty. Intra-articular injections are typically used for OA pain relief if less invasive forms of therapy have failed.⁴ Injecting local anesthetic and corticosteroids

into a degenerative hip joint is a relatively safe and highly effective treatment that provides pain reduction and improvements in range of motion, although typically only for short periods.⁷ Injecting more restorative substances, such as platelet-rich plasma and other regenerative substances, is a promising option still under study.^{8,9}

Historically, fluoroscopic guided intra-articular hip injections have utilized a standard anterior-posterior (AP) view.^{10,11} Figure 1A shows the traditional AP view.¹² However, this approach can expose the patients to inadvertent femoral nerve or vessel infiltration owing to the proximity of the neurovascular bundle to the joint space, as seen in Figure 2. This study describes a novel technique using fluoroscopic ipsilateral oblique angulation and caudal tilt to position the fluoroscope intensifier. In this view, the clinician can advance the needle in a lateral to medial trajectory to obtain intra-articular access to minimize the risk of complications.¹³ This method was performed in five patients with refractory chronic hip OA.

METHODS AND MATERIALS

Fluoroscopic-Guided Technique Description

A scout AP fluoroscopic image of the desired femoral neck is obtained with the patient in the supine position. The fluoroscope image intensifier is then repositioned with approximately 20 degrees ipsilateral oblique angulation and 15 degrees caudal tilt to bring the anterolateral femoral neck into view. This positioning of the C-arm can be seen in Figures 1C and D. Figures 1E and F shows the traditional AP view position. The needle is introduced lateral to the femoral neck and advanced superiorly and medially toward the midfemoral neck to infiltrate the joint capsule. The end-point of the needle tip needs to be either the 6-o'clock position of the base of the femoral head on the femoral neck or the 3-o'clock position. Avoid being medial to the 6-o'clock position or lateral to the 3-o'clock position of the base femoral head on the femoral neck.

With this technique, both the image intensifier and the needle assume a lateral to medial and inferior to superior angle toward the joint in question. The aim is to be safely lateral to the neurovascular bundle until the needle has cleared the bundle and heads underneath the hip joint. Patients were injected with a mixture of local anesthetic (0.2% ropivacaine) and corticosteroid (betamethasone sodium phosphate). Their preprocedural and postprocedural groin pain scores were recorded with the numeric rating scale. Any possible procedural or postprocedural complications, including bleeding, motor, and sensory loss, infections, or injection site pain, were also documented.

Patients

Five patients with symptomatic hip OA underwent the unilateral intra-articular hip injection utilizing the fluoroscopic

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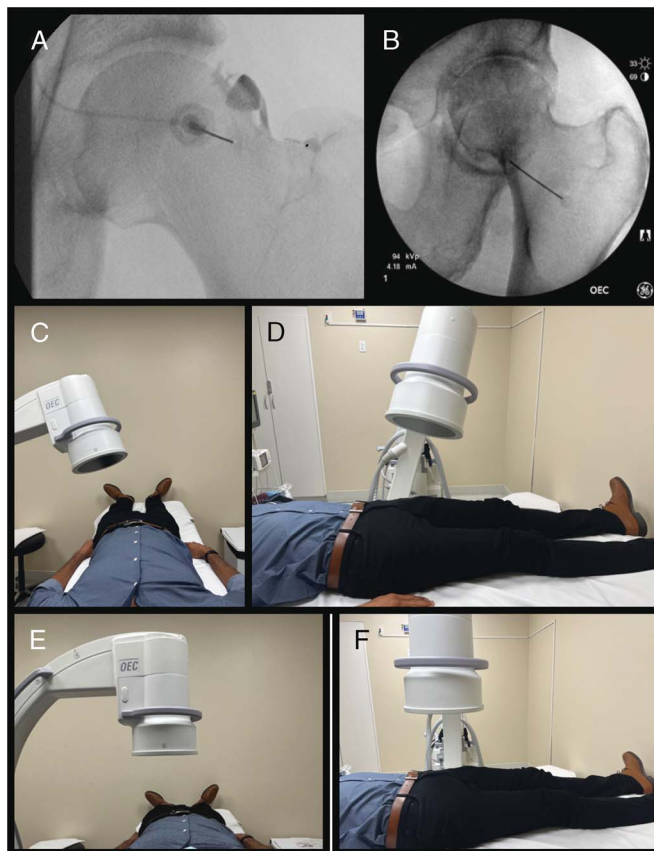


FIGURE 1. A, Traditional AP fluoroscopic view and needle insertion to the right hip joint capsule.¹² B, Ipsilateral oblique with caudal tilt fluoroscopic view of the left hip. A 22-gauge spinal needle has been advanced from an inferolateral insertion to the superomedial position and into the joint capsule. The joint capsule is enhanced with iohexol to confirm needle placement into the joint with iohexol to confirm needle placement into the joint. C and D, Proper C-arm positioning with 20 degrees ipsilateral oblique angulation and 15 degrees caudal tilt when the left hip joint is the target. E and F, Traditional AP view at 0 degrees of oblique angulation and 0 degrees of tilt when the left hip joint is the target.

imaging method described above. The patients had previously tried other less invasive treatment options, such as oral medications and physical therapy, with little relief. A 22-gauge spinal needle was guided from inferolateral to superomedial into the base of the femoral head, entering the joint. The joint access was confirmed with an injection of 0.5 to 1 mL of iohexol 240 mg/mL. Figure 1B illustrates a successful intra-articular

injection utilizing the described method on one of the patients. Then, 3 mL of the solution of ropivacaine and betamethasone was injected. All patients provided oral consent for the publication of this study. This study conforms to all Case Report guidelines and reports the required information accordingly (see Supplementary Checklist, Supplemental Digital Content 1, <http://links.lww.com/PHM/B851>).

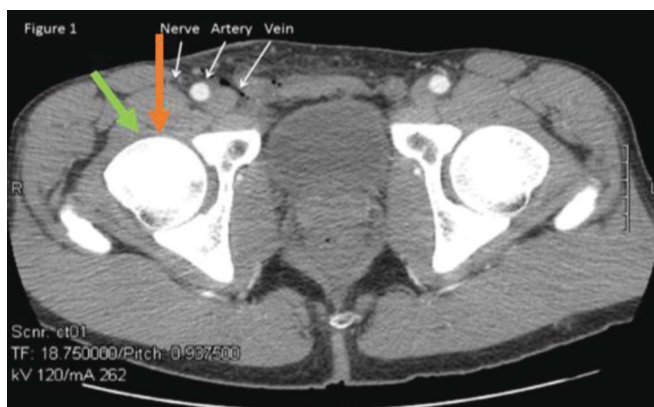


FIGURE 2. CT scan demonstrating the relationship of the femoral nerve, femoral artery, and femoral vein with simulated trajectories of the standard AP guided needle approach (orange arrow) and ipsilateral oblique with caudal tilt guided needle approach (green).¹³

RESULTS

Successful intra-articular access was achieved in all patients via fluoroscopy, as confirmed by infiltration with a contrast agent. Patients reported a mean preprocedural numeric rating scale of 8.6 (out of 10) and a mean postprocedural numeric rating scale of 0.8 at 5 mins after the procedure, suggesting successful intra-articular placement and benefit of the injectate mixture. In addition, no patients experienced the previously stated adverse effects during or after the procedure.

DISCUSSION

To the authors' knowledge, this is the first case-series description of the oblique-caudal approach for fluoroscopic guided intra-articular hip injection and outcome reporting outcomes after this intervention. The advantages of this approach include avoiding the medially located femoral neurovascular bundle and a superior path to the joint capsule that facilitates infiltration while minimizing repositioning of the needle. The authors do not believe either approach is superior in the efficacy for pain reduction as the target location remains the same.

Ultrasound has advantages over fluoroscopy. It is more readily available and affordable, does not expose to radiation, presents soft tissues, and is arguably easier to operate. However, ultrasound has significant disadvantages, which made us choose fluoroscopy when performing this procedure. Specifically, the ultrasound lacks the same amount of beam penetration achieved by a fluoroscope, which is much needed in the case of patients with large body habitus.^{14,15}

Leopold et al. performed intra-articular hip injections using anatomic landmarks on human cadavers to compare the traditional anterior approach with the lateral approach. Although the authors do not recommend either technique without radiographic guidance, their findings support that the traditional anterior approach has a higher risk of intra-procedural complications. The anterior needle approach resulted in an average distance of 4.5 and 13.8 mm from the femoral nerve and artery, respectively. Furthermore, the traditional approach pierced the nerve in 4 of the 15 cases (27%).¹³ The authors propose that this described superior-oblique needle approach under imaging guidance would theoretically increase the likelihood of joint space entry and the safety of the procedure. A chief limitation of this study is the lack of a comparison group to demonstrate the safety superiority of this approach. In this case, an appropriate comparison would be patients treated using the traditional AP

view compared with the suggested approach and noting the complications of both interventions. However, the absence of a comparison group is an inherent risk in case reports and case series. Future studies with a different design could attempt to answer this question.

CONCLUSIONS

The ipsilateral oblique-caudal fluoroscopic view may provide a safer alternative to the AP imaging technique for intra-articular hip injections, avoiding the femoral neurovascular bundle, limiting needle repositioning, and offering equivalent post-procedural analgesic effect.

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REFERENCES

- Pereira D, Peleteiro B, Araujo J, et al: The effect of osteoarthritis definition on prevalence and incidence estimates: a systematic review. *Osteoarthr Cartil* 2011;19:1270–85
- Murphy LB, Helmick CG, Schwartz TA, et al: One in four people may develop symptomatic hip osteoarthritis in his or her lifetime. *Osteoarthr Cartil* 2010;18:1372–9
- Murphy NJ, Eyles JP, Hunter DJ: Hip osteoarthritis: etiopathogenesis and implications for management. *Adv Ther* 2016;33:1921–46
- Aresti N, Kassam J, Nicholas N, et al: Hip osteoarthritis. *BMJ* 2016;354:i3405
- Oliveria SA, Felson DT, Cirillo PA, et al: Body, weight, body mass index, and incident symptomatic osteoarthritis of the hand, hip, and knee. *Epidemiology* 1999;10:161–6
- Kim C, Nevitt MC, Niu J, et al: Association of hip pain with radiographic evidence of hip osteoarthritis: diagnostic test study. *BMJ* 2015;351:h5983
- Dodré E, Lefebvre G, Cockenpot E, et al: Interventional MSK procedures special feature: review article. *Br Inst Radiol* 2016;89:20150408
- Bashir J, Panero AJ, Sherman AL: The emerging use of platelet-rich plasma in musculoskeletal medicine. *J Am Osteopath Assoc* 2015;115:24–31
- Bashir J, Sherman A, Lee H, et al: Mesenchymal stem cell therapies in the treatment of musculoskeletal diseases. *PM R* 2014;6:61–9
- Kruse DW: Intraarticular cortisone injection for osteoarthritis of the hip. Is it effective? Is it safe? *Curr Rev Musculoskelet Med* 2008;1(3–4):227–33
- Yasar E, Singh J, Hill J, et al: Image-guided injections of the hip. *J Novel Physiother Phys Rehabil* 2014;1:39–48
- Subedi N, Chew NS, Chandramohan M, et al: Effectiveness of fluoroscopy-guided intra-articular steroid injection for hip osteoarthritis. *Clin Radiol* 2015;70:1276–80
- Leopold SS, Battista V, Oliverio JA: Safety and efficacy of intraarticular hip injection using anatomic landmarks. *Clin Orthop Relat Res* 2001;391:192–7
- Han SH, Park KD, Cho KR, et al: Ultrasound versus fluoroscopy-guided medial branch block for the treatment of lower lumbar facet joint pain: a retrospective comparative study. *Medicine (Baltimore)* 2017;96:e6655
- Byrd JW, Potts EA, Allison RK, et al: Ultrasound-guided hip injections: a comparative study with fluoroscopy-guided injections. *Arthroscopy* 2014;30:42–6