Clinical outcomes of ultrasound-guided hip joint injection in the treatment of persistent pain after hip arthroscopy

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To the Editor: Arthroscopic hip surgery has developed rapidly over the past decade to become a common technique. Persistent postoperative pain is becoming an evolving domain and may influence the postoperative outcomes.[1] Several methods have been proposed for management of early postoperative pain, for example, femoral nerve block, fascia iliaca block, intra-articular injection, and injection into surrounding soft tissue.[2] However, there are few studies on the management of persistent postoperative pain.

Common causes of persistent pain include under-resected femoroacetabular impingement (FAI), residual labral tear, inflammatory reaction, and recurrent or missed structural pathology.[3] When postoperative inflammatory reaction and adhesion is the cause of persistent postoperative pain, there is likely to be good response to ultrasound-guided injection. The purpose of this retrospective study was to evaluate the efficacy of ultrasound-guided intra-articular injection for treatment of persistent pain in patients undergoing hip arthroscopy at our hospital.

For this retrospective study, we selected 33 patients from among 750 consecutive patients who underwent ultrasound-guided intra-articular injection for treatment of persistent pain after hip arthroscopy between January 2016 and February 2019. The inclusion criteria were (1) patients who underwent arthroscopy in our hospital and had persistent pain after surgery, (2) patients who had ineffective conservative treatment for >3 months, and (3) patients who underwent ultrasound-guided hip joint injection for treatment of persistent pain. Persistent pain was defined as unrelieved or new-onset pain at rest, with activity, or with motion in specific planes after hip arthroscopy with ineffective conservative treatment for >3 months. Patients with prior hip surgery were excluded from this study. The ethics committee of our hospital approved this study (No. 201931802).

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All ultrasound-guided injections were performed by the same radiologist. Ultrasound Examinations were performed as described by Gao *et al*.[4] The puncture site was prepared using povidone iodine solution, and the area was draped. Under real-time ultrasound guidance, a 22-gauge spinal needle was advanced into the hip joint from the anterolateral side to the superomedial side, targeting the anterior surface of the junction of femoral neck and head [Figure 1]. Once the tip of the needle contacted the bone cortex within the anterior recess, the position of the intra-articular portion of the needle was verified by injecting a mixture containing 2 mL of 2% lidocaine and 5 mg of compound betamethasone (Diprospan; Schering-Plough) diluted to 10 mL with normal saline.

Patient-reported outcomes (PROs) were used to assess efficacy of treatment. The modified Harris Hip Score (mHHS), Hip Outcome Score–Sport Specific Subscale (HOS-SSS), and Hip Outcome Score–Activity of Daily Living (HOS-ADL) were recorded at baseline (before injection), at 1 month after injection, and at the final follow-up. The mHHS before primary surgery was also noted. Pain score—assessed using a visual analog scale (VAS)—was recorded before injection, at 10 min after injection, at 1 month after injection, and at the final follow-up. Patient satisfaction with final outcome was documented at the final follow-up. Patients who reported "excellent" or "good" outcomes were classified as the "satisfied" group, and patients who reported "fair" or "poor" outcomes were classified as the "unsatisfied" group.

The two-tailed paired *t* test was used to evaluate the significance of difference between preinjection and postinjection PROs. Continuous variables with a normal distribution in the baseline data between groups were examined using the independent samples *t* test. Percentages were compared using the chi-squared test. $P < 0.05$ was considered statistically significant. Statistical analysis was performed with SPSS 22 (IBM Corp., Armonk, NY, USA).

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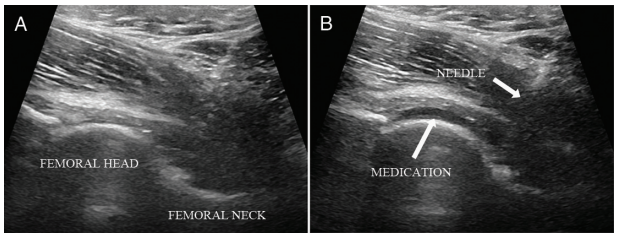

Figure 1: Ultrasound-guided hip injection. (A) Ultrasound image before injection; (B) image after injection. The anechoic area indicated by the white arrow is the injected medication.

A total of 33 patients (19 males and 14 females) in this study had a mean age of 34.9 years (range, 17–53 years). The mean body mass index (BMI) was 23.3 (range, 18.9–29.4) kg/m^2. The mean interval between primary surgery and injection was 10.7 months (range, 3–24 months), and the mean follow-up period after injection was 24.1 months (range, 12–41 months). One patient needed revision arthroscopy after hip injection because of unrelieved pain.

Arthroscopy showed cam impingement in 33 (100.0%) patients, pincer impingement in 25 (75.8%) patients, labral tear in 33.0 (100%) patients, and ischiofemoral impingement syndrome in 1 (3.0%) patient.

There were 2 (6.1%) patients with Outerbridge I or II femoral cartilage damage, 5 (15.2%) with Outerbridge II acetabular cartilage damage, 6 (18.2%) with Outerbridge III acetabular cartilage damage, and 6 (18.2%) with Outerbridge IV acetabular cartilage damage.

The mean VAS pain score was 5.6 ± 1.4 before injection; it was 2.0 ± 1.7 at 10 min after the injection, 3.3 ± 2.1 at 1 month after injection, and 2.4 ± 2.2 at the final follow-up. The mean mHHS was 67.4 ± 8.1 before the primary surgery and 56.4 ± 10.7 before the injection. It improved to 67.3 ± 12.7 at 1 month after injection and further to 76.4 ± 11.7 at the final follow-up. The HOS-ADL improved from a mean of 59.1 ± 8.5 before injection to 69.1 ± 14.7 at 1 month after injection and then to 80.3 ± 14.3 at the final follow-up. The HOS-SSS improved from a mean of 44.2 ± 17.1 before injection to 57.2 ± 23.0 at 1 month after injection and then to 69.6 ± 23.0 at the final follow-up. All changes in scores between time points were statistically significant ($P < 0.05$).

The outcome of ultrasound-guided hip injection was graded as "excellent" by 3 (9.1%) patients, as "good" by 8 (24.2%) patients, as "fair" by 9 (27.3%) patients, and as "poor" by 13 (39.4%) patients. Thus, 11 (33.3%) patients were classified as "satisfied" and 22 (66.7%) as "unsatisfied". The mean BMI was significantly higher in the satisfied group than in the unsatisfied group (25.1 *vs.* 22.0 kg/m^2, $P < 0.05$). The mean age was also significantly higher in the satisfied group (41.1 years *vs.* 31.9 years, $P < 0.05$). The mean mHHS before primary surgery, sex distribution, chondral damage, and interval between surgery and injection were not significantly different between the two groups. VAS, mHHS, HOS-ADL, and HOS-SSS scores were comparable between the satisfied group and the unsatisfied group before injection. However, there were significant differences between the two groups in all four parameters at 1 month after injection and at the final follow-up. At 10 min after injection, the mean VAS was significantly lower in the satisfied group than in the unsatisfied group (1.0 ± 1.0 *vs.* 2.6 ± 1.7, $P < 0.05$). In the satisfied group, there was no statistically significant difference between the VAS at 10 min after injection and at 1 month after injection. However, in the unsatisfied group, the VAS increased significantly from 2.6 ± 1.7 at 10 min after injection to 4.4 ± 1.7 at 1 month after injection ($P < 0.05$).

Persistent pain after arthroscopic hip surgery is usually due to under-resection of FAI, residual labral tear, inflammatory reaction, or recurrent or misdiagnosed structural pathology.[3] Gao *et al*[5] evaluated 21 patients who underwent revision arthroscopy and concluded that misdiagnosed extra-articular impingement, osteoid osteoma, and synovial chondromatosis may also be reasons for revision arthroscopy.

Previous studies have shown that ultrasound-guided hip joint injection is a safe diagnostic and therapeutic method for hip joint pain and also an effective treatment for FAI.[6] Lee *et al*[7] used intra-articular injection of steroid or hyaluronic acid to treat 30 patients with FAI and reported rapid pain relief with steroid and delayed function improvement with hyaluronic acid. In our study, the mHHS, HOS-ADL, and HOS-SSS improved progressively with time after injection. There was significant improvement between preoperative mHHS and at the final follow-up. This proved the effect of surgery and accurate diagnosis. The VAS pain score also showed a significant decrease at the last follow-up. Although there was small increase in VAS at 1 month after injection, it was still significantly lower than the score before injection.

In this study, at final follow-up, 22 (66.7%) patients were unsatisfied with the final outcome. In these patients, the mean VAS score showed a significant decrease at 10 min after injection, indicating that the cause of persistent pain was indeed intra-articular pathology. However, the mean VAS increased from 2.6 ± 1.7 at 10 min after injection to 4.4 ± 1.7 at 1 month after injection. For patients in "unsatisfied" group, injection did not provide sustained effect. Although they have temporally relief after injection, the injection did not solve the problem. In the satisfied group, the VAS at 1 month after injection was not significantly different from the VAS at 10 min after injection, showing the sustained efficacy of injection in this group. One reason for the improvement following injection is that the drug relieved a chronic non-specific inflammatory process that was blocking recovery. Recovery of muscle strength and function rehabilitation is hindered by chronic pain. The ultrasound-guided hip joint injection may help these patients to enter the virtuous stage of functional recovery for a period of time and improve the clinical outcomes finally.

One patient in our study underwent revision arthroscopy 18 months after primary surgery because of unrelieved postoperative pain. Ultrasound examination and magnetic resonance imaging (MRI) before revision surgery did not

identify obvious residual FAI, labral tear, or other pathology. Our patient was found to have labral tear and residual FAI during revision arthroscopy and, therefore, underwent labral repair, femoral osteoplasty, and acetabuloplasty. Other patients in the unsatisfied group may also have had labral tear or residual FAI that ultrasound and MRI could not identify. Intra-articular injection could be considered a diagnostic tool in these patients. Failure to achieve sustained pain relief after injection might be an indication for revision surgery.

It is interesting that older patients and patients with higher BMI were more likely to be satisfied with the outcome of intra-articular injection. Previous studies have also reported that obesity may influence the outcome of hip arthroscopy.[8] Elderly patients and those with high BMI may not be able to achieve satisfactory outcomes after surgery because of difficulties in postoperative rehabilitation. So, ultrasound-guided injection may be relatively more effective in these patients. We also found that the mean VAS at 10 min after injection was significantly higher in the satisfied group than in the unsatisfied group, suggesting that those who show good immediate response to intra-articular injection will have better final outcomes.

Ultrasound-guided hip joint injection would be a feasible treatment method of persistent pain after hip arthroscopy, especially in older patients, patients with higher BMI, and patients who are sensitive to intra-articular injection.

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Conflicts of interest

None.

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