Steroid injection for hip osteoarthritis: efficacy under ultrasound guidance

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See page 1427 for the editorial comment on this article (doi:10.1093/rheumatology/keq081)

Abstract

Objective. To determine the efficacy of IA corticosteroid (CS) injection in pain reduction for hip OA under ultrasound (US) guidance.

Methods. Forty patients [mean age 62.78 (8.16) years] fulfilling ACR criteria for hip OA, with synovitis detected at US, gave their consent for IA US-guided CS injection because of pain refractory to conventional therapy. At baseline, at 1 and 3 months, patients filled up a visual analogue scale (VAS) pain on walking, performed the Lequesne index and were checked by US for synovitis. Results were compared with age-matched controls. The occurrence of side effects both short and long term was monitored.

Results. IA steroid deposition was performed under US guidance. After 1 and 3 months, walking pain VAS was significantly reduced vs baseline (P < 0.001) and had high correlation with Lequesne index. Synovial hypertrophy was reduced in 75% of the hips after 1 and 3 months vs baseline (P < 0.001). In the group of controls, hip walking pain VAS, Lequesne index and synovial hypertrophy were not changed at 3 months vs baseline (P > 0.05). Transient facial rash was present in 16 patients during the first 24–48 h after injection. No side effects were reported.

Conclusion. US-guided steroid injections in hip OA is an efficacious and safe therapeutic approach to achieve pain control and reduction of synovial hypertrophy avoiding the use of X-ray-guided procedure.

Key words: Ultrasound, Steroid, Hip osteoarthritis.

Introduction

Hip OA frequently affects the European population [1, 2]. In hip OA, the physician faces two main problems—pain and disability—that have an impressive impact on the quality of life of patients and in particular on the health system because of the costs involved [3]. Therefore, the management of hip OA has a relevant role in rheumatology practice and the reduction of pain remains the fundamental goal. Hip corticosteroid (CS) injection may be used to reduce hip pain and its practical utility in the management of hip OA has been recently confirmed [4–7].

In the past decade, ultrasound (US) has become a useful tool for the identification of articular and periarticular structural modifications [8–11] and for guiding the needle during IA injections [12–14]. It is used more frequently now in comparison with a fluoroscopic method that may have some limitations represented by the radiological risk and by the impossibility to follow up and recheck the results in the short term [4]. The aim of the present work was to study the efficacy of steroid injection in hip OA under US guidance.

Patients and methods

In 2007–08, 61 patients with hip OA presented to the Rheumatology Department of the Turda County Hospital complaining of chronic hip pain (unilateral or bilateral) refractory to daily administration of conventional therapy (NSAIDs, codeine and paracetamol) in the previous 2 months. Patients were classified with primary hip OA according to ACR criteria, including radiological grading [1, 15]. None of the patients had prior exposure to hip IA
CS injection. Baseline clinical assessment was made by measuring walking pain intensity on visual analogue scale (VAS) (0–10 cm), Lequesne algofunctional index [16] and followed up by US hip evaluation (General Electric Logic 4, linear probe, 5–7.5 MHz), grey scale and power Doppler (PD) in a comparative bilateral protocol [8–11]. Sixty-six hips had US-detected synovitis, defined as synovial hypoechoic hypertrophy or effusion (or both) measured as an increase of the distance neck–capsule (DNC) >8 mm, >2 mm side difference, with possible positive PD signal in the synovial tissue [8, 11, 16]. These hips, according to routine practice, were chosen to receive CS IA injection. Patients were informed about the injection procedure (and conform to standards currently applied in Romania) and gave their written consent. Patients who were candidates for hip arthroplasty, with uncontrolled high blood pressure, congestive heart failure New York Heart Association Class IV and those receiving anti-coagulants were excluded.

In hips where joint effusion was detected, it was aspirated using a hand-free US-guided anterior longitudinal approach technique with an 18-gauge needle and the fluid was cultured to rule out septic coxitis. We repeated the measurements of DNC in each of the aspirated hips before starting CS injection. After receiving negative culture results, 40 patients [28 women and 12 men; mean age 62.78 (8.16) years], a total of 45 hips, consented to IA CS injection, whereas the remaining 21 patients [all women; mean age 65.21 (4.15) years, 21 hips] refused the CS injection and were followed up as controls.

In 45 hips, IA US-guided steroid injection (betamethasone 8 mg, lidocaine 1% 2 ml and 0.5 ml air) was performed in an anterior longitudinal approach, hand-free technique. The access to the joint cavity was detected and the needle tip (a 22-gauge spinal needle) was guided, using the head–neck junction as target. Objective confirmation criteria of proper needle placement were obtained by the identification of needle tip–bone contact followed by millimetric retraction, distension of joint capsule while injecting and visualization of the echogenic bubbles generated by the injected substance (Fig. 1). Immobilization after injection was not necessary. Patients were advised to avoid effort and mechanical stress in the hip area, to avoid prolonged orthostatic position and to follow a hyposodic diet in the following 3 days with serial measurement of blood pressure.

Anti-inflammatory drugs had to be stopped before the procedure and were not allowed during the follow-up. We used the same evaluation protocol after 1 month for patients and at 3 months for both patients and controls. Treatment with oral glucosamine and chondroitin sulphate was allowed. Technique incidents and side effects of medication were monitored.

Statistical analysis

Statistical analysis was performed with the Wilcoxon test for analysis inside the groups and the Mann–Whitney test for analysis between groups; significance was established at <0.05. Pearson’s correlation coefficient was used to determine possible correlations between clinical or clinical and US parameters.

Results

At baseline, 66 hips (45 hips of the patients and 21 hips of the controls, disease onset >10 years) presented with similar clinimetric parameters, X-rays (OA identified as degree 3 according to Kellgren–Lawrence scale) and following US findings: hypoechoic synovial hypertrophy and thickening of the joint capsule [mean 2 (0.39) mm] in all hips and small joint effusion (<0.6 ml per joint) in 18 hips (27.27%) (12 in patients and 6 in controls). In patients, PD baseline evaluation showed grading 1 [17] in 12 hips (26.66%) all with effusion and 33 hips (73.33%) without PD signal and no effusion. In controls, 5 of 6 hips had PD grading 1, which also had joint effusion. Aspirated SF culture was negative in all 18 hips. Criteria for correct needle placement were obtained in 100% of the injected hips. After lidocaine and steroid joint injection, rapid pain reduction was obtained in all patients allowing prompt differential diagnosis between true joint pain and referred hip pain.

Table 1 shows the characteristics of the clinimetric parameters and US measurements. Walking pain (VAS) was significantly reduced after 1 and 3 months (P < 0.001) in CS-treated patients, whereas no statistical difference was obtained in controls.

In CS-treated patients, the statistical analysis showed a strong correlation between VAS and Lequesne index from baseline to 3 months (Pearson’s correlation coefficient = 0.92; P < 0.001). In controls, at baseline, values of Lequesne index were similar to those of CS-treated patients (Mann–Whitney test, P = 0.263), but significantly different at 3 months due to persisting intense pain (Mann–Whitney test, P < 0.001).
TABLE 1 Clinimetric and US parameters for hips: patients and controls

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>1 month</th>
<th>3 months</th>
<th>P (1 month/3 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mVASp (75%)</td>
<td>8.17 (0.86)</td>
<td>2.77 (0.79)</td>
<td>3.66 (0.79)</td>
<td>&lt;-0.001/-0.001</td>
</tr>
<tr>
<td>mVASp (25%)</td>
<td>8.0 (0.7)</td>
<td>2.7 (0.68)</td>
<td>3.56 (0.79)</td>
<td>&lt;-0.001/-0.001</td>
</tr>
<tr>
<td>mVASc</td>
<td>8.6 (1.1)</td>
<td>3 (1.1)</td>
<td>4 (0.77)</td>
<td>&lt;-0.001/0.003</td>
</tr>
<tr>
<td>mLeq index p (25%)</td>
<td>7.66 (0.79)</td>
<td>–</td>
<td>7.02 (0.53)</td>
<td>&lt;-0.202</td>
</tr>
<tr>
<td>mLeq index p (75%)</td>
<td>7.36 (0.74)</td>
<td>1.7 (0.5)</td>
<td>2.61 (0.49)</td>
<td>&lt;-0.001/-0.001</td>
</tr>
<tr>
<td>mLeq index p</td>
<td>7.4 (0.7)</td>
<td>1.6 (0.6)</td>
<td>2.53 (0.51)</td>
<td>&lt;-0.001/-0.001</td>
</tr>
<tr>
<td>mLeq index c (25%)</td>
<td>7.1 (0.7)</td>
<td>1.8 (0.4)</td>
<td>2.91 (0.3)</td>
<td>&lt;-0.001/0.003</td>
</tr>
<tr>
<td>mLeq index c (75%)</td>
<td>7.52 (0.81)</td>
<td>–</td>
<td>6.81 (1.33)</td>
<td>&lt;-0.263</td>
</tr>
<tr>
<td>mDNC p (75%)</td>
<td>8.81 (1.33)</td>
<td>7.65 (0.91)</td>
<td>7.66 (0.86)</td>
<td>&lt;-0.001/-0.001</td>
</tr>
<tr>
<td>mDNC p (25%)</td>
<td>8.9 (0.6)</td>
<td>8.8 (0.6)</td>
<td>8.84 (0.72)</td>
<td>0.028/0.143</td>
</tr>
<tr>
<td>mDNC c</td>
<td>9.39 (0.99)</td>
<td>–</td>
<td>8.59 (0.55)</td>
<td>&lt;0.54</td>
</tr>
</tbody>
</table>

mVASp: mean VAS (cm) in patients; mVAS c: mean VAS in controls; mLeq index p: mean Lequesne index in patients; mLeq index c: mean value Lequesne index in controls; mDNC p: mean distance neck-capsule on US (mm) in patients; mDNC c: mean distance neck-capsule on US in controls; 75%: subgroup 75%; 25%: subgroup 25%. Data are presented as mean (s.d.).

Baseline US findings did not differ between the patients and controls and after 1 and 3 months from CS injection, regression of capsule distension was evident in 34 hips (75%), including those with positive PD. In these 34 hips (subgroup 75%), at baseline, the mean DNC was 8.81 (1.33) mm after 1 month it was reduced to 7.66 (0.91) mm (P < 0.001) and remained stable after 3 months [7.66 (0.86 mm); P < 0.001 vs baseline]. In the remaining 11 hips (subgroup 25%), the DNC was not reduced to normal range and distension of capsule persisted >8 mm and >2 mm side difference, despite the significant reduction of walking pain, which was highly correlated also with Lequesne index improvement. In subgroup 25%, DNC was significantly different vs baseline at 1 month (Wilcoxon test, P < 0.001), whereas this result was not maintained at 3 months (Wilcoxon test, P < 0.143).

During the follow-up, neither PD signal nor joint effusion was detected in CS-treated hips. Transient facial rash was present in 16 patients during the first 24–48 h after injection. No side effects were registered due to the injection technique or during follow-up and no patient developed septic arthritis.

Discussion

Our data show that US-guided CS and lidocaine hip injection rapidly reduce pain on walking and Lequesne index in hips with synovitis and that this effect lasts up to 3 months. This result was observed both in hips with positive and negative PD detection and this finding may suggest the fact that in practice it might be possible to underestimate the level of activity in synovial tissue. It is known that Doppler-mode examination of the hip is difficult with a limited PD window, and that different US machines have different detection sensitivity of very low blood flow at the synovial level. Moreover, we observed also a higher detection sensitivity of PD signal in the same joint and same settings of the machine after aspiration of joint fluid probably due to local decompression.

In practice, the treatment of the hip joint is a challenge for the physician, because a non-US-guided injection is often inaccurate [18]. Hip IA injections performed under fluoroscopic guidance, which achieve an accuracy of IA deposition of 100%, are expensive procedures, burdened by radiological risks, are time consuming and do not allow frequent follow-up [4, 5, 14, 19].

In the past decade, US has become increasingly used in rheumatology practice for repeated joint evaluation and guided IA injections [2, 13, 20, 21]. In OA, IA CS injection [22, 23] reduces pain and disability, as shown in four randomized, placebo-controlled trials and in one retrospective study. Flanagan et al. [14] treated 36 patients, on a waiting list for arthroplasty, with placebo vs triamcinolone (20 mg) injection on fluoroscopy. Improvement of pain was present in the first month, but with a rapid decline up to the third month in all patients [14]. Kullenberg et al. [19] treated 80 patients, on waiting list for arthroplasty, in a placebo-controlled study with IA triamcinolone (80 mg) on fluoroscopy, and obtained pain reduction at 3 weeks, maintained after 3 months with an increase in the range of motion in all patients receiving steroid. In a placebo-controlled vs IA triamcinolone (40 mg) fluoroscopy-guided study, Lambert et al. [5] detected, in 52 patients, a beneficial effect lasting up to 3 months, with modest results in severe OA (only 9% had pain reduction) but with good and very good efficacy in 58% of the patients with moderate OA and in 90% with mild OA [5]. In a randomized controlled trial on 101 patients, Ovistgaard et al. [6] obtained a significant and 28-day reduction of pain on walking in 66% of the patients with moderate OA (with 40 mg methylprednisolone IA injection guided by US). The presence of hip joint effusion was associated with a better clinical response [6], Margules [4] injected 510 patients, using a fluoroscopy-guided technique, with 80 mg triamcinolone, obtaining pain relief lasting for 8 weeks. The best results
were obtained in 75% of the patients with mild and moderate OA compared with 20% of the patients with severe OA [4].

Our data confirm that IA CS injection reduces hip pain in OA with US-confirmed synovitis. The use of strict criteria for IA placement of the needle may assure a safe and efficacious procedure. In our cases, the prompt reduction of pain was probably due to lidocaine, whereas the maintenance of the result in the next weeks was likely due to the effect of CS. This result spared not only chronic exposure to, and side effects of, NSAIDs, but also reduced the risk of accelerated cartilage breakdown triggered by the persistent synovitis. IA CS injection may also have protective effects on cartilage, potentially slowing cartilage fibrillation and osteophyte formation as previously suggested [24].

Our results are in agreement with previous work reported in the literature, but the work has some limitations because it is not a randomized controlled trial and results derive from routine practice, the number of patients is not extensive and no other imaging technique for comparison of soft tissue hip evaluation was available.

In conclusion, our results confirm CS utility in reducing and controlling pain and synovitis in hip OA and suggest that hip CS injection can be safely performed under US guidance. The US IA guiding technique has an important practical advantage because it is non-radioactive, safe, easy and rapid to perform at the bedside allowing the physician to choose the best treatment [25, 26]. The use of US by practitioners for diagnostic assessment and for invasive use is highly warranted to lower the cost of hip OA management.

**Rheumatology key messages**

- IA steroid injection is efficacious in treating pain and inflammation in hip OA.
- The success of the treatment is linked to the accuracy of IA deposition.

**Disclosure statement:** The authors have declared no conflicts of interest.

**References**

