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Outcomes after fluoroscopy-guided iliopsoas bursa injection for suspected iliopsoas tendinopathy

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Abstract: **OBJECTIVES:** To report patient outcomes up to 1 month after fluoroscopy-guided iliopsoas bursa injection for suspected iliopsoas tendinopathy. **METHODS:** Thirty-nine consecutive patients (mean age 45 years; range 15-77) who underwent fluoroscopy-guided therapeutic iliopsoas bursa injection using an anterolateral approach and who returned an outcomes questionnaire were prospectively included. The Patients' Global Impression of Change (PGIC) scale was recorded 1 day, 1 week, and 1 month after the injection (primary outcome measure). Patients' subjective pain level data were collected prior to the injection (baseline) using a numeric rating scale (NRS; 0 = no pain; 10 = maximum pain). NRS scores were completed 15 min, 1 day, 1 week, and 1 month post-injection and compared to baseline. **RESULTS:** Forty-nine per cent of patients reported clinically relevant 'improvement' (PGIC) 1 month post-injection. Mean NRS score prior to injection was 5.9 ± 2.1 . Mean NRS scores after 15 min (3.6 ± 2.7), 1 day (4.4 ± 2.7), 1 week (3.4 ± 1.9), and 1 month (3.5 ± 2.5) were statistically significantly lower ($p = 0.001$) compared to baseline. Reduction of NRS 50 % after 15 min was achieved in 49 % (56 % of those unimproved at 1 month). **CONCLUSIONS:** Fluoroscopy-guided iliopsoas bursa injection leads to a relevant 'improvement' at 1 month or significant pain reduction after 15 min in most patients.

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Abstract

Objectives To report patient outcomes up to 1 month after fluoroscopy-guided iliopsoas bursa injection for suspected iliopsoas tendinopathy.

Methods Thirty-nine consecutive patients (mean age 45 years; range 15–77) who underwent fluoroscopy-guided therapeutic iliopsoas bursa injection using an anterolateral approach and who returned an outcomes questionnaire were prospectively included. The Patients' Global Impression of Change (PGIC) scale was recorded 1 day, 1 week, and 1 month after the injection (primary outcome measure). Patients' subjective pain level data were collected prior to the injection (baseline) using a numeric rating scale (NRS; 0 = no pain; 10 = maximum pain). NRS scores were completed 15 min, 1 day, 1 week, and 1 month post-injection and compared to baseline.

Results Forty-nine per cent of patients reported clinically relevant 'improvement' (PGIC) 1 month post-injection. Mean NRS score prior to injection was 5.9 ± 2.1 . Mean NRS scores after 15 min (3.6 ± 2.7), 1 day (4.4 ± 2.7), 1 week (3.4 ± 1.9), and 1 month (3.5 ± 2.5) were statistically significantly lower ($p \leq 0.001$) compared to baseline. Reduction of NRS ≥ 50 % after 15 min was achieved in 49 % (56 % of those unimproved at 1 month).

Conclusions Fluoroscopy-guided iliopsoas bursa injection leads to a relevant 'improvement' at 1 month or significant pain reduction after 15 min in most patients.

Key points

- Fluoroscopy-guided iliopsoas bursa injection is a safe procedure.
- Most patients had a diagnostic or therapeutic benefit from the injection.
- The anterolateral approach may reduce the risk of damage to the neurovascular bundle.
- The procedure is eligible for patients with and without total hip arthroplasty.

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Keywords Fluoroscopy · Injections · Hip · Tendinopathy · Patient outcome assessment

Abbreviations

PGIC Patients' Global Impression of Change
NRS Numeric rating scale

Introduction

Hip pain occurs in patients with and without total hip arthroplasty (THA) and involves a wide range of differential diagnosis. One differential diagnosis is iliopsoas tendinopathy. In patients with painful THA, iliopsoas tendinopathy was reported

as the source of pain in 4.3 % [1, 2]. It can be caused by mechanical irritation on a malpositioned acetabular cup with an overhanging anterior edge due to reduced anteversion [3] or a large femoral head component in metal-on-metal hip replacements [4]. In patients without THA, iliopsoas tendinopathy was described in overuse injuries in athletes [5], in the context of rheumatoid arthritis [6], in posttraumatic conditions [7], in the presence of anterior osteophytes at the acetabulum [8], and in case of an internal snapping hip [9], and it may be associated with isolated anterior labral tears [10, 11].

Patients with iliopsoas tendinopathy complain about anterior hip pain during active hip flexion [10]. This typically occurs while getting out of the car or bed. In the clinical examination, this pain is reproducible, and there is tenderness centrally in the groin. Initial conservative treatment options are stretching [12] of the iliopsoas muscle and diagnostic and/or therapeutic iliopsoas bursa injections [13]. If conservative treatment fails, surgical options are iliopsoas tendon release or if applicable a causal surgery (e.g. revision of a malpositioned acetabular cup) [14, 15].

For iliopsoas bursa injections different techniques have been described: fluoroscopy guided [16, 17], ultrasound guided [9, 13], and CT guided [2]. The fluoroscopy-guided iliopsoas bursa injection technique and outcome have been reported only in patients with THA [17].

The aim of this study was to report outcomes of fluoroscopy-guided iliopsoas bursa injections up to 1 month in patients with and without THA with suspected iliopsoas tendinopathy.

Materials and methods

Patients

The study was approved by the hospital and county ethics committees. From September 2009 to July 2014, a total of 112 consecutive patients with suspected iliopsoas tendinopathy referred for therapeutic iliopsoas bursa injection were prospectively included in the study. Written informed consent was obtained from all patients prior to the injection. In cases of patients with repeated referrals for infiltration, only the outcome of the first injection was included in this study. Seventy-three (65 %) of these were excluded because they did not return the outcome questionnaire (see Outcome Assessment) – leaving 39 patients (27 female and 12 male, mean age 45 years; SD±17, range 15–77) for data analysis. Fourteen of the 39 (36 %) patients had a hip prosthesis on the side of injection.

Injection technique

Preparation and Positioning: All injections were made on a fully digital fluoroscopy system (Ultimax or Ultimax-i, Toshiba

Medical Systems, Tokyo, Japan). A technician prepared a small sterile working table with the needed material and medications. The patient was placed in the supine position on the fluoroscopy table. The side of puncture was slightly elevated (about 20°) using a foam material wedge under the pelvis and thigh in order to turn the needle pathway away from the neurovascular bundle (Fig. 1). A technician adjusted the vertical X-ray with a small field of view.

Injection: As in all injections, sterile conditions were mandatory including the use of a surgical mask (for both radiologist and patient), sterile gloves, and a threefold disinfection of the skin in the area of puncture. Finally, the injection site was covered with a sterile fenestrated cover. Prior to the injection, the common femoral artery was palpated. A 20-G needle with 0.9×70 mm was placed on the skin to verify the puncture site using a brief fluoroscopy. The target zone was the centre of the superior acetabular roof for patients without and with hip prosthesis (Fig. 2). After positioning in the skin, vertical needle position was verified using fluoroscopy. The needle was advanced until the tip of the needle reached the acetabular bone. Correct needle position was confirmed by longitudinal spread (Fig. 3) of a small amount of injected contrast agent (~2 ml, Iopamiro 200 or Iopamiro 300 in patients with an acetabular cup; Bracco Suisse SA, Manno, Switzerland) under live fluoroscopy. A single-shot radiograph was taken for documentation. Finally, 1 ml of a crystal suspension of triamcinolone acid 40 mg/ml was injected, followed by 5 ml of lidocaine 2 %. Observation for a potential distribution of contrast agent into the hip joint indicating a communication of the iliopsoas bursa with the hip joint was done. The needle was retrieved and a small sticking plaster was applied.

Outcome assessment

A questionnaire was handed out to all patients on the occasion of the injection. A general statement concerning the patient's overall functional status in relation to the area of injection was obtained using the Patient's Global Impression of Change scale (PGIC) [18]. In this scale the patient has to answer the following question: How are you feeling compared to before the infiltration (discomfort, emotional state, everyday restrictions, quality of life)? The PGIC is a categorical 7-point scale with the following options: "much better", "better", "slightly better", "no change", "slightly worse", "worse", and "much worse". The patient's PGIC answers were categorised in the following groups: clinically relevant improvement ("much better", "better"), no change ("slightly better", "no change"), and worsening ("slightly worse", "worse", and "much worse"). This was the primary outcome measure.

The numeric rating scale (NRS) to evaluate pain levels of the injected region was used. The NRS is an 11-point scale

Fig. 1 Illustration of needle position depending on patient positioning. **a** The supine position without elevation of the puncture side shows close proximity of the needle with the femoral nerve. **b** With elevation of about 20° the needle pathway is lateralised with increased distance from the femoral nerve

from 0 to 10 (0 = no pain, 10 = worst possible pain). The patient's NRS score was assessed prior to and 15 min after the injection by a technician. The patient received a questionnaire to report the PGIC and NRS score 1 day, 1 week, and 1 month

after the injection. The patient was asked to return the questionnaire using a postage-paid and addressed envelope 1 month after the injection. There were no additional reminders to the patient to fill out the questionnaire or to send it back.

Fig. 2 Illustration of target zone for iliopsoas bursa injection. **a** Three-dimensional model of Iliopsoas muscle and tendon and relationship with the iliopsoas bursa. **b** A 68-year-old woman with suspected iliopsoas tendinopathy. *Blue area* = target zone for injection. *Black line* (*white arrowhead*) = anterior border of the acetabulum. Longitudinal contrast agent distribution (*black arrow*) along the iliopsoas tendon indicates correct placement. **c** A 52-year-old woman with hip prosthesis and hip pain with clinically suspected iliopsoas tendinopathy. *Blue area* = target zone for injection. Needle tip is not visible because of the acetabular cup

Fig. 3 Normal appearance of longitudinal contrast agent distribution along the iliopsoas tendon with and without hip prosthesis. **a** A 68-year-old woman with clinically suspected iliopsoas tendinopathy on the right side. Radiograph demonstrating the optimal needle position and longitudinal distribution of contrast agent along the iliopsoas tendon

(black arrows). **b** A 44-year-old woman 6 years after total hip arthroplasty of the left hip with medial groin pain and clinically suspected iliopsoas tendinopathy. Radiograph demonstrating longitudinal distribution of contrast agent (black arrows) cranially along the iliopsoas tendon

PGIC and change in NRS were compared between patients with and without hip prosthesis. The written reports from all injections were evaluated in regards to the described immediate and (if reported) late complications.

Statistics

The data were analysed using a statistics programme (IBM SPSS Statistics, version 21). Besides descriptive statistics, the proportion of patients reporting clinically relevant ‘improvement’ (primary outcome) was calculated as well as the percentage of ‘unchanged’ or ‘worse’. Primary outcome (clinically relevant ‘improvement’) between patients with and without hip prosthesis was analysed using a chi-squared test.

Baseline NRS scores were compared to the NRS scores 15 min, 1 day, 1 week, and 1 month after the injection using the Wilcoxon signed rank test. The correlations between the NRS scores at 15 min and the NRS scores at 1 day, 1 week, and 1 month after the injection were analysed with the Spearman rank order correlation. As suggested by Cohen, $r=0.50$ to 1.0 indicates a large correlation, $r=0.30$ to 0.49 indicates medium, and $r=0.10$ to 0.29 indicates a small correlation [19]. NRS change scores from baseline were calculated for 15 min, 1 day, 1 week, and 1 month with positive values indicating pain reduction. The differences in NRS change scores between patients with and without hip prosthesis were calculated using an unpaired t -test (after testing for normal distribution using Q-Q plots). Reduction of the NRS ≥ 50 % after 15 min was counted a positive diagnostic test, confirming the iliopsoas tendon as the source of pain. A p -value <0.05 was considered statistically significant.

Results

A fluoroscopy-guided technique for iliopsoas bursa injection was described using an anterolateral approach. All of the patients received a combined injection of anaesthetic and corticosteroid. No communication between the iliopsoas bursa and hip joint was observed. Only one minor complication with an urticaria-like reaction was reported with a delay of 2 days in a 26-year-old female patient. No major complications were recorded.

Details of the PGIC scale are listed in Fig. 4. After 1 day, 9/39 (23 %) patients showed a clinically relevant improvement on the PGIC scale (“much better” or “better”). The majority of patients (22/39, 56 %) showed no change (“slightly better” or “no change”), and 8/39 (21 %) felt worse (“slightly worse”, “worse”, and “much worse”). After 1 week, 16/39 (41 %) patients showed a clinically relevant improvement on the PGIC scale, 20/39 (51 %) showed no change, and only 3/39 (8 %) felt worse. After 1 month, 18/37 (49 %) (missing data from 2 patients who did not answer the PGIC for this time point) still stated a clinically relevant improvement, 13/37 (35 %) unchanged, and 6/37 (16 %) felt worse. No statistically significant difference in the primary outcome (clinically relevant improvement) between patients with and without hip prosthesis was found ($p=1.0$, 0.705, and 1.0 for 1 day, 1 week, and 1 month respectively).

The mean NRS score prior to the injection was 5.9 ± 2.1 (mean $\pm$ standard deviation). The mean NRS scores after 15 min (3.6 ± 2.7), 1 day (4.4 ± 2.7), 1 week (3.4 ± 1.9), and 1 month (3.5 ± 2.5) were statistically significantly lower compared to the NRS score prior to the injection ($p < 0.0005$ for 15 min, 1 week, and 1 month comparison each and $p=0.001$

Fig. 4 Patient's Global Impression of Change (PGIC) by time after iliopsoas bursa injection. *Figures on top of the bars* are number of patients; time points (1 day, 1 week, 1 month) are post-injection. After 1 week and 1 month, more patients felt "much better" or "better" compared to 1 day after the iliopsoas bursa injection. PGIC data of two patients at 1 month were missing

for 1 day comparison). The slight elevation of the mean NRS score after 1 day compared to after 15 min was not statistically significantly different ($p=0.056$).

The correlation of the NRS scores 15 min after injection with the NRS scores after 1 day, 1 week, and 1 month showed corresponding r values of 0.58 ($p<0.0005$), 0.28 ($p=0.087$), and 0.181 ($p=0.291$) respectively. Thus there was a large and statistically significant positive correlation only between the NRS scores at 15 min and the NRS scores 1 day after the injection.

Mean NRS change scores compared to baseline (positive value=pain reduction) were calculated for 15 min (2.3 ± 2.3), 1 day (1.5 ± 2.6), 1 week (2.5 ± 2.2), and 1 month (2.3 ± 2.9).

The mean value of the NRS change score at 15 min for patients with hip prosthesis (3.5 ± 2.5) compared to patients without hip prosthesis (1.6 ± 2.0) was statistically significantly higher ($p=0.014$). Mean NRS change scores at 1 day (2.3 ± 1.7 with THA and 1.1 ± 2.9 without THA), 1 week (2.3 ± 1.5 and 2.6 ± 2.5), and 1 month (1.9 ± 2.5 and 2.5 ± 3.0) showed no statistically significant difference between the two groups ($p=0.184$, 0.656, and 0.567, respectively).

In total 19/39 (49 %) patients had a NRS reduction ≥ 50 % after 15 minutes. Ten of these 19 patients had no clinically relevant improvement at 1 month. So in addition to the 18 patients with clinically relevant improvement at 1 month, another 10 patients profited at least from a positive diagnostic test, confirming the iliopsoas tendon as the source of pain. In the end 28/39 (72 %) patients had a benefit from the fluoroscopy guided iliopsoas tendon injection with either an improvement at 1 month or a positive diagnostic test.

Discussion

The results of this current study support a significant improvement in overall function, quality of life, and pain at 1 month

post-injection in symptomatic patients with and without THA after fluoroscopy-guided iliopsoas bursa injection of corticosteroid and anaesthetic. Interestingly, more patients showed clinically significant improvement after 1 week and 1 month compared to after 1 day. This finding is consistent with other studies [20] and can be explained by the known short anaesthetic efficacy of lidocaine (up to 5 h, according to the manufacturer's data) and the late onset effect of the applied corticosteroid. So after 1 day, the effect of lidocaine is gone and the effect of triamcinolone is not yet fully established. This could explain the higher mean NRS scores on day 1 compared to 15 min after the injection, although not statistically significantly different (maybe because of the small sample size).

The overall 'improvement' and reduction in pain showed no relevant difference between patients with THA and without THA as both groups reported statistically significantly lower scores post-injection after 1 day, 1 week, and 1 month. Only the NRS change score at 15 min showed a statistically significant difference, with better pain reduction in patients with THA.

To our knowledge, there are no studies comparing the different injection techniques for iliopsoas bursa injections. The choice of guidance depends on availability and experience. In our institution we prefer the fluoroscopy-guided injection technique. Fluoroscopy is less dependent on patient's body mass index (BMI) compared to ultrasound. Documentation for the referring clinician is easier with a radiograph than with ultrasound. The risk of accidental injury of the femoral nerve or vessels is minimised by the elevation of the affected hip by about 20 degrees.

Ultrasound-guided iliopsoas bursa injection with a needle pathway from lateral to medial in an axial plane was described by Adler et al. [13]. Ultrasound has several advantages, including no radiation exposure and direct visibility of the femoral neurovascular bundle. Furthermore, morphologic changes in the iliopsoas tendon can directly be visualised using ultrasound [9].

The iliopsoas bursa is the largest bursa in the human body. It is bilaterally present in 99 % of the population with a length of 5 to 7 cm and width from 2 to 4 cm [21]. It is collapsed in healthy people, but can be enlarged and fluid filled in several conditions such as bursitis. The iliopsoas bursa can have a medial and lateral compartment [22] and septations [23]. The iliopsoas bursa communicates with the hip joint in 15 % of the population [24], with a much higher prevalence in patients with iliopsoas bursitis [23]. In patients with hip prosthesis a communication between the joint and iliopsoas bursa can occur because of capsulotomy [25]. No communication between the bursa and hip joint was found in this study. We explain this by the small amount of contrast agent we used to verify needle positioning and because we kept the fluoroscopy time as low as possible. An iliopsoas bursitis can be associated with hip pathology [23]. In the study of Wunderbaldinger et al., if an iliopsoas bursitis was present, a communication between the bursa and hip joint was detected in all patients [23]. Therefore pain reduction after iliopsoas bursa injection in the presence of a communication cannot distinguish between an internal and external source of hip pain, thus losing specificity.

Dora et al. reported failure of conservative management (stretching and injections) for iliopsoas impingement after THA in all eight patients in their conservatively treated group [14]. They stated that injections into the iliopsoas bursa can be useful for the diagnosis (to verify the source of pain), but has limited value in the long-term management. Nunlay et al. on the other hand considered iliopsoas bursa injections (even repeated injections) as part of the non-surgical treatment in cases of iliopsoas tendinopathy after THA [17]. Adler et al. reported good results in the THA group, where 9 of 11 patients had immediate relief with at least 50 % pain reduction after 1 year [13]. In that same study, in the group of patients without THA, 10 of 28 patients showed no immediate or late improvement—in six out of these ten patients other sources of pain were found [13]. In patients with a snapping iliopsoas tendon a nonoperative approach was assessed by Blankenbaker et al. [9]. After anaesthetic and steroid injection 16 of 18 patients in their study had a good response at an average of 4 months.

Thus patient selection is important. In our opinion the strength of the injection in patients with hip prosthesis is its diagnostic value to confirm the origin of pain. With the additional injection of a corticosteroid, its therapeutic effect should be considered at least once and may be helpful in patients who do not qualify for surgery or refuse surgery. In patients without THA the result of “no improvement” after an injection may help to exclude the iliopsoas tendon as the origin of pain.

This study had limitations. Only 39 of 112 patients returned the questionnaire as no reminders were given to the patients to return the questionnaire. As shown for other musculoskeletal injection sites, non-responders in general have better outcomes

compared to patients returning the questionnaire [26, 27]. It might be partially explained by the urge of unsatisfied patients to complain. On the other hand, patients with good benefit from the injection may forget about the pain and therefore the questionnaire. Therefore we assume that our data may reflect a worse outcome because of this bias. Because this is not a randomised, controlled trial, the results cannot be definitively linked to the therapeutic injection procedure. Another limitation of our study is that the questionnaire only covered the period up to 1 month after the injection, so a statement about long-term results cannot be made. As reported by a randomised controlled trial by Brinks et al. for greater trochanteric pain syndrome, steroid injections had good short-term results after 3 months but not in the long term [28]. Despite the short follow-up in our study, in our opinion the diagnostic value of the procedure and its short-term outcomes are good.

In conclusion, fluoroscopy-guided iliopsoas bursa injection leads to a relevant ‘improvement’ at 1 month or significant pain reduction after 15 min in most patients.

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