

## CONCISE REPORTS

## Placement of intra-articular injections verified by mini air-arthrography

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### Abstract

**Objective**—To develop and assess a simple, inexpensive method for ascertaining the placement of intra-articular injections for knee osteoarthritis

**Methods**—During a one year period patients with “dry” osteoarthritis of the knee who received intra-articular therapy were tested by air-arthrography. Along with triamcinolone and lignocaine (lidocaine), 5 ml of air was injected into the joint. On subsequent lateral and anterior-posterior radiographs a correct placement was verified by a sharply defined shadow of air in the suprapatellar pouch, while extra-articular air was diffusely spread in the surrounding tissue.

**Results**—In 51 of 56 cases the injection was correctly placed. In the remaining five cases the injection was immediately repeated and positioned within the joint. No adverse events were seen that could be ascribed to the use of air during the study, although bleeding in the quadriceps was seen one week after an extra-articular injection.

**Conclusion**—With mini-air arthrography, it is possible to test the placement of intra-articular injections in knee joints. The method is proposed as a learning tool as well as providing a means of quality assurance in studies involving intra-articular injections.

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Some uncertainty has been reported regarding the placement of injections.<sup>1</sup> Arthrography is possible with contrast media, although these have the disadvantage of being rather expensive. Also, this procedure would imply a mixing of several medical substances. Another means of creating a contrast medium for arthrography is by injecting air, which was extensively used in knee joints before the advent of arthroscopy and magnetic resonance imaging.

While injected corticosteroids may have some effect on soft tissue knee pain regardless of intra-articular or peri-articular placement,<sup>2</sup> the glucocorticoid action on the synovium of inflamed joints must be more effective in the case of a direct, intra-articular placement of the injection. With other kinds of intra-articular therapy, for example, viscosupplementation,

ascertaining a correct procedure becomes even more relevant.

This study was undertaken to evaluate a simple method of testing the placement of injections for knee osteoarthritis by adding a small volume of air to the injection.

### Methods

Patients with clinical signs and radiological changes of osteoarthritis (Kellgren score of at least two) were included in the study.

All patients with “dry” osteoarthritis of the knee were evaluated for the study when referred to the outpatients clinic during the study period. In “dry” osteoarthritis no clinically detectable effusion was present. An intra-articular injection of corticosteroid was indicated if (1) an acute and not traumatic deterioration of knee pain had not responded to ordinary treatment with analgesics or non-steroidal anti-inflammatory drugs (NSAIDs) and (2) signs of inflammation (other than effusion) were found, for example, pain along joint margins, or increased skin temperature over the knee.

### CRITERIA FOR EXCLUSION WERE:

Effusion not detected by the clinical examination, but present in aspiration before injection, skin lesions, or infection risks.

A total of 56 treatments were given to 38 patients. Six of the patients were treated bilaterally, and during the observation period 15 patients received repeated injections at intervals of at least three months.

Of the 38 patients eight were men and 30 women. Mean age was 69 years (range 49-91), and mean duration of osteoarthritis symptoms was seven years (1-40).

### INJECTION TECHNIQUE

With the patient in supine position, a needle (gauge 21, 0.8 × 50 mm) was inserted from the lateral aspect of the joint at the superior margin of the patella. After an attempt at aspiration, a mixture of 1 ml triamcinolone, 3 ml lignocaine (lidocaine) 1 per cent, and 5 ml air was injected into the knee. All injections were administered in the Department of Radiology and immediately afterwards, lateral and anterior-posterior radiographs were taken. In the case of extra-articular or uncertain positioning of the air the procedure was repeated. The whole procedure took no more than 10-15 minutes.

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Figure 1 Lateral radiograph of an osteoarthritic knee after injection of 5 ml air. Correct placement of the injected substance in the suprapatellar pouch.

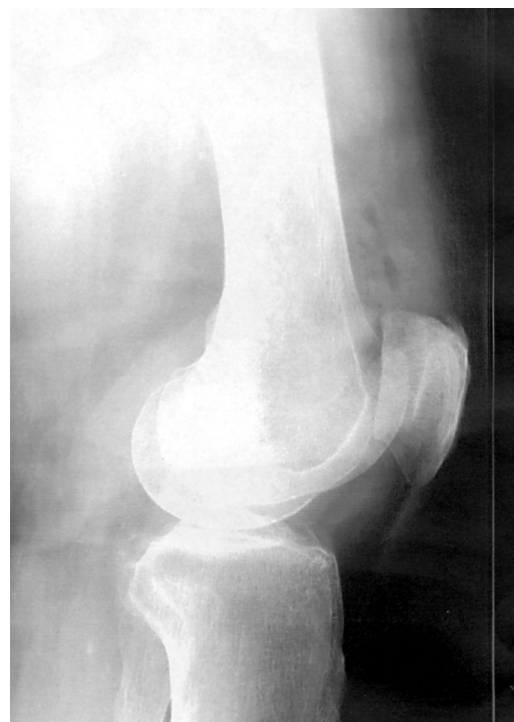


Figure 2 Lateral radiograph of an osteoarthritic knee after injection of 5 ml air. The air is distributed in the soft tissues outside the joint.

The patients were seen after one week, two months and one year after the injections: on these occasions the effect of the treatment was estimated using a visual analogue scale for pain on ambulation and Lequesne-index,<sup>3</sup> and possible adverse events were noted.

The local ethics committee approved the study.

## Results

### ACCURACY

In most cases ( $n=51$ ), the injected air was placed in the suprapatellar pouch (fig 1). However, in five cases (9 per cent, 95 per cent confidence intervals 2 to 16) the injected air was predominantly extra-articular (fig 2), although with the aid of the radiograph, the second injection was positioned correctly.

### EFFICACY

Patients generally reported an immediate alleviation of the knee pain, probably because of the local anaesthetic. In this open study, the VAS and Lequesne index of the patients before and after treatment showed that the effect of the treatment during the first months was quite pronounced. As noted, some patients were treated again in the same joint while others reported a prolonged effect of the injection.

### SAFETY

None of the patients reported a flare up of the joint pain after the procedure. However, one patient had bleeding in vastus medialis m quadriceps within 10 days after a double injection—that is, the first injection was extra-articular.

## Discussion

The general expectancy among specialists was, and still is, that practically all their own

intra-articular injections are placed correctly—that is, in the joint. This can presumably be demonstrated to be the case for most injections preceded by aspiration of joint fluid, when the injection is given through the same needle. This study was prompted by the report of Jones *et al*,<sup>1</sup> who found a concerningly low precision of intra-articular injections, even after joint aspiration. Our department decided to test the placement of injections given in “dry” joints—that is, joints without effusion—as this presented the greatest therapeutic challenge for intra-articular injections. To our dismay several of the injections were, at least in part, extra-articular judging by the presence of injected air outside the joint. Some of this extra-articular air may have been attributable to reflux through the injection canal or the injection may have been placed in the tissue surrounding the joint.

Intra-articular corticosteroid treatment was introduced by Hollander *et al*,<sup>4</sup> and is still very popular in osteoarthritis, although results of controlled trials have demonstrated a limited effect with a return of symptoms after four to six weeks.<sup>5,6</sup> Predominantly patients with joint effusions were included in these studies. Results of the use of corticosteroids for “dry” osteoarthritis as in this open study need to be tested in a controlled setting.

Contrast media are costly and cannot always be mixed with other substances for injection purposes. Instead, air was chosen for the procedure, as this can be readily added to the medications used. When the procedure was still in use for the demonstration of lesions of the meniscus, it was generally considered safe<sup>7</sup> even with the application of much larger volumes of air than the 5 ml used in our procedure. The use of 40 ml air may cause some local irritation of the joint,<sup>8</sup> although this was

not experienced in the present series. In the radiographs, the position of the air in the suprapatellar pouch left no doubt as to the correctness of the placement of the injection.

Local corticosteroids may have an effect on non-specific knee pain even if administered peri-articularly.<sup>2</sup> However, if a medication is to act on the synovial membrane, it should definitely be placed in the joint cavity. Other intra-articular medications, for instance hyaluronan, would not be expected to have any effect when applied in the tissue surrounding the joint.

A larger frequency of adverse reactions has been reported after injections of hyaluronan administered from the medial aspect of patella than from the lateral side.<sup>9</sup> The adverse reactions are predominantly local pain after the injection of hyaluronan<sup>10</sup> and one could well speculate on whether some of this is caused by extra-articularly injected substance.

Further documentation of the presumed effect of hyaluronan is necessary in the treatment of osteoarthritis<sup>11 12</sup> and the present method might be used to demonstrate the correct placement of such medications during multicentre trials with therapists of varying levels of skill. This could be used during both the training of the participants and as random tests during a study.

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