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Accuracy of needle placement in ACJ injections

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Abstract Localization of the Acromioclavicular joint (ACJ) even at arthroscopic surgery may be difficult because of its small size, osteophytes, variable anatomy of the joint and capsule. Therefore injection of the ACJ in the clinic may well be inaccurate. The aim of this study was to review the clinical accuracy of needle placement in ACJ injections, if performed without the aid of image intensification. Sixty patients with 66 shoulders were injected in the Day Unit in our department. The joint was palpated clinically, and the needle was placed in the site thought to be in the AC Joint. An image intensifier was then used to check the position of the needle in the AP and axillary views. The needle was considered correctly placed if between the bony boundaries of the acromion and clavicle. This was found in only 26 injections (39.4%). The remaining 40 injections (60.6%)

were misplaced, either laterally in 21 injections (31.8%), medially in 13 (19.8%), anteriorly in 3 (4.5%) and inferiorly in 3 injections (4.5%). These were then reinserted under image intensifier guidance. The misplaced injections would have led to inaccurate clinical outcomes, and decision making. This study is similar to other studies in that X-ray guidance improves the accuracy of injections and surgery. However the potential error rate for the small, anatomically variable AC joint is high. There is a 60% potential for ACJ injections to be out of the joint if performed by palpation alone, and we recommend the routine use of image intensification guidance.

Keywords Acromioclavicular joint · Intra-articular injections · Fluoroscopy · Diagnosis · Therapeutics

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Introduction

Injection of the acromioclavicular joint (ACJ) is a common procedure widely used in the Orthopaedic practice. It can be used for diagnostic or therapeutic purposes [8]. As a diagnostic tool, a local anaesthetic is injected into the joint to confirm the origin of pain [6]. Therapeutically, intraarticular steroids injections can give prolonged relief of symptoms as a conservative way of treating ACJ arthritis [3]. In addition, it is a good prognostic indicator for operative treatment [8].

The great majority of injections are performed after ACJ palpation in clinic [1]. However, doubts have been raised about the accuracy of ACJ injection without using X-ray guidance, with reports suggesting 67% accuracy, but with half of these injections also involving other structures [6]. Localization of the ACJ even during shoulder arthroscopy can be quite difficult because of its small size, osteophytes, the variable anatomy of the joint and capsule.

The purpose of this study was to assess the accuracy of ACJ injections in 60 consecutive patients using the

Image Intensifier after needle positioning. We are not aware of any other similar clinical studies published in the literature.

Materials and methods

From April to August 2002, we collected 60 consecutive patients with 66 shoulders, which needed diagnostic or therapeutic ACJ injections. A thorough history was taken and clinical examination was performed. We diagnosed problems arising from the ACJ clinically, by tenderness on palpation and a positive cross adduction test, in addition to radiological evidence of OA.

The mean age was 52 years (range 21–92). Twenty-eight (42.4%) shoulder injections were right, 26 (39.4%) were left and 6 patients had bilateral injections—twelve shoulders (18.2%).

Body mass index (BMI) was calculated, and the mean was 27.7.

The X-rays of the patients were also assessed for degenerative changes in the ACJ, which were present in 27 (40.9%) ACJs. Osteoarthritis was defined by the presence of osteophytes, and joint space narrowing in the ACJ, in the AP and axial views.

A correlation between BMI, radiological ACJ OA and injection accuracy was explored.

The injections were performed in the Day Unit in our hospital, with the additional cover of Image Intensification.

Two surgeons with experience of more than four years in orthopaedics, and one of them with a special interest in shoulder surgery, performed the injections. With the injections being a part of the patients' normal management or treatment, ethical permission was not required for the assessment of this procedure.

An attempt was made to put the needle into the joint, after palpation, utilizing a superior approach. If bone was hit, further manipulation of the needle was allowed in order to find the ACJ, however, it was also considered possible to be hitting the medial edge of the acromion or the lateral edge of the clavicle intra-articularly. When the surgeon was satisfied with the placement of the needle, Image Intensification was used to assess the position in two planes, anteroposterior and axillary. The tip of needle was considered being in the joint when it was between the bony boundaries of the acromion and the clavicle (Fig. 1). The joint confinements were defined using the two lines connecting the superior and inferior corners of the two bones in the anteroposterior view, and the anterior and posterior corners in the axillary view. If the needle was out of the joint confinements, the surgeon then replaced the needle into the ACJ under image intensification (II) guidance.

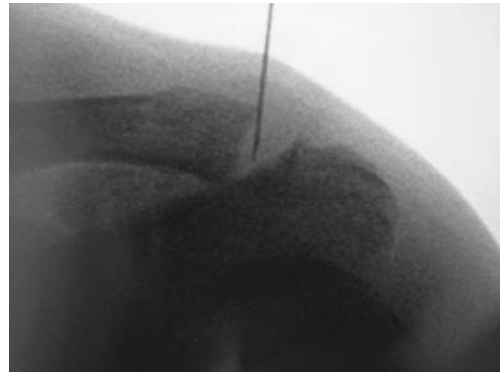


Fig. 1 II view of an ACJ with well-positioned needle in it

Results

In 26 (39.4%) ACJ injections the needle was placed accurately with palpation alone. In the remaining 40 (60.6%) shoulders, the needle was not in the ACJ and it was repositioned using II cover. Therefore all injections were in the end accurately placed. In the 40 misplaced injections, the needle was lateral in 21 injections (31.8%) (Fig. 2), medial in 13 (19.8%), anterior in 3 (4.5%) and inferior in 3 injections (4.5%), (Figs. 3, 4). There was no difference in accuracy of injections between the two surgeons. The BMI of the patient or the degree of arthritic change in the ACJ did not show any statistically significant correlation with the accuracy of needle placement ($P > 0.05$).

As a result, 60.6% of the injections would have been performed outside the anatomical confinement of ACJ either in the coronal or sagittal plane, with lateral placement being the commonest error.

Discussion

Diagnosing shoulder pain is often difficult. Pain from ACJ pathology is commonly confused with pain from

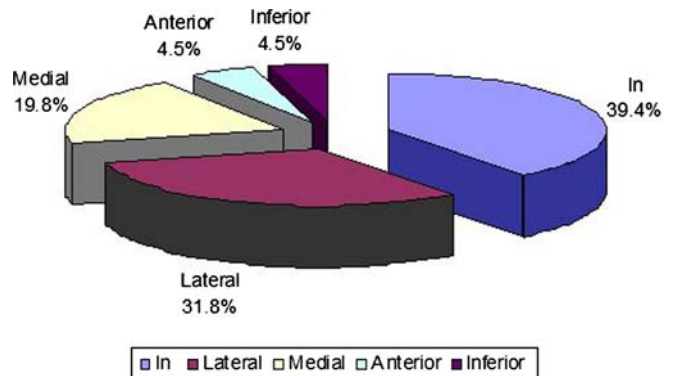


Fig. 2 Chart showing accuracy of ACJ injections



Fig. 3 AP of II view (*coronal plane*) of an ACJ with needle malpositioned laterally

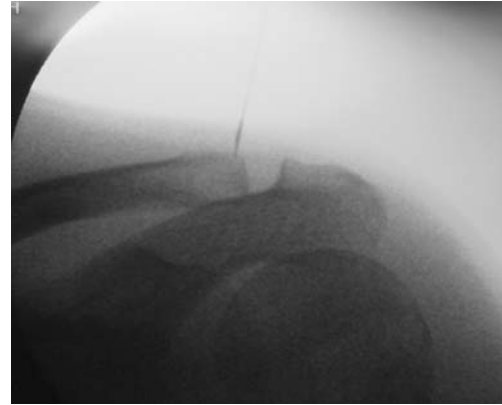


Fig. 4 AP view ACJ with needle malpositioned medially

other intrinsic or extrinsic shoulder problems [8]. The commonest intrinsic problems are impingement syndrome, rotator cuff tendinopathy, adhesive capsulitis and glenohumeral arthritis. Extrinsic problems such as cervical spine, heart or lung pathology also need to be excluded.

A detailed history and clinical examination supported by injection of local anaesthetics in the ACJ is a valuable tool to establish the diagnosis, in suspected ACJ problems [8]. It is also a valuable prognostic indicator for operative management i.e. excision of the lateral end of clavicle [5]. As a therapeutic measure, injection of steroids intraarticularly in ACJs can be effective and adequate enough for relief of pain [3].

The ACJ is a small diarthrodial joint with a variable anatomy regarding inclination of the articulating bones. This, in addition to arthritic changes, especially local osteophytes may alter the three dimensional perception of the ACJ with palpation [2, 4]. This can result in either hitting the bones with the needle, or missing the joint completely. The injection will then be inaccurate and insufficient, giving the wrong clinical impression and therefore leading to wrong management of the patient [6, 7].

In diagnostic injections, observation of the back pressure on the plunger of the syringe while attempting the injection, or feeling a change in resistance while going through the soft tissues, can be useful tools in

realizing intraarticular placement. However, this does not address the difficulty of positioning the needle in the right plane, and a change in resistance is a subjective feeling, we did not utilize this method in our injections.

Our method of identifying the margins of the joint under II, is a replicatable way, as it relies on applying straight lines from the bony margins, however the joint margins and capsule may extend outside these lines. A further study utilizing a dye injection intra-articularly, would be able to identify the exact joint margins.

Patients having injections without II control are distressed by pain caused by the needle hitting the bone or maneuvering of the needle in soft tissues to find the small ACJ. Injection with II control minimizes these maneuvers. Ultrasound has been described to aid in intra-articular injections [10], and could be a useful tool, but it is dependant on the US machine and operator to be present in clinic.

Overall, the results of this study demonstrate that ACJ injections relying on palpation alone had a 39.4% accuracy, this is because of the small size and anatomical variability of the AC joint. We did not find any correlation between the accuracy of injections and the BMI of the patient, nor the degree of OA of the ACJs.

There is a 60.6% potential for ACJ injections to be out of the joint if performed by palpation alone, and we recommend the routine use of image intensification guidance.

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