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Juan D. Berná-Serna
Francisco Martínez
Manuel Reus
Jose Alonso
Ginés Domenech-Ratto

Wrist arthrography: a simple method

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J. D. Berná-Serna (✉) ·
M. Reus · J. Alonso
Department of Radiology, Virgen de la Arrixaca University Hospital,
30120 El Palmar (Murcia), Spain
e-mail: jdberna@um.es
Tel.: +34-9-68369596
Fax: +34-9-68398178

F. Martínez · G. Domenech-Ratto
Department of Human Anatomy,
Faculty of Medicine,
University of Murcia,
Murcia, Spain

Abstract A technique of wrist arthrography is presented using an adhesive marker-plate with radiopaque coordinates to identify precisely sites for puncture arthrography of the wrist and to obviate the need for fluoroscopic guidance. Radiocarpal joint arthrography was performed successfully in all 24 cases, 14 in the cadaveric wrists and 10 in the live patients. The arthrographic procedure described in this study is simple, safe, and rapid, and has the advantage of precise localisation of the site for puncture without need for fluoroscopic guidance.

Keywords Wrist · Arthrography · Arthrography technique

Introduction

Wrist arthrography is an accepted technique for the evaluation of patients with chronic wrist pain [1, 2]. Arthrography of the wrist, specifically three-compartment arthrography, has traditionally been recommended for the investigation of the triangular fibrocartilage (TFC) and the intrinsic ligaments of the wrist [1, 3–5]. Problematical aspects associated with this technique, which is usually carried out under fluoroscopic guidance, are the dose of radiation received and the length of time needed to carry out the procedure: the intraarticular insertion of the needle under fluoroscopic guidance needs a period of time that has obvious repercussions on the dose of radiation to both patient and examiner. Obviously, these aspects are minimised when the procedure is carried out by an experienced radiologist. Nevertheless, it is important to optimise the conditions for intraarticular insertion of the needle under fluoroscopic guidance, particulary for those learning the technique. The objective of the present study is to describe a simple procedure for arthrography of the wrist by using a flexible adhesive marker-plate which enables the intraarticular insertion of the needle without need of fluoroscopic guidance.

Materials and methods

After Institutional Review Board approval of the study fourteen specimen wrists, deep frozen at −40°C, harvested from different anonymous non-embalmed cadavers, were obtained. The specimens were allowed to thaw for 24 hours at room temperature. Radiocarpal joint arthrography was performed in the specimen wrists and since then the technique has been employed in 10 patients (8 men and 2 women) with unilateral chronic ulnar-sided wrist

pain. Ages ranged from 27 to 55 years, mean age was 40 years. All patients were given detailed information about the procedure and informed consent was obtained.

Arthrographic technique

A digital imaging system (Fluorostop Compact AX; Siemens Medical Solutions; Eslanger, Germany) was used for the radiologic studies.

The arthrographic procedure consisted of 3 stages:

1. Positioning of the adhesive marker-plate on the skin surface of the wrist (Fig. 1a). The plate used is made of 1-mm-thick highly flexible plastic with a network of holes (1 mm and 2 mm in diameter) and radiopaque coordinates (Patent N° 20002983, Spain). The sterile one-use device is square (6 cm×6 cm). The skin is cleaned prior to placement of the device.
2. Selecting the site of puncture. Each wrist was placed in the prone position on the fluoroscopic table and a fluoroscopic spot image was obtained (Fig. 1b). This image enabled the selection of the hole for puncture either in the radial or the ulnar area without fluoroscopic guidance. Access to the radiocarpal joint can be performed from the radial side (the radioscaphoid region or the radiolunate joint) or from the ulnar side. In order to avoid opacification of the midcarpal compartment it is advisable not to perform the puncture in the area corresponding to the scapholunate joint [5]. Additionally, on the radial side it is necessary to bear in mind the radial edge, especially at the radiolunate joint, and if the puncture is to be performed in this area the needle must pass distal to the radial edge and be angled in the cranial direction. For insertion from the ulnar side the hole selected on the plate must be the hole superimposed over the proximal edge of the triquetrum at the radial margin of the pisiform. Of the 24 arthrographies performed, in 21 cases the puncture site was radial-sided and the ramaining 3 the site was ulnar-seded.
3. Insertion of the needle. Insertion of the 22 gauge needle (0.7×30 mm) was carried out through the hole selected on the marker-plate. In the l0 live patients sterile preparation of the skin was performed and local anesthaesia (2% mapivacaine) was applied. The position of the needle in the joint was confirmed by obtaining a spot image and by the lack of resistance to injection after placement of the needle (Fig. 2a). Initially we injected a small amount of contrast material and then progressively injecte a volume of between 3 and 5 mL of non-ionic contrast material (iopramide [Ultravist 330; Schering, Berlin, Germany]), previously mixed with an equal amount of saline solution, were injected after attaching the contrast-filled syringe and connecting tube to the previously-inserted needle. During the procedure appropriate spot fluoroscopic images were obtained to evaluate in detail any possible communication with the midcarpal joint and/or distal radioulnar joint (Fig. 2b).

Procedure times were recorded for each arthrography. Procedure time was defined as the interval of time between the placement of the adhesive marker-plate on the skin of the wrist and the withdrawal of the needle. All arthrographies in the present study were performed by the same radiologist with 5 years' experience in wrist arthrography.

Results

The 24 radiocarpal arthrographs performed, 14 in the cadaveric wrists and 10 in the live patients, were carried out

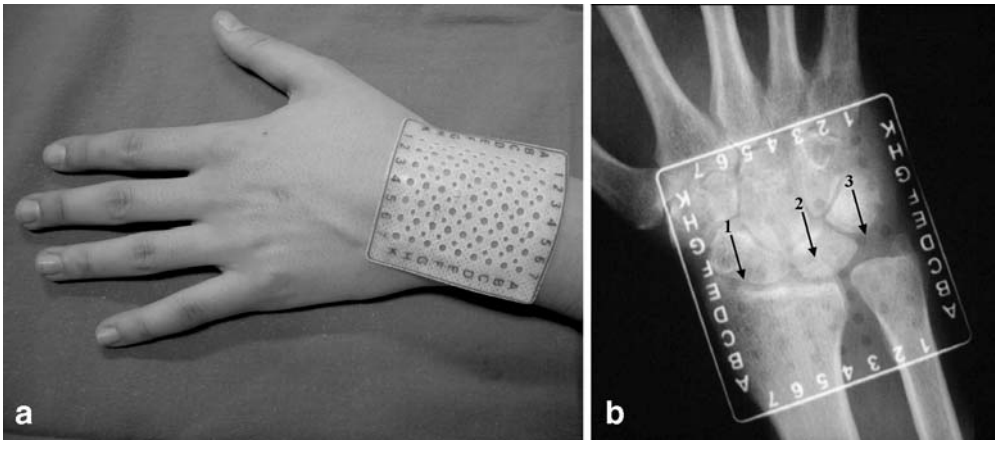

Fig. 1 **a** Photograph showing adhesive marker-plate on the wrist. **b** Image showing the radiopaque coordinates and the possible sites for punction of the radiocarpal joint. *1* Radioscaphoid region; *2* radiolunate region; *3* ulnar side

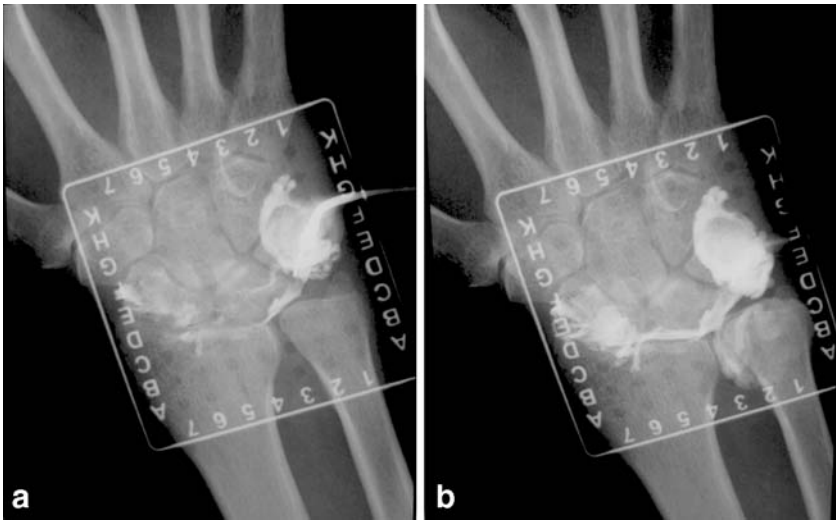

Fig. 2 50-year-old man with chronic ulnar wrist pain. **a** Arthrogram of the radiocarpal joint confirming intraarticular distribution of contrast material; **b** arthrogram showing communication between the radiocarpal joint and the distal radioulnar joint

successfully. Mean procedure performance time was 5 minutes (range: 3–8 minutes). In the arthrographic procedures performed on the live patients the spot images obtained occupied a total time for fluoroscopy of less than three seconds in each patient. Communication was observed between the radiocarpal joint and the distal radioulnar joint in 11 cases, between the radiocarpal joint and the midcarpal joint in 4 cases, and between the radiocarpal joint and the distal radioulnar joint and also the radiocarpal joint and the midcarpal joint in 3 cases. No extravasation of contrast material was observed in any case. All patients tolerated the procedure well. Slight discomfort occurred in a single case. No complications were observed.

Discussion

Arthrography is the technique of choice for the evaluation of abnormalities of the TFC and of the intrinsic ligaments of the wrist [3]. Three-compartment arthrography is used to enhance diagnostic accuracy and to identify the site of perforation [1, 2], though some authors state that MR imaging, especially MR arthrography, is the most appropriate procedure for evaluation of these lesions [6–8]. Nevertheless, conventional arthrography remains an accepted technique for evaluation of the intrinsic ligaments of the wrist.

The arthrographic procedure described in the present study is simple, safe, and rapid, and reduces the time of exposure to fluoroscopic spot imaging and consequently the dose of radiation. The site of intraarticular punction was determined without difficulty by use of the adhesive marker-plate without need of fluoroscopic guidance. Using this device, multiple sites of puncture can be chosen for both conventional and three-compartment arthrography, the latter obviously to be carried out sequentially. We have also successfully used the arthrography technique described in the present study to perform both distal radioulnar joint arthrography (3 cases) and midcarpal joint arthrography (5 cases). We habitually perform wrist arthrography combined with MRI. The device can also be used for therapeutic intraarticular injections of lidocaine and/or corticosteroids, or as a guide for interventionist procedures. In a recent work [9] on giant-cell tumours of bone of the hand and wrist, the performance of CT-guided percutaneous biopsies is described. In that context the device described in the present study could well be used to carry out radioguided percutaneous biopsies. The device referred to in this study is in the process of commercialization (Dispositivos Médicos de Imagen; Albatera, Spain). Although radiologists experienced in wrist arthrography are able to carry out successfully the intraarticular insertion of the needle under fluoroscopic guidance, we consider that the technique for wrist arthrography described here can also be of help in teaching residents as it is very easy to perform. The Residents of the Radiology Service of our hospital are easily learning how to perform the arthrographic procedure we describe here.

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