Concise Report

Frequency of successful intra-articular puncture of finger joints: influence of puncture position and physician experience

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Objective. Physicians and specialists routinely perform IA punctures and injections on patients with joint injuries, chronic arthritis and arthrosis to release joint effusion or to inject drugs. The purpose of this study was to investigate the frequencies of intra- and peri-articular cannula positioning during this procedure.

Methods. A total of 300 cadaveric finger joints were injected with a methyl blue-containing solution and subsequently dissected to distinguish intra- from peri-articular injections. To assess the influence of puncture position on successful injection, half of the joints were injected dorsally and the other half dorso-radially. To assess the importance of practical experience for a positive outcome, half of the injections were performed by an inexperienced resident and half by a skilled specialist.

Results. The overall frequency of occurrence of peri-articular injections was much higher than expected (overall: 23%, specialist: 15%, resident: 32%) The failure rate was significantly higher than the average with the joints of the little finger and the DIP joints of each phalanx.

Conclusions. Even skilled specialists cannot guarantee to insert the cannula into the joint in every case. Unintended peri-articular drug injection moreover may affect the surrounding ligaments or tendons, leading to serious complications. Correct positioning of the needle in the joint may be facilitated by fluoroscopy in doubtful cases.

KEY WORDS: Intra-articular injection, Joint puncture, Finger joint.

Introduction

Physicians and specialists routinely perform IA punctures and injections on patients with joint injuries, chronic arthritis and arthrosis to release joint effusion or to inject drugs. Corticosteroids, hyaluronic acid, radioactive or other miscellaneous agents for instance are frequently injected into joints to alleviate pain caused by rheumatic diseases or arthrosis [1–8]. Serious complications following unintentional peri-articular injection of corticosteroid are well documented in the literature [9–18]. The literature, in contrast, contains only a limited number of reports regarding the frequency of occurrence of peri-articular injections in finger joints [19–22]. The objectives of this study were (i) to estimate the overall frequency of occurrence of peri-articular injections in clinical practice, (ii) to investigate the degree to which experience contributes to successful joint injection and (iii) to compare the utility of the different puncture positions recommended in the literature.

Materials and methods

Fifty hands (25 left, 25 right) from fifty cadaver specimens with a mean age of 72.5 yrs (59–98) and preserved using the method of Thiel were used for the study. This special embalming technique, which was developed over a 30-yr period, provides a close-to-life model through the preservation of the original tissue colour, consistency and degree of transparency [23]. Extremities with arthrosis, evidence of trauma or other pathological changes were excluded from the study. Pathological skeletal changes were detected by means of X-rays. Finger joints with clinical functional deficits were also rejected. An inexperienced resident (first year of training) and a skilled specialist (surgeon) were chosen to perform the injections. Each punctured a total of 150 joints (50 DIP, 50 PIP and 50 CMC thumb joints). The cannula (14G, 23Ch) was connected to a 5 ml syringe, and then filled with methyl blue. Following palpation, 0.2 ml of methyl blue was injected into each joint. According to the current literature, punctures are to be carried out by positioning the cannula almost perpendicular to the joint along the axis of the finger (Fig. 1) [1]. Half of the punctures were performed dorsally, and half dorso-radially. After the completion of all 300 injections, arthrotomy was performed for each joint and the location of the injected methyl blue recorded in

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Submitted 24 January 2008; revised version accepted 26 June 2008.

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FIG. 1. Dorsal injection of methylene blue into the PIP joint of the indices.
ethics committee of the Medical University of Graz.

USA). Ethical approval for this study was obtained from the local
golden and by prednisone, in particular [10–12]. Gottlieb and Riskin
calcifications are known to be caused by triamcinolone hexaceto-
cases of peri-articular calcification related to corticosteroid
osteoarthritic finger joints) [2–8].

different drugs into finger joints (hyaluronic acid or corticosteroid

Discussion

Although injection of drugs into finger joints is carried out less
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Results

A total of 300 finger joints were punctured and injected with methyl
blue. An inexperienced resident and a skilled specialist each injected
half of these joints. The frequencies of unintended peri-articular
injection were: overall: 23% (70/300), specialist: 15% (22/150);
resident: 32% (48/150). The frequency of peri-articular injection
was higher for radial compared with dorso-radial punctures for
both the resident and the specialist [overall: radial 23% (75/300),
dorso-radial 30% (45/150); specialist: dorso-radial 7% (5/75), dorso-
ultrasound provides a non-radiation alter-

disclosure rate of the experienced physician was clearly higher than that of
the novice (15 and 32% peri-articular injections, respectively). The
injections for the study were moreover performed from two
different orientations with respect to the joint, i.e. either dorsally or
dorso-laterally [1]. The markedly higher failure rate observed
with dorso-lateral compared with dorsal injections (30 and 17%,
respectively), indicates the importance of needle positioning for
successful IA injection. The directing of the oblique opening of the
needle tip towards the cartilage surface is therefore to be
recommended in order to avoid cartilage trauma and to increase
the frequency of correctly placed IA injections.

In conclusion, the main message provided by the results of this
study is that IA injection is a challenging procedure since even a
highly experienced physician cannot guarantee success and that

Rheumatology key messages

• Injection of finger joints is a challenging task.
• Even skilled physicians do not hit the joint every time.
• Unintended peri-articular injection may lead to serious
complications.

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

References


decleriously affected by hydrocortisone acetate. Oxlund [17]
reports an increase in strength and stiffness of tendons, but a
decrease in the strength of the bone attachments of the ligaments
following local corticosteroid treatment. In a follow-on investiga-
tion the author demonstrated thinning of the tissue and collagen
loss [18].

Literature reports concerning the rate of unintended peri-
articular injections are rare. Jones et al. [22] injected various
different joints of 109 patients with a mixture of methylpredni-
solone and a radiographic contrast medium in order to determine
the frequency of successful IA drug delivery by radiography. In
the published study, a total of only five finger joints were injected
(thumb carpometacarpal: three times, finger metacarpophalangeal
and distal interphalangeal: twice). None of these injections were
IA. One was extra-articular and four were uncertain [22].

The aim of the present study was to provide solid insight into
the frequency of occurrence of peri-articular finger joint injections
during daily clinical practice. The approach taken was the
injection of a dye into a large number of cadaveric finger joints
(300). The overall frequency of peri-articular injection was found
to be surprisingly high: injection was unsuccessful in 23% of the
injected finger joints. Half of the injections were done by a skilled
specialist and half by an inexperienced resident to reflect the fact
that, in daily practice, these injections are performed by persons

unintended peri-articular injection and subsequent complications.
Fluoroscopy, however, results in radiation exposure to the hands of
the patient and of the physician, especially when multiple joints
are to be injected. Ultrasound provides a non-radiation alter-
native to fluoroscopy but must be learnt by the physician and can
sometimes be demanding to perform in a helpful manner.

FIG. 2. Arthrotomy to determine the location of the injected methylene blue.

each case (Fig. 2). All results were entered into a computerized
database and analysed using Microsoft Excel® (Redmond, WA,
USA). Ethical approval for this study was obtained from the local
ethics committee of the Medical University of Graz.

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half of these joints. The frequencies of unintended peri-articular
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was higher for radial compared with dorso-radial punctures for
both the resident and the specialist [overall: radial 23% (75/300),
dorso-radial 30% (45/150); specialist: dorso-radial 7% (5/75), dorso-
radial 23% (17/75); resident: dorsal 27% (20/75), dorso-radial 37% 
(28/75)]. The rate of failure of IA injection was highest with DIP
joints [overall: 29% (29/100), specialist: 16% (8/50), resident: 42% 
(21/50)], and lowest with PIP joints [overall: 18% (18/100),
specialist: 12% (6/50), resident: 24% (12/50). An intermediate
failure rate was observed with CMC thumb joints [overall: 23% 
(23/100), specialist: 16% (8/50), resident: 30% (15/50)].


