Can the Carpometacarpal Joint Be Injected Accurately in the Office Setting? Implications for Therapy

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ABSTRACT. ***Objective.*** To investigate whether carpometacarpal (CMC) injections can be performed accurately in the office setting in patients with moderate to severe CMC osteoarthritis (OA).

Methods. Patients were recruited from rheumatology and hand surgical practices as part of an open label trial of hylan G-F 20 for CMC OA. CMC injections were performed without radiologic guidance, using anatomic landmarks to guide needle placement. Once injected, the patient was immediately taken to an adjacent ultrasound suite, and the injected CMC joint examined for evidence of intraarticular material and air microbubbles.

Results. Thirty-two patients were injected. All patients had ultrasound evidence of intraarticular material: 91% also had evidence of microbubbles in the joint.

Conclusion. CMC injections can be performed accurately in the office setting, without the need for radiologic guidance, in patients with moderate to severe CMC OA. (J Rheumatol 2006;33:1137–9)

Key Indexing Terms:
OSTEOARTHRITIS CARPOMETACARPAL JOINT INJECTION ACCURACY

Carpometacarpal osteoarthritis (CMC OA) affects at least 30% of women over 65 years of age[1]. CMC OA can lead to hand pain and impairment, and poor hand ability predicts future functional limitation and dependency[2]. CMC OA can seriously restrict both vocational and recreational activities, especially since it often occurs in otherwise healthy people.

Local corticosteroid injections are a common treatment for CMC OA. Most of these injections are performed in physicians' offices using anatomic landmarks to guide needle placement. However, intraarticular injections performed without radiographic guidance are generally quite inaccurate, with accuracy rates of 66-93% in the knee, 50% in the wrist, and 37% in the glenohumeral joint[3-5]. If therapeutic effectiveness is contingent upon accurate placement, using anatomic landmarks to guide injection may be inadequate. Injection failures may be even more common in small, hard to inject joints such as the CMC, especially if OA has distorted normal joint anatomy.

We investigated whether CMC injections, performed by an experienced hand surgeon using anatomic landmarks, are accurate in patients with moderate to severe CMC OA.

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Supported in part by grants from Wyeth Pharmaceuticals and Genzyme Corporation. Dr. Mandl is supported by NIH K23 AR050607-01. Dr. Katz is supported by NIH P60 AR 47782; NIH K24 02123.

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Accepted for publication January 22, 2006.

MATERIALS AND METHODS

Patients with symptomatic CMC OA and radiographic changes greater or equal to Kellgren and Lawrence (K+L) Grade 2 were recruited from rheumatology and hand surgery practices.

Patients were injected with hylan G-F 20 (Synvisc®) as part of an open label pilot trial. Treatment consisted of one weekly injection for 3 consecutive weeks. The first injection in each patient was evaluated for this study. If CMC OA was bilateral, the most painful side was injected. The injecting surgeon has over 20 years' experience and performs 350 operative cases annually.

Injections were performed using anatomic landmarks to guide needle placement. The injection site was identified by locating the most proximal margin of the metacarpal, along the dorsal surface. The joint was entered antero-medially with a syringe of lidocaine and a 25 gauge needle. The needle was advanced approximately 5 mm at 45°. If syringe compression met with resistance, the needle was repositioned. Once there was no resistance, the syringe was removed using sterile technique, a pre-filled syringe of hylan G-F 20 attached, and 1 ml injected. The choice of 1 ml was based on previous studies and current accepted practice[6]. Accuracy was confirmed clinically by ease of flow and distension of the periarticular capsule.

Immediately after injection, patients were taken to an adjacent ultrasound suite. Scans were performed in the longitudinal plane using a linear 17 MHz transducer and an IU22 ultrasound machine (Philips Medical, Bothell, WA). Since baseline ultrasounds were not logistically or financially feasible, the investigators also evaluated whether air microbubbles could be visualized. Microbubbles should not be seen intraarticularly unless the joint capsule has been broached. Microbubbles produce bright echoes, often with a ring-down artifact, which can be detected even below the axial resolution of the transducer. Ultrasound is a reliable method of confirming both the presence of intraarticular therapeutic agents, as well as microbubbles of air introduced during injection[7]. Radiology studies were performed by an ultrasound specialist with over 20 years' experience.

RESULTS

Thirty-two patients were injected over 10 months. Average age was 64 years (range 46-79), and 69% were women. The

average baseline visual analog scale (VAS) for pain was 6.2 (range 3.8-10). All patients had moderate or severe radiographic OA: 59% were K+L Grade 4, 25% K+L Grade 3, and 16% K+L Grade 2. Most patients received the goal volume of 1 ml of hylan G-F 20, although 3 received 1.5 ml, 2 received 1.75 ml, and 1 each received 1.2 ml and 0.5 ml. All patients had ultrasound evidence of intraarticular hylan G-F 20 (95% confidence interval, CI: 0.89 -1.00); 72% had evidence of extravasation of material outside the joint capsule; and 91% (29/32) had evidence of microbubbles in the joint in addition to visualization of echogenic material (See Figure 1).

DISCUSSION

Our data show that CMC injections can be performed accurately in an office setting, without the need for radiologic guidance. This is important, as there is a clear need for more effective, non-surgical therapies for CMC OA, and intraarticular therapies are relatively safe.

There are presently no proven medical treatments for CMC OA. The only published randomized controlled treatment trial found no benefit of steroids compared to placebo injection[8]. A recent open label trial also found steroids to be of no benefit[9]. While surgery is effective for severe disease, operative therapies are not always acceptable to patients. An effective, local treatment for CMC OA, such as viscosupplementation, would be very appealing. However, if accurate delivery requires costly radiologic guidance, such a therapy would be both prohibitively expensive and inconvenient to administer.

To our knowledge this is the only study that rigorously documents that CMC OA injections can be performed accurately in an office setting. One study using cadavers found a similarly high accuracy rate of 82%[10]. Another study showed a lower accuracy rate of 58%[11]. However, that study was performed in the operating room, and the injectors included house officers in addition to a senior consultant. These contrasting findings suggest injecting the CMC joint accurately may require an experienced clinician.

Limitations of our study include a relatively small sample size and a single injector. These results cannot be extrapolated to trainees or physicians in other specialties. We did not have baseline ultrasounds of the CMC joint to ensure there was no intraarticular material present prior to the injections. However, air bubbles are not normally present in joint fluid, and visualization of microbubbles, such as we observed, is an accepted method of validating intraarticular injections[1].

CMC OA affects at least 1 in 3 women over 65. From 1997-2020, the population aged 65 and over in developed countries is projected to increase by 71%, which will substantially increase the overall burden of CMC OA[12]. If CMC injections can be performed easily and accurately in the community, the development of targeted intraarticular therapies is a potential area for future research. Our study provides evidence that an experienced surgeon can accurately inject the CMC joint in an office setting.

ACKNOWLEDGMENT

Thanks to Alison Swigart, BA, Elizabeth Gluck, BA, and Jason Grossman, BA for their help performing the injection protocol, and to Margaret Peterson, PhD, for statistical assistance.

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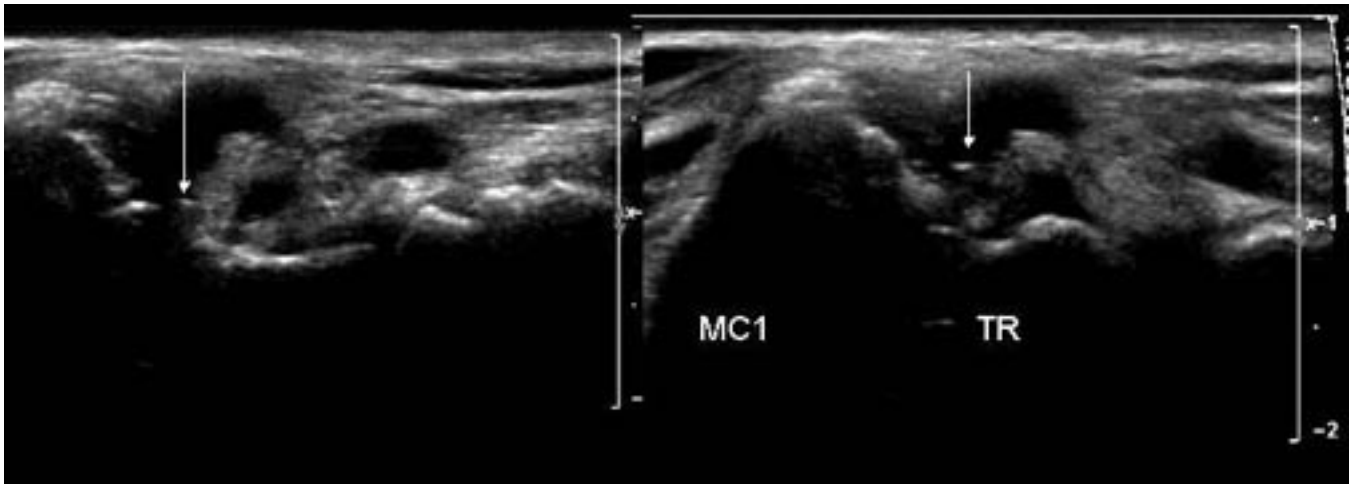

Figure 1. Longitudinal image obtained over the 1st CMC joint illustrates a single microbubble rising to the non-dependent surface of the distended capsule following intraarticular injection of hyaluronan (Hyalgan G-F 20). Left: the wrist is in neutral position. Right: the wrist is slightly dorsiflexed. MC1: 1st metacarpal; TR: trapezium.

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