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Comparison of glenohumeral and subacromial steroid injection in primary frozen shoulder: a prospective, randomized short-term comparison study

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Background: Glenohumeral (GH) joint steroid injection is one of the most well-known treatments for frozen shoulder. However, the low accuracy of GH joint injections and the improvement of symptoms after subacromial (SA) steroid injections led us to design a study that compares the efficacy of a steroid injection for primary frozen shoulder according to the injection site.

Materials and methods: Patients with primary frozen shoulder were randomly divided into 2 groups according to the location of the injection: a GH group of 37 for the glenohumeral joint and an SA group of 34 for the subacromial space. Injections were completed using ultrasonographic guidance. Evaluations using a visual analog scale (VAS) for pain, the Constant score, and passive range of motion (ROM) were completed at 3, 6, and 12 weeks after the injection.

Results: The GH group showed lower pain VAS at 3 weeks, but no statistical difference was found between the 2 groups at 6 and 12 weeks. Improvement in pain was evident at every follow-up visit compared with the preinjection evaluation. There was no significant difference between the 2 groups with respect to the Constant score or ROM at serial follow-up.

Conclusions: The GH steroid injection was not superior to a SA injection for patients with primary frozen shoulder even though injection at the GH joint led to earlier pain relief compared with the SA injection. SA steroid injection along with a GH injection is an alternative modality, and the treatment should be individualized and tailored appropriately.

This work was performed at Seoul National University College of Medicine, Seoul National University Bundang Hospital. The Investigational Review Board (IRB No. B-0607/035-023) approved the human protocol for this investigation. All investigations were conducted in conformity with ethical principles of research, and research expenses were approved by the IRB.

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Frozen shoulder is one of the most well-known causes of shoulder pain and disability. Codman[8] first described ''frozen shoulder'' in 1934, and Neviaser[26] first used the term ''adhesive capsulitis'' and described the synovial changes of the glenohumeral (GH) joint in 1945.[8,26] There have been many efforts to identify the pathophysiology and find the best treatment for this condition.* Bunker and Anthony[6] revealed that the pathologic process of frozen shoulder includes active fibroblastic proliferation, and Uhthoff and Boileau[35] also focused on the contracture of the anterior capsular structures as the main pathologic process.

For the treatment of frozen shoulder, different authors reported several techniques with favorable outcomes, including medical treatment,[5] physical therapy and exercises,[17,23] intra-articular steroid injection,[7,31,39] hydraulic distension,[4,13] blockade of the suprascapular nerve,[9,21,38] manipulation under anesthesia,[11,15] arthroscopic release,[3,19,37] and skillful neglect.[10,24]

Steroid injection into the GH joint, accompanied by therapeutic shoulder exercises, is one of the most well-known approaches, regardless of the etiology for the frozen shoulder.[2,7,31] However, a low accuracy of injection into the GH joint without radiologic guidance,[12,33,39] relative ease of access into the subacromial (SA) space, improvement of frozen shoulder symptoms after a SA steroid injection in certain patients, few reports discussing the effects of SA pathology on frozen shoulder, and the effect of steroid injections into the SA space[1,31] raise questions regarding the etiology of the disease entity and how we should approach this peculiar shoulder disorder.

The current study compared the clinical efficacy of steroid injection in patients with primary frozen shoulder using a prospective randomized comparison model according to the location of the injection (GH joint vs SA space). The purpose was to evaluate postinjection pain and function using shoulder range of motion (ROM) and Constant scores. Our hypothesis was that clinical outcomes of GH steroid injections would be better than SA injections in patients with primary frozen shoulder.

Materials and methods

This was a prospective randomized comparison study of steroid injection into the GH joint or SA space in primary frozen shoulder, combined with stretching exercises and nonsteroidal anti-inflammatory drug (NSAID) supplementation.

Between January 2007 and August 2008, we recruited 102 patients with shoulder pain and a limitation of both active and passive motion in at least 2 directions (abduction and forward flexion <100°, external rotation <20°, or internal rotation <L3). Patients were examined with plain radiographs (true anteroposterior, 30° caudal tilt, and axial view) and ultrasonography (USG) to detect the secondary cause of the frozen shoulder, such as a rotator cuff tear, calcific tendinitis, or osteoarthritis. The study excluded 4 patients with a full-thickness rotator cuff tear, 7 with a partial-thickness rotator cuff tear, 10 with calcific tendinitis, 1 with osteoarthritis of the shoulder, and 1 with a greater tuberosity fracture of the humeral head. An additional 8 patients did not want to participate in the study (5 were inconvenienced by the follow-up interview, and 3 did not respond to our request for a reason). The remaining 71 patients with primary frozen shoulder were included (Fig. 1), and written informed consent was obtained from all participants. All included patients had undergone conservative management, including medication and physiotherapy, for at least 6 weeks before inclusion in this study but had no improvement in their symptoms.

Treatment procedure

Randomization was done according to an automatic generated randomization list. Patients were divided into 2 groups by the site of the steroid injection: GH joint (GH group), which comprised 37 patients, or the SA space (SA group). For injection into the shoulder joint, we used the posterior approach.[40] For the SA space, a lateral approach was used.[25] One musculoskeletal radiologist (J.A.C.) performed diagnostic USG (iU22 scanner, Philips Healthcare, Bothell, WA, USA) and USG-guided injections.

A mixture of 1 mL triamcinolone (40 mg), 4 mL of 2% lidocaine, and 4 mL of normal saline was injected, and all patients in both groups were prescribed NSAIDs and analgesics for pain control. Patients were also given a self-exercise program[17] consisting of gentle active-assistive or passive forward flexion, abduction, external rotation, adduction, and sleeper's stretch exercises; these were repeated 10 times slowly and held for 5 to 10 seconds at a frequency of 3 to 5 times daily. Patients were instructed to stretch the shoulder gently against the limits of tolerance and to avoid strengthening exercises until shoulder pain subsided.

If at any time during the study a patient was unable to continue the treatment protocol, he or she was dropped from the study and managed with other treatments. In the GH group, one suprascapular nerve block was given at 3 weeks and one additional hyaluronic acid injection was given after the index injection as a result of continued severe pain. In the SA group, 2 patients required suprascapular nerve block at 3 weeks and 1 patient was given an additional hyaluronic acid injection at 6 weeks after the index injection as a result of continued severe pain.

* 2, 5, 7, 11, 13, 18, 28, 30, 31, 34, 35, 36, 39.