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One-Year Outcome of Subacromial Corticosteroid Injection Compared With Manual Physical Therapy for the Management of the Unilateral Shoulder Impingement Syndrome

A Pragmatic Randomized Trial

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Background: Corticosteroid injections (CSIs) and physical therapy are used to treat patients with the shoulder impingement syndrome (SIS) but have never been directly compared.

Objective: To compare the effectiveness of 2 common nonsurgical treatments for SIS.

Design: Randomized, single-blind, comparative-effectiveness, parallel-group trial. (ClinicalTrials.gov: NCT01190891)

Setting: Military hospital–based outpatient clinic in the United States.

Patients: 104 patients aged 18 to 65 years with unilateral SIS between June 2010 and March 2012.

Intervention: Random assignment into 2 groups: 40-mg triamcinolone acetonide subacromial CSI versus 6 sessions of manual physical therapy.

Measurements: The primary outcome was change in Shoulder Pain and Disability Index scores at 1 year. Secondary outcomes included the Global Rating of Change scores, the Numeric Pain Rating Scale scores, and 1-year health care use.

Results: Both groups demonstrated approximately 50% improvement in Shoulder Pain and Disability Index scores maintained through 1 year; however, the mean difference between groups was not significant (1.5% [95% CI, −6.3% to 9.4%]). Both groups showed improvements in Global Rating of Change scale and pain rating scores, but between-group differences in scores for the Global Rating of Change scale (0 [CI, −2 to 1]) and pain rating (0.4 [CI, −0.5 to 1.2]) were not significant. During the 1-year follow-up, patients receiving CSI had more SIS-related visits to their primary care provider (60% vs. 37%) and required additional steroid injections (38% vs. 20%), and 19% needed physical therapy. Transient pain from the CSI was the only adverse event reported.

Limitation: The study occurred at 1 center with patients referred to physical therapy.

Conclusion: Both groups experienced significant improvement. The manual physical therapy group used less 1-year SIS-related health care resources than the CSI group.

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The shoulder impingement syndrome (SIS) is a generic term used for patients with shoulder pain that encompasses the rotator cuff syndrome, tendinosis of the rotator cuff muscles, and bursitis in the shoulder area (1). It has a cumulative incidence between 5 and 30 per 1000 person-years (2, 3).

Conservative treatment options include corticosteroid injections (CSIs) and physical therapy. Subacromial CSI is one of the most common procedures used by orthopedists, rheumatologists, and general practitioners (4, 5). However, evidence to support long-term efficacy is conflicting (6–10). Clinical practice guidelines cannot recommend for or against CSI for rotator cuff pathology without evidence of tears (11). Four recent systematic reviews have differing conclusions on the efficacy of CSI for SIS (6, 8, 9, 12), but the consensus suggests that any benefit may only be short-term.

Although manual physical therapy (MPT) may be effective for SIS management (13–21), 2 recent systematic reviews found no clear evidence to suggest additional benefits of MPT to other interventions (22, 23), indicating the need for further research. Data are also lacking about the patterns and timing of CSI and MPT use for patients with SIS. Studies suggest that a CSI is often considered initially (4, 5), whereas a referral to physical therapy may occur only 24% of the time (24). Other studies introduced CSI only after 6 weeks of physical therapy was unsuccessful (5). Some investigations evaluated the effect of providing CSI before, or in conjunction with, MPT or shoulder exercises (14, 25, 26), but CSI and MPT have not been directly compared. The objective of this study was to compare the 1-year effectiveness of CSI and MPT for SIS management.

METHODS

Design Overview

This pragmatic, randomized, controlled trial compared 2 treatments for patients with SIS: subacromial CSI and MPT. The primary end point was 1-year improvement on the Shoulder Pain and Disability Index (SPADI). Sec-

See also:

Editorial comment. 224
Summary for Patients. I-22

Context

The shoulder impingement syndrome includes conditions, such as rotator cuff tendinosis and shoulder bursitis. Conservative management may include corticosteroid injections (CSIs) or manual physical therapy (MPT).

Contribution

In this randomized, controlled trial, groups of patients with the shoulder impingement syndrome receiving CSI or MPT showed similar symptom improvements that did not differ significantly. Compared with the MPT group, the CSI group used more health care resources during the 1-year follow-up.

Caution

The trial recruited only patients referred to MPT.

Implication

Manual physical therapy and CSI produced similar clinical outcomes in patients with the shoulder impingement syndrome.

—The Editors

ondary outcomes included changes in Global Rating of Change (GRC) scale and Numeric Pain Rating Scale (NPRS) scores and shoulder-related health care use. We followed the SPIRIT (Standard Protocol Items: Recommendations for Interventional Trials) statement at the time of protocol development (27), and our reporting followed the CONSORT (Consolidated Standards of Reporting Trials) extension for pragmatic clinical trials (28). The study was approved by the Madigan Army Medical Center Institutional Review Board, the trial was registered (ClinicalTrials.gov: NCT01190891), and the protocol was published with open access (29).

Setting and Participants

Consecutive patients aged 18 to 65 years with a primary symptom of unilateral shoulder pain referred from family practice and orthopedic clinics to the physical therapy department at Madigan Army Medical Center were screened for eligibility during their initial visit in the physical therapy clinic. Exclusion criteria included a history of shoulder dislocation, fracture, or adhesive capsulitis; history of CSI or physical therapy for the shoulder pain in the past 3 months; baseline SPADI score less than 20%; reproduction of shoulder symptoms with cervical spine examination; history of systemic or neurologic disease affecting the shoulder; positive rotator cuff lag sign or history of full-thickness rotator cuff tear; pending litigation; or inability to attend physical therapy for 3 consecutive weeks. Patients at this medical center included a mix of active-duty and retired military service members and their families. Copayments were not required for care.

Randomization and Interventions

The randomization schedule was computer-generated, with assignments placed in opaque, sequentially numbered envelopes by an off-site investigator not involved with patient care or follow-up. Treatment allocation was revealed after collection of baseline outcomes. Patients and treating clinicians were not blind to the intervention. The research assistant who collected outcome assessments at each time point was blind to group assignment. Two physical therapists provided the MPT, and 1 physician administered all of the injections. Patients were allowed to continue any current medications prescribed by their primary care providers (PCPs).

MPT Group

At the first session, the physical therapists performed a standardized clinical examination to identify relevant impairments (weakness, mobility, or pain). The MPT intervention consisted of a combination of joint and soft-tissue mobilizations; manual stretches; contract–relax techniques; and reinforcing exercises directed to the shoulder girdle or thoracic or cervical spine. Specific details of the treatment are published (29). Patients did not receive identical treatments, but the MPT techniques were matched to individual impairments identified on examination. Patients were treated twice weekly over a 3-week period, a typical episode of care for SIS, by the same physical therapy in most cases. Home exercises were prescribed to reinforce clinic interventions (29). The physical therapists were fellowship-trained in MPT from an American Physical Therapy Association–credentialed program.

CSI Group

A credentialed family practice physician with sports medicine fellowship training injected 40 mg of triamcinolone acetonide to the subacromial space of the symptomatic shoulder (29). Each participant received a handout explaining the effects of the steroid injection and how to manage potential side effects. As many as 3 total injections could be administered by the study physician (>1 month apart) during the 1-year period. Patients received printed instructions to perform a gentle gravity-assisted distraction and oscillatory pendulum exercise.

Patients were discouraged, but not prohibited, from seeking additional care for at least the first month (study-related treatment period). At the 1-, 3-, and 6-month follow-up periods, patients were also given written instructions and a number to call if they believed that they were not improving and needed additional care. A study coordinator, who was not involved with data collection or treatment, fielded these calls. She advised patients in the MPT group to return to their PCP for additional care and facilitated contact with the physician providing the injection for patients in the CSI group. Each case was managed individually, and another CSI was administered if the patient and physician mutually agreed that it was appropri-

ate. Patients in either group could return to their PCP if they felt the need, and the PCP would manage the patient as they thought best, potentially including a CSI or referral to physical therapy. These patients would not see the same physical therapist or physician who administered the initial study intervention.

Outcomes and Follow-up

Outcome measurements were administered at baseline, 1 month, 3 months, 6 months, and 1 year. The SPADI is a 100-point, 13-item, self-administered questionnaire that is divided into 2 subscales: a 5-item pain subscale and an 8-item disability subscale. It is valid, is responsive to change, and accurately discriminates between improving and worsening status (30, 31). The minimal clinically important difference for the SPADI is a change between 8 and 13 points (6% to 10%) (32).

The GRC is an instrument that measures overall perceived changes in the participant's quality of life (33). It provides a valid measurement of change in patients' perceived status (34). A GRC score of 3 rating points or greater is clinically meaningful (35).

An 11-point NPRS ranging from 0 (no pain) to 10 (worst imaginable pain) was used to assess pain intensity (36). This scale has been demonstrated to be a reliable, generalizable, and internally consistent measure of clinical and experimental pain intensity (37, 38). The suggested minimal clinically important difference for the NPRS is a change of 2 points (39).

A research assistant blinded to treatment allocation collected health care use information from electronic health records at the 1-year follow-up using an established process (40, 41). This included additional use after completion of the study interventions. We identified shoulder-related visits to physical therapists, PCPs, rheumatologists, and orthopedists, as well as frequency and types of procedures, including additional steroid injections, magnetic resonance imaging, and radiography, similar to other studies (42). A second clinician manually verified the electronic health record information to ensure that the care was related to the same shoulder condition.

Statistical Analysis

The sample size estimated to achieve 80% power to detect a 12-point difference (or a 9.2% change) in the SPADI, based on a reported minimal clinically important difference range of 8 to 13 points (32), with an SD of 10 points, a 2-tailed test, and an α level of 0.05 was 43 participants per group. To allow for a conservative withdrawal rate of approximately 20%, we recruited 104 participants.

The primary analyses of effectiveness included all available data from patients who received their assigned treatment (that is, the CSI or at least 1 session of MPT). We used a linear mixed-effects model, which is flexible in accommodating data assumed to be missing at random (43) (MIXED in SPSS, version 20 [SPSS, Chicago, Illinois]) with data from 5 time points (0, 1, 3, 6, and 12 months) for the SPADI (primary outcome) and NPRS and 4 time points for GRC. The intervention (MPT or CSI) was the fixed effect with random effects for the repeated measures over time within a patient; the primary treatment comparison was the difference between groups from baseline to 1 year. For the sensitivity analysis to explore the effect of missing data, they were imputed for the 3 outcome variables at all follow-ups (20 imputations using MULTIPLE IMPUTATION-FULLY CONDITIONAL SPECIFICATION) (44). Descriptive statistics were provided for demographic and health characteristics that may influence prognosis between groups.

Health care use for 1 year after enrollment was compared between groups using frequency counts and risk ratios with 95% CIs (CROSSTABS-RISK).

Role of the Funding Source

The study was partially funded by Cardon Rehabilitation Products through the American Academy of Orthopaedic Manual Physical Therapists. The funding source had no role in the design or analysis.

RESULTS

Over a 22-month period (June 2010 to March 2012), 242 consecutive patients were screened for eligibility (**Figure 1**), and 138 patients were excluded. The most common reasons for exclusion were the patient not wanting an injection (24%), nonimpingement classification of shoulder pain (18%), and unavailability for treatment if randomly assigned to the MPT group (10%). The remaining 104 patients met the inclusion criteria, provided informed consent, and were randomly assigned. Six patients in the MPT group were randomly assigned but never received any treatment and were not included in the analysis. Comorbid conditions, mean body mass index, and reported fear avoidance beliefs were the same in both groups (**Table 1**). Twice as many patients disclosed that they smoked tobacco in the MPT group than in the CSI group. All other baseline variables were similar in each group.

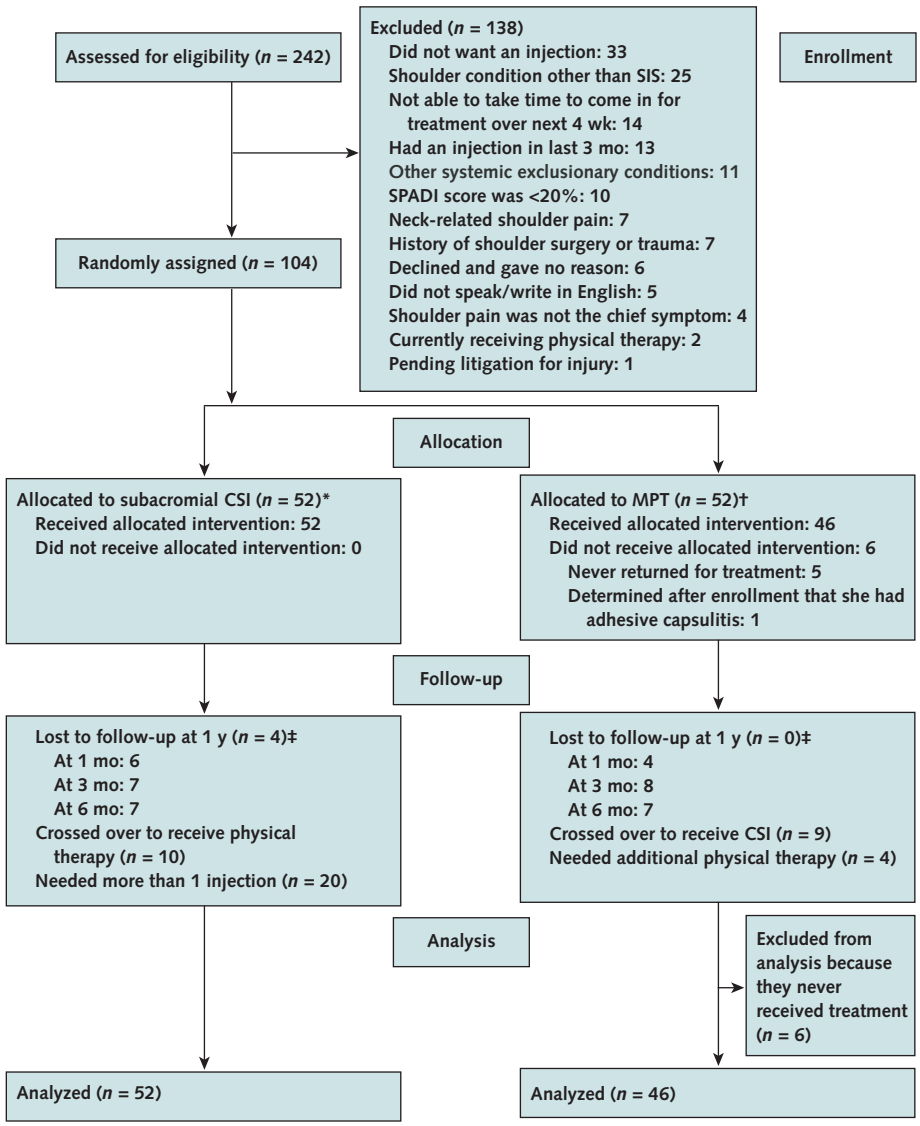
Treatment Implementation

All patients in the CSI group received at least 1 injection as required by the study protocol; 20 patients (38%) had more than 1 injection. All but 6 patients in the MPT group received the 6 physical therapy treatments according to the protocol; overall, the MPT group received a median of 5.5 PT treatments (minimum, 1; maximum, 6).

1-Year Outcomes

Most patients (96%) returned for follow-up visits at 1 year. Although an improvement greater than 50% was seen in the SPADI from baseline to 1 year in each group (**Figure 2**), neither treatment was superior (between-group difference at 1 year, 1.5% [95% CI, −6.3% to 9.4%]). Self-perceived improvement on the GRC was 3 points [CI, 2 to 4]), and self-reported pain (NPRS) improved at 1 year (mean change, 0.8 for CSI and 1.7 for MPT), but neither

Figure 1. **Study flow diagram.**



CSI = corticosteroid injection; MPT = manual physical therapy; SIS = shoulder impingement syndrome; SPADI = Shoulder Pain and Disability Index.
* 1 clinician performed the subacromial CSI.
† 2 clinicians performed MPT.
‡ Loss to follow-up was reported independently for each time point. It is possible that a patient missed 1 time point but then was followed up at a different time point. The primary outcome was measured at 1-y follow-up.

group was superior (between-group difference in change from baseline to 1 year: GRC, 0 [CI, −2 to 1]; NPRS, 0.4 [CI, −0.5 to 1.2]). The differences at each time point are shown in **Table 2**. We performed a sensitivity analysis with imputation for missing data (43) and the results remained unchanged. Other than transient pain from the CSI, there were no other adverse events reported by patients in either group.

Health Care Use

Shoulder-related health care use is detailed in **Figure 3**. Patients in the MPT group made fewer visits to their PCP for shoulder pain—37% of patients in the MPT group versus 60% in the CSI group had at least 1 additional visit (risk ratio, 0.64 [CI, 0.43 to 0.95]). The MPT group also had fewer additional CSIs than the CSI group; 20% compared with 38% had at least 1 additional injection (risk ratio, 0.77 [CI, 0.59 to 0.99]). Out of the patients who had additional injections, 4 in the CSI group had 4 total injections each (including some from providers outside of this study), and 1 from both the MPT and CSI group had 3 total injections each. In addition, 10 patients (19%) in the CSI group and 4 patients (9%) in the MPT

group received physical therapy after the planned study intervention period.

DISCUSSION

Regardless of treatment, patients in our study had significant improvement from baseline to 1 month (>50% mean change), and that improvement was sustained for 1 year. Most studies that assessed CSI for shoulder disorders have only reported short-term results (4 to 12 weeks) (26, 45–49). We found only 1 trial that followed patients to 12 months, reporting no difference between CSI and acupuncture plus home exercises (50). One observational study without a control followed patients receiving CSI for 1 year and reported a satisfaction rate of 88% (51). Gaojoux-Viala and colleagues (7) conducted a meta-analysis on the safety and efficacy of steroid injections for the shoulder. In the short term (8 weeks), effect sizes reached 1.3, but after 12 weeks, the effects were no longer significant, and no study collected outcomes at 1 year.

The long-term effectiveness of CSI has been questioned, as well as the potentially deleterious effects of repetitive CSIs (7–9, 12). For example, physical therapy, CSI, "wait and see," and placebo injection have been compared in patients with lateral epicondylalgia (52, 53). Although CSI was effective in the short term, those patients had worse outcomes than the "wait and see" or placebo groups at 1 year. We did not see these results in the current study, and the question about side effects and safety of CSI still remains. Furthermore, symptom improvement may not necessarily reflect decreased progression of the disease. Ramirez and colleagues (54) found a 17% incidence of full-thickness rotator cuff tears after CSI (66% had a previous partial-thickness tear), even though patients reported a decrease in pain. Future work is needed to understand the effect of both interventions on disease progression.

The long-term improvements with MPT are consistent with previous reports (13, 14). However, the CSI group also had similar improvements. We found 1 study with a 1-year follow-up that compared CSI with 10 sessions of acupuncture, both combined with a home exercise protocol (50). Both groups showed improvement, but there were no between-group differences. However, this study used a different outcome measure, limiting direct comparisons with our results. Another study compared CSI with a community-based physiotherapy program and also showed improvement in both groups at 6 months but no between-group differences (55).

The CSI group used more health care throughout the 1-year follow-up than the MPT group. More than one third of the CSI group (38%) received more than one injection, whereas 20% of the MPT group also had a CSI after their original treatment. Although the MPT group was not offered maintenance MPT after the planned intervention, 4 patients sought additional physical therapy. Ten patients in the CSI group also sought physical therapy.

Table 1. **Characteristics of Patients With the Shoulder Impingement Syndrome***

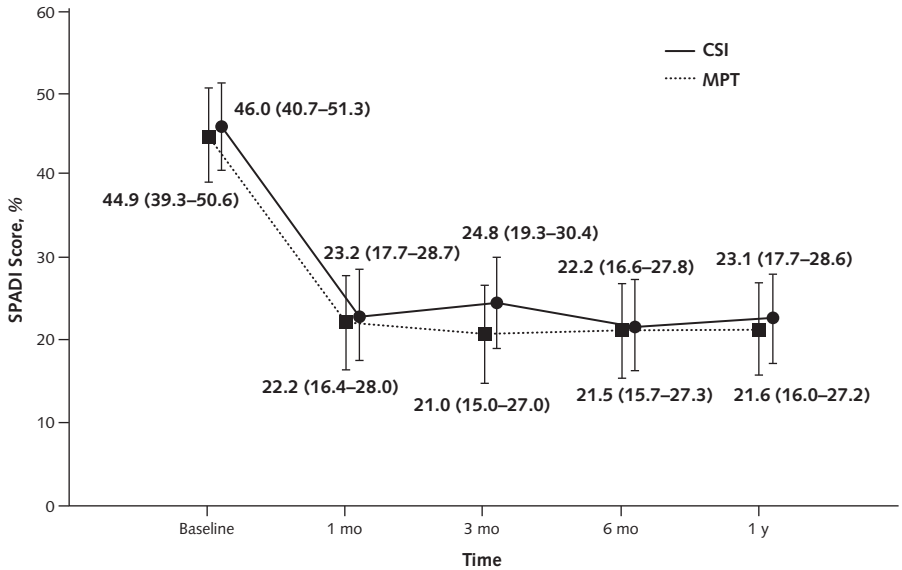
Characteristic	Patients Receiving CSI (n = 52)	Patients Receiving MPT (n = 46)
Mean age (SD), *y*	42 (12)	40 (12)
Male sex	38 (73)	29 (63)
Mean BMI (SD), kg/m^2	28.65 (4.72)	28.34 (4.24)
Mean duration of symptoms (SD), *mo*	6.5 (13.9)	4.9 (4.4)
Comorbid conditions	16 (31)	22 (48)
Mental health conditions	6 (12)	11 (24)
Hypertension	10 (19)	10 (22)
Type 2 diabetes mellitus	1 (2)	2 (4)
Other cardiovascular (e.g., angina and history of MI)	3 (6)	3 (7)
Obesity	–	1 (2)
Beneficiary category		
Active-duty service member	28 (54)	24 (52)
National Guard or reservist	2 (4)	6 (13)
Family member/dependent	8 (15)	10 (22)
Retired service member	14 (27)	6 (13)
Currently smoking tobacco	6 (12)	11 (24)
Right-hand dominance	45 (87)	39 (85)
Shoulder pain on same side as hand dominance	27 (52)	26 (57)
Percentage of work/daily activities that require overhead movement		
75%–100%	1 (2)	2 (4)
50%	7 (13)	8 (17)
1%–25%	31 (60)	24 (52)
0%	11 (21)	10 (22)
How shoulder pain affects sleep		
Not at all	3 (6)	4 (9)
Some, but still able to sleep	40 (77)	38 (83)
Cannot sleep due to pain	8 (15)	4 (9)
Mean baseline FABQ score (SD)		
Work subscale	12 (10)	12 (10)
Physical activity subscale	15 (4)	15 (5)

BMI = body mass index; CSI = corticosteroid injection; FABQ = Fear Avoidance Beliefs Questionnaire; MI = myocardial infarction; MPT = manual physical therapy.
* Values are numbers (percentages) unless otherwise indicated.

This additional care received by the CSI group throughout the 1-year follow-up may have led to their reporting improved pain and function.

Other factors can affect the prognosis of shoulder conditions, including psychosocial risk (56–58). Fear avoidance beliefs were originally described by Lethem and colleagues (59) as a model for how patients develop chronic pain by implementing coping strategies that avoid activity or exercise. The Fear Avoidance Beliefs Questionnaire is a standard measure taken in our physical therapy clinic, and both groups had similar scores. Shoulder pain severity has also been associated with sleep quality (60, 61) and obesity (62). Both groups reported similar effects of pain on sleep quality. Although overall the patients in this study were overweight (mean body mass index >25.0 kg/m^2) (63), body mass index did not differ between groups. Tobacco use may be associated with a greater prevalence of shoulder pain (62), and the MPT group reported more tobacco use than the CSI group. The CSI group had more than twice

Figure 2. **Comparative effectiveness measured by changes in SPADI scores over time.**



Mean effect estimates (95% CIs) from observed data. Overlapping error bars indicate that no significant difference was found between groups at any time point. CSI = corticosteroid injection; MPT = manual physical therapy; SPADI = Shoulder Pain and Disability Index.

the number of retired military personnel than did the MPT group. However, after 20 years of military service, retirement can occur as early as age 38 years. As a result, a patient on active duty may actually be older than a retired one. However, we do not believe that this was a considerable issue because the mean age between both groups was almost identical.

Although CSI is relatively safe, adverse effects of transient pain (10.7%) and changes in skin pigmentation (4%) are most commonly reported (7), and progression to full-

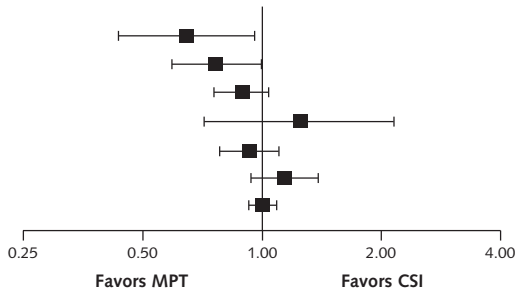
Table 2. **Outcome Measures at All Time Points***

Outcome Variable	Mean Measure (95% CI)			*P* Value Mean Difference
	CSI	MPT	Difference	
SPADI score (0 to 100), %				
Baseline	46.0 (40.7 to 51.3)	44.9 (39.3 to 50.6)	1.0 (6.7 to 8.8)	0.79
1 mo	23.2 (17.7 to 28.7)†‡	22.2 (16.4 to 28.0)†‡	1.0 (7.0 to 9.0)	0.81
3 mo	24.8 (19.3 to 30.4)†‡	21.0 (15.0 to 27.0)†‡	3.8 (−4.3 to 12.0)	0.36
6 mo	22.2 (16.6 to 27.8)†‡	21.5 (15.7 to 27.3)†‡	0.7 (7.3 to 8.7)	0.86
1 y	23.1 (17.7 to 28.6)†‡	21.6 (16.0 to 27.2)†‡	1.5 (−6.3 to 9.4)	0.70
GRC score (−7 to +7)				
1 mo	3 (2 to 5)‡	3 (2 to 5)‡	0 (−2 to 2)	0.99
3 mo	3 (2 to 4)‡	4 (3 to 5)‡	1 (−2 to 1)	0.32
6 mo	3 (2 to 4)‡	3 (1 to 4)‡	1 (−1 to 2)	0.32
1 y	3 (2 to 4)‡	3 (2 to 4)‡	0 (−2 to 1)	0.53
NPRS score (0 to 10)				
Baseline	3.3 (2.7 to 3.9)	3.8 (3.2 to 4.5)	0.5 (1.4 to 0.4)	0.26
1 mo	1.7 (1.1 to 2.4)†	1.6 (1.0 to 2.3)†	0.1 (−0.8 to 1.0)	0.80
3 mo	2.6 (2.0 to 3.2)†	1.8 (1.1 to 2.5)†	0.8 (−0.1 to 1.8)	0.077
6 mo	2.2 (1.6 to 2.8)†	1.7 (1.1 to 2.4)†	0.5 (−0.4 to 1.4)	0.29
1 y	2.5 (1.9 to 3.1)†	2.1 (1.5 to 2.8)†	0.4 (−0.5 to 1.2)	0.42

CSI = corticosteroid injection; GRC = Global Rating of Change; MPT = manual physical therapy; NPRS = Numeric Pain Rating Scale; SPADI = Shoulder Pain and Disability Index.
* Report based on observed data. The numbers of patients at each follow-up visit were as follows: 1 mo = 88; 3 mo = 83; 6 mo = 84; 1 y = 94.
† Significant improvement from baseline ($P < 0.05$).
‡ Meets established minimally clinically important improvement from baseline (≥12 points for SPADI; ≥3 points for GRC).

Figure 3. **Relative risk for using additional health care resources.**

	Participants, *n* (%)		Risk Ratio (95% CI)
	CSI	MPT	
All patients	52	46	
PCP visits after initial care	31 (60)	17 (37)	0.64 (0.43–0.95)*
Needed any additional CSI	20 (38)	9 (20)	0.76 (0.59–0.99)*
Additional PT visits	10 (19)	4 (9)	0.86 (0.75–1.04)
Orthopedic surgeon visits	8 (15)	10 (22)	1.24 (0.71–2.15)
Plain radiography	10 (19)	6 (13)	0.93 (0.78–1.11)
MRI	7 (13)	11 (24)	1.14 (0.94–1.38)
Surgery	2 (4)	2 (4)	1.01 (0.93–1.09)



CSI = corticosteroid injection; MPT = manual physical therapy; MRI = magnetic resonance imaging; PCP = primary care provider; PT = physical therapy.
* Significantly favors MPT.

thickness rotator cuff tear after CSI is possible (54). We could not find any reports of adverse effects of MPT in this patient population. Considering that aversion to an injection was the main reason that patients chose not to participate in the study, MPT may serve as an effective low-risk alternative.

Our study has limitations. Patients and clinicians were not blinded to the intervention. It also was limited to patients who were referred to physical therapy, so our sample may not be representative of all patients who present to primary care for SIS management. Some patients referred to physical therapy had already tried other interventions without success (average symptom duration, 5 to 6 months). Others may have elected physical therapy specifically because they did not want an injection, which was the primary reason that persons declined participation (24%).

Another limitation is the lack of standardized diagnostic criteria for SIS. We used criteria from previous studies (13, 15) in an attempt to identify a homogeneous subset of patients with similar impairments and functional limitations. Use of imaging criteria in isolation, especially magnetic resonance imaging, is potentially problematic because greater than 50% of the asymptomatic population can have abnormal findings (64–68). We also included only participants with a negative lag sign, decreasing the likelihood of enrolling someone with a full-thickness rotator cuff tear (negative likelihood ratio, 0.02) (69, 70). Although CSI or MPT may benefit patients with full-thickness rotator cuff tears (54, 71), we chose to include a more homogeneous group of patients and opted to exclude patients with those findings. A recent Cochrane review suggested that screening for larger rotator cuff tears is important because it may change the plan of care (72). We do not believe that this was a problem because all but 2 patients in the CSI group had a reduction in pain symptoms by at least 50% immediately after receiving an injection. Pain reduction after CSI has been used to confirm SIS diagnosis (73–75).

It is possible that patients received care outside the military health system; however, the PCP managing each of these patients was within the military health system and coordinated all care. It is unlikely that ongoing care for an established condition would transition outside the military health system. In these cases, patients would have likely paid the cost of care. We also asked each patient about additional care at each follow-up visit.

Future work should compare MPT and CSI in persons with new symptoms of shoulder impingement based on their initial presentation at the primary care level. Additional research is needed to better understand the optimal timing and long-term costs associated with each treatment pathway.

Manual physical therapy and CSI produced similar outcomes in the treatment of patients with SIS. However, patients receiving CSI had more shoulder-related health care use through 1 year. A better understanding of how to effectively integrate these 2 management strategies or the optimal timing of use may help better establish standardized best practice guidelines.

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