Pain Physician 2024; 27:169-174 • ISSN 1533-3159

Prospective Study

Do Patients Accurately Recall Pain Levels Following Sacroiliac Joint Steroid Injection? A Cohort Study of Recall Bias in Patient-reported Outcomes

Davin C. Gong, MD[1], Aditya Muralidharan, MD[1], Bilal B. Butt, MD[2], Ronald A. Wasserman, MD[1], Joshua D. Piche, MD[1], Rakesh D. Patel, MD[1], and Ilyas Aleem, MD[1]

From: [1]University of Michigan, Ann Arbor, MI; [2]Cleveland Clinic, Cleveland, OH

Address Correspondence:
Ilyas Aleem, MD
Department of Orthopedic Surgery, University of Michigan
1500 East Medical Center Drive
2912 Taubman Center, SPC 5328
Ann Arbor, MI 48109
E-mail: ialeem@med.umich.edu

Disclaimer: There was no external funding in the preparation of this manuscript.

Conflict of interest: Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.

Manuscript received: 10-07-2023
Revised manuscript received: 11-03-2023
Accepted for publication: 12-22-2023

Free full manuscript: www.painphysicianjournal.com

Background: Sacroiliac joint (SIJ) injections are crucial in the diagnostic toolkit for evaluating SIJ pathology. Recall bias is an important component in patient-reported outcomes that has not been well studied in SIJ injection.

Objective: The purpose of this study was to characterize the accuracy, direction, and magnitude of pain level recall bias following SIJ steroid injection and study the factors that affect patient recollection.

Study Design: Prospective cohort study.

Setting: Level 1 academic medical center.

Methods: Using standardized questionnaires, baseline Numeric Rating Scale (NRS-11) scores were recorded for patients undergoing SIJ steroid injections at preinjection, at 4 hours postinjection, and at 24 hours postinjection. At a minimum of 2 weeks postinjection, patients were asked to recall their preinjection, 4-hour, and 24-hour postinjection NRS-11 scores. Actual and recalled NRS-11 scores were compared using paired t tests for each time interval. Multivariable linear regression was used to identify factors that correlated with consistent recall.

Results: Sixty patients with a mean age of 66 years (65% women) were included. Compared to their preinjection pain score, patients showed considerable improvement at both 4 hours (mean difference [MD] = 3.28; 95% CI, 2.68 – 3.89), and 24 hours (MD = 3.23; 95% CI, 2.44 – 4.03) postinjection. Patient recollection of preinjection symptoms was more severe than actual (MD = 0.65; 95% CI, 0.31 – 0.99). Patient recollection of symptoms was also more severe than actual at 4 hours (MD = 0.50; 95% CI .04 – 1.04) as well as at 24 hours postinjection (MD = 0.80; 95% CI, 0.16 – 1.44). The magnitude of recall bias was mild and did not exceed the minimal clinically important difference. There was a moderate correlation between actual and recalled pain levels when comparing preinjection with the 4-hour postinjection NRS-11 score (correlation coefficient [r] =0.64; $P < 0.001$) and moderate correlation when comparing preinjection with the 24-hour postinjection NRS-11 score (r = 0.62; $P < 0.001$). Linear regression models showed that at preinjection, patients with a lower body mass index and the presence of coexisting psychiatric diagnoses were better at recalling their pain ($P < 0.05$). Patients with a higher body mass index also experienced less pain relief when comparing preinjection with the 4-hour postinjection NRS-11 score ($P < 0.05$).

Limitations: Recall pain scores were obtained via telephone surveys, which can lead to interview bias. One patient died, and 3 were lost to follow-up. We did not control for patient use of adjunctive pain relief modalities, which may modulate the overall response to injection. SIJ injections can also be diagnostic, so some patients may not have shared the same indication for injection or pain-generating diagnosis.

Conclusions: Patients had favorable pain level responses to their SIJ steroid injection for both actual and recall surveys. Although patients demonstrated poor recall of absolute pain scores at

preinjection, 4-hour postinjection, and 24-hour postinjection, they demonstrated robust recall of their net pain score improvement at both 4- and 24-hours postinjection. These findings suggest that there is utility in using patient recollection to describe the magnitude of pain relief following treatment for sacroiliac joint dysfunction.

Key words: Recall bias, injection, patient-reported outcomes, sacroiliac joint, nonoperative

Level of Evidence: II

Pain Physician 2024: 27:169-174

Sacroiliac joint (SIJ) dysfunction is a common contributor to chronic low back pain and can lead to a high burden of economic and medical resource utilization. One review of a large cohort of patients with Medicare who had SIJ dysfunction showed that over a 5-year period, the mean direct medical costs was $18,526 per patient (1).

Low back pain generated by the SIJ is challenging to evaluate as there can be a wide variability of inciting causes, ranging from low-impact repetitive stress to sequelae from multilevel spinal fusion or high energy trauma (2,3). Corticosteroid injection (CSI) is the gold standard nonoperative first-line intervention for SIJ pain (4). Before considering an SIJ injection, a comprehensive physical examination should be performed, which includes at least 3 provocative tests, such as the flexion abduction external rotation (FABER) test, also known as Patrick's test; thigh thrust; or compression distraction test (5).

When nonoperative modalities are exhausted, arthrodesis of the SIJ can be a surgical option to provide relief and has been shown to be superior to conservative management (6). Having a positive response to a CSI in relieving SIJ pain has thought to carry a similarly encouraging prognosis for SIJ fusion. Historical selection criteria advocate for at least 75% improvement in symptoms after SIJ injection as an indication for SIJ fusion (7), but one randomized controlled trial demonstrated that the degree of pain improvement from SIJ fusion was not predicted by SIJ injection, and even patients with 50% improvement after SIJ injection had excellent post-SIJ fusion response (8). The Centers for Medicare and Medicaid Services has determined, among other criteria, that a patient must experience at least a 75% reduction of pain following image-guided intraarticular SIJ injection for the SIJ arthrodesis procedure to be deemed necessary (9).

Despite these recommendations, the accuracy of patient recall following SIJ injection has not previously been studied. Patient-reported outcomes (PROs) are becoming widely used in both clinical and research settings as a metric for quantifying disease burden and disability (10). However, PROs are not flawless; they can be subjective and susceptible to individual patient interpretation.

Perhaps the most important limitation in the use of PROs is recall bias, a phenomenon in which patients may exhibit poor accuracy in recollecting their pre- and even postintervention symptoms when prompted after a certain time interval (11). If patients are not able to accurately recall their initial degree of disability, or the amount of improvement gained from an intervention, then spine clinicians may be remiss to use these data to recommend further treatment options.

The purpose of our study was to characterize the magnitude and direction of recall bias post-SIJ injection in patients with SIJ dysfunction. We hypothesized that patient recall would have weak agreement with both pre- and post-intervention pain scores at a minimum of 2 weeks following an SIJ steroid injections.

Methods

Study Design

This was a prospective cohort study conducted at a single academic tertiary center. Patients with suspected SIJ pain were referred to the anesthesia back pain clinic for CSI by various specialists, from primary care physicians to board-certified neurosurgeons or orthopedic spine surgeons. All SIJ steroid injections were performed under fluoroscopic guidance by a board-certified interventional pain medicine physician.

Baseline Numeric Rating Scale (NRS-11) scores were obtained immediately preinjection, and at 4- and 24-hours postinjection. At a minimum of 2 weeks following the CSI, patients were contacted by telephone and asked to recall their preinjection and short-term 4- and 24-hour postinjection NRS-11 scores. Additionally, demographic information such as patient age, gender, body mass index (BMI [kg/m^2]), lumbar spine surgery history, and psychiatric diagnoses history were collected (Table 1). Institutional review board approval (HUM00151764) was obtained prior to study initiation.

Inclusion and Exclusion Criteria

Patients were eligible to be enrolled in the study if they were at least 18 years of age and underwent an SIJ steroid injection at our institution from August 2022 through July 2023. Patients were enrolled if they completed the initial pain questionnaire and mailed it to our office for review. Patients were excluded if they failed to complete the pain questionnaire or had incomplete documentation of either the preinjection or short-term postinjection pain questionnaire. Every attempt was made to include all patients from the time of study initiation. Patients were not excluded based on the indication for their SIJ steroid injection.

Outcome Measures

We obtained baseline NRS-11 score on a standard 11-point scale from 0 to 10, with 0 representing no pain and 10 representing the worst conceivable pain. Additionally, we recorded time in hours for postinjection short-term pain relief.

Data Collection

All enrolled patients were asked to complete a baseline NRS-11 survey prior to their SIJ steroid injection. They were asked to complete the short-term survey at home for the 4- and 24-hour postinjection NRS-11. We again contacted each patient via telephone at a minimum of 2 weeks postinjection to complete the recall portion of the survey. The telephone script was standardized and performed by authors DCG and AM, neither of whom were involved with performing the SIJ injections. Patients were asked to recall their preinjection and 4- and 24-hour postinjection NRS-11 scores. Additional demographic information and past medical history were obtained from an electronic medical record review.

Statistical Analyses

Actual NRS-11 scores and recalled NRS-11 scores at preinjection, 4-hour, and 24-hour postinjection time points were compared using 2-sided paired Student t tests. Actual and recalled differences for preinjection and 4-hour postinjection NRS-11 scores, as well as preinjection and 24-hour postinjection NRS-11 scores, were also compared using paired t tests to assess net postinjection pain improvement. Concordance between actual and recalled NRS-11 scores was calculated with Pearson correlation coefficients (Pearson's r).

Coefficients less than 0.35 represent a weak correlation, coefficients 0.35 – 0.70 represent a moderate correlation, and coefficients greater than 0.7 represent a strong correlation (12). A multivariate linear regression analysis was used to determine whether age, gender, BMI, coexisting psychiatric diagnoses, or a history of lumbosacral surgery were associated with changes in the NRS-11 scores. Using an α of 0.05 and a power of 80%, we performed an a priori power analysis using IBM SPSS Statistics 28.0 (IBM Corporation) to determine the sample size required to detect a minimal clinically important difference (MCID) of 1.4 (13,14).

Results

Sixty patients (65% women) with a mean age of 66 years (SD = 11.8 years) were included. Compared to their preinjection pain score, patients showed considerable improvement at both 4 hours (mean difference [MD] = 3.28; 95% CI, 2.68 – 3.89), and 24 hours (MD = 3.23; 95% CI, 2.44 – 4.03] postinjection. Compared to their recalled preinjection score, patients showed similar improvement at both recalled 4 hours (MD = 3.43; 95% CI, 2.55 – 4.32) and recalled 24 hours (MD = 3.08; 95% CI, 2.29 – 3.88] postinjection (Table 2).

Patients' recollections of preinjection symptoms were more severe than the symptoms they reported at preinjection (MD = 0.65; 95% CI, 0.31 – 0.99); there was a mild magnitude of recall bias. Patients' recollections of symptoms was also more severe than the symptoms they reported at 4 hours postinjection (MD = 0.50; 95% CI, 0.04 – 1.04); there was a mild magnitude of recall bias. Patients' recollections of symptoms were also more severe than at the symptoms they reported at 24 hours postinjection (MD = 0.80; 95% CI, 0.16 – 1.44);

Table 1. *Patient demographics, n = 60.*

Demographics	Mean
Age	66 yrs
Gender	21 men, 39 women
Body Mass Index (BMI)	31.0 kg/m^2
Prior Lumbar Surgery	24/60 (40%)
Prior Psychological History	21/60 (35%)

Table 2. *Mean difference in therapeutic effect (reported and recall).*

	Mean Difference (95% CI)
Preinjection vs 4 hours post	3.28 (2.68 - 3.89)*
	3.43 (2.55 - 4.32)**
Preinjection vs 24 hours post	3.23 (2.44 - 4.03)*
	3.08 (2.29 - 3.88)**

* Reported; ** Recall

there was a mild to moderate magnitude of recall bias. The magnitude of recall bias in all 3 groups was statistically significant (Fig. 1), however, no group's Δ NRS-11 score mean difference reached MCID.

When analyzing net improvements in pain levels following our patients' SIJ injections, there was a moderate correlation between their reported and recalled pain levels when comparing preinjection with 4-hour postinjection NRS-11 scores (r = 0.64; $P < 0.001$) (Fig. 2), and moderate correlation when comparing preinjection with 24-hour postinjection NRS-11 scores (r = 0.62; $P < 0.001$) (Fig. 3). Linear regression models for differences between reported and recalled pain scores reveal that at preinjection, patients with a lower BMI and the presence of coexisting psychiatric diagnoses were better at recalling their pain ($P < 0.05$). Patients with a higher BMI also experienced less pain relief when comparing preinjection with 4-hour postinjection NRS-11 scores ($P < 0.05$).

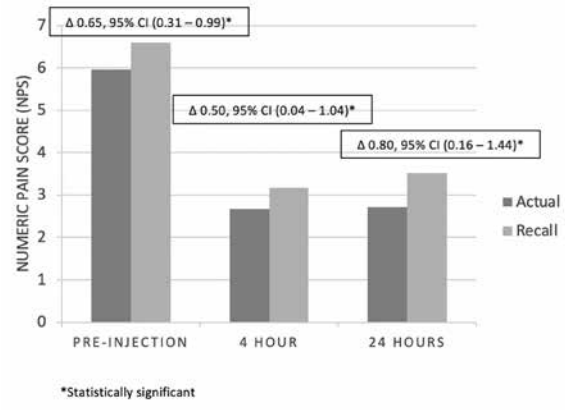

Fig. 1. *Actual vs recalled Numeric Rating Scale score as a function of time.*

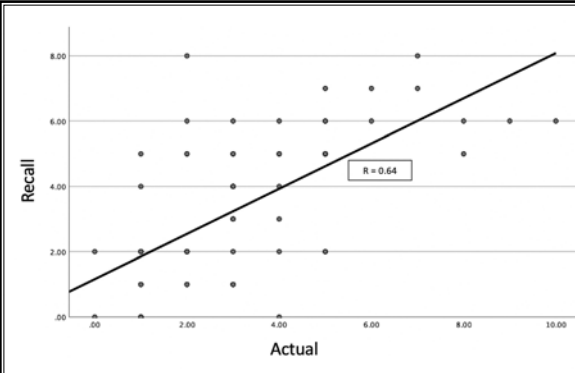

Fig. 2. *Preinjection vs 4 hours postinjection (reported vs recall).*

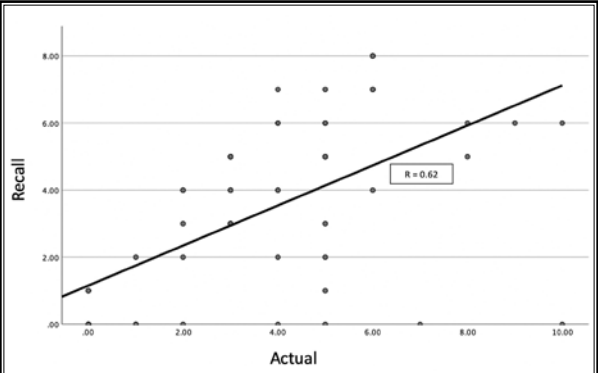

Fig. 3. *Preinjection vs 24 hours postinjection (reported vs recall).*

Discussion

Our study demonstrates that patient recall of their absolute pain scores following an SIJ injection was significantly more severe than their reported pain scores, but these differences did not exceed the MCID. However, we found that their relative pain recollection, that is their Δ NRS-11 score (postinjection compared to preinjection), was consistent with what they had reported. Reliability with the latter is more important in the clinical setting because relative improvement in pain following an injection is useful for both diagnostic purposes and prognostic implications for further treatment. If surgeons can rely on a patient recalling a 75% reduction of their pain levels following an SIJ injection, then they may feel greater confidence in offering SIJ arthrodesis as a more definitive treatment option.

Similar findings regarding poor absolute recall of preoperative symptoms have been reported in related studies evaluating lumbar epidural steroid injections (15), cervical spine surgery (16), and lumbar decompression and fusion (17). In all 3 studies, preintervention pain levels had weak agreement with recalled preintervention pain levels at a minimum of 2 weeks postintervention. Additionally, recalled pain levels were, on average, more severe than reported, as was the case in our study. Further studies may need to be conducted to illuminate this phenomenon.

We used 2 weeks as the recall time interval because it is the first standard short-term follow-up period following an SIJ injection at our institution. We did not evaluate for recall in longer term follow-up time

intervals, although we hypothesize that recall accuracy diminishes in a time-dependent manner. Recall intervals that are too long tend to overestimate the health state and have higher rates of recall error (18,19). The benefit of a longer-term follow-up is that patients may be able to recall the total duration of an injection's therapeutic effect, as injections tend to wear off over several weeks to months. At 2 weeks, patients that have responded favorably to an SIJ injection are unlikely to be offered surgical intervention as the corticosteroid is typically still working.

Interestingly, we found that patients with a higher BMI had less improvement in 4-hour postinjection pain, but this correlation was not seen at 24-hours postinjection. There are technical challenges in performing SIJ injections on patients with obesity, such as the use of longer needles and increased radiation doses under fluoroscopy (20). It is possible that patients with obesity require a greater number of needle punctures and longer procedural times, as is the case with similar patients who receive epidural anesthesia in obstetrics (21). This may have influenced short-term pain scores in our study. Another hypothesis is that patients with a higher BMI may have a higher incidence of suboptimal injections. However, all patients in our enrolled cohort had successful intraarticular SIJ injections confirmed by fluoroscopy. The effects of local anesthesia as a function of BMI may also be a contributor due to its short-acting quality. The therapeutic effects of local anesthesia can vary widely and last between 30 minutes and 48 hours, although typically is worn off by 120 minutes (22). There is a scarcity of literature on the relationship between BMI and PROs as a function of the anesthesia derived from intraarticular injections.

Limitations

Our study originally enrolled 64 patients; 3 were lost to follow-up and an additional patient died following SIJ steroid injection before the recall survey portion was conducted. The death was unrelated to the CSI. These 4 patients were excluded from the final analysis.

We conducted the recall survey over the telephone, which can lead to interview bias. Typically, patients follow up with the clinic in person with a provider, thus using the telephone to collect survey information is a potential factor that may influence recalled pain scores. No monetary incentives were provided for patients to participate in this study; those who enrolled may have different secondary characteristics than those who chose not to participate in the study. Patients were free to take any pain medications and use adjunctive postoperative modalities for pain relief such as heat/ice, massage, or activity modifications. These adjuncts may modulate the therapeutic effect of the CSI, although no such studies were found in our literature review.

Finally, it is unlikely that all those who received an SIJ steroid injection had SIJ dysfunction. Low back pain can be mimicked by many different pathologies of which SIJ pain is one. One study estimates the prevalence of SIJ dysfunction in chronic low back pain is 15% to 30% (23). Although we did not control for indications for SIJ steroid injection, our outcome measures were not dependent on the preintervention diagnosis, and we did not find studies that showed certain back pain pathologies were more perceptive to analgesia recall.

Conclusion

Two weeks following an SIJ steroid injection, patients could not accurately recall the absolute magnitude of their pre- and postinjection pain scores, but they could accurately recall the change in their pre- and postinjection pain scores. Some factors such as higher patient BMI were associated with less improvement in pain scores at 4-hours postinjection. These findings indicate that pain recall at 2-weeks post-SIJ injection may be used by spine providers to accurately determine an injection efficacy. Providers should attempt to collect baseline pain diaries at the time of injection and be cautious of recall bias when interpreting response to treatment. Further studies are needed to evaluate how different demographic factors influence pain score recall accuracy.

Authors' Contributions:

DG carried out the entire procedure including the study design, data acquisition, statistical analysis, manuscript writing, and editing. AM assisted with data acquisition, statistical analysis and manuscript writing. RW is credited with data acquisition, statistical analysis, and critical manuscript revisions. BB, JP, RP, and IA conceived study and revised it critically for content. All authors read and approved the final manuscript.

References

1. Ackerman SJ, Polly DW Jr, Knight T, Holt T, Cummings J Jr. Nonoperative care to manage sacroiliac joint disruption and degenerative sacroiliitis: High costs and medical resource utilization in the United States Medicare population. *J Neurosurg Spine* 2014; 20:354-363.
2. Rashbaum RF, Ohnmeiss DD, Lindley EM, Kitchel SH, Patel VV. Sacroiliac joint pain and its treatment. *Clin Spine Surg* 2016; 29:42-48.
3. Thawrani DP, Agabegi SS, Asghar F. Diagnosing sacroiliac joint pain. *J Am Acad Orthop Surg* 2019; 27:85-93.
4. Newman DP, Soto AT. Sacroiliac joint dysfunction: Diagnosis and treatment. *Am Fam Physician* 2022; 105:239-245.
5. Buchanan P, Vodapally S, Lee DW, et al. Successful diagnosis of sacroiliac joint dysfunction. *J Pain Res* 2021; 14:3135-3143.
6. Chang E, Rains C, Ali R, Wines RC, Kahwati LC. Minimally invasive sacroiliac joint fusion for chronic sacroiliac joint pain: a systematic review. *Spine J* 2022; 22:1240-1253.
7. Schmidt GL, Bhandutia AK, Altman DT. Management of sacroiliac joint pain. *J Am Acad Orthop Surg* 2018; 26:610-616.
8. Polly D, Cher D, Whang PG, Frank C, Sembrano J; INSITE Study Group. Does level of response to SI joint block predict response to SI joint fusion? *Int J Spine Surg* 2016; 10:4.
9. Centers for Medicare and Medicaid Services. Percutaneous minimally invasive fusion/stabilization of the sacroiliac joint for the treatment of back pain. www.cms.gov/medicare-coverage-database/view/lcd.aspx?LCDId=36000
10. Chauhan D, Ahmad HS, Subtirelu R, et al. Defining the minimal clinically important difference in smartphone-based mobility after spine surgery: Correlation of survey questionnaire to mobility data. *J Neurosurg Spine* 2023; 26:1-11.
11. Crutchfield CR, Givens RR, O'Connor M, deMeireles AJ, Lynch TS. Recall bias in the retrospective collection of common patient-reported outcome scores in hip arthroscopy. *Am J Sports Med* 2022; 50:3190-3197.
12. Taylor R. Interpretation of the correlation coefficient: A basic review. *J Diagn Med Sonogr* 1990; 6:35-39.
13. Hung M, Saltzman CL, Kendall R, et al. What are the MCIDs for PROMIS, NDI, and ODI instruments among patients with spinal conditions? *Clin Orthop Relat Res* 2018; 476:2027-2036.
14. Copay AG, Glassman SD, Subach BR, et al. Minimum clinically important difference in lumbar spine surgery patients: A choice of methods using the Oswestry Disability Index, Medical Outcomes Study questionnaire Short Form 36, and pain scales. *Spine J* 2008; 8:968-974.
15. Butt BB, Kagan D, Gagnier J, et al. Do patients accurately recall their pain levels following epidural steroid injection? A cohort study of recall bias in patient-reported outcomes. *Pain Physician* 2022; 25:59-66.
16. Aleem IS, Currier BL, Yaszemski MJ, et al. Do cervical spine surgery patients recall their preoperative status?: A cohort study of recall bias in patient-reported outcomes. *Clin Spine Surg* 2018; 31:E481-E487.
17. Aleem IS, Duncan J, Ahmed AM, et al. Do lumbar decompression and fusion patients recall their preoperative status?: A cohort study of recall bias in patient-reported outcomes. *Spine (Phila Pa 1976)* 2017; 42:128-134.
18. Norquist JM, Girman C, Fehnel S, DeMuro-Mercon C, Santanello N. Choice of recall period for patient-reported outcome (PRO) measures: Criteria for consideration. *Qual Life Res* 2012; 21:1013-1020.
19. Clarke PM, Fiebig DG, Gerdtham UG. Optimal recall length in survey design. *J Health Econ* 2008; 27:1275-1284.
20. Cushman D, Flis A, Jensen B, McCormick Z. The effect of body mass index on fluoroscopic time and radiation dose during sacroiliac joint injections. *PM&R* 2016; 8:767-772.
21. Ranta P, Jouppila P, Spalding M, Jouppila R. The effect of maternal obesity on labour and labour pain. *Anaesthesia* 1995; 50:322-326.
22. Lemke KA, Dawson SD. Local and regional anesthesia. *Vet Clin North Am Small Anim Pract* 2000; 30:839-857.
23. Cohen SP, Chen Y, Neufeld NJ. Sacroiliac joint pain: A comprehensive review of epidemiology, diagnosis and treatment. *Expert Rev Neurother* 2013; 13:99-116.