The Prevalence and Clinical Implications of Comorbid Back Pain in Shoulder Instability

A Multicenter Orthopaedic Outcomes Network (MOON) Shoulder Instability Cohort Study

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Background: Understanding predictors of pain is critical, as recent literature shows that comorbid back pain is an independent risk factor for worse functional and patient-reported outcomes (PROs) as well as increased opioid dependence after total joint arthroplasty.

Purpose/Hypothesis: The purpose of this study was to evaluate whether comorbid back pain would be predictive of pain or self-reported instability symptoms at the time of stabilization surgery. We hypothesized that comorbid back pain will correlate with increased pain at the time of surgery as well as with worse scores on shoulder-related PRO measures.

Study Design: Cross-sectional study; Level of evidence, 3.

Methods: As part of the Multicenter Orthopaedic Outcomes Network (MOON) Shoulder Instability cohort, patients consented to participate in pre- and intraoperative data collection. Demographic characteristics, injury history, preoperative PRO scores, and radiologic and intraoperative findings were recorded for patients undergoing surgical shoulder stabilization. Patients were also asked, whether they had any back pain.

Results: The study cohort consisted of 1001 patients (81% male; mean age, 24.1 years). Patients with comorbid back pain (158 patients; 15.8%) were significantly older (28.1 vs 23.4 years; $P < .001$) and were more likely to be female (25.3% vs 17.4%; $P = .02$) but did not differ in terms of either preoperative imaging or intraoperative findings. Patients with self-reported back pain had significantly worse preoperative pain and shoulder-related PRO scores (American Shoulder and Elbow Surgeons score, Western Ontario Shoulder Instability Index) ($P < .001$), more frequent depression (22.2% vs 8.3%; $P < .001$), poorer mental health status (worse scores for the RAND 36-Item Health Survey Mental Component Score, Iowa Quick Screen, and Personality Assessment Screener) ($P < .01$), and worse preoperative expectations ($P < .01$).

Conclusion: Despite having similar physical findings, patients with comorbid back pain had more severe preoperative pain and self-reported symptoms of instability as well as more frequent depression and lower mental health scores. The combination of disproportionate shoulder pain, comorbid back pain and mental health conditions, and inferior preoperative expectations may affect not only the patient's preoperative state but also postoperative pain control and/or postoperative outcomes.

Keywords: shoulder instability; shoulder; back pain; dislocation; shoulder instability surgery; patient-reported outcomes

Shoulder instability is common, with the prevalence of primary anterior shoulder dislocation estimated to be as high as 1.7%.[11,26] When shoulder instability is treated nonoperatively, there is a high risk of recurrent shoulder instability, estimated to occur in 25% to 100% of patients.[1,3,12,24] Both open and arthroscopic procedures have been extensively described in the literature, with most recent data showing equivalent outcomes when appropriate selection criteria are applied.[5] Factors associated with failure after open or arthroscopic soft tissue repairs for instability include age, sex, contact sport, time from first dislocation to surgery, and the number of preoperative dislocations.[15,22]

The use of opioid analgesics has reached epidemic levels in the United States.[9,25] The opioid crisis has led to an increased focus on pain, the treatment for pain, and how this affects patient outcomes. The orthopaedic community has a unique place in the opioid debate, as orthopaedic surgeons represent the third highest prescribers of narcotic pain medications.[29] Opioids continue to be prescribed even as recent evidence shows that abuse and dependence lead

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to increased morbidity and mortality, more pain, and decreased satisfaction after orthopaedic surgery.[2,16,18] Many factors have been associated with increased opioid dependence after orthopaedic surgery, including younger age, anxiety, preoperative opioid abuse, depression, and back pain.[17]

The presence of comorbid back pain has recently been identified in the total joint literature as an independent risk factor for worse functional and patient-reported outcomes (PROs) and increased opioid dependence after the acute postoperative period.[4,7,27] This finding is significant given that 57.4% of patients with knee osteoarthritis and 49.4% of patients with hip osteoarthritis were found to have concomitant low back pain.[20,28]

Neither the prevalence nor impact of back pain in patients undergoing shoulder stabilization is known. The purpose of this study was to evaluate whether comorbid back pain would be predictive of pain or self-reported instability symptoms at the time of stabilization surgery. We hypothesized that comorbid back pain would correlate with increased pain at the time of surgery as well as worse scores on preoperative, shoulder-related PRO measures.

METHODS

The Multicenter Orthopaedic Outcomes Network (MOON) Shoulder Instability cohort has been previously described in the literature.[13] It is a prospective, multicenter study of patients undergoing surgery for shoulder instability. Patients were prospectively enrolled at 10 private and academic practices across the United States by 20 sports medicine or shoulder and elbow fellowship–trained orthopaedic surgeons. The study was approved by the institutional review board at each institution.

Enrolled patients were diagnosed with glenohumeral instability based on history and physical examination by the MOON investigators. Patients underwent primary or revision, open or arthroscopic, shoulder stabilization surgery. Exclusion criteria included patients with concomitant rotator cuff tear necessitating repair, proximal humeral fractures (not including Hill-Sachs lesions), workers' compensation claims, or inability to provide informed consent.

Demographic characteristics, medical history, preoperative PRO scores, mental health scores, radiographic imaging, intraoperative findings, and procedures performed were recorded. Data collected included patient demographics, medical comorbidities, past surgical history, past shoulder injury history, and sport. Patient expectations were calculated through use of a previously validated method.[10] Patients were asked 7 questions regarding expectations, and responses were recorded on a Likert scale. Answers to the 7 questions were then averaged to obtain a score from 1 to 5. A score of 4 or higher is considered a high expectation of a successful outcome.

As part of the intake questionnaire, patients were asked, "Do you have back pain?" Possible responses were "yes" or "no." This was a self-reported diagnosis of back pain.

Multiple PRO scores were collected, including the American Shoulder and Elbow Surgeons (ASES) score, Western Ontario Shoulder Instability Index (WOSI), RAND 36-Item Health Survey (RAND-36), and Single Assessment Numeric Evaluation (SANE). Mental health outcome measures included the RAND-36 Mental Component Score (RAND-36 MCS), Iowa Quick Screen, and Personality Assessment Screener (PAS) score. The PROs and mental health scores were completed using REDCap electronic forms. The intraoperative findings, imaging findings, and procedures performed were recorded by the MOON investigators immediately following surgery. Computed tomography and magnetic resonance imaging were obtained at the discretion of the treating surgeon if deemed necessary.

For statistical analyses, patients were grouped based on the presence of preoperative back pain. Continuous variables were compared between groups by use of 2-tailed independent *t* tests, and categorical variables were compared via chi-square or Fisher exact tests as appropriate.

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Ethical approval for this study was obtained from the University of Iowa Institutional Review Board.

TABLE 1
Comparison of Patient Demographics and Injury History Between Shoulder Instability Patients Either With or Without Comorbid Back Pain

	No Back Pain	Back Pain	P
n	843	158	—
Female, male, n (% female)	147, 696 (17.4)	40, 118 (25.3)	.02
Age, y, mean ± SD	23.4 ± 8.3	28.1 ± 10.2	<.001
Body mass index, mean ± SD	25.5 ± 4.3	26.6 ± 4.9	.003
Injury during sport, n (%)	637 (75.5)	99 (62.8)	.001

All analyses were performed by use of SPSS Statistics Version 24 (IBM), and an alpha level of $P < .05$ was considered statistically significant.

RESULTS

The study cohort consisted of 1010 patients; however, 9 patients did not respond to the question regarding the presence of back pain. Of the 1001 patients included in the current analyses, 158 (15.8%) self-reported having comorbid back pain. Patients with comorbid back pain were significantly older (28.1 vs 23.4 years; $P < .001$), were more often female (25.3% vs 17.4%; $P = .02$), had a higher body mass index, and had injuries less frequently occurring during sport (back pain, 62.8% sports injuries; no back pain, 75.5% sports injuries; $P = .001$) but did not differ in terms of preoperative imaging, intraoperative findings, or the need for an open procedure (Tables 1 and 2). A significantly greater proportion of patients with back pain reported having symptoms of instability lasting more than 1 year than did those without back pain (62.7% vs 48.5%; $P < .001$); however, the frequency of self-reported dislocations prior to surgery did not differ between groups ($P = .58$). Patients with self-reported back pain had significantly worse preoperative pain and shoulder-related PRO scores (ASES, WOSI, SANE; $P < .001$), more frequent depression (22.2% vs 8.3%; $P < .001$), poorer mental health status (worse RAND-36 MCS, Iowa Quick Screen scores, and PAS scores; $P < .01$), and worse preoperative expectations ($P < .01$) (Table 3).

DISCUSSION

The findings of our study show that patients with shoulder instability who had comorbid back pain had worse preoperative PROs, more depression, worse mental health scores, and lower preoperative expectations than did patients with shoulder instability who did not have comorbid back pain. However, we found no differences in the severity of preoperative imaging or surgeon-reported intraoperative pathological findings. This suggests an alternative explanation for the lower PROs not specifically related to the shoulder pathological condition. Our findings are similar to those seen in the hip and knee arthroplasty literature.[4,6,7,14,20,21,27]

TABLE 2
Comparison of Imaging and Intraoperative Findings Between Shoulder Instability Patients Either With or Without Comorbid Back Pain[a]

	No Back Pain	Back Pain	P
Radiographic findings			
Humeral deficiency	181 (21.5)	28 (17.7)	.29
Glenoid deficiency	98 (11.6)	16 (10.1)	.59
MRI, CT findings			
Anterior humeral bone loss	24 (2.8)	6 (3.8)	.46
Posterior humeral bone loss	365 (43.3)	59 (37.3)	.16
Anterior glenoid bone loss	809 (96.0)	149 (94.3)	.39
Posterior glenoid bone loss	13 (1.5)	1 (0.6)	.71
Anterior labral tear	535/840 (63.7)	89/157 (56.7)	.10
SLAP tear	123/840 (14.6)	31/157 (19.7)	.10
Intraoperative findings			
Normal anterior capsule/labrum	549 (65.1)	96 (60.8)	.12
Normal inferior capsule/labrum	676 (80.2)	116 (73.4)	.32
Normal posterior capsule/labrum	725 (86.0)	138 (87.3)	.23

[a]Values are expressed as n (%). Total sample size was different for anterior labral tear and SLAP tear due to missing information during data collection. CT, computed tomography; MRI, magnetic resonance imaging; SLAP, superior labrum anterior-posterior.

TABLE 3
Comparison of Preoperative Patient-Reported Outcomes and Self-Reported Psychological Diagnoses Between Shoulder Instability Patients Either With or Without Comorbid Back Pain[a]

	No Back Pain	Back Pain	P
Shoulder-related scores			
ASES	67.1 ± 20.0	57.0 ± 20.2	<.001
WOSI	1168.5 ± 404.9	1389.4 ± 366.1	<.001
Marx Shoulder Activity	13.3 ± 4.4	12.6 ± 4.9	.09
SANE	47.3 ± 23.8	39.0 ± 23.0	<.001
VAS Pain	2.7 ± 2.4	3.9 ± 2.4	<.001
RAND-36 PCS	46.7 ± 8.1	44.0 ± 7.7	<.001
Mental health scores			
RAND-36 MCS	51.5 ± 10.0	47.5 ± 11.7	<.001
PAS	26.6 ± 25.7	38.8 ± 29.1	<.001
Iowa Quick Screen	1.1 ± 1.9	1.6 ± 1.9	.007
Self-reported mental health diagnosis, n (%)	31 (3.7)	24 (15.2)	<.001
Preoperative expectations score	4.6 ± 0.6	4.4 ± 0.7	<.01

[a]Values are expressed as mean ± SD unless otherwise noted. AKSS, American Knee Society Score; MCS, Mental Component Score; PAS, Personality Assessment Screener; PCS, Physical Component Score; RAND-36, RAND 36-Item Health Survey; SANE, Single Assessment Numeric Evaluation; VAS, visual analog scale; WOSI, Western Ontario Shoulder Instability Index.

The rate of comorbid back pain is lower in patients who had shoulder instability than in patients undergoing hip and knee arthroplasty. Our patients had a 15.8% incidence of comorbid back pain, whereas Parvizi et al[20] reported a 49.4% rate in a review of 344 patients undergoing total hip arthroplasty, and Clement et al[7] found an incidence of 35% in a subset of 2392 patients undergoing primary total knee arthroplasty (TKA). This can likely be attributed to the large age difference in those undergoing surgery for shoulder instability as opposed to patients undergoing either hip or knee arthroplasty. The mean age in our cohort was 24.1 years compared with 64.5 years in the study by Parvizi et al and 70.4 years in the work by Clement et al. Similar to our cohort, those undergoing TKA with comorbid back pain were more likely to be female. However, our study also showed those with comorbid back pain were more likely to be older than their counterparts without back pain, but this was not seen in the total knee group described by Clement and colleagues.

Along with increased age and female sex, our patients with comorbid back pain had lower scores on multiple PRO measures including the ASES, WOSI, and SANE. The differences in the ASES and WOSI scores were greater than the reported minimal clinically important differences (MCIDs) of 6.4 and 220, respectively.[8,19] The difference in the SANE score approached, but did not reach, the published MCID of 9.5.[30] The total joint literature also consistently shows lower preoperative PRO scores in patients with comorbid back pain. In the study by Clement et al,[7] TKA patients with comorbid back pain had worse scores on the Oxford Knee Score (OKS) and the 12-Item Short Form Health Survey Physical Component Summary (SF-12 PCS). A similar study comparing TKA patients with and without comorbid back pain did not show any differences in OKS, American Knee Society Score (AKSS), and SF-12 PCS preoperatively. However, that study did find significantly lower scores on all outcome measures (OKS, AKSS, and SF-12 PCS) in patients with preoperative back pain at 2-year follow-up.[4] In a similar study of patients with total hip arthroplasty, Loth et al[14] showed worse pre- and postoperative Oxford Hip Score and Forgotten Joint Score-12 in those with comorbid back pain. Additionally, the presence of back pain has been shown to be an independent risk factor for dissatisfaction after total joint arthoplasty.[6,7] Further studies should assess whether the differences in PROs between those patients with and without comorbid back pain remain after surgical stabilization of the shoulder.

In addition to having lower scores on multiple functional outcome measures, patients with comorbid back pain were also more likely to be depressed and had worse scores on multiple mental health outcome measures including the RAND-36 MCS, the Iowa Quick Screen, and the PAS. Similar to our previous discussion of functional outcome measures, this relationship is also reported in the total joint literature. Patients undergoing TKA with comorbid back pain also have lower preoperative mental health scores including the SF-12 MCS.[7] Boyle et al[4] showed a lower SF-12 MCS in patients with comorbid back pain 2 years postoperatively compared with patients without back pain, although no difference existed preoperatively. Depression is also a known independent risk factor for dissatisfaction after TKA.[6] Future studies are needed to further evaluate the relationship between worse mental health scores, depression, and postoperative outcomes in shoulder instability.

Few reports in the literature are available describing opioid use in the patient population with shoulder instability. Back pain has been shown to be an independent risk factor for opioid dependence after orthopaedic surgery.[17] Young males are known to have the highest potential risk of opioid abuse and make up the majority of shoulder instability patients.[16] Studies have evaluated opioid abuse after total shoulder arthroplasty. A large database study from Kaiser Permanente describing patients undergoing total shoulder arthroplasty showed comorbid back pain to be a risk factor for continued opioid use from 90 days to 1 year after surgery.[23] These data serve as a cautionary tale and emphasize the need for further research regarding opioid abuse and shoulder instability patients.

Limitations of our study include the lack of inclusion of nonoperatively treated patients, which makes our findings less generalizable to the shoulder instability patient population as a whole. We also do not report on preoperative opioid use. Our cohort had very few female patients; however, this is consistent with the expected demographics of those with instability requiring surgery. Our results consist of preoperative findings, and we provide no evidence that patients with comorbid back pain experience a worse postoperative outcome; this will be the topic of future studies. Strengths of our study include the large number of patients, the geographically diverse area from which patients were enrolled, and the multiple surgeons included in the study group. All of these factors enhance the generalizability of our results. Recommendations for future research include comparing those with and without comorbid back pain in the postoperative period and further addressing opioid use in the shoulder instability patient population.

CONCLUSION

Despite having similar radiographic and intraoperative findings, patients with shoulder instability who had comorbid back pain had more severe preoperative pain and self-reported symptoms of instability as well as more frequent depression and lower mental health scores than patients with shoulder instability who did not have back pain.

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