Prior Antidepressant Prescription is Associated with Greater Opioid Prescriptions and Complications in Cervical Spine Surgery

A Propensity Matched Cohort Study

Abdullah Ghali, MD, Jad Lawand, MS,† Aaron Singh, BA,‡ Alexander Mihas, MD,* Meghana Jami, MD,* Anthony Farhat, BS,* and Lorenzo Deveza, MD, PhD**

Study Design: Retrospective cohort study of national database.

Objective: This study evaluates the impact of antidepressant prescriptions on postoperative outcomes and complications in cervical spine surgery.

Summary of Background Data: Patients who underwent cervical spine surgery often receive antidepressant prescriptions (ADP) to address concurrent mental health issues such as depression and anxiety. However, the use of antidepressants can affect bone metabolism. Yet, there is an opacity in the literature regarding the effects of ADP on outcomes of cervical spine surgery.

Methods: Utilizing the TriNetX database, ACDF and Cervical Arthroplasty patients were matched on a 1:1 basis according to ADP status. Outcome variables such as emergency department visits, hospital readmissions, opioid prescription, and misuse, pseudoarthrosis, adjacent segment disease, and hardware failure were evaluated over follow-up periods ranging from 2 to 24 months.

Results: In a matched sample of 12,838 patients, those with ADP exhibited significantly higher rates of opioid prescriptions at 2 weeks (OR 1.34, $P<0.0001$), 6 months (OR 1.36, $P<0.0001$), 12 months (OR 1.36, $P<0.0001$), and 24 months (OR 1.33, $P<0.0001$). Emergency Department visits were significantly higher at 6 months (OR 1.11, $P=0.0082$) and 24 months (OR 1.083, $P=0.014$). Opioid abuse is notably higher by 24 months (OR 1.37, $P=0.0033$). Hospitalization rates were significantly increased at 12 months (OR 1.16, $P=0.0013$) and 24 months (OR 1.18, $P<0.0001$). Adjacent segment disease (OR 1.54, $P<0.0001$ at 24 mo), hardware failure (OR 1.42, $P=0.013$ at 24 mo), and pseudarthrosis (OR 1.48, $P<0.0001$ at 24 mo) were also significantly higher in the ADP group.

Conclusions: Patients with ADP undergoing cervical spine surgery experience higher risks of opioid use and abuse, increased hospital readmissions, emergency department visits, and a higher rate of mechanical complications.

Level of Evidence: III

Key Words: antidepressant, cervical spine, fusion, opioids, pseudoarthrosis, adjacent segment disease, ACDF, cervical disk replacement, risk factors, complications

(*Clin Spine Surg* 2024;00:000–000)

Depression is a common comorbid condition in patients with spinal pathology.[1,2] A systematic review and meta-analysis of patients with degenerative spine disease estimates that 30% of these patients have depression.[3]

Interestingly, treatment of the physical spinal pathology, such as degenerative cervical radiculopathy and myelopathy, has been shown to improve psychiatric symptoms.[4] Although patients with comorbid anxiety and depression may experience worse outcomes, compared with patients without these comorbid conditions, they still experience significant improvements in quality of life outcomes.[5,6] This may be due to a potential association between the spinal pathology or chronic pain, which may cause or at least exacerbate psychiatric conditions.[7] Still, this association presents a challenge, as treatment of physical symptoms may alleviate the psychiatric ones, but the psychiatric ones may result in worse surgical outcomes.[8]

Although psychiatric conditions, such as anxiety and mood disorders, are common, they may be modifiable. In patients with back pain, treatment of comorbid psychiatric conditions may increase the odds of successful therapeutic outcomes.[9] In patients undergoing cervical decompression and fusion for radiculopathy or myelopathy, findings by Chen et al[10] suggest that antidepressants may increase the odds of depressed patients achieving similar clinical improvements, measured via patient-reported outcomes, as nondepressed patients.

Received for publication May 16, 2024; accepted October 26, 2024.

From the *Department of Orthopaedics, Baylor College of Medicine, Houston; †Department of Orthopedics, University of Texas Medical Branch, Galveston; and ‡Department of Orthopedics, University of Texas Health Science Center, San Antonio, TX.

The authors declare no conflict of interest.

Reprints: Abdullah Ghali, MD, Baylor College of Medicine, Department of Orthopaedics, Houston, TX (e-mail: abdullah.ghali@bcm.edu).

Supplemental Digital Content is available for this article. Direct URL citations are provided in the HTML and PDF versions of this article on the journal's website, www.jspinaldisorders.com.

DOI: 10.1097/BSD.0000000000001730

However, there is still a dearth of literature assessing the impact of these medications on postoperative outcomes following cervical spine surgery. Therefore, this study aims to assess the impact of antidepressant prescriptions on postoperative outcomes following cervical spine surgery, including cervical arthroplasty and anterior cervical discectomy and fusion.

METHODS

Data Collection and Study Population

We utilized TriNetX, a database of deidentified electronic medical records from 86 healthcare organizations. The query for deidentified patient data was executed on March 13, 2024, encompassing procedures from inception to March 10, 2022, and follow-up visits up to March 13, 2024, to identify eligible patients. As our study relied solely on deidentified records without individually identifiable data, it was exempt from Institutional Review Board approval.

Cohort Selection and Propensity Matching

Patients who underwent cervical arthroplasty (CPT 22856) or anterior cervical discectomy and fusion (CPT 22551) were identified within the TriNetX network. Two cohorts were established based on NLM:VA:CN600 prescriptions within 1 year before the procedure, with subsequent filtering for patients having a 2-year follow-up. Specific query codes can be found in Supplemental Digital Content 1, Table 1, http://links.lww.com/CLINSPINE/A369.

Propensity score matching (1:1) was applied using the TriNetX algorithm to adjust for variables such as age, sex, body mass index, race, ethnicity, chronic kidney disease, obesity, hypothyroidism, diabetes, heart failure, liver disease, hypertension, anxiety, dissociative stress-related disorders, nonpsychotic mental disorders, major depressive disorder, nicotine dependence, obesity, and overweight.

Initially, 47,265 patients who underwent cervical arthroplasty or discectomy with a 2-year follow-up were identified, with 15,631 (33%) receiving antidepressant prescriptions within 1 year before the procedure. After propensity matching, each group consisted of 12,838 patients. Significant differences in demographic characteristics were observed before cohort propensity matching, with patients in the antidepressant prescription cohort more likely to have comorbidities such as diabetes mellitus, hypertension, heart failure, COPD, liver disease, obstructive disorders, heart failure, chronic kidney disease, hypertensive disease, anxiety, dissociative stress-related disorders, nonpsychotic mental disorders, major depressive disorder, nicotine dependence, obesity, and overweight ($P < 0.05$) (Table 1).

Outcomes

The primary outcomes, which included opioid prescription, new-onset opioid abuse, emergency room visits, inpatient hospitalization, and hardware failure were recorded at postoperative intervals of 2 weeks, 6 weeks, 3 months, 6 months, 12 months, and 24 months. New-onset pseudoarthrosis and adjacent segment disease were assessed at 6 months, 12 months, and 24 months postoperatively.

Statistical Analysis

Categorical variables were compared using χ^2 or Fisher's exact test. The Measure of Association Analysis package through the TriNetX platform to perform univariate regressions that quantified and compared the proportion of patients experiencing the selected outcome to generate an odds ratio and quantified significance. The output summary provides comprehensive information, detailing patient counts within each cohort and the prevalence of outcomes among them. Data are presented in various formats, including absolutes, odds ratios, percentages, and 95% CIs.

RESULTS

Unmatched Cohort

Before matching, the average ages of patients undergoing cervical spine procedures, including cervical arthroplasty or anterior cervical discectomy and fusion, in the ADP and control cohorts were 57 ± 11.3 and 57.4 ± 12.3 ($P < 0.001$), respectively, and the BMI was 30.1 ± 6.7 and 29.3 ± 6.2. There were 1137 patients (7.00% of the cohort) who underwent cervical arthroplasty, compared with 2504 patients who received cervical arthroplasty without ADP, with a P-value of 0.049. In addition, there were significant differences observed across various demographic characteristics, including race/ethnicity (White, unknown race, female, non-Hispanic or Latino, Hispanic or Latino, African American, Male, Asian), as well as medical conditions such as diabetes mellitus, hypertensive diseases, heart failure, other chronic obstructive pulmonary disease, diseases of the liver, chronic kidney disease (CKD), anxiety, dissociative, stress-related, somatoform, and other nonpsychotic mental disorders, major depressive disorder, recurrent, nicotine dependence, overweight and obesity, and use of opioid analgesics among the study populations before 1:1 propensity matching ($P > 0.05$).

Propensity Matched

A total of 12,838 patients diagnosed with ADP, who underwent ACDF or cervical arthroplasty, were propensity matched to a cohort of patients without ADP. After 1:1 propensity matching, age and BMI were no longer significantly different between groups, with a mean age of 57.1 ± 11.4 and 57.0 ± 12.0 ($P = 0.75$) and BMI of 29.7 ± 6.6 and 29.7 ± 6.4 ($P = 0.94$), respectively. In addition, there was no significant difference in demographic characteristics between the cohorts ($P > 0.05$). Furthermore, the difference in comorbidities were no longer significant after matching ($P > 0.05$), except for major depressive disorder, with 1034 cases in one group and 908 cases in the other group, corresponding to rates of 8.1%

TABLE 1. Demographic and Comorbidity Characteristics in Patients With and Without ADP: Pre- and Postpropensity 1:1 Match

		Cohort characteristics					
		Unmatched			Matched		
	Cohort	**Patients**	**% of Cohort**	***P***	**Patients**	**% of Cohort**	***P***
Age at index	Prior ADP	15,631	100	< 0.001	12,838	100	0.940
	No ADP	31,634	100		12,838	100	
White	Prior ADP	12,845	82.2	< 0.001	10,467	81.5	0.128
	No ADP	24,394	77.1		10,561	82.3	
Unknown race	Prior ADP	738	4.7	< 0.001	631	4.9	0.817
	No ADP	1,905	6.0		623	4.9	
Female	Prior ADP	9,811	62.8	< 0.001	7,498	58.4	0.138
	No ADP	14,148	44.7		7,615	59.3	
Unknown ethnicity	Prior ADP	1,868	12.0	0.516	1,544	12.0	0.848
	No ADP	3,846	12.2		1,534	11.9	
Not Hispanic or Latino	Prior ADP	13,202	84.5	< 0.001	10,809	84.2	0.656
	No ADP	26,318	83.2		10,835	84.4	
Hispanic or Latino	Prior ADP	561	3.6	< 0.001	485	3.8	0.598
	No ADP	1470	4.6		469	3.7	
African American	Prior ADP	1564	10.0	< 0.001	1330	10.4	0.593
	No ADP	3799	12.0		1304	10.2	
Male	Prior ADP	5814	37.2	< 0.001	5334	41.5	0.148
	No ADP	17,448	55.2		5220	40.7	
Other race	Prior ADP	289	1.8	0.059	237	1.8	0.166
	No ADP	667	2.1		208	1.6	
Asian	Prior ADP	118	0.8	< 0.001	113	0.9	0.026
	No ADP	701	2.2		82	0.6	
Comorbidities							
Diabetes mellitus	Prior ADP	4246	27.2	< 0.001	3166	24.7	0.468
	No ADP	6559	20.7		3116	24.3	
Hypertensive diseases	Prior ADP	9806	62.7	< 0.001	7701	60.0	0.919
	No ADP	16,624	52.6		7693	59.9	
Heart failure	Prior ADP	1178	7.5	< 0.001	844	6.6	0.431
	No ADP	1565	4.9		813	6.3	
Other chronic obstructive pulmonary disease	Prior ADP	2333	14.9	< 0.001	1599	12.5	0.531
	No ADP	2626	8.3		1566	12.2	
Diseases of liver	Prior ADP	2187	14.0	< 0.001	1489	11.6	0.756
	No ADP	2669	8.4		1505	11.7	
Chronic kidney disease (CKD)	Prior ADP	1489	9.5	< 0.001	1071	8.3	0.316
	No ADP	2023	6.4		1027	8.0	
Anxiety, dissociative, stress-related, somatoform and other nonpsychotic mental disorders	Prior ADP	9480	60.6	< 0.001	6729	52.4	0.144
	No ADP	8277	26.2		6846	53.3	
Major depressive disorder, recurrent	Prior ADP	2566	16.4	< 0.001	1034	8.1	**0.003**
	No ADP	1034	3.3		908	7.1	
Nicotine dependence	Prior ADP	5246	33.6	< 0.001	3166	24.7	0.468
	No ADP	7508	23.7		3116	24.3	
Overweight and obesity	Prior ADP	6283	40.2	< 0.001	7701	60.0	0.919
	No ADP	8961	28.3		7693	59.9	
Opioid analgesics	Prior ADP	15,566	99.6	< 0.001	12,773	99.5	0.184
	No ADP	29,404	93.0		12,757	99.4	

Bold values indicate statistically significant (P value < 0.05.)

and 7.1%, respectively, with a P-value of 0.003. There was no difference in the number of patients receiving cervical arthroplasty versus ACDF, with 967 patients in the ADP cohort and 1039 patients in the comparator cohort who had received cervical arthroplasty, yielding a P-value of 0.0948. For detailed information, please refer to Table 1.

Postsurgical Outcomes: Opioid Use, Emergency Visits, Opioid abuse Incidents, and Hospitalization Rates

At 2 weeks postsurgery, patients with ADP had a significantly higher rate of opioid prescriptions (9.99% vs. 7.64%, OR 1.34, $P < 0.0001$) which persisted and increased through 6 months (32.15% vs. 25.81%, OR 1.36, $P<0.0001$), 12 months (40.23% vs. 33.36%, OR 1.36, $P<0.0001$), and 24 months (48.29% vs. 41.38%, OR 1.33, $P<0.0001$). ED visit rates were slightly higher but not significant at 2 weeks (ADP: 1.92% vs. control: 1.79%, OR 1.08, $P=0.432$), became significant at 6 months (ADP: 11.82% vs control: 10.77%, OR 1.11, $P=0.0082$), continued the trend at 12 months (ADP: 17.35% vs. control: 16.47%, OR 1.082, $P=0.058$), and were significantly higher at 24 months (ADP: 23.76% vs. control: 22.46%, OR 1.083, $P=0.014$). Opioid abuse rates were comparable at 2 weeks (ADP: 0.09% vs. control: 0.08%, OR 1.2, $P=0.67$) and remained nonsignificant at 6 and 12 months, but a significant difference emerged by 24 months (ADP: 0.80% vs. control: 0.51%, OR 1.37, $P=0.0033$). Hospitalization rates showed no significant difference at 2 weeks (ADP: 2.10% vs. control: 2.20%, OR 0.95, $P=0.58$), but an almost significant difference by 6 months (ADP: 6.49% vs. control: 5.93%, OR 1.10, $P=0.0626$), which became significant at 12 months (ADP: 9.76% vs. control: 8.60%, OR 1.16, $P=0.0013$) and more pronounced at 24 months (ADP: 13.88% vs. control: 12.02%, OR 1.18, $P<0.0001$). A detailed list of postoperative complications and events can be found in Figure 1, Tables 2, 3. Comprehensive data detailing postoperative complications and associated events are presented in Figure 1, Tables 2, 3.

Mechanical Complications

Adjacent segment disease was more prevalent in the ADP group at 6 months (2.87% vs. 1.89%, OR 1.54, $P<0.0001$), 12 months (3.90% vs. 2.72%, OR 1.35, $P<0.0001$), and 24 months (5.17% vs. 3.60%, OR 1.34, $P<0.0001$). For hardware failure, no significant differences were observed at 6 months (ADP: 0.23% vs. control: 0.18%, OR 1.31, $P=0.34$) or 12 months (ADP: 0.39% vs. control: 0.33%, OR 1.21, $P=0.60$), but a significant difference was noted at 24 months (ADP: 0.69% vs. control: 0.45%, OR 1.42, $P=0.013$). Pseudarthrosis rates were slightly higher in the ADP group at 6 months (ADP: 2.85% vs. control: 2.44%, OR 1.17, $P=0.0393$), with an increasing trend at 12 months (ADP: 3.99% vs. control: 3.25%, OR 1.39, $P=0.0015$), and significant differences noted at 24 months (ADP: 5.11% vs. control: 4.03%, OR 1.48, $P<0.0001$). A detailed list of mechanical complications can be found in Figure 2 and Table 3.

DISCUSSION

This retrospective cohort study assessed postoperative outcomes following ACDF or CDA in propensity score matched cohorts of patients with and without prior antidepressant prescriptions using a large database. We assessed both short-term outcomes, as well as intermediate-term outcomes out to 24 months, allowing for robust longitudinal analysis. Key findings included increased opioid use, higher rates of opioid abuse, and greater surgical complications, including pseudoarthrosis, and adjacent segment disease in patients with prior antidepressant use. These patients also had greater healthcare utilization, with both more emergency department visits and hospitalizations at 12 and 24 months.

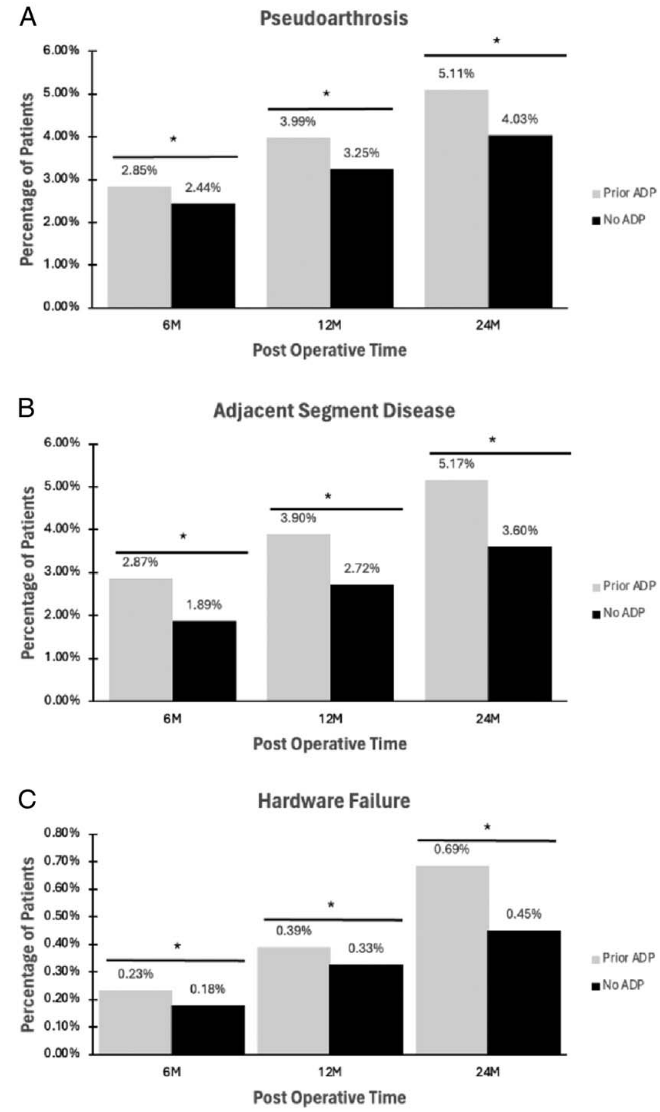

FIGURE 1. Comparison of postoperative opioid use, abuse, hospital admissions, and emergency room visits in patients with and without ADP before cervical spine surgery.

Our findings are corroborated by related literature. Toci et al found that patients with depression or anxiety undergoing posterior cervical fusion had less improvement in patient-reported outcomes and higher rates of revision surgery.[11] Patients with depression also experience a worse hospital course, with longer hospital stays and greater odds of an unfavorable discharge disposition, and greater complications following anterior cervical discectomy and fusion.[12] Furthermore, there is ample evidence demonstrating a greater risk of intraoperative bleeding in patients taking antidepressants due to platelet dysfunction.[13]

Lambrechts et al[14] also reported increased rates of pseudoarthrosis in patients taking serotonin reuptake inhibitors (SSRIs), a major class of antidepressants, undergoing ACDF and implicated SSRI's impact on osteoblast differentiation. They also reported a greater rate of

TABLE 2. Comparison of Postoperative Outcomes Between Cohorts With and ADP at 2 Weeks to 3 Months

		2 W			6 W			3 M		
Outcome	**Cohort**	**%**	**OR (95% CI)**	***P***	**%**	**OR (95% CI)**	***P***	**%**	**OR (95% CI)**	***P***
Opioid prescription	Prior ADP	9.99	1.34 (1.230, 1.464)	< 0.0001	17.88	1.35 (1.26, 1.44)	< 0.0001	24.41	1.35 (1.27, 1.43)	< 0.0001
	No ADP	7.64			13.91			19.36		
ED visits	Prior ADP	1.92	1.08 (0.90, 1.29)	0.432	4.48	1.15 (1.013, 1.294)	0.030	7.49	1.12 (1.014, 1.23)	0.024
	No ADP	1.79			3.93			6.76		
Opioid abuse	Prior ADP	0.09	1.2 (0.52, 2.78)	0.67	0.16	2.002 (0.94, 4.28)	0.068	0.19	1.41 (0.76, 2.63)	0.27
	No ADP	0.08			0.08			0.13		
Hospitalization	Prior ADP	2.10	0.95 (0.81, 1.13)	0.58	3.07	1.049 (0.91, 1.21)	0.51	4.36	1.051 (0.93, 1.19)	0.42
	No ADP	2.20			2.93			4.16		

adjacent segment disease in these patients. Pirkle et al[15] had similar findings—increased rates of pseudoarthrosis associated with SSRI use—in the setting of lumbar fusion. SSRIs are also associated with bone loss, and may increase fall and fracture risk.[16–19] These effects on bone quality and fall and fracture risk may contribute to some of the complications we observed in our study.

With respect to opioid use, findings in the literature are somewhat mixed. Makanji et al[20] found that patients with a diagnosis of anxiety, depression, or both did not require any more opioid prescriptions than a control group in the setting of cervical spine fusion. However, this study used the presence of a diagnosis to define these comorbid conditions, rather than antidepressant therapy, which may explain these disparate findings. It is possible that those receiving antidepressant prescriptions have more severe disease and may be more likely to be actively experiencing a mental health episode. Still, multiple studies have reported findings similar to our own, with patients with depression or anxiety demonstrating increased opioid use and experiencing a higher risk of chronic opioid use following ACDF.[21,22]

This may reflect a difference in pain, response to pain control, or other multifaceted relationship between mental illness and pain. Kim et al[23] reported that patients with depression had less successful pain control following steroid injections for degenerative spine disease, suggesting greater difficulty with nonopioid pain control modalities for depressed patients as well. Rogers et al[24] proposed that emotional dysregulation—an impaired ability to identify and appropriately respond to one's own emotions—may contribute to increased opioid use disorder in patients with depression, suggesting behavioral and psychosocial factors, not just physical pain, may contribute to this relationship. Sullivan proposed a biological mechanism, suggesting that depressed patients may have an impaired endogenous opioid response to stressors and may compensate by increased opioid use.[25] They also suggested depressed patients may be more susceptible to use opioids for other uses, including treatment of insomnia, stress, and nonmedical uses. Furthermore, the relationship between depression and opioid use may be bidirectional, with patients using opioids longer than 30 days are at increased risk of depression.[26]

Regardless, our findings suggest increased risk of complication and chronic opioid use in patients with preoperative antidepressant use. This data can inform surgeons and other providers in managing these patients in the postoperative period, as well as aid in preoperative risk assessment and patient counseling. Specifically, these findings indicate cause for concern with respect to pain control for these patients. Future research should aim to create better multimodal and opioid sparing pain control regimens for patients with psychiatric conditions. This work could mitigate the risks of opioid use, both chronic

TABLE 3. Comparative Analysis of Postoperative Outcomes Between ADP and Non-ADP Cohorts at 6 to 24 Months

		6 M			12 M			24 M		
Outcome	**Cohort**	**%**	**OR (95% CI)**	***P***	**%**	**OR (95% CI)**	***P***	**%**	**OR (95% CI)**	***P***
Opioid prescription	Prior ADP	32.15	1.36 (1.29, 1.44)	< 0.0001	40.23	1.36 (1.29, 1.43)	< 0.0001	48.29	1.33 (1.27,1.40)	< 0.0001
	No ADP	25.81			33.36			41.38		
ED visits	Prior ADP	11.82	1.11 (1.027, 1.12)	0.0082	17.35	1.082 (1.015, 1.153)	0.058	23.76	1.083 (1.023,1.15)	0.014
	No ADP	10.77			16.47			22.46		
Opioid abuse	Prior ADP	0.30	1.45 (0.89, 2.36)	0.1391	0.55	1.42 (0.972, 2.087)	0.020	0.80	1.37 (1.012,1.85)	0.0033
	No ADP	0.21			0.35			0.51		
Hospitalization	Prior ADP	6.49	1.10 (0.995, 1.219)	0.0626	9.76	1.16 (1.065, 1.257)	0.0013	13.88	1.18 (1.095,1.26)	< 0.0001
	No ADP	5.93			8.60			12.02		
Pseudarthrosis	Prior ADP	2.85	1.17 (1.008, 1.37)	0.0393	3.99	1.39 (1.079, 1.78)	0.0015	5.11	1.48 (1.21,1.83)	< 0.0001
	No ADP	2.44			3.25			4.03		
Adjacent segment disease	Prior ADP	2.87	1.54 (1.307, 1.815)	< 0.0001	3.90	1.35 (1.096, 1.66)	< 0.0001	5.17	1.34 (1.13,1.58)	< 0.0001
	No ADP	1.89			2.72			3.60		
Hardware failure	Prior ADP	0.23	1.31 (0.76, 2.25)	0.34	0.39	1.21 (0.84, 1.79)	0.40	0.69	1.42 (1.031,1.95)	0.013
	No ADP	0.18			0.33			0.45		

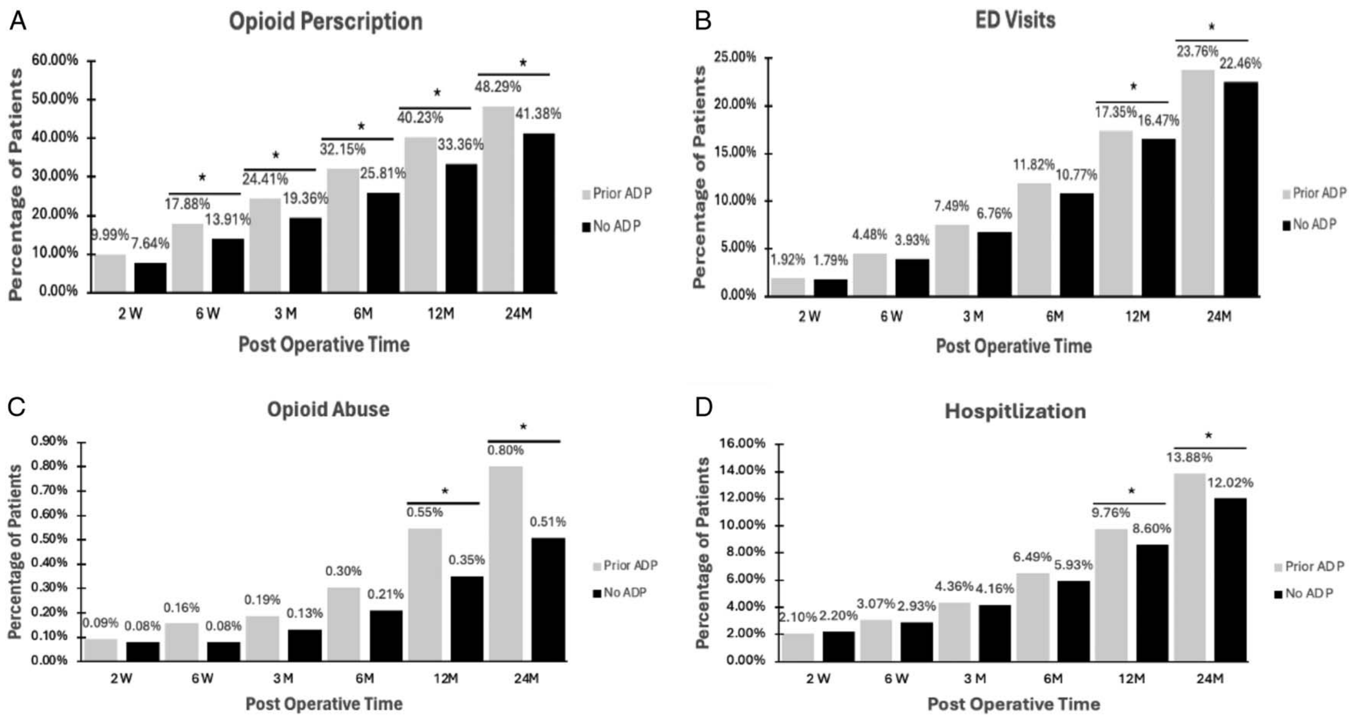

FIGURE 2. Comparison of pseudoarthrosis, adjacent segment disease, and hardware failure in patients with and without ADP before cervical spine surgery.

and in the acute setting for these patients. In addition, research into the biologic effects of antidepressants on bone healing is warranted. Understanding this mechanism could potentiate interventions to improve surgical and potentially all cause musculoskeletal health outcomes in these patients.

Limitations

Our study benefits from a large patient cohort and data from multiple institutions, enhancing generalizability. However, limitations include a lack of granularity in data hindering factors such as bone loss quantification, tracking care transitions outside the TriNetX network, and obtaining patient-reported outcomes. Billing practices may introduce potential errors, and missing data on surgery indication and implant type are notable limitations. The retrospective nature of this study introduces inherent bias, relying on electronic medical records that may contain errors and vary across institutions. We did not include information on treatment compliance, surgery indication, surgeon experience, rehabilitation protocol, specific antidepressants, dosage, duration of therapy, or prescription indication, despite the heterogeneity of antidepressants and the variety of patient pathologies they may address. It is important to note that our results are associations that we found using statistical analysis of a propensity matched cohort. They do not represent any causal relationship. Propensity score matching minimizes bias, but future prospective studies are needed to clarify relationships between medications, prescribed pathologies, and outcomes in cervical spine surgery.

CONCLUSIONS

Mood and anxiety disorders are common in patients with operatively managed cervical spine pathology, with many patients undergoing treatment with antidepressants in the perioperative period. This study assessed outcomes associated with antidepressant use in the setting of ACDF or CDA and found that antidepressants were associated with an increased risk of surgical complications including hardware failure, pseudoarthrosis, and adjacent segment disease. They also had greater opioid prescriptions, higher risk of opioid abuse, and greater hospitalizations and ED visits in the postoperative period.

REFERENCES

1. Lin SY, Sung FC, Lin CL, et al. Association of depression and cervical spondylosis: a nationwide retrospective propensity score-matched cohort study. *J Clin Med*. 2018;7:387.
2. Sang D, Xiao B, Rong T, et al. Depression and anxiety in cervical degenerative disc disease: who are susceptible? *Front Public Health*. 2022;10:1002837.
3. Chen Z, Luo R, Yang Y, et al. The prevalence of depression in degenerative spine disease patients: a systematic review and meta-analysis. *Eur Spine J*. 2021;30:3417–3427.
4. Tachibana N, Doi T, Nakajima K, et al. Does surgical treatment affect the degree of anxiety or depression in patients with degenerative cervical myelopathy? *Global Spine J*. 2023;13: 2479–2487.
5. Chan AK, Shaffrey CI, Park C, et al. Do comorbid self-reported depression and anxiety influence outcomes following surgery for cervical spondylotic myelopathy? *J Neurosurg Spine*. 2023;39:11–27.

6. Doi T, Nakamoto H, Nakajima K, et al. Effect of depression and anxiety on health-related quality of life outcomes and patient satisfaction after surgery for cervical compressive myelopathy. *J Neurosurg Spine*. 2019;31:816–823.
7. Stoffman MR, Roberts MS, King JT. Cervical spondylotic myelopathy, depression, and anxiety: a cohort analysis of 89 patients. *Neurosurgery*. 2005;57:307–313; discussion 307–313.
8. Gornet MF, Copay AG, Schranck FW, et al. Observational Study of depression in patients undergoing cervical disc arthroplasty: evidence of a correlation between pain relief and resolution of depression. *Int J Spine Surg*. 2016;10:11.
9. Kinney RK, Gatchel RJ, Polatin PB, et al. Prevalence of psychopathology in acute and chronic low back pain patients. *J Occup Rehabil*. 1993;3:95–103.
10. Chen X, Li X, Gan Y, et al. Is depression the contraindication of anterior cervical decompression and fusion for cervical spondylosis? *Front Endocrinol (Lausanne)*. 2022;13:1031616.
11. Toci GR, Lambrechts MJ, Karamian BA, et al. Depression Increases Posterior Cervical Decompression and Fusion Revision Rates and Diminishes Neck Disability Index Improvement. *Spine (Phila Pa 1976)*. 2022;47:1287–1294.
12. Chen J, Li JY, Tian GH, et al. A national snapshot of the impact of clinical depression on post-surgical pain and adverse outcomes after anterior cervical discectomy and fusion for cervical myelopathy and radiculopathy: 10-year results from the US Nationwide Inpatient Sample. *PLoS One*. 2021;16:e0258517.
13. Bayoumi AB, Ikizgul O, Karaali CN, et al. Antidepressants in spine surgery: a systematic review to determine benefits and risks. *Asian Spine J*. 2019;13:1036–1046.
14. Lambrechts MJ, D'Antonio N, Toci G, et al. Serotonin reuptake inhibitor increases pseudarthrosis rates in anterior cervical discectomy and fusions. *Asian Spine J*. 2023;17:304–312.
15. Pirkle S, Bhattacharjee S, El Dafrawy M, et al. The influence of selective serotonin reuptake inhibitors on lumbar arthrodesis. *Clin Spine Surg*. 2021;34:E200–E204.
16. Mercurio M, de Filippis R, Spina G, et al. The use of antidepressants is linked to bone loss: a systematic review and metanalysis. *Orthop Rev (Pavia)*. 2022;14:38564.
17. Sansone RA, Sansone LA. SSRIs: bad to the bone? *Innov Clin Neurosci*. 2012;9:42–47.
18. van Poelgeest EP, Pronk AC, Rhebergen D, et al. Depression, antidepressants and fall risk: therapeutic dilemmas-a clinical review. *Eur Geriatr Med*. 2021;12:585–596.
19. Marcum ZA, Perera S, Thorpe JM, et al. Antidepressant use and recurrent falls in community-dwelling older adults: findings from the health ABC study. *Ann Pharmacother*. 2016;50:525–533.
20. Makanji H, Solomito MJ, Kostyun R, et al. Influence of anxiety and depression on opioid use following lumbar spine fusion: a large database study. *Clin Spine Surg*. 2024;37:E24–E29.
21. Harris AB, Marrache M, Jami M, et al. Chronic opioid use following anterior cervical discectomy and fusion surgery for degenerative cervical pathology. *Spine J*. 2020;20:78–86.
22. Harris AB, Marrache M, Puvanesarajah V, et al. Are preoperative depression and anxiety associated with patient-reported outcomes, health care payments, and opioid use after anterior discectomy and fusion? *Spine J*. 2020;20:1167–1175.
23. Kim EJ, Chotai S, Schneider BJ, et al. Effect of depression on patient-reported outcomes following cervical epidural steroid injection for degenerative spine disease. *Pain Med*. 2018;19: 2371–2376.
24. Rogers AH, Orr MF, Shepherd JM, et al. Anxiety, depression, and opioid misuse among adults with chronic pain: the role of emotion dysregulation. *J Behav Med*. 2021;44:66–73.
25. Sullivan MD. Depression effects on long-term prescription opioid use, abuse, and addiction. *Clin J Pain*. 2018;34:878–884.
26. Scherrer JF, Salas J, Copeland LA, et al. Prescription opioid duration, dose, and increased risk of depression in 3 large patient populations. *Ann Fam Med*. 2016;14:54–62.

