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Elective surgery for acute pain in patients with substance use disorder: lessons learned at a rural neurosurgical center. Patient series

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BACKGROUND The incidence of pain-generating degenerative spinal problems in patients who are currently using or have previously used drugs has increased as substance use disorder (SUD) becomes a chronic, lifelong condition. Health system–level data in recent years indicate a significant increase in patients with coexisting SUD and degenerative disc disease, representing an emerging population. A retrospective electronic medical record review identified seven patients with SUD who underwent elective spine surgery by orthopedic or neurosurgical staff from 2012 to 2021. The authors present two of these illustrative cases and a framework that can be used in the treatment of similar patients.

OBSERVATIONS Substances used included opioids, benzodiazepines, barbiturates, cocaine, methamphetamines, hallucinogens, lysergic acid diethylamide, phencyclidine, and cannabis. All were abstaining from drug use preoperatively, with four patients in a formal treatment program. Five patients were discharged with an opioid prescription, and two patients deferred opioids. Three experienced a relapse of substance use within 1 year. All patients presented for follow-up, although two required additional contact for follow-up compliance.

LESSONS Perioperative protocols focusing on patient-led care plans, pain control, communication with medication for opioid use disorder providers, family and social support, and specific indicators of possible poor results can contribute to better outcomes for care challenges associated with these diagnoses.

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KEYWORDS MOUD; SUD; pain; opioids

Despite its prominent position in political and medical discourse, with significant allocated funding, programs, and initiatives, substance use disorder (SUD) remains a daunting public health concern with substantial global socioeconomic cost.[1–3] The *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*, defines SUD as a constellation of behaviors involved in compulsive drug seeking, including impaired control of substance use, impaired social interactions with others because of substance use, risky drug use (e.g., substance use in hazardous settings), and pharmacological changes (e.g., experiencing withdrawal symptoms). With the number of opioids prescribed in 2015 being three times higher than the number prescribed in 1999, the Centers for Disease Control and Prevention recently named opioid overdose prevention as a top five public health challenge.[4,5]

Patients with SUD have a high rate of coexisting acute and chronic pain conditions, and in the majority of these patients, chronic pain preceded the SUD.[6–9] This chronic pain persists during recovery/treatment with medication for opioid use disorder (MOUD). Up to 80% of patients reported pain within the past week, and one-third to one-half of these patients used illicit substances to control their pain.[9] Patients with SUD report chronic pain and that their medical providers do not understand how to help with their pain and recommend improved pain control as a needed improvement in their medical care.[10]

ABBREVIATIONS DDD = degenerative disc disease; ICD = International Classification of Diseases; MOUD = medication for opioid use disorder; MRI = magnetic resonance imaging; NMASSIST = NIDA-Modified Alcohol, Smoking, and Substance Involvement Screening Test; PICC = peripherally inserted central catheter; SUD = substance use disorder.

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Notably, the incidence of pain-generating degenerative spinal problems in patients who are currently using or have previously used drugs has increased as SUD has become a chronic, lifelong condition, even if patients are not actively using drugs. Martini and colleagues reported that 0.91% of elective spinal fusion patients had SUD based on a national sample.[11] Our health system–level data indicate a significant increase in the incidence of patients with coexisting SUD and degenerative disc disease (DDD) in recent years (Fig. 1), representing an additional emerging population requiring future study regarding optimal management. Therefore, the present review describes our early experiences with patients who undergo elective spinal surgery and have coexisting SUD.

Study Description

Chart Review

After receiving institutional review board approval, we performed a retrospective electronic medical record chart review of patients with SUD (using International Classification of Diseases [ICD] Revisions 9 and 10 codes for SUD) at a level I trauma center and spine referral center who underwent spine surgery (using billing codes) by orthopedic or neurosurgical staff from 2012 to 2021. ICD-9 codes used included 305.90, 305.60, 305.61, 305.71, 305.50, 305.51, 305.52. ICD-10 codes used include F14.10, F19.10, F15.10, and F11.10. Current Procedural Terminology billing codes used to identify spine surgery patients include the range 22010–22515. Variables assessed included indication for surgery, type of surgery, complications, mortality, type of drug dependency, preoperative and postoperative drug program enrollment and opioid addiction treatment, the continuation of active substance misuse postoperatively, length of hospital stay, follow-up, and self-reported pain control at follow-up. Complications were screened via chart and imaging review. Enrollment in a preoperative drug program was defined as participation in an addiction treatment clinic or admission for detoxification before surgery, whereas the postoperative interval was any treatment within 1 year after discharge within our hospital system.

Additional chart review assessed whether patients were receiving prescribed opioids immediately before admission (e.g., preoperatively) and at discharge (e.g., postoperatively), as well as MOUD (e.g., Suboxone [Indivior; buprenorphine and naloxone], Subutex [Indivior; buprenorphine], methadone, naltrexone) before the primary surgery, during admission for surgery, and at any point after discharge. Continued substance misuse postoperatively was noted at future encounters. Patient encounters and scheduled appointments were reviewed from the time of release from the primary surgery up to 1 year after the discharge date. Pain control postoperatively was assessed by narrative at follow-up encounters, searching the most recent encounter for patients' self-reported pain levels.

We identified seven patients. Substances used by the patients in this series included opioids, benzodiazepines, barbiturates, cocaine, methamphetamines, hallucinogens, lysergic acid diethylamide, phencyclidine, and cannabis. The most common substance used was opioids (six of seven patients), and four of seven patients were multisubstance users, all of whom used opioids. The average age of our series was 47 years, with a range from 37 to 55 years. The most common indication for surgery was herniated nucleus pulposus causing radiculopathy (six of seven patients). Three patients had unstable housing situations, and two patients had other uncontrolled medical issues such as diabetes with poor hemoglobin A1c or hypertension under poor control.

All patients were abstaining from drug use preoperatively, with four patients participating in a formal MOUD program. Five patients were discharged with an opioid prescription, and two patients deferred opioids. One patient experienced a relapse of substance

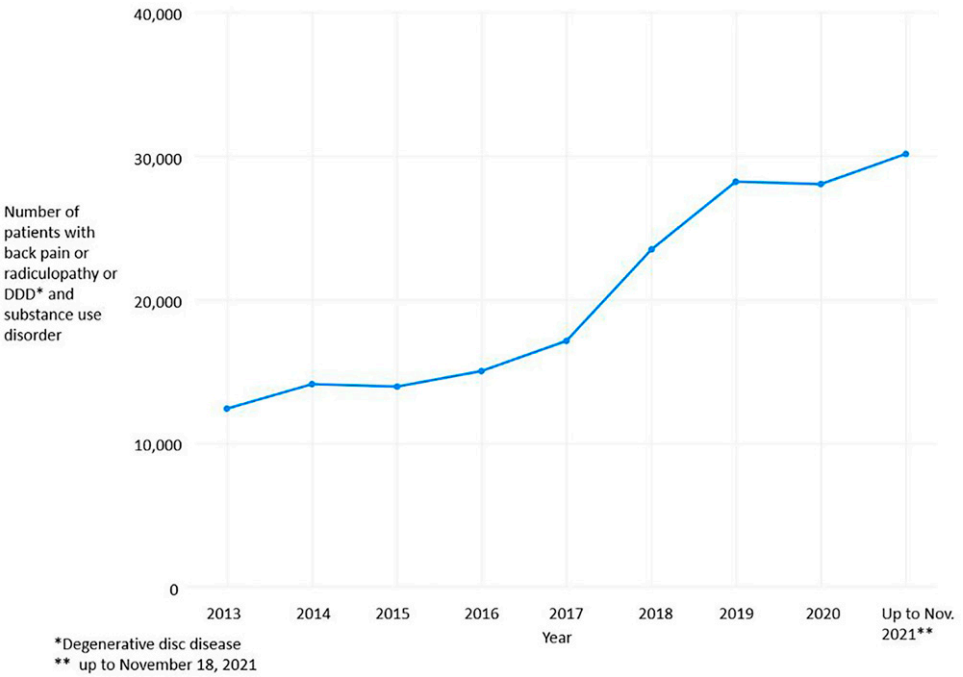

FIG. 1. Incidence of patients with back pain or radiculopathy or DDD and SUD.

use within 1 month of surgery, and two additional patients experienced relapse within 1 year.

One patient had a persistent postoperative infection, and this required three additional trips to the operating room. Six of seven patients reported persistent pain at the most recent follow-up, but all patients except one reported pain improvement after surgical intervention. Four of seven patients were discharged the same day as surgery, and three had very brief admissions, mainly for pain control. All patients presented for follow-up, although two patients required additional contact for follow-up compliance. See Table 1 for patient data.

Illustrative Cases

Case With Complications

A 47-year-old male with poorly controlled diabetes mellitus, coronary artery disease, and multiple myocardial infarctions presented with low-back pain and left lower extremity radiculopathy, which was severe and showed no improvement with physical therapy. Imaging showed L5–S1 herniated nucleus pulposus. He reported past use of heroin, fentanyl, methamphetamine, and marijuana with previous admissions for treatment and also previous overdoses requiring naloxone. He reported no active drug use at the time of surgery. He had an unstable housing situation as well as transportation issues and identified his mother as a contact person, although he did not live with her. He elected to proceed with L5–S1 microdiscectomy. The procedure was planned as a same-day discharge, but the patient required admission due to severe postoperative pain. He was admitted for pain control. He was discharged on postoperative day 1 with an outpatient prescription for opioid pain medication.

He reported 7/10 pain and difficulty walking that "puts him in tears" 2 weeks later at neurosurgery follow-up. He was subsequently lost to follow-up despite multiple follow-up calls to him and his mother, but he presented to the clinic again several weeks later with persistent pain symptoms and clear wound drainage. His inflammatory markers were elevated at this time (C-reactive protein 29.8 mg/L, erythrocyte sedimentation rate 40 mm/hour), and magnetic resonance imaging (MRI) confirmed infection. The patient underwent an irrigation and debridement procedure the next day, with cultures growing methicillin-resistant *Staphylococcus aureus*. Infectious disease was consulted and recommended 6 weeks of intravenous daptomycin treatment. Psychiatry was consulted to determine peripherally inserted central catheter (PICC) line eligibility, and the patient admitted to relapse after surgery at this time as an attempt to control the pain. He was determined ineligible for a PICC line and was discharged on the fifth day after his admission with an oral linezolid prescription. One week later, he presented to the emergency department, reporting a popping sound after having stood up from the toilet, with subsequent drainage of blood from his incision. He was admitted for wound dehiscence at this time and underwent an additional irrigation and debridement procedure with wound vacuum-assisted closure placement with secondary closure. At the most recent neurosurgery follow-up, the patient reported an overall improvement in pain but still reported low-back pain with radiation down his posterior left lower extremity at a severity of 6/10. This case demonstrates a complicated patient with uncontrolled medical issues and continued substance use after surgery, in part as a strategy to control pain. He developed a significant surgical

TABLE 1. Summary of patient data

Age (yrs), Sex	Diagnosis	Surgery	Substances Used	Recent Preoperative Use	Unstable Housing	Uncontrolled Medical Issues	Complications	Postoperative Decrease in Pain Rating	Postoperative Relapse
47, M	Radiculopathy	ACDF	Stimulant	No	Yes	No	No	Yes	No
43, F	Radiculopathy	ACDF	Opioid/stimulant	No	Yes	No	No	Yes	Yes
54, M	Compression fracture	Kyphoplasty	Opioid	No	No	Yes	No	No	No
37, F	Radiculopathy	MLD	Opioid	No	No	No	No	Yes	No
49, F	Radiculopathy	MLD	Opioid	No	No	No	No	Yes	No
55, M	Radiculopathy	Posterior cervical fusion	Opioid	No	No	No	No	Yes	No
47, M	Radiculopathy	MLD	Opioid	No	Yes	Yes	Yes	Yes	Yes

ACDF = anterior cervical discectomy and fusion; MLD = microlumbar discectomy.

complication that was complicated by an unstable housing situation and uncontrolled medical problems.

Case With Good Outcome

A 37-year-old female presented to the neurosurgical clinic with back and left leg pain and sensory deficits, resistant to more than 20 physical therapy sessions, and epidural steroid injections. MRI showed left-sided herniated nucleus pulposis at L3–4 and L4–5. Of note, she had a history of SUD with no current active use and reported complete abstinence, including no MOUD. She reported a stable housing situation, living with her husband, who was supportive of her recovery and their young children. Same-day surgery for microlumbar discectomy at both levels was planned, and the patient desired no opioid medications at all in the postoperative period. She underwent surgery without complication using an enhanced recovery after surgery protocol, but both she and her family expressed significant distress over having received opioid medication during the actual surgical procedure and required extensive counseling. Ultimately, she reported improved leg pain and numbness upon follow-up.

Discussion

SUD holds a prominent position in global public health concerns, with a high socioeconomic cost and increases in patient morbidity and mortality.[1–3] Nearly 841,000 people have died of drug overdoses since 1999.[12] Of the 70,630 overdose deaths in 2019, half involved a synthetic opioid.[13] From 2013 to 2019, the age-adjusted rate of death involving synthetic opioids other than methadone increased by 1,040%.[13] Despite decelerations in opioid prescribing since 2012 as data emerged about misuse and dependence, mortality due to opioid overdose has increased due to the transition toward illicit substances and away from prescribed ones.

Painful diagnoses persist during recovery and treatment for SUD, and pain control represents a significant driver in using illicit substances during treatment for these patients.[9,14] At the same time, sequelae from SUD also complicate acute medical care and pain control.[15] Chronic pain among patients with SUD is associated with more mental health disorders, medical conditions, and increased healthcare use.[16] The two diseases seem to potentiate each other in qualitative studies.[17] Furthermore, although the Substance Abuse and Mental Health Services Administration has provided a detailed treatment improvement protocol for managing chronic pain in patients with SUD, the best practices of care of these patients at the intersection of acute and chronic spinal pain, such as during acute radiculopathy, is less well characterized.[18,19]

Spinal conditions such as radiculopathy are painful, complicating several aspects of treating those with SUD. Pain is a significant risk factor for barriers to accessing healthcare among people who use or have used drugs[17] and may drive further substance use because patients may prefer to self-treat their pain[16] or to fulfill social expectations despite the pain,[20] thus exposing them to further related harms of substance use. During admission to the hospital, untreated pain is a commonly cited reason for substance use in the hospital[21] or leaving against medical advice.[22]

Furthermore, there is a paucity of guidance for clinicians treating painful spinal conditions in patients with SUD.[23] Perioperative protocols for patients with SUD undergoing surgery are poorly characterized. Studies examining this topic are few and rarely discuss expected drug use outcomes.[14] The surgical literature of the treatment of patients with SUD focuses on avoiding opioid medications for pain control using "enhanced recovery protocols" or opioid-free surgical plans;[11,23,24] however, the addiction and pain fields recommend a more nuanced and holistic approach, and the experiences of patients relate that pain control in these situations is already inadequate.[10] We previously reported on 49 patients with SUD who required 72 urgent spinal surgeries and the subsequent poor outcomes: 29% of patients had complications, 20% of patients left against medical advice before completion of treatment, and 22% did not attend follow-up after leaving the hospital. After discharge postoperatively, 47% were known to have continued active drug use.[25]

Observations

Although MOUD is known to be the most effective evidence-based treatment for SUD involving opioids, some patients in our rural location have had success with abstinence-based treatment paradigms. In these patients, the idea of receiving opioid medications in the perioperative period may cause particular distress due to the perceived risk of relapse. Patient-led care plans can help identify these concerns.

Patients with unstable housing or transportation saw poor outcomes more often, which interfered significantly with follow-up when complications occurred. For example, the first illustrative case demonstrated a precarious housing situation, lack of transport, and perceived social pressures to leave the hospital for court dates and parenting classes to resume custody of his children. These aspects were particularly problematic when dealing with his complicated postoperative course and required additional support during his recovery from surgery. In this case, the surgeon provided that support to the extent feasible.

Lessons

Based on lessons learned in the early experience reported here, our current protocols for elective spine surgery among patients with SUD include the following (with rationales):

1. *Patient-led plans of care for pain control*: We now discuss with patients preoperatively in detail which opioids may be used and when during or after surgery. Discussion with involved family members is included due to their similar distress and, in some cases, concern for the patients' deception regarding opioids. Realistic plans for pain control (with or without opioids) are delineated before surgery, and the ability to avoid (or obtain) opioids may play into the patient's ultimate decision to have surgery.
2. *Acute pain consult perioperatively*: Poor pain control has previously been identified by our patient population as a reason for leaving the hospital against medical advice;[22] therefore, we consult acute pain for any patient with SUD requiring admission postoperatively for pain control. The recommendations may include or avoid opioid medications based upon patient preferences, type of MOUD if used, and expected pain level.
3. *Communication with MOUD provider for planning*: MOUD provider contact allows perioperative tapering or increase in medication dosage, depending upon the particular medication and expected level of postoperative pain. Partial agonists such as Suboxone may be used for postoperative pain control in selected but not all cases. In addition, preoperative contact with the MOUD provider is essential if postoperative opioids may be

prescribed to alert them to likely SUD results if the provider performs such screening.

4. *Identification of family contact or support person*: In our early experience, it became apparent that patients in successful recovery often had dedicated and involved support people who were invested in their success. With appropriate patient consent, these people often had vital insight into the patients' success and desired input on the plan of care and could serve as additional contacts if the patient him- or herself could not be contacted for follow-up. Examples of such support contacts included parents or spouses.
5. *Social work support*: Poor outcomes were seen more often in patients with unstable housing or transportation. A programmatically sustainable solution would be to retain a case manager to aid with these issues, mainly because these needs are more extensive than generally encountered in the elective spine surgery population.
6. *Screening for characteristics of concern in this population, including current drug use and other unmanaged medical comorbidities*: Current use levels may be minimized by the patient's direct questioning by the care provider due to fear of stigma, but this element did seem to affect outcomes in our small series; therefore, standardized measures may be preferable. The NIDA-Modified Alcohol, Smoking, and Substance Involvement Screening Test (NMASSIST)[26] is a screening tool developed by the National Institute on Drug Abuse (NIDA) based upon the World Health Organization Alcohol, Smoking, and Substance Involvement Screening Tool. The American Psychiatric Association has adapted the NMASSIST tool for further clinical evaluation and research, enabling self-administration. For patients in recovery, information which may help with risk stratification as relates to relapse may include historical substances used, frequency, and route.

This small and early exploratory study on patients with elective spinal procedures with coexisting SUD and pain has significant limitations, given its retrospective nature and small size. However, we maintain that this work is an essential preliminary exploration, given the immensity of this emerging population and the current lack of treatment options and care disparities that relate to socioeconomic challenges of care, widespread stigma, and disciplinary siloing, which may prevent known best practices of addiction medicine or pain management from being followed in the perioperative management of these patients or in the decision to provide care in the first place. These patients can have acceptable outcomes, and surgery should not be withheld from patients with a history of SUD or those patients currently or previously receiving MOUD.

Future directions for our work include prospective evaluation to identify predictors of success and ultimately broadening the population to which we can apply these protocols (e.g., those requiring fusion, deformity procedures) when sufficient experience and success are achieved.

Conclusions

Feasible protocols for performing elective spine surgery on patients with SUD can be developed with reasonable surgical results. Our initial exploration into providing this care demonstrates acceptable results and predictable challenges. As with any patient, particular care should be exercised in the operative selection and perioperative support for patients with unstable housing, uncontrolled medical issues, and significant pain-related maladaptive coping. A history of SUD or current MOUD should not represent a reason to withhold elective spine surgery when indicated, particularly for acute pain. We detail our current perioperative protocols focusing on patient-led plans of care, pain control, communication with MOUD providers, identification of family and social support, and identification of specific indicators of potentially poor outcomes.

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Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: Sedney. Acquisition of data: all authors. Analysis and interpretation of data: Sedney, Ferari, Katsevman. Drafting the article: Sedney, Ferari, Katsevman. Critically revising the article: Sedney, Katsevman, Dekeseredy. Reviewed submitted version of manuscript: Sedney, Katsevman, Dekeseredy. Approved the final version of the manuscript on behalf of all authors: Sedney. Administrative/technical/material support: Dekeseredy.

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