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Preoperative Narcotic Use as a Predictor of Clinical Outcome

Results Following Anterior Cervical Arthrodesis

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Study Design. Prognostic Study, Level II (Retrospective review of prospectively collected data).

Objective. To identify an association between preoperative narcotic use and clinical outcome after cervical arthrodesis.

Summary of Background Data. Little data exists regarding the influence that chronic preoperative narcotic use has on clinical outcomes after surgery. Cervical arthrodesis is a common procedure that has a predictably high success rate for relief of radicular pain. In addition, the patient population presenting for this procedure has a high propensity for preoperative narcotic use.

Methods. Charts and prospectively collected questionnaires concerning the use of pain medication from 91 consecutive patients who underwent cervical arthrodesis for relief of radicular pain by a single surgeon at a single institution were reviewed. Group I consisted of 47 patients who took narcotic pain medication for their radicular pain on a daily basis for greater than 6 months before surgery. Group II consisted of 44 patients who were not on narcotics chronically before surgery. Postoperative narcotic use and patient outcome based on the modified Robinson criteria were assessed. Patients were observed for a minimum of 2 years.

Results. Of the group I patients, 16 (34%) continued to require chronic narcotic pain medication up to 2 years after surgery whereas only 3 (7%) of the group II patients required narcotic pain medication past 3 months ($P = 0.002$). Of the group I patients, 24 (51%) had a good or excellent result after surgery and 15 (32%) had a poor result whereas 38 (86%) of the group II patients had a good or excellent result and no patient had a poor result ($P < 0.001$).

Conclusion. Chronic narcotic use before cervical arthrodesis was found to be associated with continued narcotic use after surgery and worse functional outcomes following surgery. While further studies will be necessary to ascertain if this relationship is generalizable to other orthopaedic procedures and to analyze for potential confounding variables, surgeons may want to counsel their patients about the potential for inferior clinical outcomes if narcotics are used before surgery.

Key words: chronic narcotic use, opioid use, cervical arthrodesis, clinical outcome, Robinson criteria. **Spine 2008;33:2074–2078**

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Most patients visit their surgeon seeking relief from pain and limitations in activity. They have the expectation that an offered operation will relieve their pain and improve their functionality. Before surgery, many physicians prescribe and many patients use narcotic pain medication to address their pain. However, the effect of chronic preoperative narcotic use on the outcome of a surgical procedure has not been thoroughly investigated. Webster *et al* have shown that the early use of high dose narcotics was an independent risk factor for prolonged disability, increased medical utilization including surgery, and continued narcotic use after a workman's compensation related lower back injury.[1] They suggested that more intensive use of narcotics might be counterproductive to recovery from injury, but did not assess outcome after surgery.

Patients being evaluated for cervical radiculopathy may have a high prevalence of preoperative narcotic use to treat their pain. Many of these patients have failed conservative management including treatment by pain management specialists. Cervical arthrodesis is highly efficacious, with many authors demonstrating greater than 90% success rate for relief of radicular pain and return of function.[2–4] If followed for an extended period, pain can recur in one quarter to one third of these patients but this is most often due to adjacent level disease and usually does not occur for a number of years after the index procedure.[4,5]

Because of the high prevalence of preoperative narcotic use and the good relief of symptoms which cervical fusion is able to provide, this patient population qualifies as an appropriate cohort to investigate the effects of preoperative narcotic use. Thus, we sought to test the hypotheses that there was an association between chronic preoperative narcotic use and clinical outcome after cervical fusion and that preoperative narcotic use may predispose patients to continued use of narcotics after surgery.

Materials and Methods

Institutional review board approval was obtained and a retrospective chart review of data prospectively collected for another study was performed. Ninety-one consecutive patients underwent primary cervical arthrodesis by a single orthopaedic spine surgeon at a single center. The surgical indications were uniform and included radicular pain greater than neck pain with a diagnosis of cervical stenosis or a herniated nucleus pulposus. All patients had failed a course of nonoperative treatment including anti-inflammatory medications and physical

therapy. In all cases the goal of surgery was for the relief of cervical radicular pain. Patients with neck pain greater than radicular pain were not included. At the time of scheduling for surgery, all patients filled out a questionnaire regarding pain medication usage. Surgery was carried out through a standard left-sided anterior approach using a transverse incision. Fusion was achieved with the use of autograft tricortical iliac crest bone without instrumentation. Patients who had discectomies and fusions were immobilized in a hard cervical collar whereas those that had corpectomies were treated in a 2-poster brace for 6 weeks. After surgery, all patients were admitted to the hospital overnight and maintained on a standard protocol of intravenous Morphine Sulfate. They were discharged the next day with a prescription for Percocet, 5 mg oxycodone HCL/325 mg acetaminophen, USP, (Endo Pharmaceuticals Inc.) and instructed to take 1 or 2 every 4 to 6 hours as needed for pain. All postoperative narcotics were prescribed by the same Nurse practitioner without the knowledge of the treating surgeon. Patients were seen after surgery at 2 weeks for a wound check. Patients requiring ongoing narcotics at this point were transitioned, if possible, to Vicodin 5 mg hydrocodone bitartarate/500 mg acetaminophen, USP (Abbott Laboratories). Patients were then followed at 6 weeks after surgery with plain radiographs and as needed thereafter for a minimum of 2 years. At each visit pain medication usage was recorded via questionnaire.

Charts were reviewed for the following prospectively collected information: age, surgical procedure, preoperative pain medication usage, postoperative pain medication utilization, and surgical and postsurgical complications including pseudarthrosis. Patients were considered to be using narcotic pain medications chronically before surgery if they took any narcotic pain medication on a daily basis for 6 months before surgery.[6] Occasional usage, less than 2 times per week, or a brief period of daily usage followed by a period of at least 4 weeks of only occasional usage before surgery, did not constitute chronic preoperative usage, and these patients were considered with the patients not on chronic preoperative narcotics. Chart review for comorbidities and potential confounding variables, like other medical or psychiatric problems, chronic pain syndromes, smoking, or litigation was collected but deemed unreliable for meaningful analysis.

Follow-up was for a minimum of 2 years. Functional outcome was graded according to a modification[7,8] of the Robinson criteria.[9] Plain radiographs were used to determine fusion. A patient was considered to be fused if there was less than 1 mm of motion between the spinous processes on lateral flexion and extension views.[10] Statistical analysis was through the use of the Fisher exact test and χ^2 analysis using commercially available statistical analysis software (JMP Statistics, SAS Institute, Carey, NC).

■ Results

Complete data were available for all 91 patients treated with cervical arthrodesis. Of the 91 patients, 47 had taken narcotics on a daily basis for at least 6 months before the day of surgery. These were designated group I. All of these patients indicated that they were taking the narcotics for radicular pain that they hoped surgery would relieve. The remaining 44 patients who were not taking narcotics chronically before surgery were designated group II. The average age, age range, level of fusion (mean and median), number of levels fused, and duration of follow up was similar between the two groups (Table 1). The diagnoses and surgical indications were similar between the two groups. In follow up, all but one patient in each group achieved radiographic fusion. Both cases of pseudarthrosis were asymptomatic and did not require prolonged postoperative narcotic use or revision surgery.

Table 1. Study Populations

	Group I Preoperative Narcotic Use	Group II No Preoperative Narcotic Use
No. patients	47	44
Age (range)	52 (13–77)	54 (15–82)
Mean No. levels fused	2.11 ± 1.05	2.28 ± 1.06
Level of fusion, mean (median)	C5.2 ± 0.91 (C5)	C5.05 ± 1.06 (C5)
Follow-up (mo)	31 (24–64)	32 (24–60)

Postoperative Narcotic Use

Of the 44 patients who were not taking narcotic medication before surgery (group II), 18 (41%) were taking other nonnarcotic pain medications on a regular basis before surgery (Table 2). At 2 weeks after surgery, 9 (20%) patients required narcotic pain medication and by 3 months, only 3 patients (7%) were still taking narcotic pain medication. Of these patients that had not been on narcotics before surgery but that remained on narcotic pain medication longer than 3 months, all had been on multiple other nonnarcotic pain medications including nonsteroidal anti-inflammatory medications, muscle relaxants, and neuroleptics before surgery.

In comparison, of the 47 patients who used narcotic pain medication for at least 6 months before surgery (group I), 21 (45%) were able to discontinue the use of narcotics within 2 weeks of surgery (Table 2). An additional 9 (20%) were able to stop taking narcotic pain medications within 3 months after surgery. One more patient required narcotic pain medication intermittently for a longer period but was able to stop after about 6 months. Thus a total of 32 patients (68%) who had been on chronic narcotic pain medication were off all narcotics 6 months after surgery. However, 16 (34%) patients were chronically taking narcotic pain medication up to 2 years after cervical fusion. Analysis of the cohort of patients who continued to require narcotic pain medication revealed that their fusions were at approximately the

Table 2. Postoperative Narcotic Use

	Group I n = 47	Group II n = 44	
Preoperative			
Nonnarcotic	—	18 (41%)	
Narcotic	47 (100%)	—	
Postoperative			
Nonnarcotic	8 (17%)	8 (18%)	$P = 1$*
Narcotic (>3 mo)	16 (34%)	3 (7%)	$P = 0.002$*

*Fisher exact test.

Table 3. Clinical Outcome After Cervical Arthrodesis

	Group I n = 47	Group II n = 44
Excellent	16 (34%)	25 (56%)
Good	8 (17%)	13 (30%)
Fair	8 (17%)	6 (14%)
Poor	15 (33%)*	0

*χ^2 test: $P < 0.001$.

same level (mean = C5.21 ± 1.41, median C5) and that they had a similar number of levels fused (2.07 ± 0.96 levels) compared with the other groups as a whole (compare to Table 1). Not surprisingly they were much more likely to have used extended release narcotics. Only 7 patients were taking extended release narcotics before surgery, and 6 of them continued to require narcotic pain medication after surgery.

Analysis of these results with Fisher exact test revealed that the difference observed between groups I and II, as it relates to continued chronic narcotic use after surgery, was significantly different at greater than 3 months after surgery ($P = 0.002$). Results obtained for earlier time periods were not statistically significantly different (data not shown).

Clinical Outcome

Clinical outcome after cervical arthrodesis was assessed through the use of modified Robinson criteria.[7–9] The criteria are used to evaluate patients following cervical arthrodesis and are based on a subjective assessment of pain and objective measurements of medication use, level of activity, and work status.

Of the patients who were not taking pain medication before fusion (group II), 38 (86%) of them had good or excellent results and no patient in this group had a poor result (Table 3). In contrast only 24 (51%) of the patients who had been on narcotic medication before surgery had a good or excellent result from cervical fusion. In addition, 15 (33%) had a poor result from surgery. χ^2 analysis confirmed that this was a highly statistically significant difference in clinical outcomes ($P < 0.001$). Analysis of the cohort of patients with poor results from surgery revealed that their fusions were at approximately the same level (mean = C5.29 ± 1.35, median C5) and that they had a similar number of levels fused (2.14 ± 0.95 levels) compared with the other groups as a whole (compare to Table 1). Again, not surprisingly they were much more likely to have used extended release narcotics. Of the 7 patients taking extended release narcotics before surgery, 6 of them had a poor outcome after cervical fusion.

■ Discussion

There is inherent concern when prescribing narcotics that patients who are chronically dependent on narcotic pain medication may have worse clinical outcomes following surgical procedures aimed at relieving the source of their pain. This concern may lead to the belief that chronic narcotic use is a relative contraindication to surgery. However, there is little formal clinical evidence to support this concern. In this analysis of consecutive patients presenting for cervical arthrodesis, we have been able to convincingly prove the hypotheses that chronic use of narcotic pain medication before surgery was associated with continued postoperative narcotic use and significantly worse clinical outcomes. Furthermore, these data suggest that an additional modification of the Robinson criteria[7–9] should be made to account for preoperative narcotic use and not just postoperative use.

Thirty-four percent of the patients who were on narcotics chronically before cervical fusion were still taking narcotic pain medication for their cervical radiculopathy 2 years after surgery. This was in contrast to patients undergoing the same surgical procedures but not taking narcotic pain medication before their surgical procedure, where only 7% of patients required narcotic pain medications greater than 3 months after the procedure.

Clinical outcome after cervical fusion was also greatly affected by the use of preoperative narcotics. Whereas 86% of patients who were not taking narcotic medication before surgery were able to achieve a good or excellent result based on the modified Robinson criteria,[7–9] only 51% of the patients who were on narcotic medication before surgery were able to achieve this kind of outcome. Perhaps more importantly, the only patients that had a poor outcome were those who had used narcotics chronically before surgery; nearly one-third of them had poor outcomes. These differences in clinical outcomes were highly significant ($P < 0.001$).

For the treatment of acute pain, narcotic pain medications can be highly effective. However, chronic narcotic use for the treatment of radicular pain is controversial.[11–15] In the treatment of lower back pain, treatment recommendations have been to try narcotic analgesics only after failing a trial of nonnarcotic analgesics, and only for a limited time-course due to their side effects, including drowsiness, debilitation, impaired judgment, and reaction time.[16] In a study of injury related back pain, Webster *et al* demonstrated that the early use of high dose narcotics was independently associated with worse long-term outcomes, including prolonged disability, increased medical utilization including surgery, and continued narcotic usage.[1] Given this negative association they suggested that more intensive use of narcotics might be counterproductive to recovery. Although they did not directly assess the outcome of surgical intervention, their findings are in general agreement with the findings presented here for cervical spine surgery.

It is interesting to speculate why chronic or high dose narcotic use may be counterproductive to recovery and what implications that may have on treatment recommendations. Chronic narcotic use leads to addiction. In these patients, relief of the pain generator with surgical intervention then does not relieve them of their addiction to narcotics. This addiction must be overcome separately after surgery. It has been proposed that the sedating ef-

Table 4. Chin* Modified Robinson Criteria for Assessment of Clinical Outcome in Patients Taking Narcotics Preoperatively

Outcome	Pain	Medication	Activity	Work Status
Excellent	None	None	Normal	Normal
Good	Mild	Use of NSAIDs	Normal	Normal
Fair	Moderate	Continued use of narcotics but below pre-operative levels	Restricted	Limited
Poor	Severe	Continued use of narcotics at or above preoperative levels	Incapacitated	Disabled

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fects and altered sensorium associated with narcotic usage may lead some patients not to return to work or productive lifestyles.[1] Chronic narcotic usage may also be a marker for many psychosocial factors that have been shown to contribute to poor clinical outcomes.[17–19] Unfortunately, physicians may contribute to this as it has been shown that physicians often prescribe narcotics in response to their patients' pain behaviors or demands rather than on objective physical findings or on their reported pain severity or duration.[20] Thus in light of the findings presented here, one could make the argument that increasing narcotic use or prolonged duration of need for narcotic pain relief could be a relative indication for operative intervention. In addition, one might propose that all patients undergoing anterior cervical fusion discontinue use of all narcotic pain medication before surgery. This may include formal detoxification in an appropriate professional setting. However, further study will be necessary to determine if the effect of chronic preoperative narcotic use can be reversed through such measures. Indeed one may argue that detoxification done after surgery may not only be more cost effective because less patients would be likely to need professional help but that it may be more humane and not subject a patient having just detoxified to a brief temptation period with narcotics after surgery.

The Robinson criteria, and modifications thereof, have been used to evaluate the clinical outcome of patients undergoing cervical spinal surgery.[7–9] However, one of the parameters within the Robinson criteria is the use of narcotic pain medication after the procedure. Based on the data presented here, this parameter clearly skews to a less favorable outcome those patients taking narcotic pain medication before surgery because as a population they have an increased prevalence of narcotic use after surgery. However, this is just one of the criteria and does not solely account for the highly significant difference noted in this study. Nevertheless, it does suggest that the Robinson criteria should be modified to account for preoperative narcotic use. We propose modifying the Robinson criteria to include an assessment of the amount of postoperative narcotics used in comparison to preoperative use, with only an increase in use after surgery being considered a poor outcome (Table 4).

One of the limitations of this retrospective analysis is that, despite great efforts, complete demographic and risk stratification data were not available for all of the patients. Because of this, a complete analysis of the confounding factors contributing to the observed differences was not possible. Areas of consideration include the presence of litigation such as a workmen's compensation claim, medical conditions such as diabetes or chronic pain syndromes, mental health problems including the presence of depression, and social factors such as smoking or a prior treatment for addiction. Even though narcotic usage has been shown to be an independent predictor of disability duration after an injury causing low back pain,[1] the formal investigation with respect to surgical outcome must be left to subsequent investigations.

This study is also limited because there was some heterogeneity in the operative procedure performed, even though the distribution of diagnoses and surgical procedures was similar between the two groups. The average number of levels fused was about 2 in all of the groups. An analysis of the single level fusions showed the same trends displayed by the whole population however, likely because of the sample size, this effect was not statistically significant. Thus, it is our feeling that the conclusions of the study would not change given a more uniform study population.

This study provides evidence of an association between chronic preoperative narcotic use and poorer functional outcome after a surgical procedure intended to relieve the pain for which the pain medication was being used. Although further studies will be necessary to ascertain if this association is generalizable to other orthopaedic procedures and to analyze for potential confounding variables, surgeons may want to counsel their patients about the potential for inferior clinical outcomes if narcotics are used before surgery.

■ Key Points

- Little data exists to support the perception that patients on chronic narcotic pain medications have inferior clinical outcomes after surgery and are at higher risk for continued postoperative narcotic use.
- Chronic narcotic use before cervical fusion was found to be associated with worse functional outcomes and prolonged narcotic use following surgery.
- The Robinson Criteria for assessing clinical outcome after cervical arthrodesis should be further modified to account for level of narcotic use.

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