

# ■ Childhood Psychological Trauma Correlates with Unsuccessful Lumbar Spine Surgery

Jerome Schofferman, MD, David Anderson, MD, Robert Hines, MD, George Smith, MD, and Arthur White, MD

In a retrospective study of 86 patients who underwent lumbar spine surgery, patients who had three or more of a possible five serious childhood psychological traumas (risk factors) had an 85% likelihood of an unsuccessful surgical outcome. Conversely, in patients with a poor surgical outcome, the incidence of these traumas was 75%. In the group of 19 patients with no risk factors, there was only a 5% incidence of failure. This study shows that a highly significant correlation exists between unsuccessful lumbar spine surgery and a history of childhood traumas. Although recognition of predictors for unsuccessful outcome can be useful in avoiding surgery in patients whose indications for surgery are borderline, the greater challenge is to help the patient who, despite being at high psychological risk for negative outcome, has severe spinal pathology that will likely require surgery. In such cases, psychiatric treatment is critical. In the group of 19 patients with no risk factors, single-level laminectomies and discectomies were performed on 6 patients. The other 13 cases were complex, involving a combination of repeat surgeries (n = 4) fusions (n = 3), and/or multilevel laminectomies and discectomies (n = 11). [Key words: failed back surgery, sexual abuse, physical abuse, childhood psychological trauma]

It is accepted that there is a strong correlation between the outcome of lumbar spine surgery and the preoperative psychological status of a patient.<sup>18,22</sup> Most experienced spine surgeons recognize that there is a higher surgical success rate in patients who are psychologically healthy than in those who have psychological difficulties.

Most studies that support this conclusion are based on the use of a screening instrument, the Minnesota Multiphasic Personality Inventory (MMPI). In some studies, a strong correlation has been shown to exist between abnormalities on MMPI and poor surgical outcome.<sup>10,12,17,18,20,22</sup> It also has been shown, however, that improvement in MMPI score can occur after treatment that reduces pain or improves function.<sup>3,19</sup> Therefore, it has been suggested that the abnormalities on

MMPI may be a result of the chronic pain state rather than a cause of chronic pain.<sup>3,19</sup> The MMPI score might not reflect underlying psychological abnormalities but instead might be a reflection of the unremitting pain itself.

Despite extensive literature on the use of MMPI to predict surgical failures, its use has not become popular in routine clinical practice. Most spine surgeons do not use the MMPI or other psychological screening tools. We are not aware of any studies that support exclusion of patients from surgery solely on the basis of an abnormal MMPI score.

Major advances in the ability to diagnose abnormalities of the lumbar spine, as well as significant improvements in surgical techniques, have occurred recently. The success rate for lumbar spine surgery, however, has not reached expectations. Many surgeons recognize that too frequently the pathology appears to have been corrected, but the patient does not do well. Some also feel that the psychological factors usually offered to explain a poor outcome (eg, secondary gain, depression, or Worker's Compensation payments) are insufficient to explain the failures. Therefore many continue to explore the spinal-psychological axis from other perspectives.

The current investigation has roots in the work of Engel, who in his 1959 study hypothesized that various constellations of childhood psychological neglect and abuse established a proclivity toward the development of chronic pain in excess to what would be expected for the known peripheral stimulus.<sup>6</sup> The factors he identified bear a close resemblance to those we have studied.

In a retrospective study, Adler et al compared patients with psychogenic pain, organic pain, psychogenic bodily symptoms, and organic disease.<sup>1</sup> Among other things, they found that the patients with psychogenic pain had a significantly higher incidence of childhood abuse and neglect than did any of the other groups.

Many patients with failed back surgery syndrome and chronic refractory spine pain are evaluated at the San Francisco Spine Institute, a referral tertiary care practice. Each evaluation includes a semistructured interview with a psychiatrist who is experienced in working with chronic pain. During these evaluations, a large number of

**Table 1. Surgical Success Rate Versus Number of Individual Psychological Risk Factors**

Number of Risk Factors	Number of Patients	Surgical Outcome		
		Number of Successes	Observed Probability of Success	Estimated Probability of Success
0	19	18	(95%)	93%
1	12	9	(75%)	77%
2	14	6	(43%)	50%
3	25	5	(20%)	19%
4	14	1	(7%)	6%
5	2	0	(0%)	2%
	86	39	100%	

patients who have had severe childhood psychological trauma during childhood have been identified.<sup>1,6</sup>

All patients at the San Francisco Spine Institute being considered for elective surgery are interviewed by a psychiatrist using the same semistructured format. We reviewed these psychiatric evaluations to determine 1) the presence or absence of childhood psychological traumas; and 2) whether surgical outcome correlated with these events.

### ■ Study Definitions and Methods

The charts of 100 consecutive patients who underwent lumbar spine surgery at a single institution from September 1, 1988, through June 1, 1989, were reviewed. Each patient had a well-defined spinal pathology that satisfied criteria for surgical intervention. In patients who were found to have significant psychopathology (eg, major depression) in the preoperative evaluation, surgery was postponed until adequate psychotherapy could be implemented and the psychological condition improved. Therefore, no patient in this series had active psychopathology. All surgeries were performed by the same experienced spine surgeons (AW and associates).

The preoperative psychiatric assessments were reviewed independently by two psychiatrists (DA and RH) who were blind to spinal pathology and surgical outcome. For each patient, each psychiatrist rated a series of childhood risk factors as present or absent. After all reviews were completed, the evaluations were compared for agreement. Interrater reliability was excellent. When differences existed, charts were reviewed jointly by both psychiatrists and agreement was reached.

For the purpose of this study, childhood was considered 21 years of age or younger. A primary caregiver was considered a parent or other significant adult entrusted to care for the child, including grandparent, aunt, uncle, surrogate, or guardian.

The following is a list of definitions of childhood traumas that were considered risk factors<sup>8</sup>:

1. *Physical abuse* was considered present if the patient had received intentional physical injury by a primary caregiver.
2. *Sexual abuse* was considered present if a primary caregiver or other adult abused or exploited the patient as a child for that adult's sexual stimulation. Abuse can range from fondling to actual sexual intercourse.
3. *Alcohol or drug abuse in a primary caregiver* was considered present if the patient stated that the primary caregiver had problems with the use of alcohol or drugs.

4. *Abandonment* was present if the patient suffered loss of a primary caregiver in a manner that the patient perceived as abandonment. Uncomplicated divorce was not considered abandonment unless there were unusual circumstances.

5. *Emotional neglect or abuse* was considered present if the patient related that the primary caregivers were not available for emotional support or actively and persistently criticized, neglected, or invalidated the patient's emotional needs as a child.

To evaluate surgical outcome, each chart was reviewed by two nonsurgeons (JS and GS) who were blinded to the psychiatric assessment. Surgery was considered unsuccessful if one or more of the following criteria were present (all other surgeries were considered successful):

1. Repeat surgery (excluding debridement for infection);
2. Failure to return to work or usual housework 1 year after fusion or 6 months after discectomy;
3. Magnetic resonance imaging or computed tomographic scan of the lumbar spine performed more than 6 months after surgery;
4. Epidural corticosteroid injection or selective nerve root injection 6 months or more after surgery;
5. Continued use of opioid analgesics (more than 10 times per month) 6 months or more after surgery.

### ■ Results

There were adequate data available in 86 charts, which included a preoperative psychiatric assessment that addressed each risk factor and progress notes that provided sufficient documentation of postoperative status. The study group included 53 men and 33 women with a mean age of 41 years (range, 24–70).

Patients were evaluated at a mean of 13 months after surgery (range, 4–24 months). All patients whose final evaluation was done at less than 6 months had successful outcome and did not wish to return to follow-up.

Table 1 demonstrates a very strong relationship between the number of psychological risk factors and the observed probabilities of success of the lumbar spine surgeries. It also shows the estimated probabilities of success relative to the number of risks, as fitted by a linear logistic regression model, which provided an excellent fit to the observed probabilities (chi-square test for lack of

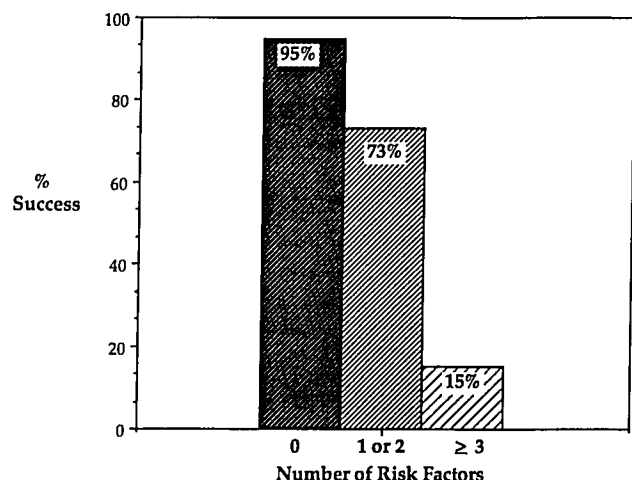


Figure 1. Surgical success rate.

fit,  $P = .98$ ). As fitted by this model, the relationship was highly significant ( $P < .0001$ ).

The success rate was 95% in the 19 patients who had no risk factors and 87% in the 31 patients who had either zero or one risk factor. There was a marked drop in success (45%) in patients with two risk factors. In the 39 patients with successful outcome, 33 (85%) had zero to two risk factors. Successful outcome was uncommon (6 of 39 [15%]) in the patients with three or more risk factors (Figure 1).

A striking difference was found between the success rates of two groups: those with zero to two risk factors and those with three or more risk factors. Patients with zero to two risk factors had a 73% success rate vs. only a 15% success in those with three or more risk factors ( $P = .001$ ) (Table 2). Outcome was unsuccessful in 35 (85%) of the 41 patients with three or more risk factors.

In the 47 patients with unsuccessful outcomes, 35 (75%) had three or more risk factors ( $P = .0001$ ). In the 41 patients with three or more risk factors, there was an 85% failure rate ( $P = .0001$ ).

The patients were compared with respect to the types and complexity of surgery. Thirty patients underwent single-level surgeries (Table 3), which included either repeat surgeries or fusion, or both. A similar relationship was seen between the number of risk factors and the surgical outcome. Again, patients with zero or one risk factor did well and those with three or more risk factors did poorly. Patients with two risk factors were intermediate.

Table 2. Surgical Success Rates Versus Grouped Psychological Risk Factors

No. of Risk Factors	No. of Patients	Surgical Outcome	
		Successful	Unsuccessful
0-2	45	33 (73%)	12 (27%)
3-5	41	6 (15%)	35 (85%)

Table 3. Single-Level Surgeries: Surgical Outcome Versus Number of Childhood Risk Factors

Number of Risk Factors	Surgical Outcome	
	Successful	Unsuccessful
0	7 (88%)	1 (12%)
1	3 (100%)	0 (0%)
2	2 (40%)	3 (60%)
3	2 (22%)	7 (78%)
4-5	0 (0%)	5 (100%)

Table 4. Single-Level Primary Surgeries Versus Psychological Risk Factors

Number of Risks	Surgical Outcome	
	Successful	Unsuccessful
0	5	1
1	3	0
2	2	2
3	2	4
4-5	0	4

The single-level surgery group was analyzed further. Table 4 demonstrates the results in the 23 patients who underwent single-level surgeries for the first time, revealing a trend similar to that shown in Table 3.

The results in the 56 patients who underwent surgery at multiple levels are shown in Table 5. Once again, a relationship similar to that shown in Table 3 can be observed. In the 29 patients with zero to two risk factors, 21 (72%) had a successful outcome. In the 27 patients with three or more risk factors, there was only a 15% success rate. Conversely, of the 25 successes, 21 (84%) had zero to two risk factors, and of the 31 failures, 23 (75%) had three or more risk factors.

■ Discussion

The outcome of lumbar spine surgery continues to be less than desired. Even when patients are carefully selected in terms of spinal pathology and surgery is performed by experienced spine surgeons, results do not always meet the expectations of the surgeon or the patient. Therefore physicians have been searching for ways to improve outcome.

Table 5. Results of Multiple-Level Surgeries Versus Psychological Risk Factors

Number of Risks	Surgical Outcome	
	Successful	Unsuccessful
0	11 (100%)	0
1	6 (67%)	3 (33%)
2	4 (44%)	5 (56%)
3	3 (19%)	13 (81%)
4-5	1 (9%)	10 (91%)

There has been a great deal of new information on the pathophysiology of spinal disorders and the mechanism of pain generation.<sup>14,16,21</sup> That the disc as a primary pain generator is now well recognized.<sup>14,16</sup> It is generally accepted that patients can have pain without nerve-root compression.<sup>14</sup> This has led to better selection of patients who are likely to benefit from spine surgery, who better match of the type of surgery to the pathology, and who would be better served by nonoperative care.

Major advancements have occurred in the area of diagnostic testing. Magnetic resonance imaging and computed tomographic scans correlate well with surgical findings. Many clinicians believe discography enhances diagnostic accuracy. Electrodiagnostic testing continues to be important.

Many technical advances have occurred in surgical technique, but a significant number of patients still fail to improve despite surgery that appears to be technically successful. Therefore, almost by exclusion, some or all of the residual pain is considered to be of psychological origin. To minimize unsuccessful outcomes, surgeons have sought ways to screen for psychological problems before surgery; that way, those patients most likely to fail to benefit from surgery could be identified.

In 1975, Wiltse and Rocchio showed that abnormal elevations of the hypochondriasis (Hs) and hysteria (Hy) scales of the MMPI were the best predictors of failure of chymopapain chemonucleolysis for disc herniation.<sup>22</sup>

In a retrospective study of spinal fusion, Turner and Leiding found that patients who had abnormal elevations of the triad of Hs, Hy, and depression (D) scales of MMPI had fewer good or excellent results compared to patients who had normal MMPI.<sup>20</sup> They also had fewer good results in patients who had "warning" physical signs during examination.

Herron et al found that abnormal MMPI predicted surgical failure in patients with disc herniation but not in those with spinal stenosis.<sup>10</sup> They raised the question of whether the usefulness of MMPI is dependent on diagnosis or age. They recommended that the MMPI be one component of the psychosocial evaluation process, but they stated: "Surgery should not be withheld from patients with abnormal profiles as long as physical and radiographic findings unequivocally demonstrate surgical pathology," despite their having no data to support that conclusion.<sup>10</sup> Conclusions such as these are worrisome. It does not make empiric sense that psychological abnormalities should be dependent on age or diagnosis in patients who are undergoing surgery for the treatment of pain.

Spengler et al studied five factors that can influence the outcome of surgery for disc herniation.<sup>18</sup> They found that none of seven patients who had a distinctly abnormal MMPI who had surgery for disc herniation had a good outcome. In their overall data analysis, the most powerful predictor of surgical outcome was the preoperative MMPI.

Despite a large body of literature suggesting the usefulness of MMPI screening in potential surgery patients, its use for this purpose has not gained general clinical acceptance. In all of the above studies, even patients with abnormal MMPI or "warning" findings underwent surgery. To our knowledge, no author has reported an improved success rate in a large series of surgical patients by eliminating potential surgery candidates because of an abnormal MMPI.

The MMPI was not designed to screen for psychological abnormalities in patients with pain or chronic illness. It was designed to screen a physically healthy population for psychological abnormalities. The abnormalities found in the Hy, Hs, and D scales of the MMPI may reflect the chronic pain and disability status of the patient rather than any pre-existing psychological characteristics.<sup>13</sup>

Barnes et al reviewed their experience with a group of 69 patients treated in a functional restoration program.<sup>3</sup> They demonstrated significant reductions in the Hy, Hs, and D scales after treatment. Patients also showed significant improvements in functional capacity and a high return-to-work rate. They hypothesized that an abnormal MMPI might in part reflect the situational stressors of the chronic dysfunctional state.

Sternbach and Timmerman compared a group of patients with pain who were treated with surgery, psychotherapy, and rehabilitation to a group treated with psychotherapy and rehabilitation alone.<sup>19</sup> In the first group, there was a significantly greater reduction of pain and a significantly greater improvement in MMPI. They concluded that many of the abnormal psychological features seen in the patients with chronic pain were the consequence of pain, not the cause, and that many of the psychological abnormalities tended to disappear when pain was successfully reduced.

A possible explanation for the failure of MMPI to become accepted as a screening tool by surgeons in clinical practice is the paucity of useful information that can be gained from it. There seems to be a gestalt by physicians that the information is incomplete and that MMPI does little to help us know the patient. The MMPI does not lead us to a dynamic understanding of the patient: It presents only static descriptive information without suggestions that can improve treatment.

We had used the MMPI for years. It was our frustration with the MMPI and other psychological screening tests that led us back to the clinical interview. We believe the need for a dynamic understanding of the patient is critical for strategic planning of overall treatment. For this reason, we believe a clinical interview by an experienced psychological examiner is essential to obtain the detailed history necessary to understand the patient. A skilled interview by an empathic examiner is also essential to identify childhood experiences that we have shown to correlate with unsuccessful surgery.

In our referral tertiary care practice, we see many patients with failed back surgery syndrome or chronic spine pain that has failed to improve despite several attempts at diagnosis and therapy. As part of a multidisciplinary evaluation, each patient underwent a psychiatric interview. We were struck by the large number of patients with either refractory spine pain or failed back surgery syndrome, or both, who had a history of severe childhood psychological trauma.

The theoretical basis for this study was derived from the observations of Engel.<sup>6</sup> His description of factors that might lead to a person's becoming a "pain-prone adult" closely matches the dysfunctional backgrounds of our patients. In a study of child development, Ainsworth et al provided a framework for Engel's work and that of subsequent researchers.<sup>2</sup> Ainsworth empirically studied early childhood relationships with significant caregivers. She demonstrated that the kind of relationship (ie, "attachment") a child has with his or her significant caregiver is highly predictive of the kind of relationship the child will have with significant others throughout life.

Observational studies demonstrate that the capacity of a distressed child to be consoled is linked to the security of his or her attachment to early caregivers. The childhood abuse and neglect Engel observed to lead to the pain-prone adult is the same neglect that would profoundly affect the capacity of the distressed adult to be consoled. This need for consolation is particularly manifest at times of emotional stress. Our early experiences working with patients with refractory spine pain led us to observe that patients with childhood experiences potentially damaging to the development of healthy, secure attachments were much more likely to fail to improve after surgery. The converse also appeared to be true.

Our five risk factors listed above were a consolidation and simplification of the factors we have observed or that have been reported to be potentially damaging to the development of a secure attachment.<sup>2,6</sup> Each factor was assessed during the course of a semistructured clinical interview with the patient for whom surgery was being considered.

To understand the impact of caregiver sensitivity on attachment and subsequent response to either physical or emotional trauma, or both, the following vignette may be illustrative. A young child falls from a play structure and begins to cry. The caregiver might be physically or emotionally absent and neglect the child, or if present, might respond to the child in a variety of ways, including soothing reassurance, shattering humiliation, anxious smothering, or irritated impatience. If effective, the intervention helps to restore order and well-being for the child. This type of interaction between child and caregiver occurs hundreds of times in various contexts throughout childhood. As a result of these repeated interactions, a unique template of expectations, autonomic nervous system responses, and behaviors develops

within the individual, which becomes activated throughout life when either physical or emotional stress, or both, is experienced. This activated template will also have pronounced effects on the nature and effectiveness of any caregiver intervention.

Unremitting spine pain and the trauma of spine surgery present unique and strenuous challenges to the patient. Those confronted with these challenges face the threat of being overwhelmed by ongoing pain and loss.

Just as the child in the playground must rely on a consoling parent or caregiver, the spine patient turns to the spine physician for pain relief (consolation). Unremitting spine pain is the equivalent of the playground injury. The patient turns to the medical system for care, but does not get better. Surgery is performed as an attempt to relieve pain. Patients who can be consoled are highly likely to improve. Those who have been psychologically traumatized and are not readily consolable may not improve. The surgery serves a dual purpose in our model. First it is an attempt to console. Second it is another traumatic event that can in itself reactivate the childhood template. Often surgery is successful; however, our data show that the more psychologically damaged the individual (greater number of risk factors), the less likely the patient is to get better. Although this study did not address the issue of psychotherapy, we feel that psychological treatment can enhance the patient's ability to be consoled.

Others have looked at the role of some forms of adverse childhood traumas on future medical illnesses, particularly various forms of pain. Gamsa compared 163 subjects with chronic pain with 81 control subjects without pain to try to determine whether psychological abnormalities were the cause or the result of chronic pain.<sup>7</sup> She evaluated early childhood deprivation and trauma, pain models in the patient's family of origin, marital adjustment, previous depression, and other psychological variables. She concluded that the emotional disturbances seen in chronic pain patients generally are the consequences rather than the causes of the pain. In addition, the only measure of early childhood experience that was found to be associated with the chronic pain state was inadequate parental care.

Drossman et al prospectively evaluated 206 women who presented to a gastroenterology practice for the presence of sexual or physical abuse and compared patients with organic vs. functional disorders.<sup>5</sup> They found that 44% of patients had been subjected to some form of sexual or physical abuse. Interestingly, 30% of these patients had never discussed the abuse with anyone—family, friends, or physicians. The risk for abuse, particularly physical abuse, was found to be greater in those with functional disorders than in those with organic disease. The abused group also had a much higher incidence of backache, pelvic pain, and chest pain and had undergone more surgical procedures in their lifetime than had the nonabused patients.

Domino and Haber reviewed their experience with women being treated for headache at a pain clinic.<sup>4</sup> They found that 66% had been physically or sexually abused. Compared to nonabused headache patients, the abused patients experienced more severe pain, a higher frequency of constant daily headaches, and a greater proportion of hospitalizations and surgeries.

Wurtele et al investigated childhood sexual abuse among chronic pain patients and found that 39% of women and 7% of men had been sexually abused.<sup>23</sup> They proposed that there is a relationship among abuse, chronic muscle tension, and chronic pain. They also suggested that pain problems might be related to other aspects of childhood that might be more prevalent in the environment of a child who is abused, such as lack of parental support or disturbed family relationships.

Harness and Donlon reported on two patients with refractory facial pain who had failed to improve despite surgical intervention.<sup>9</sup> In both patients, a history of physical abuse during childhood was eventually obtained. After psychotherapy, both patients experienced significant pain reduction.

These reports support our observations that continued pain after technically successful lumbar spine surgery can in part be due to the psychological impact of severe childhood psychological trauma. In our study, there was a direct correlation between the number of different types of childhood trauma and the incidence of unsuccessful surgery. Certainly there is a great deal of information on the psychological consequences of having had an alcoholic parent. A great deal of attention has been focused on the psychological treatment of adults whose parents were alcoholics.

We are not aware of any study that explores the somatic effects of the other forms of childhood trauma we studied. Abandonment and emotional neglect are difficult to quantify and, perhaps for this reason, have not been studied adequately. The overall surgical success rate of 45% seen in our patients is disappointing. There are many possible explanations for this. Our criteria for unsuccessful surgery were quite restrictive. As Howe and Frymoyer showed, the criteria selected to determine surgical success or failure can greatly effect the reported results.<sup>11</sup> Our endpoints were clear and unambiguous. Most clinicians would agree that if a patient is unable to return to work or to manage a household, insufficient functional improvement has occurred to call the surgery successful. Most investigators would also consider the use of long-term opioids after surgery to indicate unsuccessful surgery. The need for magnetic resonance imaging or computed tomographic scanning 6 months or more after surgery is an indication that the patient and surgeon believe there has not been adequate improvement in pain. The need for therapeutic intraspinal corticosteroid injections would also indicate that the patient is not doing well. In our unsuccessful surgery group, no patient failed

only because of a scan or injection. All failures in these two categories had both.

In our practice, all patients who might eventually be considered surgery candidates are initially treated with aggressive conservative care. A large number of these patients improve and avoid surgery.<sup>15</sup> Many of these patients have come to us for a second opinion after having had surgery recommended elsewhere and were successfully treated with conservative care. This kind of patient can be included in some surgical series, but would therefore not be included in our surgery study. Many patients also come to us having been treated elsewhere previously. Although we did not specifically evaluate this point, it is our impression that we initially saw many of our patients long after they were injured and had experienced a long duration of pain, disability, and time off work. This made them less likely to have a good outcome.

We recognize that there are inadequacies in our study. It was retrospective. The success and failure groups were not matched by specific pathology. The surgeries varied and could not be matched according to the number of risk factors. We did not evaluate the effect of Worker's Compensation status or other types of litigation, and there was only a 13-month average follow-up. Establishing the fact that surgery has been a failure, however, can be satisfactorily achieved within this period of time. We also found a large number of patients with multiple risk factors, and we do not know whether or not this is reflective of the population as a whole.

Despite these shortcomings, the results are striking. There was a clear and significant correlation between the number of childhood psychological traumas and the success rate of lumbar spine surgery. This correlation was seen in single-level, multilevel, primary, and repeat surgeries.

## ■ Conclusion

Patients who have three or more risk factors appear to be at high risk for unsuccessful lumbar spine surgery. Therefore we believe a preoperative psychological interview is important to determine whether or not risk factors are present. If three or more risk factors are present, surgery should be avoided unless there is overwhelming spinal pathology. Further, patients who have failed to improve despite surgery that appears technically successful should have a psychological interview to determine the presence of childhood risk factors.

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*Address reprint requests to*

Jerome Schofferman, MD  
San Francisco Spine Institute  
1850 Sullivan Avenue  
Daly City, CA 94015