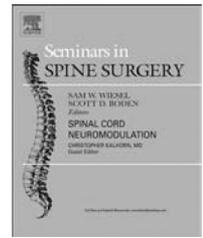
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# Symptoms of post-traumatic stress disorder as an adverse collateral event in spine surgery

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## ABSTRACT

Patients undergoing elective lumbar spine fusion experience symptoms of PTSD relating to their surgeries in substantial numbers. While pre-operative symptoms of psychiatric distress or psychiatric diagnoses are risk factors for such symptoms, many patients without such “red flags” also report these effects. In addition, the ultimate clinical benefit reported by patients experiencing post-operative symptoms of PTSD is reduced when compared to patients without such symptoms. Recognition and management of such concerns peri-operatively may offer an avenue to enhance clinical outcomes and improve patient experience following elective lumbar fusion.

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## Introduction

It has been well established that adult spinal deformity (ASD) can have a significant impact on a patient’s health-related quality of life (HRQOL) with lower scores often being reported in this patient population.<sup>1–3</sup> Furthermore, pre-operative psychiatric illness has been shown to not only affect spine patient pain intensity and disability, but has also been established as an independent risk factor for adverse events peri-operatively.<sup>4–8</sup> Although the relationship between pre-operative mental health disease and post-operative outcomes in spine surgery has been studied, the relationship between the development of mental health disease after spine surgery is less well recognized. More specifically, few studies have investigated the incidence of developing psychiatric illness such as post-traumatic stress disorder (PTSD) symptoms after spine surgery.<sup>9,10</sup>

PTSD has been previously described as the “re-experiencing of any extremely traumatic event accompanied by symptoms of increased arousal and by avoidance of stimuli associated with the trauma”.<sup>9,11</sup> These symptoms must be directly related and attributable to the inciting traumatic event,

persist for at least 4 weeks, and cause psycho-social dysfunction. As such, the definition and diagnosis of PTSD as per the Diagnostic and Statistical Manual of Mental Disorders (DSM) can be thought of consisting of three distinct, yet related, components—a biological, psychological, and social component. The psychological component consists of the “re-experiencing” of the traumatic event, which then results in the biological component consisting of the signs and symptoms of arousal, and the social component that often manifests as avoidance behavior to any circumstance or stimulus that triggers these recollections of the event. Although the diagnosis of PTSD has been historically described in the context of traumatic events associated with military combat, natural disasters, and assault,<sup>9,12–14</sup> more recently the idea of surgical procedures acting as the inciting traumatic event for PTSD occurrence has been investigated. In fact, up to 51% of patients suffering medical conditions such as cancer and having undergone procedures such as orthopaedic surgeries or organ transplants have been reported to experience symptoms of PTSD.<sup>9,10,15–29</sup>

More recently, the relationship between spine surgery and the development of PTSD symptoms has been evaluated. In a

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couple of different studies, Hart et al. first investigated the incidence of PTSD symptoms post-operatively in a cohort of elective lumbar spine arthrodesis patients with 100% follow-up,<sup>9</sup> and then in a follow-up study examined the correlation between PTSD symptom occurrence and clinical outcome.<sup>10</sup> In a prospective fashion, Hart et al. evaluated 73 patients undergoing a variety of elective lumbar spine arthrodesis operations, excluding those whose primary operative indication was for oncological, traumatic, or infectious etiologies. Patients completed a PTSD Checklist-Civilian Version (PCL-C) questionnaire at 6 weeks and 3, 6, 9 and 12 months post-operatively to evaluate the incidence of PTSD symptoms. Patients also completed a Short-Form 36 (SF-36) and Oswestry Disability Index (ODI) questionnaire at 1 year post-operatively to evaluate the correlation between PTSD symptoms and post-operative clinical outcomes. Signs and symptoms of PTSD were reported to occur in approximately 20% of patients at least once within the first year after elective lumbar spine surgery, and anywhere from 7.5% to 13.6% of patients experiencing these symptoms at any one time point within the first year after surgery.<sup>9</sup> Although previous studies had detailed the post-operative effect on clinical outcomes of depression and its incidence after spine surgery,<sup>30–37</sup> this seminal work was among the first to demonstrate a link between the spinal procedure itself and the de novo occurrence of PTSD symptomatology. In addition to the correlation between post-operative PTSD symptom incidence and spine surgery, the group also examined risk factors that may predispose patients to this occurrence. Not surprisingly, the strongest predictor of a patient experiencing these symptoms post-operatively was the presence of pre-operative psychiatric disease (major depressive disorder, schizophrenia, bipolar disorder, panic disorder and generalized anxiety disorder). The other major risk factor found in the study to be predictive of PTSD symptoms was the occurrence of a post-operative complication. Although potentially not adequately powered to reveal other significant risk factors, variables that trended toward a significant correlation were age, estimated surgical blood loss, length of hospital stay, and pre-operative diagnosis. This latter finding of pre-existing psychiatric illness predisposing to PTSD symptomatology post-operatively is in-keeping with multiple previous studies suggesting that a pre-operative spine surgery diagnosis of depression can have a significant impact on a patient's perceived outcome.<sup>30–37</sup> However, this is not to say that patients with pre-operative psychiatric illness see no benefit from surgery as it has also been demonstrated that both low mental health and high mental health groups alike experience similar improvements in many HRQOL domains (although the low mental health group is less likely to see improvements in physical component HRQOL scores).<sup>1</sup> It seems intuitive that patients with pre-operative co-morbid psychiatric illness are pre-disposed to PTSD symptoms as, although maybe not entirely accurate description, it makes sense that a fragile emotional disposition pre-operatively would be more susceptible to PTSD post-operatively. Moreover, the finding that post-operative complications also correlate with post-operative PTSD symptoms, albeit again not surprisingly, is interesting in that it highlights the precariousness of how and what patients use to define a "successful surgical outcome." This also serves to emphasize

the discrepancy that exists between patients' and surgeons' perceived impact of post-operative complications.<sup>9,38,39</sup>

In-keeping with other studies showing that patients with a diagnosis of depression are more likely to see less clinical benefit from spine surgery, Hart et al. report similar findings with respect to PTSD symptoms.<sup>10</sup> In another study, patients experiencing PTSD symptoms (defined as a PCL-C score of 50 or greater), or approximately 20% of patients, had significantly worse clinical outcomes than those without PTSD symptoms (with respect to final score, change in score, and achieving minimum clinically important difference, MCID, on both the ODI and physical component score, PCS, of the SF-36). Based on the strength of the correlation, the occurrence of post-operative PTSD symptoms also seemed to have a greater impact on a patient's outcome than did a pre-operative psychiatric diagnosis or their pre-operative mental composite score. From these studies, two important findings have become clear: 1) that a substantial number of patients experience post-operative PTSD symptoms, and 2) that PTSD symptoms have a significantly negative impact on post-operative patient self-reported outcomes. These two points underline the importance of both recognizing patients who are experiencing these symptoms, and then treating them accordingly.

Spine surgeons are often vigilant with respect to pathophysiological peri-operative complications, however are often less attentive to psychological post-operative complications.<sup>10</sup> Much of this likely relates to the lack of awareness amongst surgeons about the impact of post-operative psychological distress on patient outcomes. Although there is increasing awareness about the effects of pre-operative diagnoses of psychiatric illness on surgical outcomes (and thus also an increasing amount of pre-operative psychiatric optimization for patients), this has not necessarily translated to post-operative screening and treatment as well. As previously mentioned, the strength of the relationship between PTSD symptoms post-operatively and patient reported outcomes should hopefully help to increase the awareness of PTSD post-surgically within the medical community and lead to better patient screening and treatment. This is especially true in the current surgical climate where surgeons are graded and, in some instances, remunerated based on quality-of-care.<sup>40</sup> More specifically, if patient reported outcomes start to become used as surrogate markers for quality care, the recognition and treatment of post-operative psychological symptoms such as those related to PTSD, could become paramount.

Although the discussed studies represent a large step-forward in our knowledge of the complex interplay between psychiatric illness and spine surgery, there is still much more work needed before more concrete conclusions can be drawn. It is important to recognize that many of these studies utilize patient self-reported screening forms for the occurrence of symptoms, and they do not necessarily imply a formal psychiatric diagnosis. The occurrence of PTSD symptoms at any given time point post-operatively does not equate to a DSM-based diagnosis as outlined above. Furthermore, although the occurrence of PTSD symptoms correlates with significantly less clinical improvement post-operatively, it is difficult to comment on exactly what the cause of the worse reported outcomes may be (correlation does not imply causation). For example, lack of clinical improvement for whatever reason may lead to PTSD symptoms, as opposed to the other way around. There have

been no large, randomized, studies carried out on this subject, and as such, other unmeasured and confounding variables (for example on-going litigation, revision surgery, smoking status, or other medical comorbidities) may be responsible for the observed results and not necessarily the occurrence of PTSD symptoms. Another interesting concept that has emerged from the studies done on examining the relationship between PTSD and psychiatric illness and spine surgery is how best to classify the occurrence of PTSD symptoms with respect to post-operative complications. The terms “sequelae” and “collateral outcome” have been previously used to describe an unavoidable, adverse event or outcome as a result of a surgical intervention.<sup>41,42</sup> Unlike arthrodesis procedures in which increased stiffness is almost a certainty post-operatively, not all spine surgery patients will experience PTSD symptoms. Furthermore, and it can be quite difficult to predict who those patients that will suffer PTSD-related symptoms will be. Nevertheless, until further studies are completed investigating PTSD symptom occurrence and whether it is avoidable, we believe that it should fall under the category of being a collateral outcome.

The occurrence of post-operative PTSD symptoms is a relatively new, and underappreciated collateral adverse outcome following spine surgery. Considering that its incidence approaches nearly 20% of post-operative spine patients and the strength of its relationship with significantly worse patient reported outcomes, increased awareness, screening, and treatment for it are required. Further study is also required for elucidating which patients are at highest risk for its occurrence based on independent risk factors identified through multivariate analysis, and appropriate pre-operative patient optimization and counseling regarding its risk is prudent.

## Disclosures

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

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