



Peri-Operative Pain Control in the Neurosurgical Patient

M. Neil Woodall, Nathan D. Todnem, Joseph Withrow BS and Scott Y. Rahimi*

Department of Neurological Surgery, Georgia Regents University Augusta, Georgia, USA

*Corresponding authors: Scott Y. Rahimi, MD, Department of Neurological Surgery, Georgia Regents University Augusta, Georgia, USA, E-mail: SRAHIMI@augusta.edu

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Abstract

The importance of peri-operative pain control cannot be overstated. The overwhelming majority (87%) of patients experience pain after craniotomy – 44% of patients report moderate pain and 10% report severe pain in the first 24 hours post-procedure. Adequate analgesia in the post-operative period is associated with improved patient satisfaction, increased mobility, early ambulation, shorter hospital stays, and reduced cost. There has been a tendency in neurosurgery to underestimate the severity of, and therefore under-treat, post-operative pain following craniotomy and spinal surgery. An increasing body of evidence suggests that aggressive pain control in the acute post-operative period may reduce the risk of chronic pain and chronic opioid dependence. Analgesic options are limited by bleeding risk, the need for a reliable neurologic examination, and the risk for pseudoarthrosis following spinal fusion. Prevention of acute severe pain is likely to improve visual analog scale (VAS) scores in the hospital, reduce opioid consumption, reduce opioid related side effects, and decrease the likelihood of going on to develop chronic pain. We would recommend a multi-modal strategy including the liberal use of opioids coupled with acetaminophen, gabapentin/pregabalin, and non-narcotic analgesics such as tramadol and COX-2 inhibitors. While the liberal use of opioids is encouraged in the early post-operative period, patients must be discharged with a clear and concise weaning schedule. The use of local anesthetic is recommended also. Pre-treatment protocols and the use of epidural catheters represent therapeutic options that warrant further study. More study is required both in the laboratory and in the clinic to enhance our understanding of the pain phenomenon and to formulate better treatment.

Keywords: Craniotomy; Spine surgery; Neurosurgery; Post-operative pain; Peri-operative pain; Opioid; Multimodal pain management

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The importance of peri-operative pain control cannot be overstated. The overwhelming majority (87%) of patients experience pain after craniotomy – 44% of patients report moderate pain and 10% report severe pain in the first 24 hours post-procedure [1]. Adequate analgesia in the post-operative period is associated with improved patient satisfaction, increased mobility, early ambulation, shorter hospital stays, and reduced cost [2,3]. There has been a tendency in

neurosurgery to underestimate the severity of, and therefore under-treat, post-operative pain following craniotomy [4]. An increasing body of evidence suggests that aggressive pain control in the acute post-operative period may reduce the risk of chronic pain and chronic opioid dependence [5-7].

Neurosurgery patients represent a complex and heterogenous patient population. Procedures range from supratentorial burr holes to multi-level thoracolumbar deformity correction. Acute perioperative pain control is challenging in these patients because of restrictions imposed by the nature of the disease processes and procedures. There is a tendency to limit narcotics in cranial patients for fear of masking the neurologic examination, and for fear of hypercapnea that might lead to cerebral vasodilation and subsequent increases in intracranial pressure [8]. For both cranial and spine patients, there is hesitation regarding the use of agents that could inhibit platelet aggregation such as non-steroidal anti-inflammatory drugs (NSAIDs) because of the risk of post-operative epidural hematoma, resulting in neurologic deficit and an unplanned return to the operating room [9]. Some spine surgeons avoid NSAIDs because animal studies have suggested that they may interfere with bone healing [10]. Epidural infusions can be problematic because of a high incidence of numbness and tingling masking the neurologic examination [11]. Furthermore, the intraoperative anesthetic technique is sometimes limited by a need for neuro-monitoring (motor evoked potentials, somatosensory evoked potentials, and electromyography), avoidance of certain inhalational anesthetics, need for a rapid wake-up and neurological examination, and sometimes by the need for awake-craniotomy for functional mapping [12].

Despite these limitations, adequate peri-operative analgesia is mandatory for neurosurgery patients. Improved pain control as expressed by improved visual analog scale (VAS) scores correlate with improvements in patient anxiety, fear, and ability to rest [8]. Pain and gastrointestinal dysfunction are the leading causes of delayed in-hospital recovery after spine fusions [13]. Improved pain control is associated with deep breathing as well as early ambulation which, theoretically, reduce the risk of pneumonia, deep vein thrombosis, and pulmonary embolism [2,3,8]. Adequate analgesia results in decreased sympathetic outflow, autonomic stability, and improved blood pressure – arterial hypertension is a risk factor for post-operative intracranial hematoma [1]. Excellent pain control should improve patient comfort, prevent hospital-associated complications, shorten length of stay, and reduce cost.

Women, younger patients, and patients on chronic preoperative

rates of vomiting and urinary retention, and no difference in adverse events post-operatively [24].

The rationale for a multi-modal approach to pain management involves using multiple agents with varying mechanisms of action to target pain pathways at multiple sites. The goal is synergism allowing for improved efficacy, reduction in dose of each agent, and improvement in toxicity and side effects. A recent literature review by Devin et al. found Level I evidence to support the use of gabapentin, acetaminophen, neuraxial blockade, and long-acting local anesthetics; Level II evidence to support the use of NSAIDs; and conflicting

opioids alone or in combination with local anesthetics have achieved earlier return of bowel sounds [13], earlier oral intake [40], significant reduction in opioid requirements [41], reduced need for muscle relaxants [42], reduction in VAS at 12, 24, and 48 hours [43], and improved patient satisfaction compared to controls [44]. The use of epidural catheters does not seem to be associated with an increased risk of infection or opioid-related symptoms. There was, however, a 41% incidence of post-operative lower extremity paresthesias in comparison to placebo in one study [11]. Clouding of the neurologic examination represents a potential drawback to post-operative epidural infusions.

Pain in the post-operative neurosurgical patient is an under-appreciated and under-treated problem. Neurosurgical patients

31. Mayberg TS, Lam AM, Matta BF, Domino KB, Winn HR (1995)
Ketamine does not increase cerebral blood flow velocity or intracranial pressure during isoflurane/nitrous