Editorial

Pain control after craniotomy: off balance on the tightrope?

MARCEL E. DURIEUX, M.D., PH.D.,¹ AND SABINE HIMMELSEHER, M.D.²

¹Department of Anesthesiology, University of Virginia Health System, Charlottesville, Virginia; and
²Klinik für Anaesthesiologie, Klinikum rechts der Isar, Technical University of Munich, Germany

Postoperative pain remains a major challenge associated with many types of surgery, but in few situations is it as potentially detrimental as after intracranial procedures. Moderate to severe pain causes agitation and sympathetic stimulation, and subsequent blood pressure increases may induce brain swelling in areas with disturbed autoregulation. Postoperative intracranial hemorrhage, prolonged hospital stay, and an increased mortality rate have been attributed to systemic perioperative hypertension in the setting of craniotomy.¹ Therefore, adequate treatment of postoperative pain in these patients is essential.

Unfortunately, the treatment of pain comes with its own set of potential problems. Cyclooxygenase inhibitors may interfere with hemostasis and may therefore be contraindicated. In addition, their efficacy is limited in patients with moderate to severe pain. In the general surgical population, opiates would be the drugs of choice to effectively treat severe pain, but their side-effect profiles are particularly problematic in the neurosurgical setting. Sedation can suggest an intracranial event. Nausea and vomiting induce hypertension and may increase the risk for aspiration if the patient has compromised laryngeal reflexes. Most feared, however, is respiratory depression, with resulting increases in arterial carbon dioxide levels and intracranial pressure.

Hence, the clinician walks a tightrope, threatened on the one hand by the adverse effects of pain, and on the other by the side effects of its treatment. It seems that some of us have adapted to this uncomfortable situation by assuming that pain is inevitable after craniotomy, whereas others reassure themselves that pain after craniotomy is really not that bad and that, therefore, limited pain management is sufficient. Support for this conventional wisdom came from a paper by Dunbar et al.² who reported in 1999 that craniotomy procedures were associated with less pain than lumbar laminectomies. Although frequently quoted, this study consisted of only 90 minutes of immediate postoperative observation in patients who had received more than 500 μg of fentanyl intraoperatively. The results therefore cannot be easily extrapolated to other intraoperative anesthetic and analgesic approaches or to the later postoperative period.

In fact, the authors of more recent studies stress that these reassuring findings do not tell the whole story and that we may be a bit off balance on the tightrope. Many of our patients do in fact suffer moderate to severe pain, and we undertreat it. In their article “Prospective evaluation of pain and analgesic use following major elective intracranial surgery” in this issue of the Journal of Neurosurgery, Gottschalk and colleagues add to this growing body of evidence. They report a prospective study of 187 patients undergoing elective intracranial procedures. Moderate to severe pain was reported by 69% of the patients on the 1st postoperative day and by 48% on the 2nd postoperative day. Intratentorial surgery was associated with more intense pain than were supratentorial procedures. Treatment consisted mostly of acetaminophen (at times in alarmingly large amounts) and very small doses of fentanyl. This seems to suggest that the treating physicians on the one hand believed that they should be able to get by with nonopioid analgesics (because craniotomy is not painful...), yet on the other hand realized that their patients suffered and therefore, fearing opiates, prescribed more and more of the nonopioid analgesic medication. These new data confirm other recent reports and expert opinion.³⁴ Based on the currently available evidence, it seems clear that patients who undergo craniotomy do suffer significant pain and that this pain often goes untreated.

To regain our balance on the tightrope, we will need to provide more effective pain management. This, however, is not an easy matter, as very little guidance exists. Only 11 double-blinded randomized controlled trials on postcraniotomy pain have been published since 1994, with an average of approximately 50 patients per trial. Considering the complexity of the issue, this is very limited information. In addition, different patient populations, procedures, and protocols make extrapolation of the data almost impossible. As a result, no validated protocol exists for the provision of analgesic medications in this population. The difficulty of diagnosing pain and its severity in patients with altered mental status, cognitive impairment, or aphasia adds to the problem, as does the lack of standardization of intraoperative anesthetic practice.

Nonetheless, a few observations from these trials can advance our therapeutic approaches to treating pain in patients who have undergone craniotomy. The intraoperative use of the short-acting opiate remifentanil is associated with post-
operative hyperalgesia, and appropriate transitional analgesia (preferably with a long-acting drug such as morphine) is indispensable. As confirmed in the study conducted by Gottschalk and associates, perioperative scalp infiltration or scalp nerve blocks with local anesthetic agents improves postoperative pain control, albeit for a short duration only. Postoperative pain must be formally assessed by using objective, validated measures. In most studies, morphine provides better and more consistent analgesia than other compounds, which is to be expected from a drug with a long duration of action. Fentanyl boluses, in this setting, are a poor choice, because the drug is too short acting. With careful use, serious morphine-related complications have been avoided. Acetaminophen, oxycodone, and tramadol may play supplementary roles. The use of codeine and intramuscular drug therapy are discouraged.

For more substantial progress, however, well-designed clinical trials are needed to address the main issues in this debate. Which intraoperative anesthesia approach is associated with the best postoperative balance between pain control and the patient’s recovery profile? Is the postoperative use of morphine in these patients truly safe? Which are the neurosurgical procedures and approaches associated with the most challenging postoperative pain control? These questions will only be answered definitively by trials that are adequately powered to assess complications (both from pain and from its treatment), which include standardized pain assessment tools and which pay careful attention to the intraoperative process, both the anesthesiological and the neurosurgical approaches.

The data generated by Gottschalk and associates’ study do not answer these questions. However, their study is a wake-up call that clearly underscores how we are off balance on the tightrope, and maybe dangerously so. Regaining the balance will not only make recovery after neurosurgery less painful for our patients but likely even safer.

References
2. Dunbar PJ, Visco E, Lam AM: Craniotomy procedures are associated with less analgesic requirements than other surgical procedures. Anesth Analg 88:335–340, 1999

RESPONSE: The authors thank Drs. Durieux and Himmelseher for their further elucidation of the clinical context of our study and for anticipating the direction of future lines of investigation.

In general, we agree with the editorial by Drs. Durieux and Himmelseher. Postcraniotomy pain exists and is often poorly treated. Drs. Durieux and Himmelseher provide personal clinical insight as to why treatment of the pain associated with intracranial surgery is such a therapeutic conundrum. On one hand, there is a desire to treat pain and, on the other, are the complications of analgesic therapy. Although it is generally assumed that analgesic therapy will introduce complications, preliminary analysis of an ongoing trial in our neurosurgical intensive care unit (ICU) indicates that reduced pain levels, in addition to minimizing hypertensive extremes, are associated with improved cognitive performance and more accurate neurological assessment. Currently, we believe that many healthcare professionals still fail to recognize the intensity of pain in these patients because pain is often poorly assessed.

Pain assessment and management are interdependent, and one is useless without the other. Without formal assessment, many see only the tip of the pain iceberg. There are many reasons for this. First, when assessing pain by direct patient observation, even empathetic nurses and physicians tend to underrate pain levels, and the discrepancy between professionals’ assessment of pain and the actual self-reports of pain is greatest when pain scores are most severe.5 Second, when patients recall the intensity of past painful events, their recollection is generally less intense than what they actually reported at the time of the event.6 This casts a shadow on anecdotal information about a patient’s perioperative pain experience recalled during office visits following a surgical procedure. Moreover, for unknown reasons, patients are reluctant to let nurses and physicians know they are in pain.7 Lastly, patient satisfaction with analgesic therapy should not be taken as a proxy for effective analgesic therapy because many patients are satisfied with less-than-ideal therapy. In general, patients expect perioperative pain8 and often value efforts to provide pain relief even if these efforts are inadequate. Collectively, these observations illustrate that there are fundamental reasons why the intensity of perioperative pain associated with intracranial and other types of surgery may not appear to be as great as it really is.

Apart from reading studies like ours, one means of developing an awareness of the remainder of the “pain iceberg” is through explicit pain assessment by physicians and nurses over the course of hospitalization. The Joint Commission on Accreditation of Healthcare Organizations’ recent emphasis on pain as the fifth vital sign is meant to encourage this.2 Not surprisingly, however, physicians’ awareness of actual pain intensity will occur only if these assessments are actually performed. Evaluation of our unpublished data indicates that, for both the ICU and the surgical floor, formal pain assessment by attending neurosurgeons, neurosurgical house staff, and intensivists is infrequent.1 Collectively, these observations illustrate that there are fundamental reasons why the intensity of perioperative pain associated with intracranial surgery may not appear to be as great as it really is.

Assuming the collective interdisciplinary desire to improve analgesic therapy for patients undergoing intracranial surgery, what might the future hold? Unfortunately, there is little available evidence-based literature to guide the practitioner. We are currently investigating the use of patient-controlled analgesic medication in these patients in a randomized controlled trial. This technique, in which patients