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The management of post-craniotomy pain

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Historically, the pain associated with intracranial surgery has been under-treated because of the fear that the use of opioids may interfere with the post-operative neurologic examination or lead to its deterioration[1,2]. Much of the information concerning the quality, duration, and treatment of pain following cranial surgery was until recently anecdotal. Opioids, the analgesics most often prescribed for moderate to severe acute post-operative pain were rarely used because of the fear that they may produce sedation and miosis and mask signs of intracranial catastrophe. Furthermore, opioids, even when administered in therapeutic doses, may depress minute ventilation leading to hypercapnia, increased intracerebral blood volume, and potentially increased intracranial pressure and cerebral edema[3]. Moreover, why expose a patient to these risks when there is a presumed lack of need? Decades of training and anecdote have reinforced a widely held belief that patients do not experience intense pain following intracranial surgery, a belief supported by the fact that surgery on the brain parenchyma per se is not painful[3,4].

On the other hand, a growing body of published studies in adult and pediatric patients report that pain following intracranial surgery is in fact common, often intense, and under-treated[3,5-7]. Failure to adequately treat pain in other postoperative conditions is associated with poor outcome[8,9]. Indeed, aggressive assessment and treatment of pain for other conditions is now routine and the standard of care.

Over the past decade, the adult and pediatric neuro-anesthesia and neuro-critical care group at the Johns Hopkins Hospital have demonstrated that opioids administered via intravenous patient-controlled analgesia (PCA) provides more effective analgesia than opioids administered on as needed (PRN) basis for supra- and infra-tentorial intracranial surgery[1,3,5,6,10,11]. In the adult studies, pain was better controlled with PCA because patients with free access to opioids when they felt the need for more pain relief received 1.7-fold more opioid than the PRN group. We also recently found that despite this increase in opioid consumption there were no clinically relevant differences in respiratory parameters between the two groups as measured by end-tidal carbon dioxide (measured by capnography), respiratory rate (also measured by capnography) or in oxygen saturation as measured by pulse oximetry (results in press). Additionally, no patient in either group needed to be rescued by naloxone for suspected respiratory depression. In children we found that pain control with opioids was similar with both intravenous PCA and PRN as long as both groups received adequate amounts of opioids[10,12].

In this lecture I will review this data and demonstrate that pain following craniotomy surgery is very painful and that this pain can safely and effectively be treated with opioids. I will also discuss methods to best monitor for respiratory depression to minimize the possibility of respiratory depression particularly with opioid accumulation. Finally, in this era of opioid reduction (not omission!), I will discuss multi-modal pain methods of pain control that go beyond opioids as well, particularly the use of acetaminophen and local anesthetics[10,13]. Indeed, it is my belief that local anesthetics should routinely be used for postoperative analgesia by intraoperative skin infiltration and scalp blockade. Analgesia can be achieved by blockade of six nerves: the supraorbital nerve, supratrochlear nerve, auriculotemporal nerve, zygomaticotemporal nerve, greater occipital nerve, and lesser occipital nerve. I will outline and demonstrate these blocks at the lecture[14].

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