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## Enhanced Recovery after Elective Craniotomy for Brain Tumours

Ummey Hani, Saqib Kamran Bakhshi, Muhammad Shahzad Shamim

### Abstract

Enhanced recovery after surgery (ERAS) is aimed at accelerated rehabilitation after surgery, and involves a multidisciplinary approach. Significant work has been published on this concept with regards to abdominal surgeries, however, the idea is relatively new for those undergoing neurosurgical procedures. We have reviewed literature on ERAS in patients undergoing craniotomy for brain tumours.

**Keywords:** ERAS, craniotomy, brain tumour.

### Introduction

Early, uneventful post-operative convalescence, and a quick resumption of pre-disease activities by the patient, is every surgeon's goal after performing a major surgical procedure. Craniotomy for brain tumours is associated with significant physiological, emotional and psychological strain, and too much stress can lead to secondary cardiovascular and cerebrovascular events and nutritional insufficiency.<sup>1,2</sup> Postoperative nausea and vomiting, worsening neurological deficits and haemodynamic instability are some of the common conditions encountered after oncological craniotomies, and are a common hindrance in early recovery.<sup>3</sup>

The concept of enhanced recovery after surgery (ERAS) was first introduced by Kehlet in an effort to reduce perioperative morbidity and achieve improved postoperative functional outcomes.<sup>4,5</sup> It includes a multidisciplinary approach for preoperative, perioperative and postoperative patient care by anaesthetist, nursing staff, surgeon and home health services.<sup>5</sup> During the past two decades, a wide variety of surgical subspecialties including colorectal surgery, gynaecological and pelvic surgery, urological surgery and vascular surgery, have developed ERAS protocols that have been widely accepted.<sup>6,7</sup>

Owing to recent developments in neuro-oncology, including awake craniotomies; early recovery and discharge from hospital are now possible. However,

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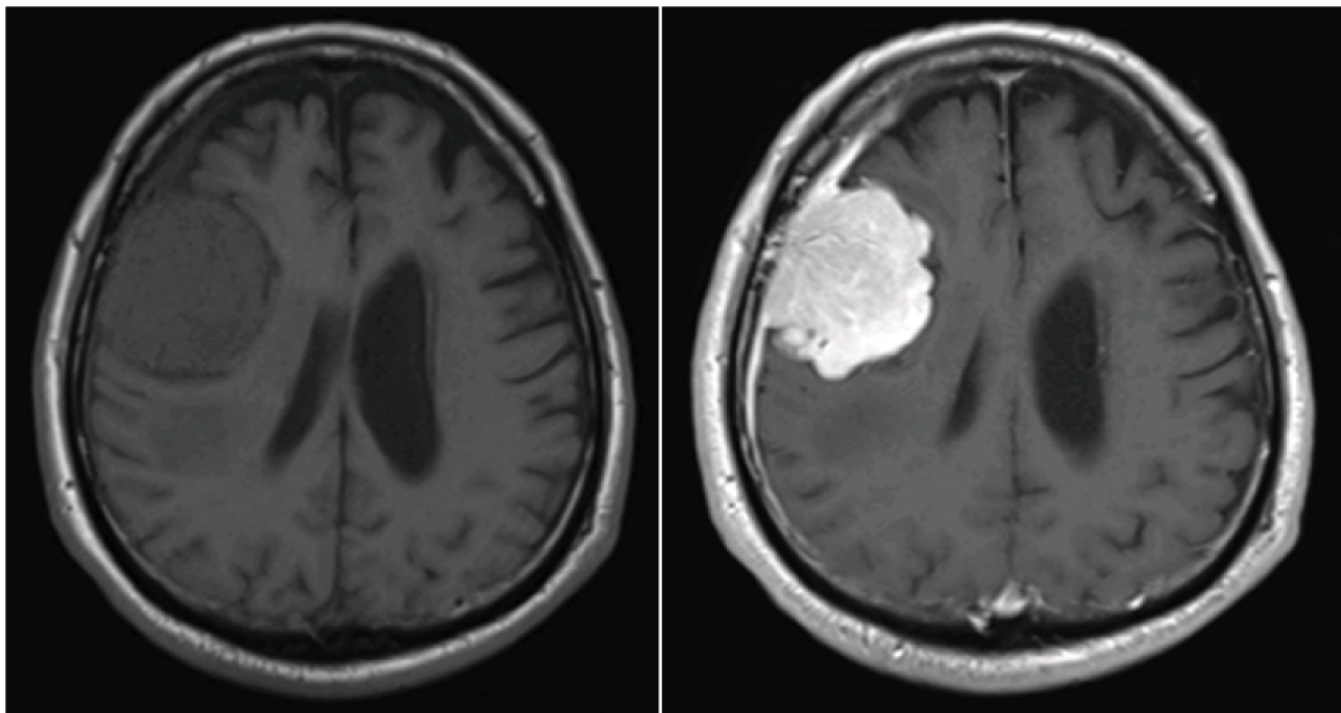
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studies on ERAS protocol in neurosurgery, particularly oncological craniotomies have been few. Herein, we have reviewed the existing English language literature on ERAS for elective craniotomies.

### Review of Literature

We searched ERAS related keywords on PubMed and Google scholar database. ERAS in essence is a list of recommended practices, based on best evidence, and includes pre-, intra-, and post-operative interventions, that help to improve morbidity, hospital stay, recovery, cost and eventually patient outcomes. Hagan et al.<sup>8</sup>, conducted an extensive systematic review of existing data on various aspects of oncological craniotomy, and proposed key components of ERAS protocol. These components are based on best evidence related to principles relevant to elective craniotomy patients, as well as those derived from other surgical specialties, but applicable to neurosurgical patients. Hagan et al., strongly recommended preoperative patient education regarding surgical procedure and its objectives, abstinence from alcohol and cigarette smoking for at least a month before surgery and encouraged enteral nutrition with carbohydrate rich clear liquid intake upto two hours before surgery.<sup>8</sup> Intraoperative application of intermittent pneumatic compression and graduated compression stockings, administration of Cefazolin as prophylactic antibiotic in general population and Vancomycin in MRSA colonizers one hour before incision were also strongly advocated.<sup>8</sup> Scalp blocks and infiltration of local anaesthetic agent along the line of incision were proposed to reduce requirement of opioids post-operatively.<sup>8</sup> They cited evidence supporting use of non-opioid analgesics for good side-effect profile in craniotomy patients and discouraged use of tramadol, gabapentin, pregabalin and NSAIDs.<sup>8</sup> Post-operative recommendations included avoidance of hypothermia, removal of urinary catheter on day one after surgery or earlier, good fluid balance, early initiation of enteral nutrition and early mobilization out of bed.<sup>8</sup> Post-operative nausea and vomiting (PONV) is witnessed in nearly half of all post-craniotomy patients and Hagan et al., proposed Dexamethasone and Serotonin antagonists for its prevention. They concluded that their recommendations warranted early rehabilitation and discharge from hospital, but



**Figure-1 & 2 :** MRI brain axial sections T1 weighted images, with and without contrast, showing homogeneously enhancing, lobulated, extra-axial lesion in the right frontal area which is originating from the dura and is displacing the adjacent brain parenchyma. This is a convexity meningioma, suitable for ERAS protocol.

suggested further research for improving quality of evidence.<sup>8</sup>

In 2016, Venkatraghavan et al., reported 198 patients who had undergone craniotomy for supratentorial tumours out of which 88.4% were discharged on the day of surgery.<sup>9</sup> They had reported worsening of preoperative neurological exam, seizures and PONV as the main reasons for delay in discharge of remaining patients. Five of their same-day discharge patients had readmission due to seizure, worsening neurological response, wound bleeding and headache. In the other sub-group of their study, 154 patients remained admitted in the hospital after surgery and 86% of them were discharged within three post-operative days. These patients had more opioid and antiemetic consumption. Venkatraghavan et al., concluded that early, same-day discharge is feasible in patients undergoing awake craniotomy or craniotomy under general anaesthesia for procedures that are less than four hours long and there was minimal risk of developing any complications in these patients.<sup>9</sup>

Wang et al., conducted a randomized control trial on ERAS protocol for elective craniotomy patients.<sup>10</sup> They recruited 140 patients of which, 70 were controls and 70 followed the ERAS protocol. They had set up a

multidisciplinary working group that formulated a customized ERAS protocol that was guided by recommendations put forth by Hagan et al.<sup>8</sup> Their discharge criteria was similar for both groups and included tolerable pain with oral medicines, sufficient enteral nutrition, absence of fever and established mobility out of bed. They reported that ERAS protocol reduced length of stay in hospital by three days and lead to early removal of urinary catheter and initiation of enteral nutrition which were statistically significant. More patients in the ERAS group reported mild postoperative pain but the overall duration of pain was short. They concluded that implementing ERAS protocol steered relatively faster recovery after elective craniotomies, with no increase in complications.<sup>10</sup>

### Conclusion

Despite very little specialty-specific data to support it, the larger body of evidence available for non-neurosurgical patients, and the few papers available for neurosurgical patients; clearly suggest that the implementation of ERAS for neurosurgical treatment can be useful in improving at least some aspects of patient care.

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