Opioid-Free Anesthesia in Transsphenoidal Surgery: A Case Report

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Abstract

Transsphenoidal surgery is a less invasive approach that leaves no visible scars, minimizes complications, and enables rapid recovery. The Enhanced Recovery After Surgery (ERAS) concept in neurosurgery aims to reduce hospitalization duration. Opioid-free anesthesia supports ERAS by reducing pain, postoperative nausea and vomiting (PONV), and shivering. This case series features women diagnosed with a suprasellar mass, who underwent transsphenoidal surgery with opioid-free anesthesia, achieving good outcomes through various agents and modalities for postoperative pain management. The operation proceeded with stable hemodynamics, underscoring the benefits of opioid-free anesthesia in supporting ERAS.

Significance | The case study shows the opioid-free anesthesia for transsphenoidal surgery, highlighting its efficacy in supporting Enhanced Recovery After Surgery (ERAS) protocols.

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Introduction

Transsphenoidal surgery is a procedure performed to remove pituitary gland tumors. This less invasive approach allows for no visible scars, minimizes the risk of complications, and allows for faster recovery. Currently, the concept of Enhanced Recovery After Surgery (ERAS) in neurosurgery is being developed to reduce the duration of hospitalization (Hagan et al., 2016). The various components of the ERAS concept, including pain management during and postoperatively, have been shown to provide long-term benefits for patients. Currently, the pattern of pain management in patients undergoing neurosurgical surgery is increasingly shifting to the concept of using non-opioid agents (Joshi & Kehlet, 2019).

Several studies have shown that long-term opioid use starting from the treatment of acute pain, both intra-operatively and postoperatively, does not always provide the expected benefits (Joshi & Kehlet, 2019; Brat et al., 2018). In addition, patients who have never received opioid treatment are likely to have repeated postoperative opioid administration, which is associated with a significant increase in opioid misuse. This finding is also confirmed by other studies that found opioid misuse due to uncontrolled opioid use during postoperative acute pain management (Brat et al., 2018; Macintyre et al., 2014).

This case report features the use of opioid-free anesthesia techniques in an effort to achieve rapid recovery after transsphenoidal surgery.

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Case Report

Female, 49 years old with body weight of 50 kg and height of 160 cm. The patient complained of blurred vision in both eyes accompanied by headache that had beengetting worse since 1 year ago. Because of her complaints, the patient was referred to the neurosurgery clinic and a contrast CT scan of the head and contrast MRI were performed. The patient was diagnosed with SOL Supratentorial at Sellar Region Extend to Suprasellar suspected to be a Macroadenoma Hypophysis and transsphenoidal surgery was planned.

Physical examination showed composmentis consciousness, blood pressure 125/80mmHg, pulse 80 times per minute, respiration 16 times per minute, temperature

36.4 degrees Celsius, saturation 98% free air. Neurological examination GCS 15, isochor round pupils, visus Occuli Sinistra >6/60. Meningeal excitatory sign examination found no rigidity, normal laseque and kernig, no hemiparesis.

Laboratory results are within normal limits, thorax X-ray results are within normallimits. CT scan results obtained isodense lesions in the sellar region that extends tothe suprasellar region which is very inhomogeneous with contrast administration, there is no midline shift, there is no peritumoral edema (Figure 1).

Preoperative management, the patient is given an explanation of anesthesia and asked to sign an agreement for anesthesia. The patient was fitted with an 18G intravenous line. The patient was given solid food 8 hours preoperatively and drinks 2 hours preoperatively.

The patient was given paracetamol 1 gram intravenously 2 hours before induction.

The patient was induced using dexmedetomidine *loading dose of* 50mcg in 10 minutes followed by maintenance dose of 0.2-0.7mcg/kgbb/hour, propofol 120mg, rocuronium 40mg and lidocaine 60mg. Intubation was performed with a size 7.0 endotracheal tube. Maintenance of anesthesia using dexmedetomidine 0.2- 0.6mcg/kgbb/hour, propofol 50-150mcg/kgbb/min, and intermittent rocuronium 0.15mg/kgbb every 45 minutes. After induction, the patient was given *infraorbital block* with bupivacaine 0.25%, dexamethasone 5mg was given and an arterial line was placed for invasive monitoring during surgery.

At the end of the operation after spontaneous breathing was obtained, the patient was given a muscle-paralyzing reversal agent, propofol maintenance was stopped while dexmedetomidine was still continued at a dose of 0.2mcg / kgbb / hour. Post-extubation, the patient was found to be fully conscious and painless (VAS 1/10). Post-surgery, the patient is brought to the *high care unit (*HCU) with full consciousness and spontaneous breathing. Neurological examination could be performed immediately upon arrival at the HCU. The patient was given postoperative analgesic paracetamol 1gram per 6 hours intravenously and dexmedetomidine was continued at a dose of 0.2mcg/kgbb/hour for 24 hours in theHCU. The patient had no complaints of pain (VAS maximum 1/10), nausea, vomiting, chills, or respiratory depression during the postoperative period. After 1 day of HCU treatment, the patient returned to the room and was discharged after2 days of treatment in a regular room.

Discussion

Transsphenoidal surgery is a less invasive approach that allows for no visible scars, minimizes the risk of complications, and enables rapid recovery. One of the biggest challenges for clinicians is providing effective analgesia during surgery and post-operatively to support the success of the ERAS concept (Chong, 2019; Stumpo et al., 2021).

The goal of analgesic selection in patients undergoing intracranial tumor surgery is to control perioperative pain with drugs that have minimal effect on cognitive function and orientation. Therefore, the administration of non-opioid agents is expected to replace the role of opioids as adequate analgesics in intra-operative neurosurgery (Ban, Bhoja, & McDonagh, 2019; Stumpo et al., 2021). In this case report, we present a patient who underwent transsphenoidal surgery with opioid-free anesthesia techniques and achieved good outcomes using a combination of several agents and other modalities for postoperative acute pain management. The anesthetic technique applied in this patient's case involved a multimodal approach utilizing specific agents to achieve the desired effect. The patient received 1 gram of paracetamol intravenously two hours before induction. Induction was performed by administering dexmedetomidine, followed by maintenance doses of propofol, rocuronium, and lidocaine. At the end of the operation, after spontaneous breathing was achieved, the patient was given muscle-paralyzing reversal agents. In neurosurgical surgery, intravenous anesthesia techniques are preferred over inhalation anesthesia. The combination of propofol with dexmedetomidine in this patient provided adequate maintenance of anesthesia and served as a replacement for opioids in terms of analgesia during the surgery (Ban et al., 2019; Chong, 2019).

Dexmedetomidine is an alpha-2 agonist that has hypnotic, sedative, and analgesic effects. Studies involving dexmedetomidine have shown a reduction in postoperative opioid use by approximately 60%. Dexmedetomidine has demonstrated analgesic effects without significant respiratory depression, providing good perioperative hemodynamic stability and decreased intraoperative opioid requirements (Ban et al., 2019; Stumpo et al., 2021). Lidocaine has analgesic, anti-inflammatory, and opioid-lowering effects. Several randomized controlled trials and systematic reviews have proven that perioperative intravenous lidocaine infusion significantly reduces opioid requirements, decreases the incidence of postoperative nausea and vomiting, and improves the quality of

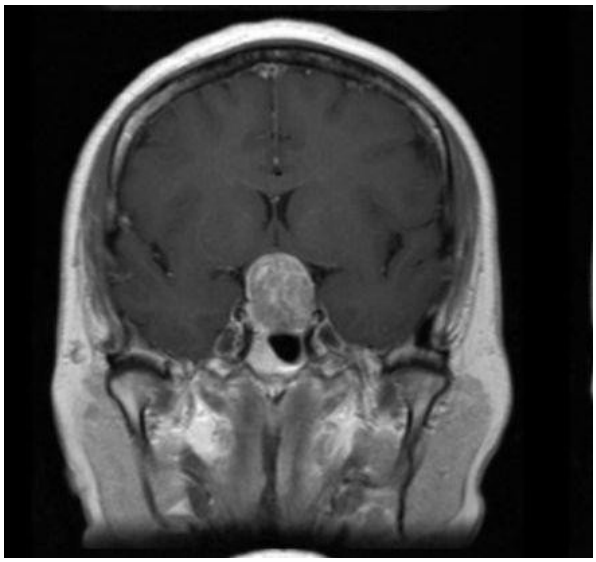

Figure 1. Isohypohypintense mass in the sellar region that extends suprsasellar

recovery (Vigneault et al., 2011). Paracetamol (acetaminophen) has been shown to reduce pain intensity and opioid requirements when used as an adjuvant (Ban et al., 2019). Infraorbital nerve block is used as a perioperative analgesia adjuvant. The infraorbital nerve is a branch of the maxillary nerve which is the second division of the trigeminal nerve. Infraorbital nerve block anesthetizes the anterior and middle maxillary, inferior palpebral, lateral nasal, and superior labial alveolar nerves (Takechi et al., 2015; Allam et al., 2018).

In this case, there were no significant hemodynamic fluctuations. Prevention of hemodynamic fluctuations aims to avoid the occurrence of increased intracranial pressure, brain edema, and prevent secondary brain injury. Factors that need to be avoided intraoperatively include hypoxemia, hypercapnia, anemia, and hypotension (Chong, 2019; Stumpo et al., 2021).

One of the postoperative side effects is nausea and vomiting. The presentation of Postoperative Nausea and Vomiting (PONV) in post-craniotomy patients is around 47%. PONV is at risk of triggering increased intracranial pressure, intracranial hemorrhage, cerebral edema, and aspiration. Serotonin antagonists and corticosteroids are considered very useful in suppressing PONV. The patient received dexamethasone as a postoperative antiemetic (Brat et al., 2018; Macintyre et al., 2014). The patient did not complain of postoperative nausea and vomiting. If pain management and PONV are adequate, ambulation can be performed in neurosurgery patients 1 day postoperatively so that early mobilization can be carried out as soon as possible. Early mobilization is beneficial in preventing venous thrombosis, decreasing muscle mass, reducing infection rates, and shortening the duration of care (Hagan et al., 2016; Joshi & Kehlet, 2019).

In this case, there was no postoperative respiratory depression. Continuous administration of dexmedetomidine is known to cause a decrease in minimum alveolar concentration (MAC) and has an opioid-sparing effect. Dexmedetomidine is an effective sedative compound with minimal respiratory depression, so the airway is maintained and hemodynamics are stable. However, there is a need to be aware of the hypotensive effect that can occur when administered in non-titrated doses. Dexmedetomidine may attenuate the cardiostimulating effects and complications of post-anesthesia delirium (Chong, 2019; Stumpo et al., 2021).

ERAS is considered very beneficial in accelerating recovery time, reducing the duration of hospitalization and treatment costs. However, perioperative pain management in craniotomy is a challenge for anesthesiologists, especially with the development of the ERAS concept in neurosurgical surgery including tumor resection craniotomy (Hagan et al., 2016; Joshi & Kehlet, 2019).

Conclusion

In this case report, the use of opiod alternative agents was considered adequate to replace opioids as the main analgesic for perioperative pain management in transsphenoidal surgery. It can be concluded that the use of *free opioid anaesthesia* is very beneficial in supporting the concept of ERAS.

Author contributions

I.S. conceptualized the study, designed the methodology, and prepared the original draft. M.R.A. handled data curation, performed formal analysis, and contributed to the review and editing of the manuscript. R.A.H. was responsible for investigation, acquiring resources, and creating visualizations. D.Y.B. supervised the project and managed administrative tasks. All authors have read and approved the final manuscript.

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Competing financial interests

The authors have no conflict of interest.

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