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The effect of opioid-free anesthesia on enhanced recovery after lumbar spine surgeries

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Abstract
An evidence-based, interdisciplinary perioperative care route and surgical quality improvement project is called Enhanced Recovery After Surgery (ERAS). The frequent adverse effects of ε, β, and κ activation such as sleepiness, dysphoria, constipation, urine retention, delirium, and postoperative nausea and vomiting can be reduced by opioid-free anesthesia (OFA). The likelihood of potentially fatal adverse effects such as respiratory center depression and airway blockage is decreased with OFA. OFA Usage encourages quick healing. Reducing perioperative opioid consumption is advised by ERAS guidelines for a simple and quick recovery. The length of hospital stays, and medical care costs are reduced by the OFA procedures. One of the main components of an ERAS procedure is opioid minimization.

Keywords: Opioid-free anesthesia, enhanced recovery, lumbar spine surgeries, postoperative recovery, pain management, spinal surgery

Introduction
Improving postoperative recovery (ERAS) is an evidence-based and multidisciplinary approach to gynecological and surgical quality control. ERAS processes are of great clinical importance for both the patient and the healthcare system as a whole [1]. Opioids are frequently utilized in anesthetic practice for the preparation, induction, and maintenance of anesthesia or postoperative analgesia. It has several advantages, including hemodynamic stability and postoperative analgesia. But using opioids can also have adverse consequences; the most common ones are respiratory center depression, nausea, and vomiting [2]. Alternatives to opioids include dexmedetomidine [3], ketamine [4], esmolol [5], and lidocaine [6]. Most non-opioid anesthesia methods are additive-based, and the combination of two or more of these mechanisms can lead to a reduction in drug use and reduce the risk of side effects associated with the use of a single agent [7, 8]. If approved, the concurrent use of regional anesthesia may also reduce the total amount of postoperative and postoperative pharmacological analgesics [9, 10].

Opioid-free anesthesia (OFA)
OFA is an anesthesia technique that does not administer perioperative opioids through systemic, intercavitary routes, or neuraxial, including patient hemodynamic stability, comfort, or analgesia [11-13].

OFA Advantages [14, 15]
- OFA administration reduces common side effects of μ, β, and κ, such as sedation, dysphoria, delirium, somnolence, urinary retention, and postoperative nausea and vomiting.
- Opioid-free anesthesia reduces the risk of life-threatening side effects such as depression and shortness of breath.
- OFA use promotes faster healing. This effective postoperative recovery protocol (ERAS) recommends minimizing perioperative opioid use for a smoother and faster recovery.
- OFA protocol reduces hospital stays and treatment costs.
- Opioid reduction is one of the cornerstones of the ERAS protocol.

OFA Disadvantages [16]

A significant bad effect of non-opioid anesthesia is predicted hypotension, which may need vasoconstriction medication. Bradycardia and hypotension are common with alpha-2 agonist use. Moreover, the risk of detection is still possible, especially if the duration of anesthesia is not followed or if an experienced anesthesiologist is not available. The ketamine usage may also disrupt EEG monitoring. An extra minimal dosage of opioids with a short half-life may be necessary to alleviate complications of tracheal intubation.

OFA Indications

An important reason for using non-opioid anesthesia techniques is the risk of postoperative depression. Causes of induced respiratory failure, sedation for a long time and excessive somnolence, postoperative vomiting and nausea, tolerance, and dependence muscle weakness, urinary retention, poor inotropic, and dizziness [17]. Currently, the usage of OFA improves wound healing [18], prevents the opioids' immunodeficiency effects [19], improves oncological outcomes [20], and decreases the risk of pre-surgical complications [21]. It is also seen in patients with opioid addiction or those at high risk of chronic pain [22].

OFA Contraindications

Avoid in individuals with autonomic dysfunction, beta-blocker medication, hypovolemia, polytrauma, nodal rhythm, and chronic heart disease. In certain situations, it may result in peripheral blood vessel vasodilation, harming the inside surfaces of important organs. Furthermore, hypersensitivity to any medication taken suggests infection with OFA [11].

OFA Requirements

It takes time to become proficient in OFA. It is recommended that you do not suddenly stop using opioids during training but switch to using fewer opioids. Anesthesiologists need to be familiar with the medicinal properties of alternatives to opioids. Furthermore, it is important to regulate the level of anesthesia. [23, 24].

Protocols of OFA

OFA was first described by Mulier in Europe [11], and many clinical studies subsequently demonstrated its use and benefits in obese patients [25-27]. Mulier described an infusion called Muli mix consisting of from one to three of the coming factors [11]:

- Clonidine or dexmedetomidine are anesthetics, sympatholytic, and analgesics that are used to reduce the need for anesthesia. Pushing dexmedetomidine dosage: 0.5-1 ug/kg IBW followed by 0.5-1 ug/kg IBW/hour infusion [28].
- Ketamine dose at a loading rate of 0.125 to 0.25 mg/kg followed by I.V. infusion of 0.125 to 0.25 mg/kg IBW/hour as non-opioid analgesics [29].
- I.V. lidocaine 1.5 mg/kg IBW followed by I.V infusion of 1.5-3 mg/kg IBW/hour as choanesthetic and sympatholytic agent [30].
- Intravenous administration of magnesium as a supplement [31].
- Maximum neuromuscular pressure during all activity is adequately modulated.
- At least alveolar primary anesthetic inhalation (Desflurane 0.7-1.0 MAC) was titrated to maintain an adequate value of two units.

Pharmacological opioid agents in lumbar spine surgeries

A common medication during the perioperative phase is paracetamol. Even though within the first 24 hours following surgery, it is ineffective at decreasing opioid usage [32]. In spine surgery, selective COX-2 inhibitors seem to be a useful tool for managing postoperative pain and reducing the need for opioids. The danger of hemorrhage and nonunion, however, is up for discussion [33]. For up to 48 hours following surgery, pregabalin and gabapentin effectively lower VAS ratings and opioid usage without causing noticeably negative side effects [34]. Ketamine or bolus usage (0.2-1 mg/kg) or infusion (1-4 mg/kg/min) lowers pain ratings with unpleasant dreams, dysphoria, salacity, postoperative nausea and vomiting, and morphine-equivalent hunger without vomiting, according to a meta-analysis of 14 randomized controlled studies [35]. Tramadol's great efficacy makes it the cornerstone of postoperative pain treatment. After surgery, opioids are taken for up to six hours, and VAS ratings are decreased [36].

Short-term anesthesia care with short hospital stays. Thappa *et al*. [37] evaluated the unique effects of a dexmedetomidine infusion combined with low-dose ketamine and compared them with fentanyl on postsurgical analgesia after spine surgery. The study found that patients with OFA had a shorter recovery time after induction of anesthesia than the fentanyl group. This can be explained by the fact that the negative effects of opioids, which require monitoring and treatment, increase the time spent in the anesthesia department. Thappa *et al*. [37] showed that postoperative pain scores were significantly lower in patients treated with fentanyl than in patients treated with OFA during the prescribed period. Hwang *et al*. [38] also found that dexmedetomidine was more effective than remifentanil at reducing pain and managing pain following surgery for 48 hours following posterior lumbar interbody fusion. Thappa *et al*. [37] showed that patients who used fentanyl in the first 24 hours after surgery had significantly more nausea and vomiting compared with patients with OFA. Six patients had respiratory distress and two patients had seizures with fentanyl. Postoperative delirium developed in four patients in the OFA group.

Additionally, Hwang *et al*. [38] shown that patients receiving remifentanil had higher postoperative nausea and vomiting until 24 hours after surgery, as well as a greater need for rescue analgesics at all points following surgery.

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