

**Comparison of Haloperidol versus
Midazolam for Prevention of Sevoflurane
Emergence Agitation in Pediatric Patients
undergoing Inguinal Surgeries**

Thesis

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Anaesthesia, ICU & Pain Management*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

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List of Abbreviations

<i>Abb.</i>	<i>Full term</i>
<i>5-HT</i>	<i>5-Hydroxytryptamine</i>
<i>ALT</i>	<i>Alanine Aminotransferase</i>
<i>ASA</i>	<i>American Society of Anaesthesiologist</i>
<i>BARS</i>	<i>Behavioral Activity Rating Scale</i>
<i>BP</i>	<i>Blood Pressure</i>
<i>Cl</i>	<i>Clearance</i>
<i>CNS</i>	<i>Central Nervous System</i>
<i>CPK</i>	<i>Creatine Phosphokinase</i>
<i>CYP450</i>	<i>Cytochrome P450</i>
<i>D2</i>	<i>Dopamine</i>
<i>EA</i>	<i>Emergence Agitation</i>
<i>ECG</i>	<i>Electrocardiography</i>
<i>ED</i>	<i>Emergency Department</i>
<i>FDA</i>	<i>Food and Drug Administration</i>
<i>FLACC Scale</i>	<i>Face, Legs, Activity, Cry, Consolability Scale</i>
<i>GABA</i>	<i>Gamma-Aminobutyric Acid</i>
<i>HCl</i>	<i>Hydrogen Chloride</i>
<i>HFIP</i>	<i>Hexafluoroisopropanol</i>
<i>HR</i>	<i>Heart Rate</i>
<i>ID</i>	<i>Intellectual Disability</i>
<i>ICU</i>	<i>Intensive Care Unit</i>
<i>IM</i>	<i>Intramuscular</i>
<i>IV</i>	<i>Intravenous</i>
<i>LMA</i>	<i>Laryngeal Mask Airway</i>
<i>MAC</i>	<i>Minimum Alveolar Concentration</i>
<i>MAP</i>	<i>Mean Arterial Blood Pressure</i>
<i>MRI</i>	<i>Magnetic Resonance Imaging</i>
<i>NMDA</i>	<i>N-methyl-D-aspartate</i>
<i>NMS</i>	<i>Neuroleptic Malignant Syndrome</i>

List of Abbreviations (Cont...)

Abb.	Full term
<i>NSAID</i>	<i>Non Steroidal Antiinflammatory Drugs</i>
<i>OASS</i>	<i>Overt Agitation Severity Scale</i>
<i>OR</i>	<i>Operating Room</i>
<i>PACU</i>	<i>Postanaesthesia Care Unit</i>
<i>PAED</i>	<i>Pediatric Anaesthesia Emergence Delirium</i>
<i>PO</i>	<i>Per Oris</i>
<i>SD</i>	<i>Standard Value</i>
<i>SPO₂</i>	<i>Oxygen Saturation</i>
<i>SPSS</i>	<i>Statistical Package for Social Sciences</i>
<i>TFA</i>	<i>Trifluoroacetic Acid</i>
<i>US</i>	<i>United States</i>
<i>Vd</i>	<i>Volume of Distribution</i>

Abstract

If necessary, administer analgesics if pain is suspected, such as dipyrene and anti-inflammatories, or any other analgesic that may be indicated, Allow parents or whoever is accompanying the child to remain in the anesthetic recovery room, helping to reduce emergence agitation.

According to the our study, midazolam appear to be the most effective for preventing and treating this complication.

Post anesthetic agitation is a self-limiting phenomenon, and there is no evidence that these short episodes of agitation prejudice the recovery or behavior of children over the long term.

Keywords: Volume of Distribution - Pediatric Anaesthesia Emergence Delirium

INTRODUCTION

Emergence agitation (EA) in children early after sevoflurane anaesthesia is a common postoperative problem, with incidence ranging up to 80%. It is characterized by behavior that can include crying, disorientation, excitation and delirium. Several drugs have been tried in this regard including but not limited to propofol, midazolam, ketamine and ketorolac among other drugs (*Abu- Shahwan, 2008*).

Symptoms of (EA) are worse for pediatric patients, they cry heavily and writhe to free themselves, pull on their IV line, and impose a heavy burden on the medical staff, they play a very big role in making their parents lose confidence and satisfaction in the anaesthesia and surgery, so effective treatment requires understanding and addressing the multifactorial cause of the agitation, including pain, psychiatric symptoms, physical distress, and environmental triggers (*Voepel-Lewis et al., 2003*).

While pain is not the sole cause for EA, surgery associated with elevated postoperative pain has been thought to increase the risk of EA. The site of surgery has been proposed as a risk factor, as well. Many studies have shown that Procedures affecting the head and neck may be relatively more likely to induce EA (*Voepel-Lewis et al., 2003*).

Although EA is self-limiting and might not result in permanent sequelae, it carries the risks of self-injury and is a cause of stress to both caregivers and families (*Kuratani and Oi, 2008*).

Non pharmacological strategies should be first line for preventing and managing agitation. These strategies include effective communication, behavioral strategies and multidisciplinary collaboration. Medications used for treatment of agitation should focus on addressing the cause of the agitation, such as pain, anxiety, delirium, or psychosis, and any underlying psychiatric syndromes, pharmacologic options include first-generation antipsychotics, second-generation antipsychotics, benzodiazepines, and ketamine (*Gerson et al., 2018*).

Different strategies have been suggested to decrease the incidence and severity of EA, such as administering sedative medication before induction, a change in the maintenance technique of anaesthesia, or pharmacological agent administration at the end of anaesthesia (*Kuratani and Oi, 2008*).

The side effects of sedatives used in management of EA are potentially harmful and lead to an increased length of stay in the post anaesthesia care unit (PACU), resulting in patient discomfort and increased perioperative costs (*Joseph et al., 2003*).

Sevoflurane in particular has been associated with an increased amount of agitation on emergence from anaesthesia in children when compared with a more soluble anesthetic (halothane) even in the absence of any surgical intervention (*Abu-Shahwan, 2008*).

Sevoflurane is used frequently in pediatric patients, when inhalational induction of anaesthesia is required, because of its fast and non-irritating effects on the airway. The speed of emergence from sevoflurane anaesthesia, however, sometimes presents a dilemma to both patient and anesthetist. Thesis show a higher incidence of post anesthetic agitation has been attributed to the use of this newer inhalational anesthetic. However, the exact etiology of restlessness after sevoflurane anaesthesia is still not known (*Aono et al., 2007*).

Midazolam is one of the most commonly and popularly benzodiazepine used premedication. It possesses potent anxiolytic, amnestic, sedative-hypnotic, anticonvulsant, and skeletal muscle relaxant properties. Its anterograde amnesic property is useful for premedication before surgery to inhibit Unpleasant memories (*Jain et al., 2017*).

Haldol (haloperidol) is an antipsychotic medication. that works by helping to restore the balance of certain natural substances in the brain (neurotransmitters).

This study is expected to add new insight on the haloperidol; which is feasible, whether it would be comparable to well tested pharmacological agents such as midazolam and safety profile for such use. Haloperidol is the most thoroughly and frequently reviewed antipsychotic in the treatment of aggression in agitated patients (*Adimando et al., 2010*).

AIM OF THE WORK

The objective of this study is to compare the effect of intravenous midazolam vs intravenous haloperidol & in prevention of sevoflurane emergence agitation in pediatric patients undergoing inguinal surgeries.

Chapter 1

EMERGENCE AGITATION IN CHILDREN

Introduction:

I. Epidemiology:

An average of 30 million children present to an emergency department (ED) in the United States, 3-4% have a psychiatric or behavioral chief complaint (*Adimando et al., 2010*).

II. Pathophysiology

Not well known and can mostly be associated with the mechanism of the underlying disorders that manifest with agitation (*Lindenmayer, 2000*).

III. Assessment scales:

- a. Overt Agitation Severity Scale (OASS) – see appendix A.
- b. Behavioral Activity Rating Scale (BARS).
- c. Describes the level of activity of a patient by assigning a score as an overall assessment (*Seeman, 2002*).