بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / هناء محمد علي

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: ....

The Effect of Adding Magnesium Sulphate to Epidural Bupivacaine Compared to the Addition of Fentanyl to Epidural Bupivacaine in Patients Undergoing Lower Limb and Pelvic Orthopedic Surgery under Combined Spinal Epidural Anesthesia

A Thesis

Submitted for partial fulfillment of Master degree
in **Anesthesia**

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List of Abbreviations

Abbr.		Full-term
AASC	:	Anterior Arachnoid Spinal Cyst
ADRB1	:	Beta-Adrenergic Receptors
COMT	:	Catechol-O-Methyl Transferase
CSE	:	Combined Spinal-Epidural Anesthesia
CSF	:	Cerebrospinal Fluid
DVT	:	Deep Venous Thrombosis
ES	:	Extensive Syringomyelia
GPCRs	:	G-Protein Coupled Receptors
JCAHO	:	Joint Commission On Accreditation Of Healthcare Organizations
LA	:	Local Anaesthetic
LMWH	:	Low-Molecular-Weight Heparin
MAP	:	Mean Arterial Pressure
MGSO4	:	Magnesium Sulphate
MRI	:	Magnetic Resonance Imaging
NMDA	:	N-Methyld-Aspartate
NMDARs	:	N-Methyl-D-Aspartate Receptors
OPRs	:	Opioid Receptors
PDPH	:	Post-Dural Puncture Headache
PE	:	Pulmonary Embolism
RCT	:	Randomized Clinical Trial
SD	:	Standard deviation
SNPs	:	Single Nucleotide Polymorphism
SPSS	:	Statistical package for social science
VAS	:	Visual Analogue Scale

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Abstract

Background: Epidural anesthesia is safe and inexpensive technique with the advantage of providing surgical anesthesia and prolonged postoperative pain relief. Research continues concerning different techniques and drugs that could provide better surgical anesthesia and postoperative pain relief. **Aim of the Work:** to investigate how the addition of magnesium sulphate to 0.5% bupivacaine affects duration, quality, complications and dermatome spread of anesthesia in comparison to fentanyl. **Patients and Methods:** The current study included 50 patients who had been scheduled to undergo lower limb or pelvic orthopedic surgery under combined spinal - epidural anesthesia. The study had been done after approval of the local ethics committee and after obtaining written informed consent from all patients enrolled in the study; which had been held at Ain Shams Hospital, Faculty of Medicine. **Results:** Pain assessment using VAS showed no statistically significant difference between the two studied groups in the first and second hours postoperative. Starting from the third hour statistical significant differences were observed between the two groups, VAS was higher in groups (M) than in group (F); (1.82 ±0.6 vs. 1.42 ±0.4 in both groups respectively. At the fourth hour; VAS was higher in groups (M) than in group (F); (2.80±0.8 vs. 1.76 ±0.6 in both groups respectively. The incidence of complications was significantly lower among group (M) where 52% of patients had no complications at all. **Conclusion:** the use of both magnesium and fentanyl as adjuvants to local anesthetics in epidural anesthesia is safe and effective. No significant differences regarding quality of motor block and hemodynamics. But the study shows that fentanyl is significantly a better adjuvant regarding postoperative analgesia and time for first analgesic dose. While magnesium is a significantly better adjuvant regarding complications such as nausea, vomiting and pruritis.

Key words: magnesium sulphate, epidural bupivacaine, fentanyl, lower limb, pelvic orthopedic surgery, spinal epidural anesthesia

Introduction

Epidural anaesthesia is a safe and inexpensive technique with the advantage of providing surgical anaesthesia and prolonged postoperative pain relief. It is also an effective treatment of operative pain as it blunts autonomic, somatic and endocrine responses.

Research continues concerning different techniques and drugs that could provide better surgical anaesthesia and postoperative pain relief ***(Širvinskas and Laurinaitis, 2002).***

Magnesium is the fourth most plentiful cation in our body. It has antinociceptive effects in animal and human models of pain ***(Begon et al., 2002).*** The addition of magnesium to epidural bupivacaine in patients undergoing elective lower limb orthopedic surgery improved intraoperative conditions and the quality of postoperative analgesia ***(Lysakowsi et al., 2007).***

Because of its greater lipophilic nature, fentanyl offers some advantages for epidural analgesia. Fentanyl undergoes rapid vascular absorption from the epidural space, and it spreads less rostrally than other commonly used opioids ***(Block et al., 2003).***

The rapidity of analgesic effect of epidural fentanyl administration and the relatively short duration of action

makes it the drug of choice for postoperative acute pain ***(Varrassi et al., 2002).***

Lipophilic nature of fentanyl limits its cephalad migration and this results in a lower incidence of side-effects such as respiratory depression, urinary retention, nausea, and vomiting ***(Raj et al., 2002).*** This study is designed to assess the effect of adding magnesium sulphate compared to fentanyl in epidural anesthesia for lower limb orthopedic surgery.

Aim of the Work

The main goal of our study is to investigate how the addition of magnesium sulphate to 0.5% bupivacaine affects onset time, duration, quality and dermatome spread of anesthesia in comparison to fentanyl.

Epidural Anesthesia

- **Anatomy:**

The epidural space, a potential space between the ligamentum flavum and the dura mater, surrounds the dural sac and contains fatty tissue and thin-walled blood vessels. The actual size of the epidural space varies: it is narrow in the thoracic region, due to spinal cord protuberances in the upper thoracic and bulges in the lower thoracic region, but it is wider below the level where the spinal cord ends. The distribution of epidural fat is also very important, because the course of the epidural catheter within the epidural space is influenced more by the epidural fat, rather than by connective tissue. Because epidural fat is less viscous in children and more dense in adults, epidural catheters can be advanced more easily in children **(Stamenkovic & Karanikolas 2012).**

Epidural anesthesia ***(Figure 1)*** is a technique for pain management with multiple applications in anesthesiology. It is useful as a primary anesthetic, but it is also used as pain management adjuvant. It can be a single shot or a continuous infusion for long term pain relief. The use of epidural anesthesia reduces the exposure to other anesthetics and analgesics, decreasing side effects. It has also shown to decrease cortisol levels, expedite the return of bowel function, decrease the incidence of PE and DVT in the postoperative period, and shorten lengths of in-hospital stay **(Triffterer et al., 2017 and Avila-Hernandez et al., 2019).**

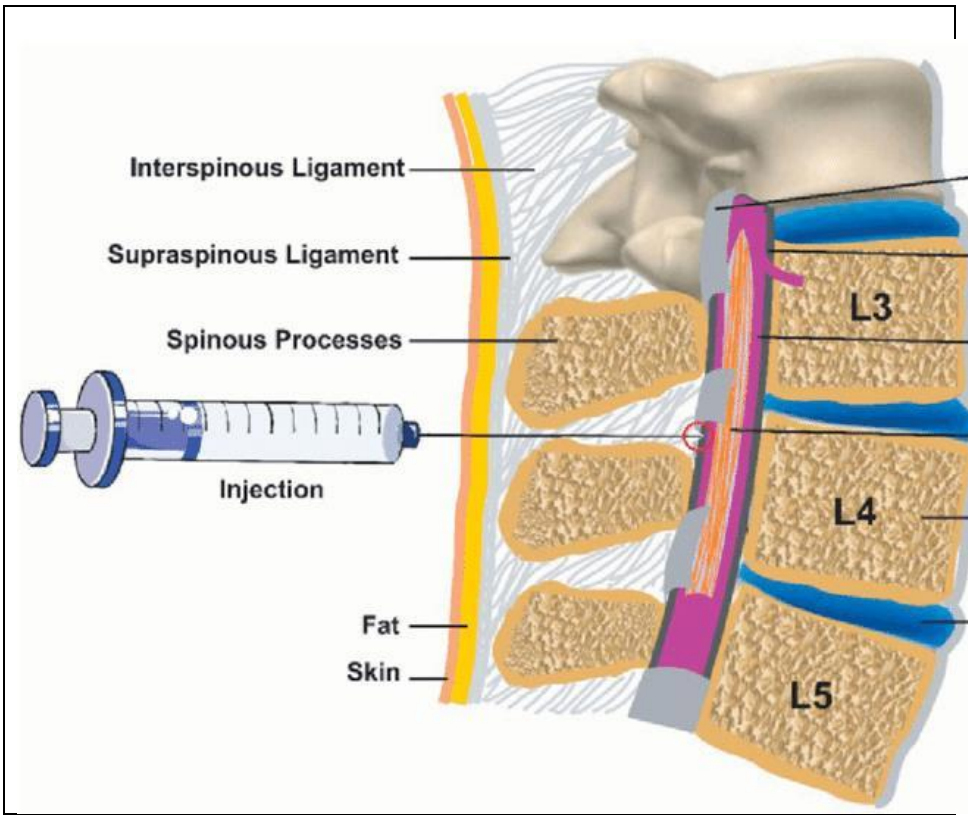

Figure (1): Epidural anesthesia, the anaesthetic solution is injected only in the epidural space and not in the cerebrospinal fluid (CSF) **(Kafshdooz et al., 2019).**

Contraindications of Epidural anesthesia:

Absolute contraindications are refusal of the patient, bacteremia, local infection at the site of puncture, hemorrhagic diathesis or therapeutic anticoagulation and increased intracranial pressure. While, **relative contraindications** are Significant aortic stenosis, right to left shunt, pulmonary hypertension and anatomical deformities of the spine (**Gerheuser and Roth 2007).**

Major complications of epidural anesthesia

1. Post-operative neurologic deficits:

The etiology of a post-operative neurologic deficit may be difficult to establish as many patients, surgical, and anesthetic risk factors may play a role. Paresthesia during insertion and multiple attempts to puncture significantly increase the risks of neurologic deficits. This suggests that direct trauma to nerve roots causes pain in the appropriate dermatome and that this may occasionally result in long-lasting paresthesia **(Mathur et al., 2008).** There is an increased risk for neurologic symptoms among patients undergoing lumbar epidural, urologic surgery, and orthopedic surgery of the lower limb especially in lithotomy position. In these cases, surgical trauma, lumbar siting, unsatisfactory patient positioning, or incorrectly applied surgical dressings may contribute to neurologic injury **(Shifman et al., 2009).** Deposition of local anesthetics into a root sleeve over a long time period could result in prolonged contact between nervous tissue and the local anesthetic. The higher volume of the drug infused may cause nerve injury by direct pressure or indirectly, through vascular compromise (**Kang et al., 2014)**.

2. Epidural hematoma:

The risk of neuraxial hemorrhagic events may increase in patients receiving anticoagulants, and the time interval between epidural manipulation and anticoagulant drug administration is importance **(Horlocker et al., 2010).** For