Effect of Adding Magnesium Sulphate to Epidural Bupivacaine Compared to Addition of Fentanyl in Patients undergoing Lower Limb Orthopedic Surgery under Combined Spinal Epidural Anesthesia

Thesis

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Mohamed Ibrahim El-Desoukey

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List of Abbreviations

Abb.	Full term
%	*Percent*
δ	*Delta*
γ	*Gamma*
κ	*Kappa*
°	*Degree*
μ	*Mue / Micron*
μg	*microgram*
5-HT	*Serotonin*
ABP	*Arterial Blood Pressure*
ACTH	*Adreno cortico-trophic hormone*
ASA	*American Society of Anesthesiologists*
AVP	*Arginine vasopressin.*
BA	*Bronchial Asthma*
bpm	*Beats per minute*
Ca^{++}	*Calcium*
CGRP	*Calcitonin Gene-Related Peptide*
cm	*Centimeter*
CM	*Costal margin*
CNS	*Central Nervous System*
COO	*Ester linkage*
COX2	*Cyclooxygenase2*
CrCl	*Creatinine clearance*
CRH	*Corticotrophin-releasing hormone*
DBP	*Diastolic Blood Pressure*
DM	*Diabetes mellitus*
DRG	*Dorsal Root Ganglion*
E	*Enkephalinergic interneurons*

List of Abbreviations cont...

Abb.	Full term
ECG	*Electrocardiogram*
ed.	*Edition*
EOM	*External oblique muscle*
ESR	*Erythrocyte sedimentation rate*
et al.	*And colleagues*
FDA	*Food and Drug Administration*
FSH	*Follicle-stimulating hormone*
G	*Gauge*
g	*Gram*
GABA	*Gamma Amino Butyric Acid*
HR	*Heart Rate*
hr	*Hour*
hrs	*Hours*
HS	*Highly significant*
HTN	*Hypertension*
I.M	*Intramuscular*
I.V	*Intravenous*
IASP	*International Association for the Study of Pain*
IC	*Iliac crest*
IOM	*Internalobliq muscle*
J.	*Journal*
Kg	*Kilogram*
LAs	*Local Anesthetics*
LH	*Luteinizing hormone*
mA	*Milliamperes*
mg	*Milligram*
min	*Minute*

List of Abbreviations cont...

Abb.	Full term

ml.....*Milliliter*
mmHg.....*Millimeters of Mercury*
-NHCO.....*Amide linkage*
NHS.....*The National Health Service*
NMDA.....*N-Methyl-D-Aspartate*
NMDA.....*N-Methyl-D-Aspartate*
NRS .....*Numeric rating scale*
NS.....*Non-significant*
NSAIDs .....*Non steroidal anti-inflammatory drugs*
P.....*Peritoneum*
P.....*Probability value*
PABA .....*Para-Amino Benzoic Acid*
PGE2 .....*Prostaglandins E2*

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INTRODUCTION

Perioperative pain management is a crucial topic especially for patients undergoing major surgeries. Postoperative pain is due to surgery and tissue trauma with concomitant nerve sparing or scarification may be the most dominant nociceptive mechanism; which results in acute inflammation induced by tissue injury with concomitant release of nociceptive cytokines and inflammatory mediators plays a role for induction and/or aggravation of pain ***(Wheatly et al., 2001; Ozalevi et al., 2002).***

The N-methyl-d-aspartate receptors (NMDARs) are amino acid inotropic receptors (ligand-gated ion channels), and are associated with Ca2+ entry through NMDARs and plays an important role in NMDAR-mediated plasticity and neurotoxicity. NMDA-gated channels are both Ca2+ permeable and strong voltage-dependent block by extracellular Mg2+, which is relieved by sustained depolarization and glutamate binding. NMDARs mediate neuronal signaling and regulate neuronal gene expression, and therefore perform critical roles in the central nervous system functioning. NMDA has been implicated in a number of physiological and pathological phenomena in the spinal cord dorsal horn, including activity-dependent synaptic plasticity ***(Buvanendran et al., 2000; Huskissons, 1974).***

Central sensitization secondary to trauma or ischemia is associated with the development of hyperalgesia and

neurotoxicity due to excessive stimulation of NMDARs, which can induce neuronal damage and death. Thus, the analgesic mechanism of NMDA antagonists is by preventing nociceptive central sensitization and/ or by the reduction of catecholamine release with sympathetic stimulation, thereby decreasing peripheral nociceptor or the stress response to surgery ***(Lin et al., 2010).***

AIM OF THE WORK

Assessment of the analgesic effect of adding magnesium sulphate to epidural bupivacaine compared to addition of fentanyl to bupivacaine in patients undergoing lower limb orthopedic surgery under combined spinal epidural anesthesia.

REVIEW OF LITERATURE

Pain Pathway

Definition:-

Pain is a subjective experience. The International Association for the Study of Pain (IASP) defines pain as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage. This definition demonstrates that pain, as well as having physiological basis, has also psychological or subjective component ***(LeResche et al., 2005).***

It can be adjunct and simultaneous to nociception, the system which carries information to the spinal cord and brain about damage or near-damage in tissue. Nociception conveys somatic information without conscious awareness, while pain is a perception of sensorial information. As a part of the body's defense system, pain triggers mental and physical behaviors that seek to end the painful experience ***(Wahezi et al., 2013).***

It is also a feedback system that promotes learning, making repetition of the painful situation less likely. The nociceptive system may transmit signals that trigger the sensation of pain, it is a critical component of the body's ability to react to damaging stimuli and it is part of a rapid-warning relay instructing diverse organs and principally the central

nervous system to initiate reactions for minimizing injury ***(Wahezi et al., 2013) .***

Pain can be classified into acute pain primarily due to nociception or chronic pain which may be due to nociception but in which psychological and behavioral factors play a major role ***(Aasvang et al., 2016).***

Acute pain is a signal of impending or ongoing tissue damage that provokes the patient to seek treatment or escape from the painful stimulation. Its most common forms include post traumatic, postoperative and obstetrical pain, as well as that associated with acute medical illness such as myocardial infarction, pancreatitis and renal calculi ***(Gregory et al., 2016).***

Chronic pain is defined as pain that persists in spite of therapy beyond the usual course of an acute disease or after a reasonable time for healing to occur, this period is more than months in most definitions. Chronic pain may result from peripheral nocireceptors or peripheral or central nervous system dysfunction ***(Woolf, 2011).***

Traditionally, the distinction between acute and chronic pain has relied upon an interval of time from the onset, the pain that lasts less than 30 days is called acute while that lasting more than six months is chronic type of pain. Sub-acute pain is the one which lasts from one to six months ***(Walters et al., 2015).***