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EFFICACY OF ACETAMINOPHEN AND MAGNESIUM SULPHATE VERSUS LIGNOCAINE IN REDUCING PAIN WHILE ADMINISTERING PROPOFOL INJECTION

Anaesthesiology

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ABSTRACT

Propofol with its attractive kinetic properties like titratable level of anaesthesia, absence of cumulation, rapid and clear headed recovery and minimal side effects makes it as an ideal agent for induction of anaesthesia. Kay and Rolly confirmed its potential as an anaesthetic agent and is being used in clinical practice since 1986. It is known to cause severe, sharp, stinging or burning pain on injection that can be distressing to the patient. This pain is considered to be clinically unacceptable as it can cause agitation and interfere with smooth induction of anaesthesia. This is a Double blind randomized control trial done to compare the effect of i.v. Acetaminophen, i.v. Magnesium sulphate with that of i.v. Lignocaine for the prevention of Propofol induced pain during induction of anaesthesia.Patients were randomly allocated to one of the three groups of 40 each. Group L received 40mg of Lignocaine diluted to 5ml. Group A received 50mg (5ml) of Acetaminophen. Group M received Magnesium sulphate 2.48mmol (500mg) diluted in 5ml of normal saline. We concluded that Lignocaine 40mg, Magnesium sulphate 500mg and Acetaminophen 50mg decreases the injection pain significantly. Lignocaine 40mg is more effective in alleviating pain of Propofol injection, followed by Magnesium sulphate 500mg and Acetaminophen 50mg. No significant hemodynamic changes were caused by all three drugs.

KEYWORDS

Acetaminophen, Lignocaine, Magnesium sulphate, Pain on injection, Propofol.

INTRODUCTION

"For all the happiness mankind can gain is not inpleasure but in rest from pain." - John Dryden (1661-1731)

International association for study of pain defines pain as "unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage."

Propofol with its attractive kinetic properties like titratable level of anaesthesia, absence of cumulation, rapid and clear headed recovery and minimal side effects is an ideal agent for induction of anaesthesia. Kay and Rolly confirmed its potential as an anaesthetic agent and is being used in clinical practice since 1986.

It causes severe, sharp, stinging or burning pain on injection that can be distressing to patient. This is clinically unacceptable as it causes agitation and interfere with smooth induction of anaesthesia. Immediate pain results from direct irritant effect, delayed pain results from indirect effect via the kinin cascade, seen 10-20seconds later.

Various methods to alleviate this pain are injection into larger size veins, cooling or warming the Propofol solution pretreatment/ preinjection of various drugs like Lignocaine, Prilocaine, Opioids like Butorphanol, Tramadol, Alfentanil, Remifentanil, Thiopentone sodium, Metoclopramide, Ketorolac, Magnesium Sulphate, Acetaminophen,Clonidine, Ketamine, and Ondensetron.

Intravenous Lignocaine, a local anaesthetic, reduces incidence and severity of pain on injection of Propofol. It is considered superior to other drugs and is standard drug.

Cause of Propofol injection pain is unknown, activation of pain mediators such as release of a kininogen from the vein wall triggering a local kinin cascade system during i.v. injection. Non-steroidal anti-inflammatory drugs(NSAIDs) diminish prostaglandin(PG) synthesis and inhibit kinin cascade, thereby reducing pain on injection of Propofol. Acetaminophen to reduce pain on injection of Propofol is included.

Magnesium, NMDA antagonist, has antinociceptive effect. The effect is primarily based on regulation of calcium ion influx into the cell, natural physiological analgesic mechanism. Magnesium sulfate is taken for study to attenuate the pain by Propofol injection.

This study is aimed to compare efficacy and safety of i.v. Acetaminophen, Magnesium sulphate with that of Lignocaine for the prevention/ attenuation of pain associated with injection of Propofol during induction of general anaesthesia.

MATERIAL AND METHOD:

This is a prospective, descriptive, comparative and clinical study conducted in M.V.J.Medical College And Research Hospital. Study was carried out after obtaining ethical committee clearance from our institution. Total of 120 patients divided into 3 groups of 40 each admitted for surgeries under general anaesthesia were considered.

- Group L:Received Lignocaine 40mg diluted to 5ml as pretreatment.
- Group M: Received 2.48mmol(500mg) of Magnesium sulphate diluted in 5ml of normal saline as pretreatment.
- Group A : Received 50mg(5ml) of Acetaminophen.

On arrival of patient to operating-room, 18gauge i.v cannula was inserted at the dorsum of non dominant hand after that ringer lactate was started. ECG, non-invasive blood pressure and pulse oximeter monitoring were instituted. No analgesic drugs were given before induction. Pneumatic tourniquet was placed on same upper arm and pressure inflated to 70mmHg to produce venous occlusion. Drugs for premedication Lignocaine40mg diluted to 5ml,2.48mmol (500mg) of Magnesium sulphate diluted in 5ml of saline, 50mg(5 ml)of Acetaminophen were injected to the patients who were randomized into three groups by computer generated software. Patients were already been explained about scale for Propofol injection pain advocated by Mc Crirrick and Hunter.

After injection of drug, tourniquet was released after one minute and initially ¼ of the total calculated dose of Propofol was administered and patients were assessed for pain intensity every 5-10 seconds till patient was fully induced. All patients were asked to recall if there was pain during injection of Propofol in recovery-room and incidence of pain was graded as no recall and recall of pain present.

Table 2. Mc Crirrick and Hunter scale of evaluation of Propofol injection pain

Degree of Pain	Response
None (0)	No response to questioning
Mild (1)	Pain reported in response to questioning only without any behavioural signs.
Moderate (2)	Pain reported in response to questioning and accompanied by behavioural sign or pain

reported spontaneously without questioning.

Severe (3) Strong vocal response accompanied by facial grimacing, arm withdrawal or tears.

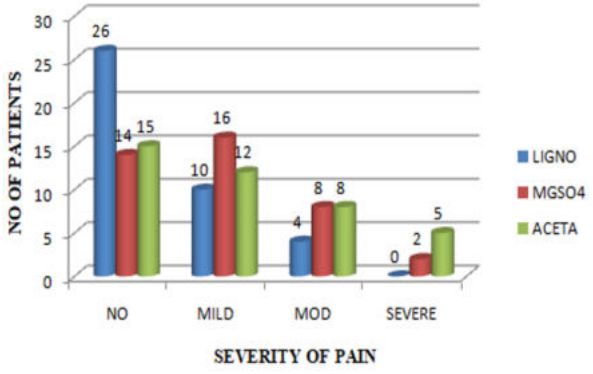
OBSERVATIONS AND RESULTS:

TABLE 1: COMPARISON OF PAIN DURING INDUCTION IN STUDY GROUPS

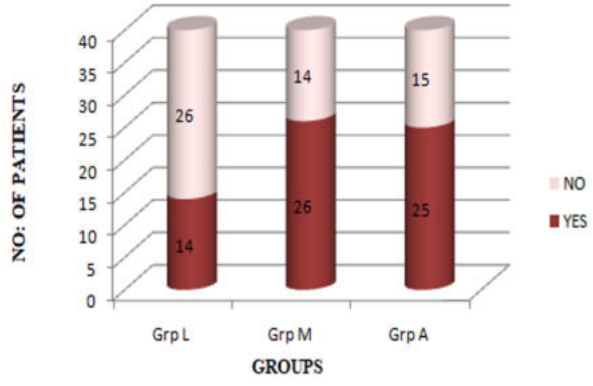
PAIN SCORE	LIGNOCAINE		MAG. SULPHATE		ACETAMINOPHEN	
	COUNT	% IN GRP	COUNT	% IN GRP	COUNT	% IN GRP
NO	26	65	14	35	15	37.5
MILD	10	25	16	40	12	30
MOD	4	10	8	20	8	20
SEVERE	0	0	2	5	5	12.5
TOTAL	40	100	40	100	40	100

TABLE 2: GROUP WISE MEAN PAIN SCORE IN THREE GROUPS

	MEAN	SD	F	p	df	INFERENCE
LIGNO	0.45	0.67	5.65	0.005	2	SIGNIFICANT
MgSO4	0.95	0.87				
ACETA	1.08	1.04				



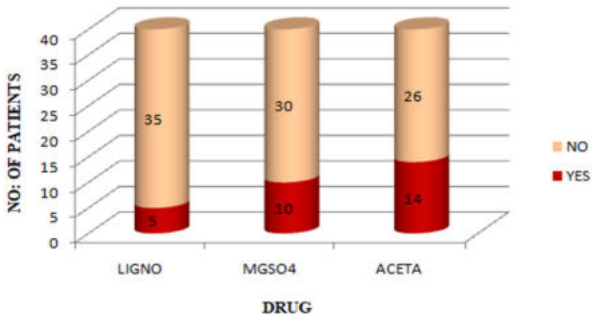
GRAPH 1: EFFECT OF THREE DRUGS ON PAIN DURING INDUCTION WITH PROPOFOL



GRAPH 2: PAIN FREE PATIENTS IN STUDY GROUPS

TABLE 3: COMPARISON OF PAIN RECALL IN STUDY GROUPS

GROUP	YES	NO
LIGNO	5	35
MGSO4	10	30
ACETA	14	26



GRAPH 3: COMPARISON OF PAIN RECALL IN STUDY GROUPS

DISCUSSION

Research is a continuous process. Efforts are being made to develop an induction agent for anaesthesia which fulfill all qualities of ideal induction agent. In 1970, while studying derivatives of phenol, a congener 2,6-diisoPropofol was found to have many qualities of ideal agent for induction. Kay and Rolly confirmed its potential as an anaesthetic agent and is used for clinical purpose since 1989.

Propofol is fast acting agent and action wears off quickly. Useful for day care procedures. Subhypnotic doses, provides excellent sedation, amnesia, anxiolysis and state of general well being. Has antiemetic action adds to advantage. Suppresses upper airway reflexes in response to laryngoscopy and intubation, helps patients-with hypertension, epilepsy or hyperactive airway. It attenuates stress response to intubation.

Propofol has tremendous popularity in daycare surgery, paediatrics, cardiac, neuroanaesthesia and ICU sedation. But it is associated with side effects like myoclonus, apnoea, hypotension and pain on injection.

Initial preparation of 2% emulsion with castor oil, ethanol, soya oil were studied. As a result of high incidence of pain and other reactions it was reformulated in 10% w/v soya bean oil, egg phosphatide and glycerol. Klement and Arndt pointed out that high osmolality and acidic pH leads to pain. Scott et al. suggested that vein size is an importan in causation of pain on injection of Propofol. Noted there was no pain when Propofol was injected in the antecubital veins. This is because is injected in the blood stream with no contact with sensitive walls of veins. Blood.Brigget al. 1981, reported 39% incidence into dorsum of palm compared with 3% incidence in forearm or ante-cubital fossa veins. Is not feasible to choose the ante-cubital-fossa-vein routinely to avoid Propofol injection pain as the IV site in ante-cubital-fossa is relatively uncomfortable to and has tendency to occlude. Our study, we preferred larger size vein on dorsum of hand so elicitation of pain and alleviation can be compared with respect to three agents i.e Lignocaine, Magnesium sulphate andAcetaminophen.

Speed of injection is important determinant of pain on injection because high rate of injection causes rapid clearance of drug preventing release of kininogens from vascular endothelium. Similarly when speed of carrier IV fluid infusion is slow, fewer kininogen molecules may be produced as a result of the smaller contact area between Propofol and the vascular endothelium.

Many methods of alleviating or reducing intensity of pain on injection of Propofol have been studied, most common drug used for premedication was Lignocaine. Several doses of Lignocaine were studied. Dose of Lignocaine 0.1mg kg^{-1} significantly reduced incidence of pain and there was no improvement when dose was increased.

Magnesium, NMDA antagonist, has antinociceptive effect. Is primarily based on regulation of calcium ion influx into cell, natural physiological analgesic mechanism. So Magnesium sulfate was taken for study to attenuate the pain by Propofol injection.

Cause for Propofol pain is by activation of pain mediators such as release of a kininogen from vein wall triggering a local kinin cascade system. Non-steroidal anti-inflammatory drugs(NSAIDs) have been shown to diminish prostaglandin(PG) synthesis and inhibit kinin

cascade, reducing pain on injection of Propofol. Hence Acetaminophen reduces pain on injection of Propofol.

SUMMARY:

Out of 40 patients of each study group, 65% in Lignocaine group, 35% in mgso4 group and 37.5% in Acetaminophen group did not have pain. 25% in Lignocaine group, 40% in mgso4 group and 30% in Acetaminophen group had mild pain. 10% in ligno group, and 20% in both other groups had moderate pain. 5% in mgso4 and 12.5% in acetaminophen group severe pain .Thus all three Lignocaine, Magnesium sulphate and Acetaminophen significantly reduced pain on Propofol injection. But more pain reduction was with Lignocaine, followed by Magnesium and least by Acetaminophen. There was significant difference between groups. Among groups 5 patients out of 14 patients who had pain recalled pain postoperatively in Lignocaine group, 10 patients out of 26 patients in Magnesium group and 14 patients out of 25 patients in Acetaminophen groups had recall of pain post operatively.

CONCLUSION

1) Lignocaine 40 mg, Magnesium sulphate 500 mg and Acetaminophen 50 mg decreases the injection pain significantly.
2) Lignocaine 40 mg is more effective in alleviating pain of Propofol injection, followed by Magnesium sulphate 500 mg and Acetaminophen 50 mg.
3) No significant hemodynamic changes are caused by all three drugs.

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