VIMS HEALTH SCIENCE JOURNAL

March – 2014, Volume 1, Issue 1

ISSN No : 2348 – 523X www.vimshsj.edu.in

ORIGINAL ARTICLES

TO STUDY THE EFFECT OF PRETREATMENT WITH LIDOCAINE AND DICLOFENAC IN REDUCING SUCCINYLCHOLINE INDUCED MYALGIA

*Pandey. A. K, , **Sunil Kumar. V, ** Saraf. R, ***Kale. S.

* Professor, **Resident, ***Lecturer

Department of Anaesthesiology

Address for Correspondence :

Padmashree Dr. Vithalrao Vikhe Patil Medical College, Vilad Ghat, MIDC, Ahmednagar, Maharashtra - 414111.

E- mail : anandkumarp111@gmail.com

Abstract -

Background: Succinylcholine, a depolarizing muscle relaxant, known for its rapid onset of action and fast emergence, is the preferred muscle relaxant for ambulatory anaesthesia, short surgical procedures and rapid sequence induction as it provides almost ideal intubating conditions. Postoperative myalgia is a minor but frequent adverse effect of succinylcholine administration. It prolongs hospital stay and increases the cost of treatment- a demerit in day care surgery. Several drugs like lidocaine, rocuronium, diazepam & NSAIDS have been observed to decrease the incidence and severity of post operative myalgia, lidocaine and diclofenac being the safer of these drugs. The purpose of this study is to compare the effect of pretreatment with intravenous lidocaine versus intramuscular diclofenac in succinylcholine induced post operative myalgia.

Material And Methods : 120 consenting adult in-patients of Padmashree Dr. Vithalrao Vikhe Patil Medical College Hospital who were posted for elective minor surgery, under general anaesthesia, between the age group of 18-50 years with ASA physical status I and II were selected for the study. They were further divided into three groups of 40 each: Group D- to receive 75 mg intramuscular diclofenac. pretreatment, Group L - intravenous lidocaine 1.5 mg/kg and Group C – the controls.Patients were pre-oxygenated and induced with 5mg/kg IV thiopentone sodium followed by 1.5 mg/kg IV of succinylcholine. The presence and degree of fasciculation were assessed visually on a four point scale. The severity and intensity of post operative myalgia were assessed by the investigator with a standardized questionnaire 1 hour, 24 hours and 48 hours after surgery.

Results : IV lidocaine showed a statistically significant ($p<.016$) reduction in the incidence and intensity of succinylcholine induced myalgia. IM diclofenac showed no such reduction when compared to the control group. When compared to diclofenac, lidocaine proved to be more efficacious in reducing the incidence and intensity of pain at all of the three time points.

Conclusion : Intravenous lidocaine is effective in the prevention of postoperative succinylcholine induced myalgia.

Key words : Succinylcholine, myalgia, lidocaine, diclofenac, fasciculations

Introduction - Succinylcholine is a depolarizing muscle relaxant and is the only one of its kind in use today. It is favored for its rapid onset of action and fast emergence. Succinylcholine is used as muscle relaxant for ambulatory anaesthesia, short surgical procedures and rapid sequence induction as it provides almost ideal intubating conditions.

Postoperative myalgia is a minor and a frequent adverse effect of succinylcholine administration. Bourne and Collier first described the phenomenon of post operative myalgia in 1952. They attributed post operative myalgia to occur due to the vigour of uncoordinated muscle contractions after succinylcholine injection.[1]

The reported incidence of succinylcholine-induced myalgia ranges from 1.5 to 89%.[2,3] The duration of myalgia can last from 2-3 days to a week. The first postoperative day finds the patient with neck, abdomen and shoulder pain. It is self-limiting but can cause distress to the patient.

The first attempt to reduce the incidence and severity of muscle pains was made by Churchill Davidson when he used gallamine for pretreatment in 1954.[4] Since then, many methods have been tried, the most common of which, was the prior administration of a suboptimal dose of a non-depolarising neuromuscular blocker. With respect to prevention of myalgia, controversy still exists about the agent of choice for premedication, the time of administration of the drug and the accurate dose.

In a meta-analysis done in 2005, it was concluded that myalgia can be best prevented with non-depolarizing muscle relaxants, lidocaine or non-steroidal anti-inflammatory drugs. The use of small doses of non depolarizing muscle relaxants prevents fasciculations and myalgia to a certain extent but is also associated with serious adverse effects.[5] There has been an increasing need to find an easily available, effective and feasible method of reducing the incidence of myalgia. Hence, the purpose of the present study is to evaluate and compare the effect of pretreatment with intravenous lidocaine and intramuscular diclofenac in succinylcholine induced post operative myalgia.

Methodology : The study was undertaken at Padmashree Dr. Vithalrao Vikhe Patil Medical College, Ahmednagar from 2012-2013. The study design was approved by the institutional ethical committee. 120 inpatients satisfying the inclusion and exclusion criteria stated below were selected for the study using purposive sampling. Informed consent was obtained from each of the participants. Adult ASA I and II physical status of either sex, between 18 and 50 years of age, weighing 40 to 65 kgs and posted for elective minor surgeries were included in the study. Major surgeries, pregnant and lactating women, patients with neuromuscular disorders, emergency surgical procedures, age below 18 years or above 50 years, patient refusal, true allergy to lidocaine and diclofenac were excluded.

Preoperative evaluation and routine investigations like hemoglobin, urine analysis, random blood glucose, bleeding time and clotting time, HIV spot, HBsAg card test, blood urea, serum creatinine, electrocardiogram and chest x-ray were done.

All patients were kept nil per oral for 8 hours with pre medication of Tab Ranitidine 150 mg orally 12 hours before surgery. Pulse oximetry, non invasive blood pressure and ECG were monitored.

Patients were divided into three groups of 40 each, based on random number generated by computer software and as per the group pretreatment was given.

Group D (n= 40) received IM diclofenac 75 mg 20 minutes before administering the Succinylcholine. Group L (n= 40) received IV lidocaine 1.5mg/kg 3 minutes before administering succinylcholine. Group C Control (n=40) received neither of the two.

In the operating room, baseline SpO2, heart rate and ECG were recorded.

Intravenous access was secured. Inj. fentanyl 2µg/kg IV was given 5 minutes before induction of anaesthesia. Patients were pre-oxygenated and induced with 5 mg/kg IV thiopentone sodium followed by 1.5 mg/kg of succinycholine given IV. The presence, degree and duration of fasciculations were assessed visually on a four point scale. [6]

0- No visible fasciculations, 1- Mild: very fine fingertip or facial muscle movement, 2- moderate: minimal fasciculation on the trunk and extremities, 3- severe: vigorous fasciculations on the trunk and extremities.

Tracheal intubation was performed once the fasciculations reached the toes.

Anaesthesia was maintained with nitrous oxide 66% in oxygen and isofluorane 0.8%.

Loading dose of 0.1 mg/kg vecuronium was given IV followed by maintenance dose of 0.02 mg/kg every 20 minutes IV. Neuromuscular blockade was reversed with IV neostigmine 0.05 mg/kg and 0.01 mg/kg IV glycopyrrolate at the end of the procedure.

Standardized post operative care was given to all the participants. Pain related to the surgical procedure was treated with IV pentazocine in a dose of 0.3mg/kg.

Severity and intensity of post operative myalgia was assessed by the investigator with a standardized questionnaire 1hour, 24 hours and 48 hours after surgery.

Myalgia score: 0 - None; 1 -slight pain; 2 -moderate pain and 3 - severe pain.

Results :

The data obtained was statistically analyzed after calculating mean values and the standard deviation. Analysis of variance was done to compare normally distributed continuous variables between the treatments and Kruskal Wallis test was used for the ordinal variables. Chi square test was used to obtain other possible associations between two categorical variables. MS – Excel and SPSS 15.0 were the packages used for the statistical analysis.

Demographic data such as age, sex, weight showed no significant difference among the three groups. The type of surgeries such as lipoma excision, sebaceous cyst excision, breast lump excision, circumcision, closed reduction etc. were equally distributed in all the groups. Changes in intraoperative haemodynamics between groups were not significant.

Comparison of fasciculations between the groups showed no significant difference ($p>0.016$) between the intramuscular diclofenac and the control groups. There is no significant difference ($p>0.016$) in fasciculation between the intramuscular diclofenac and the intravenous lidocaine groups. However a significant difference ($p<0.016$) in fasciculation is observed between the intravenous lidocaine and the control groups.

Table No 1: Comparison of fasciculation in three groups-

Group	N	Mean	Std. Deviation	Median	Kruskal-Wallis Test Value	p-value
C	40	1.73	0.905	2.00		
D	40	1.50	0.784	1.00	**10.628**	**0.005**
L	40	1.05	0.932	1.00		
Total	**120**	**1.43**	**0.914**	**1.00**		

The fasciculation distribution of the three groups is as given below

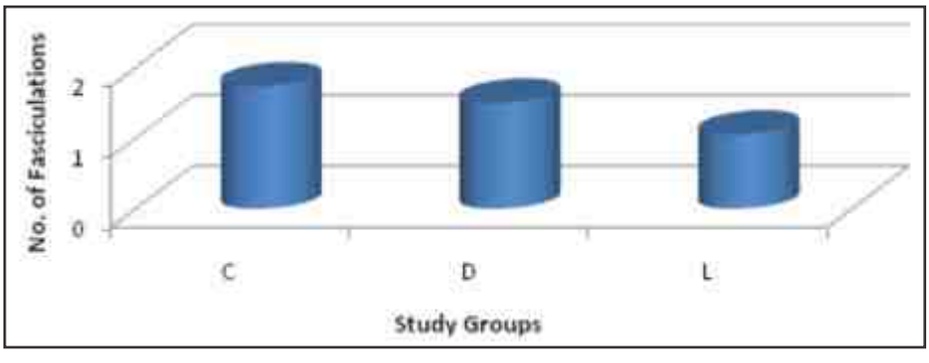

Figure 1: No. of Fasciculations in Study Groups

Table 2: Pair-wise Comparisons of fasciculation between three groups using Mann-Whitney test

Group		p value
C	D	0.196
	L	0.002
D	L	0.028

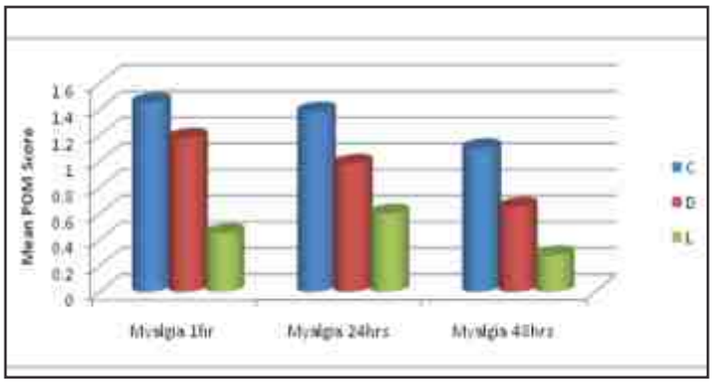

Figure 2: Post Operative Myalgia (POM) Distribution

Comparison of Postoperative Myalgia between time points showed a significant reduction in pain over time within all the three treatment groups. Though the intensity of Post Operative Myalgia does not significantly reduce ($p>0.016$) from 1hr to 24hrs in any of the groups, there is a significant reduction ($p<0.016$) in the intensity of Post Operative Myalgia from 24hrs to 48hrs in all the treatment groups.

Post operative myalgia was compared between the three treatment groups at 1 hour, 24 hours and 48 hours showed no significant difference ($p>0.016$) between efficacy of intramuscular diclofenac and the control in reducing the intensity of pain at any of the three time points. There is a significant difference ($p<0.016$) between efficacy of intravenous lidocaine and the control in reducing the intensity of pain at all of the three time points. There is a significant difference ($p<0.016$) between efficacy of intravenous lidocaine and efficacy of intramuscular diclofenac in reducing the intensity of pain at all of the three time points.

Discussion -

Succinylcholine is a popular muscle relaxant for ambulatory anaesthesia, short surgical procedures and rapid sequence induction as it provides almost ideal intubating conditions. Succinylcholine induced myalgia, a minor but frequent side effect with an incidence of 1.5 – 89%, is one of its drawbacks. A large number of trials have identified several factors contributing to a high incidence of succinylcholine induced myalgia and several strategies have been evolved to minimize both the incidence and severity of pain.

Recent studies have found that succinylcholine induced myalgia can be best prevented with non-depolarizing muscle relaxants, lidocaine or NSAIDs. A small dose of non-depolarizing muscle relaxant can prevent fasciculations and myalgia to some extent but have potentially serious adverse effects.[7]

Our study was carried out with the aim of ascertaining the efficacy of pretreatment with IV lidocaine and IM diclofenac in decreasing the intensity and incidence of succinylcholine induced myalgia. Lidocaine and diclofenac were also compared to each other. Lidocaine was given in a dose of 1.5mg/kg IV 3 minutes before succinylcholine, while diclofenac 75mg was given as an IM injection 20 minutes before succinycholine administration. Fentanyl 2µg/kg IV was used as the analgesic at induction and pentazocine 0.3mg/kg IV was used in the post operative period for rescue analgesia.

These drugs were chosen because opioids do not have any impact on the occurrence of succinylcholine myalgia.[8]

Our study showed an incidence of pain in lidocaine, diclofenac and control groups as 45%, 85% and 77.5% respectively. The incidence of myalgia is least in the lidocaine.

group similar to what had been observed by Chatterji et al.,[11] Melnick et al.,[8] and Raman et al.[7] However, Chatterji et al., reported an incidence of 8% in patients receiving lidocaine, far lower than the incidence (45%) obtained in our study.

It has been believed in the past that myalgia resulted from fasciculations induced by succinyl choline. In contradiction to this, Schreiber et al., in a meta-analysis, observed that there was no clear relationship between the incidence of fasciculations and the development of myalgia and the two possibly had different origins.[5] They along with Wong and Chung suggested a multifactorial pathogenesis for myalgia.[7] Our study, in agreement with Schrieber et al., concluded that the severity of myalgia was not related to the intensity of fasciculations. Another observation made by us was that the diclofenac group had a higher incidence of fasciculation, suggesting that NSAIDS have no role in the prevention of fasciculations.

There have been suggestions that NSAIDS could be effective against myalgia which may be inflammatory in origin.[9] Kahraman et al., confirmed this when they observed a reduction in the incidence of myalgia in patients who received pretreatment with diclofenac.

Our study showed results conflicting with the above reports as diclofenac failed to reduce the incidence of pain compared to the control group. This result however is in agreement with that of another study where ketorolac was used as the pretreatment drug and no reduction in the incidence of myalgia was observed.[10]

Interestingly, the diclofenac group showed an increase in the incidence of myalgia during the post operative period. This rise is possibly because these patients received the drug by the intramuscular route, which might have contributed to myalgia.

Lidocaine pretreatment has been noted to have a favorable effect on postoperative myalgia and it has thus been used effectively for its prevention. The lidocaine group in our study had the least intensity of pain as compared to the control and diclofenac groups at all the three time points of study i.e., at 1, 24 and 48 hr.[11]

While most researchers have studied the efficacy of lidocaine versus a control group or non depolarizing muscle relaxants, we compared the efficacy of lidocaine with that of diclofenac, a commonly used NSAID. Lidocaine was found to be superior to diclofenac, in both, increasing the number of patients without muscle pain and decreasing the frequency of moderate and severe myalgia. Moderate and severe pain were reported only in (2.5%, 0%), (10%, 2.5%) and (5%, 0%) patients at 1hr, 24hrs and 48hr respectively. Thus lidocaine pretreatment is concluded to be the most effective method of preventing succinylcholine myalgia. Lidocaine was given in a dose of 1.5 mg/kg IV as minimal side-effects occur at this dosage.[12] No significant side effects were reported by any of the participants of the study. The intramuscular route was used for the injection of diclofenac and this could have influenced the occurrence of myalgia at the site of the injection.

Conclusion -

Intravenous lidocaine is effective in reducing the incidence and intensity of succinycholine induced myalgia. Intramuscular diclofenac compares poorly to lidocaine in reducing the incidence and intensity of succinycholine induced myalgia.

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