Original Research Article

Indian Journal of Anesthesia and Analgesia
2019; 6(2) (Part - I): 498-502
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.6219.21

Effect of Lidocaine and Diclofenac in Counteracting the Myalgia Induced by Succinylcholine

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Abstract

Introduction: 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. *Materials & Methods:* Patients were divided into three groups of 50 each, based on random number generated by computer software and as per the group pretreatment was given. Pain related to the surgical procedure was treated with IV pethidine in a dose of 1 mg/kg. Severity and intensity of post operative myalgia was assessed by the investigator with a standardized questionnaire 1 hour, 24 hours and 48 hours after surgery. *Results:* There is 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 & 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.

Kwywords: Diclofenac; lidocaine; myalgia; succinylcholine.

How to cite this article:

Vijaygiri Gusai, Vishal Joshi. Effect of Lidocaine and Diclofenac in Counteracting the Myalgia Induced by Succinylcholine. Indian J Anesth Analg. 2019;6(2):498-502.

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 [1].

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 [2]. They attributed post operative myalgia to occur due to the vigour of uncoordinated muscle contractions after succinylcholine injection. The reported incidence of succinylcholine-induced myalgia ranges from 1.5 to 89%. The duration of myalgia can last from

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Received on 23.11.2018, **Accepted on** 26.12.2018

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 [3].

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. 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. This was done with the intention of reducing both postoperative myalgia as well as visible fasciculations [4].

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.

Materials & Methods

The study was undertaken at Medical College. The study design was approved by the institutional ethical committee. 150 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.

Inclusion criteria

- Adult ASA I and II physical status of either sex
- Age between 18 and 50 years
- Weight - 40 to 65 kg
- Posted for elective minor surgeries

Exclusion criteria

- Major surgeries
- Pregnant and lactating women
- Neuromuscular disorders
- Emergency surgical procedures
- Age below 18 years or above 50 years
- Patient refusal
- True allergy to lidocaine and diclofenac

Preanaesthetic evaluation

All patients were evaluated on the previous day of surgery

Pre-operative investigations:

- Hemoglobin
- Urine analysis
- Random blood glucose
- Bleeding time and clotting time
- HIV spot, HBsAg card test
- Blood urea, serum creatinine and serum electrolytes (as required)
- Electrocardiogram and chest x-ray (if required)

Premedication

All patients were kept nil per oral for 8 hours with pre medication of Tab Ranitidine 150 mg orally 12 hours before surgery.

Pre induction monitoring

Pulse oximetry, non invasive blood pressure and ECG were monitored. Patients were divided into three groups of 50 each, based on random number generated by computer software and as per the group pretreatment was given. In the operating room, baseline SpO_2, heart rate and ECG were recorded. Intravenous access was secured. Inj. fentanyl 2 µg/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. Anaesthesia was maintained with nitrous oxide 66% in oxygen and isofluorane 0.6%. 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 pethidine in a dose of 1 mg/kg. Severity and intensity of post operative myalgia was assessed by the investigator with a standardized questionnaire 1 hour, 24 hours and 48 hours after surgery.

Standardised Questionnaire To Assess Post Operative Myalgia

1. Do you have any pains or aches or stiffness in your muscles other than the site wherein the surgery was performed?

If the answer is no, myalgia will be graded 0=none (no pain); if the answer is yes, the location (i.e., neck, shoulder, arm, throat, abdomen, buttocks), the severity of pain and necessity for pain medication will be recorded.

A: If the pain is confined to one location, myalgia will be graded 1=slight (pain confirmed to one site but causing no disability).

B: If the pain is affecting more than one location, myalgia will be graded 2=moderate or 3 = severe.

2. Does the muscle pain restrict your normal activity? Restriction of normal activity will be assessed as follows: can you get out of bed? Are you able to turn your head ? Can you cough without distress or pain?

A: If the answer is yes myalgia will be graded 2=moderate (pain affecting more than one site but causing no disability).

B: If one of these questions is answered with no, myalgia will be graded 3=severe (pain affecting more than one site and causing disability).

Statistical Methods

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 theordinal variables. Chi square test was used to obtain other possible associations betweentwo categorical variables. MS – Excel and SPSS 15.0 were the packages used for the statistical analysis.

Results

120 patients who met the inclusion criteria were randomized into 3 groups of 40 each

Group L: IV Lidocaine

Group D: IM Diclofenac

Group C: Control.

Gender Distribution

The following table 1 shows the sex distribution in the three groups

Table 1: Sex distribution in the three groups

Group	Males	Females	N
C	28	22	50
D	26	24	40
L	30	20	50
Total	84	66	150

The following table 2 shows systolic blood pressure distribution in the three groups

Table 2: systolic blood pressure distribution in the three groups

Group	N	Mean	Anova	P Valiue
C	50	128.42	1.402	0.303
D	50	123.56		
L	50	125.89		
Total				

The diastolic blood pressure distribution of the three groups is as given below Table 3.

Table 3: blood pressure distribution of the three groups

Group	N	Mean	Anova	P Valiue
C	50	77.86	0.594	0.55
D	50	76.98		
L	50	79.65		
Total				

Post operative myalgia was compared between the three time points within the treatment groups. The results are as follows Table 4.

Table 4: Post operative myalgia compared between the three time points within the treatment groups

Group	Post operative myalgia	N	Mean	Friedman test value	P value
C	Myalgia 1 hr	50	1.45	14	0.0012
	Myalgia 24 hr	50	1.23		
	Myalgia 48 hr	50	1.35		
D	Myalgia 1 hr	50	1.20	28.90	0.001
	Myalgia 24 hr	50	0.94		
	Myalgia 48 hr	50	0.69		
L	Myalgia 1 hr	50	0.50	11.223	0..002
	Myalgia 24 hr	50	0.65		
	Myalgia 48 hr	50	0.23		

Based on the statistical tests, we conclude that

There is 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 [6].

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 [7].

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-depolarising muscle relaxant can prevent fasciculations and myalgia to some extent but have potentially serious adverse effects [6].

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 1.5 mg/kg IV 3 minutes before succinylcholine, while diclofenac 75 mg was given as an IM injection 20 minutes before succinycholine administration. Fentanyl 2 µg/kg IV was used as the analgesic at induction and pethidine 1 mg/ 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. 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., Melnick et al., and Raman et al. 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 [8]. They along with Wong and Chung suggested a multifactorial pathogenesis for myalgia. 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. Kahraman et al., confirmed this when they observed a reduction in the incidence of myalgia in patients who received pretreatment with diclofenac [9]. 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 myalgia was observed.

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 [10]. 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 hour, 24 hours and 48 hours.

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 1 hr, 24 hrs and 48 hrs 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 as minimal side-effects occur at this dosage. No significant side effects were reported by any of the participants of the study.

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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