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### Original Research Article

## Evaluation of Experiences of using Atracurium and lidocaine on Succinylcholine-Induced Fasciculation in Anesthesia Surgeries: a Study from Clinical Experience

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### ABSTRACT

**Introduction:** due to the wide indications for the use of rapid sequencing induction with succinylcholine and the high prevalence of fasciculation and myalgia, as well as increasing the dose of succinylcholine by up to 50% when using atracurium and long-term relaxation of atracurium, this plan Studies were performed Evaluation of experiences of using Atracurium and lidocaine on succinylcholine-induced fasciculation in anesthesia surgeries: a study from clinical experience. **Material And Methods:** This study is a clinical experience that was performed in gold in 2019 in Imam Reza Hospital [Tabriz University of Medical Sciences] with the participation of patients undergoing general anesthesia [requiring rapid sequencing anesthesia and succinylcholine injection]. One group received 0.05 mg/kg tracorium with a volume of 5 cc three minutes before induction of anesthesia and the other group received 1.5 mg/kg lidocaine with a volume of 5 cc 30 seconds before induction of anesthesia. The fasciculation status caused by succinylcholine injection was compared between the two groups. **Results:** The number and severity of fasciculation between the two groups of atracurium and lidocaine to prevent fasciculation were not statistically significant [ $p > 0.05$ ]. **Conclusion:** Atracurium and lidocaine administration to prevent saccharin-induced fasciculation had similar effects in patients undergoing general anesthesia.

**Keywords:** Atracurium, lidocaine, fasciculation, succinylcholine

## Introduction

Succinylcholine is commonly used as a sedative for outpatient anesthesia and short-term surgery. Because its duration of action is short, ie 5-10 minutes [1 and 2], this drug has obvious advantages including cheap price, rapid onset of action [1], short duration of action, deep muscle relaxation and no need to neutralize the neuromuscular block. Despite the side effects of succinylcholine, it is still widely used to induce rapid sequencing anesthesia [2]. Side effects include fasciculation, postoperative myalgia, elevated blood potassium and serum myoglobin, and elevated creatine phosphokinase. The prevalence of fasciculation is reported to be up to 95%. Fasciculation and myalgia are common side effects of this drug [3, 4]. Succinylcholine-induced fasciculation may be well prevented with a non-depolarizing muscle relaxant or lidocaine or magnesium [5], and succinylcholine-induced myalgia may be well prevented with a non-depolarizing muscle relaxant or lidocaine or a nonsteroidal anti-inflammatory drug [6]. Atracurium is a non-depolarizing muscle relaxant and lidocaine is a local anesthetic and sodium channel blocker that can independently reduce succinylcholine-induced myalgia [7]. A low dose of non-depolarizers [10% dosantubication] called a depasiculation dose 2 minutes before the intubation dose of succinylcholine minimizes the amount of fasciculation caused by this drug[8], but because this dose of atracurium acts as an antagonist and makes the muscles succulent. Indigo is relatively resistant, so the succinic dose of indigo should be increased by 50% [9]. Therefore, due to the wide indications for the use of rapid sequencing induction with succinylcholine and the high prevalence of fasciculation and myalgia [10], as well as increasing the dose of succinylcholine by up to 50% when using atracurium and long-term relaxation of atracurium, this plan Studies were performed to determine the comparison of the effect of lidocaine and atracurium in reducing these side effects [11]. Therefore, the aim of this study was to investigate the experiences of using the effect of Atracurium and lidocaine on succinylcholine-induced fasciculation in surgical procedures under anesthesia: a study from clinical experience.

Material And Methods

## Study design

This study, which was conducted as a result of a clinical experiment in 2019 at Tabriz University of Medical Sciences, was performed on 90 patients referred to Imam Reza Hospital

who needed general anesthesia for surgery. Sampling was done by available method and taking into account ethical considerations and obtaining written consent.

***Inclusion/Exclusion Criteria:*** Inclusion criteria included a candidate for general anesthesia, a candidate for endotracheal intubation, a candidate for elective surgery, routine anesthesia and consent to participate in the study. Exclusion criteria also included: trauma patients, patients with Liver and kidney diseases, patients with a history of dialysis during the past week, patients with high intraocular pressure, patients with a history of high intracranial pressure and pregnant patients.

## **Methods**

Patients who were candidates for surgery underwent general anesthesia. Patients in two equal groups of 45 divided into group A received 0.05 mg / kg atracurium with a volume of 5 cc three minutes before induction of anesthesia and group B received 1.5 mg / kg lidocaine with a volume of 5 cc 30 seconds before induction of anesthesia. they received. In all patients, induction of anesthesia was performed with fentanyl at a dose of 2 ug / kg and thiopental sodium 5 mg / kg and intramuscular relaxant succinylcholine at a dose of 1.5 mg / kg. Existence, severity of fasciculation by the student after the administration of drugs to patients and without knowing the type of drug prescribed by observing the evaluation was scored.

## **Ethical considerations**

This study was conducted after approval by the ethics committee of Tabriz University of Medical Sciences; Patients signed informed and written consent and the objectives of the study were explained to all of them in simple language. No fee was received from patients to participate in the study and patient information was recorded with fidelity and honesty.

## **Data analysis**

In describing the data, appropriate statistical tables and indicators such as mean, standard deviation and percentages and statistical graphs such as bar and box diagrams have been used. In data analysis, the normality of quantitative data using A sample of Kolmogorov-Smirnov test with Liliefors correction has been studied, which is used by confirming the normality of

parametric methods and in case of passing non-parametric tests. In analyzing data with quantitative or qualitative scale of rank and abnormal, Mann-Whitney U test and Kruskal-Wallis test, if normal, Student's t test was used. Pearson Chi-Square test was used to examine the co-distribution of nominal qualitative variables. The software used in this research is IBM SPSS 21.0 and the significance level is less than 5% [in the results, values less than 5% are marked with a "\*" sign and values less than 1% are marked with a "\*\*\*" sign].

## Results

53.3% of the subjects in the study group for lidocaine were female and 46.7% were male. These ratios are the same in the study group for atracurium as in the lidocaine group. As a result, and considering the probability of chi-square test, we conclude that there is no significant difference between lidocaine and atracurium groups in terms of gender distribution [ $p > 0.05$ ]. In other words, the two groups are the same in terms of sex distribution. The mean age was  $69.33 \pm 45.11$  in the lidocaine group and  $96.35 \pm 69.11$  in the atracurium group. Also, according to the P-value of Mann-Whitney test, lidocaine and atracurium groups are equal in terms of mean age [ $p > 0.05$ ]. In other words, the two groups are the same in terms of age distribution. The age distribution in the lidocaine group in the classes less than equal to 20 years, greater than 20 and less than equal to 30 years, greater than 30 years and less equal to 40 years, greater than 40 years and less than 50 years and greater than 50 years are: 6.7%, respectively. 44.4%, 20% 15.6% and 13.3%. The same ratios in the atracurium group are: 11.1%, 28.9%, 22.2%, 20% and 17.8%, respectively. Here it is also observed that with this age division, the age distribution in the two groups of lidocaine and atracurium is not statistically significant [ $p > 0.05$ ]. In lidocaine group, the severity of fasciculation was zero for 51.1%, 24.2% for one, 15.6% for two and 8.9% for three. The same ratios in the atracurium group were 64.4%, 17.8%, 11.1% and 6.7%, respectively. Also, the two groups of lidocaine and fasciculation were not significantly different in terms of distribution of fasciculation intensity [ $p > 0.05$ ]. In the lidocaine group, for men, the intensity of fasciculation was 47.6% for zero points, 23.8% for 1 point, 14.3% for 2 points and 14.3% for 3 points. The same ratios for women were 54.2%, 25%, 16.7% and 4.2%, respectively. Also, according to the results of Mann-Whitney test, the effect of lidocaine on fasciculation is the same in different sexes [ $p > 0.05$ ]. In the atracurium group, for men, the intensity of fasciculation was 61.9% for zero points, 9.5% for points 1, 19% for points 2, and 9.5% for points

3. The same ratios for women were 66.7%, 25%, 4.2% and 4.2%, respectively. Also, according to the results of Mann-Whitney test, the effect of atracurium on fasciculation is the same in different sexes [ $p > 0.05$ ]. The severity of fasciculation at the time of lidocaine use was reported to be zero for all those under 20 years of age. Also, no cases of severe fasciculation with a score of 3 have been reported among those over 50 years of age. [When using lidocaine] When using lidocaine, the severity of fasciculation with a score of zero, one, two and three for people less than 20 years old is: 100%, 0%, 0% and 0%, respectively. For people older than 20 years and less than 30 years, the same ratios are: 50%, 20%, 20% and 10%. For people older than 30 and less than 40 years old, the percentages are 55.6%, 33.3%, 0% and 11.1%. Also, for people older than 40 and less than 50 years old, the percentages of fasciculation intensity score are equal to 14.3%, 42.9%, 28.6% and 14.3%, respectively. For the last age group, ie people over 50 years of age, fasciculation severity scores were reported with only zero, one and two scores with 66.7%, 16.7% and 16.7%, respectively. It is also observed that in all age groups, most people received zero points for the severity of fasciculation, except for the age group older than 40 and less than 50 years, in this age group, most people had a score of one for severity of fasciculation after using lidocaine. Also, there is no statistically significant difference in the effect of lidocaine on fasciculation in different age groups according to the probability of Kruskal-Wallis test [ $p > 0.05$ ]. The severity of fasciculation when using atracurium is indicated for those under 20 years of age and for those older than 30 years and less than 40 years of age, the severity of fasciculation is reported to be zero or one for all of them. Fasciculation was also reported with a score of 2 and 3 among those over 40 years of age. [When using Atracurium]. When using Atracurium, the severity of fasciculation with a score of zero, one, two and three for people less than 20 years old is: 60%, 40%, 0% and 0%, respectively. For people older than 20 years and less than 30 years, the same ratios are: 69.2%, 15.4%, 15.4% and 0%. For people older than 30 and less than 40 years old, the percentages are 90%, 10%, 0% and 0%. Also, for people older than 40 and less than 50 years, the percentages of fasciculation intensity score are equal to 44.4%, 22.2%, 22.2% and 11.1%, respectively. For the last age group, ie people over 50 years of age, fasciculation severity scores were reported with only scores of zero, one, two and three with percentages of 50%, 12.5%, 12.5% and 25%, respectively. It is also observed that the highest score of three for the severity of fasciculation was in the use of atracurium for people over 50 years of age. In case of using lidocaine, no case of three intensities of fasciculation has been reported for people over

50 years old. Also, according to the probability of Kruskal-Wallis test, the effect of atracurium on fasciculation in different age groups is not statistically significant [ $p > 0.05$ ].

## Discussion

Succinylcholine-induced fasciculation may be well prevented with a non-depolarizing muscle relaxant or lidocaine or magnesium, and succinylcholine-induced myalgia may be well prevented with a non-depolarizing muscle relaxant or lidocaine or a nonsteroidal anti-inflammatory drug. Atracurium is a non-depolarizing muscle relaxant and lidocaine is a local anesthetic and sodium channel blocker that can independently reduce succinylcholine-induced myalgia. [6] A low dose of non-depolarizers [10% of the intubation dose] called the defasciculation dose 2 minutes before the intubation dose of succinylcholine minimizes the amount of fasciculation caused by this drug, but because this dose of atracurium acts as an antagonist [12, 13]. It makes the muscles relatively resistant to succinylcholine, so the dose of succinylcholine should be increased by 50%. Therefore, due to the wide indications for the use of rapid sequencing induction with succinylcholine and its high prevalence of fasciculation and myalgia, as well as increasing the dose of succinylcholine up to 50% when using atracurium and long-term relaxation [14]. Atracurium This research project was performed to determine the comparison of the effect of lidocaine and atracurium in reducing these side effects. In lidocaine group, the severity of fasciculation for 51.1% was zero, 24.2% was one, 15.6% was 2 and 8.9% was three. Scores of 0, 1, 2 and 3 in the atracurium group were given to 64.4%, 17.8%, 11.1% and 6.7%, respectively. There was no significant difference in the distribution of fasciculation intensity in lidocaine and atracurium groups. In a study comparing tubocurarin, rocuronium, and cisatracurium, researchers found that rocuronium and tobocurura were equally effective for defasciculation, but cisatracurium was significantly less effective than both, so rocuronium is a good alternative to tobocurin for defasciculation. Cisatracurium is next to rocuronium and tobocurarin. In our study, it was concluded that atracurium is a viable alternative to lidocaine. Although there was no significant difference, no significant difference was found between rocuronium and tobocurin in Troy's study [15]. In another study, no muscle fasciculation was observed in the rocuronium group, but patients in the lidocaine group experienced lower incidence of fasciculation than the control group [normal saline and succinylcholine]. In this study, the effect of lidocaine on reducing postoperative myalgia was investigated and rocuronium was more effective than

lidocaine, but as in our study, they were not significantly different [16]. In a similar study [17, 18] to ours, cisatracurium was only effective in preventing fasciculation caused by succinylcholine at longer pretreatment intervals [6 minutes instead of 3 minutes]. The incidence of muscle fasciculation was 45% in the Cis 6 group and 85% in the placebo group. Our study also concluded that non-depolarizers prevent fasciculation [64.4 in the atracurium and 51.1 in the lidocaine group]. In another study, fasciculation was less common in the tubocurarine and rocuronium groups than in the cisatracurium and saline groups; However, no difference was observed between the tubocurarine and rocuronium groups, and although fasciculation occurred less in the cisatracurium group than in the placebo group, this difference was not statistically significant. In our study, there was no significant difference like this study [19, 20]. In a study similar to ours in the group receiving atracurium, there was no fasciculation in 74.1%, which was about 10% more than in our study, while 25.9% had mild fasciculation. In Fatemeh's study, the sample size was 25 people and in our study, the sample size was 45 people and the dose of atracurium was different. In our study in the atracurium group, the severity of fasciculation was reported to be zero and one for all those under 20 years of age and for those over 30 years of age and under 40 years of age. In Fatemeh's study, the age group was not studied. In our study, moderate and severe fasciculation was observed in about 18% of cases, which was not observed in his study [21-23]. Another study found that succinylcholine-induced fasciculation was better prevented with muscle relaxants, lidocaine, or magnesium. In this study, as in our study, it was concluded that non-depolarizers prevent fasciculation. The researchers also similar to our study, the frequency and severity of fasciculation in the two groups receiving lidocaine and atracurium were similar to each other and there was no significant difference [8, 10, 24-26]. In a large study, the incidence of muscle tremor was 68% in the lidocaine group and 100% in the non-lidocaine group, with a statistically significant difference. The intensity of muscle tremor was higher in the group without lidocaine than in the group with lidocaine. In our study, in the group receiving lidocaine, 51.1 cases of zero fasciculation were reported. And 24.2 points were reported. According to this study and Gilani's pious study, it is concluded that non-depolarizers prevent fasciculation and muscle tremor, which was also concluded in our study [15, 27-30]. In another study, there was a clear statistical difference between the lidocaine-receiving group and the control group [without lidocaine] in terms of the prevalence of fasciculation, but did not show a statistically significant difference in the intensity of fasciculation. Also, in one study, the rate of



defasciculation in lidocaine and diazepam groups was significant compared to the control group, but diazepam and lidocaine groups were not different in terms of defasciculation in general and in terms of facilitation reduction, no major difference was observed between the two groups. These two drugs had similar defasciculation rates. In our study, atracurium and lidocaine had similar defasciculation and we did not have a control group. The dose of lidocaine was the same in both studies, but the sample size in this study was 30, which was 45 in our study [11]. In another study, the prevalence and severity of fasciculation were higher in patients in the control and lidocaine groups than in the atracurium group and the combination of atracurium and lidocaine [30% and 50% vs. 10% and 10%]. This comparison was not significant between the other groups, ie the rate of fasciculation by atracurium and lidocaine with atracurium was significantly reduced compared to succinylcholine without prodrug. In this study, the dose of atracurium was 3 mg. In our study, it was 0.05 mg / kg. [3, 5].

## Conclusion

As in our study, the age group was between 20-55 years. In this study, atracurium was more effective than lidocaine and atracurium in combination with lidocaine. Atracurium alone has been more effective. In our study, the combination of these two drugs was not studied, but as in this study, atracurium was more effective than the lidocaine group. Atracurium and lidocaine administration to prevent saccharin-induced fasciculation had similar effects in patients undergoing general anesthesia.

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