

EVIDENCE OF BRONCHOSPASM IN PATIENTS WITH HYPER-REACTIVE AIRWAY DISEASES (HRAD) FOLLOWING THIOPENTAL SODIUM INDUCTION OF ANESTHESIA

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Abstract

The objective of this study is to evaluate the evidence of bronchospasm in patients with hyper-reactive airway disease (HRAD) following induction of anesthesia by thiopental sodium.

The number of the patients participating in this study was 200. Patient's physical status was class I and II according to American society of anesthesiologists (ASA). Age range was 17-55 years. Patients were subjected to different types of elective operations.

The patients were assigned into two groups: - first group was 100 patients with normal airway considered as control group (group A) their age range was 17-55 years with a mean \pm SD 30.3 \pm 9.95.

The second group included 100 patients with asymptomatic hyper-reactive airway disease which was the case group (group B) their age range was 17 -50 years with a mean \pm SD 30.60 \pm 8.29.

From each patient a full history was taken and auscultation of the chest before induction of anesthesia was done, then oxygenation for 5 minutes with 100% oxygen was achieved without premedication. Anesthesia was induced by sleeping dose of intravenous (IV) thiopental and oxygenation was carried out by face mask, followed by auscultation of the chest immediately. Intubation was achieved with 1 mg /kg IV of Suxamethonium followed by assisted ventilation of the lung, and then re-auscultation of the chest was performed.

The frequency of bronchospasm after thiopental induction in different types of hyper-reactive airway diseases of the case group was: 14 patients (58.3 %) from the total 24 case who they were a known case of bronchial asthma were developed bronchospasm while only 2 patients (2.9%) from the total 41 case who they have allergic bronchitis were developed bronchospasm, but no one with allergic rhinitis patients had bronchospasm. The differences among different types of hyper-reactive airway diseases of the case group (disease group) regarding the evidence of bronchospasm is of statistically significant with P-value less than 0.05. It is concluded from this study that thiopental is not contraindicated in all patients with HRAD especially those with allergic rhinitis & allergic bronchitis who they don't have bronchospasm while its contraindicated in bronchial asthma who they have bronchospasm preoperatively.

Introduction

Bronchoconstriction may occur after tracheal intubation & occasionally may be severe enough to produce life-threatening decrease in gas flow. Because induction is the period of highest risk for bronchospasm, it is important to select proper induction agents which minimize the bronchoconstrictor response to tracheal

intubation & free from triggering chemical agents for bronchospasm¹⁻².

The effects of thiopental sodium on airway resistance remain controversial. Early studies indicated that thiopental release histamine & thus constrict the airways³⁻⁴. However, thiopental may also inhibit vagal reflexes⁵. And at higher

concentrations produce bronchodilatation⁶.

Intravenous (IV) induction agents are used in anesthesia practice to facilitate the patient's smooth transition to unconsciousness and intubation. The desired specific actions are an induction agent as a hypnotic and inhibition of upper airway reflexes. Generally the ideal induction agent should provide these actions without the side effects of respiratory &/or cardiac depression, nausea, vomiting & anaphylaxis. In addition, it should have a short duration of action and inexpensive. Unfortunately there is no individual induction agent has been shown to possess all of these characteristics, but the 2 agents that meet most of these criteria are thiopental and propofol⁷.

Thiopental is a primary IV induction agent for more than 50 years and considered is the standard by which newer induction agents are judged⁸. It's mechanism of action is thought to block the aminobutyric acid receptor on central nervous system (GABAA) & glycine receptors in addition which increased the channel opening time for chloride ion, the cause that increased the inhibitory effects. This results in potentiating of cell membrane chloride ion conductance and neuronal inhibition. Other inhibitory activity can be affect the central sodium & calcium ion⁹. Thiopental is highly lipid-soluble, produce unconsciousness in fewer than 30 seconds, and has a short distribution half-life, with a termination of action within 4 to 15 minutes^{10,11}. Conversely, thiopental has an elimination half-life of 18 hours, and because of this, some practitioners believe it can result in a long-lasting sedative effect and a delay of emergence from anesthesia⁷.

Thiopental is also associated with some adverse effects, for example, thiopental can reduce the blood pressure, respiratory rate and cardiac output, with a compensatory increase in heart rate via an uninhibited baroreceptor reflex¹⁰. Thiopental is also has been linked to

causing an exacerbation of porphyria, bronchospasm, myoclonus, hiccup, and laryngospasm in people with asthma, and it can cause significant venous irritation when injected^{10,11}. In addition, thiopental has been shown to produce a hyperalgesia when given in subhypnotic doses, which can result in a decrease in analgesic efficacy for most opioids and analgesics¹⁰. Despite these problems, thiopental remains the "gold standard" for induction agents because it is reliable and inexpensive¹².

Aim of the study

Hyper-reactive airway diseases are very common respiratory diseases in Basra, which contributes at high percent of population. The aim of this study is to identify the evidence & frequency of bronchospasm between HRAD patients after thiopental induction.

Patients & Methods

This is a case-control study included 200 patients undergoing different elective operations all patients were ASA physical status class I and II.

The data have been collected from AL-Taleeme Teaching Hospital, AL-Basrah General Hospital & AL-Fayha'a General Hospital during the period between April 2008-April 2010. The patients were divided in to two groups:

First group was 100 patients with normal airway as control group (group A). Their age range was 17-55 years with a mean \pm SD 30.3 \pm 9.95. The second group was 100 patients they have had different types of asymptomatic HRAD (group B), their age range was 17 -50 years with a mean \pm SD 30.60 \pm 8.29.

For the determination of statistical significance among different variables, a descriptive statistics like mean and standard deviation together with analytic statistics like chi squared test, ANOVA test, T-test or Fischer exact test have been done when appropriate. P-value less than 0.05 was considered as significant.

Results

The total number of patients including in this study were 200 patients As shown in table I, 98 (49%) of them were females and 102 (51%) of them were males, 100 patients assigned as a case group which consist of 51 females and 49 males, while the other 100 patients who are the control group consist of 47 females and 53 males and reveals there were no significant difference between these two groups statistically. P value > 0.05 is of no significance.

Table II shows the mean age of all patients is 30.4 with \pm SD of 9.14. For the case group the mean of age is 30.6 with \pm SD of 8.29 and for the control group is 30.3 with \pm SD of 9.95, this is also reveal no significant difference regarding the age difference among both groups (P value > 0.05).

Table III shows the different types of hyper-reactive airway diseases among the case group which reveals 24(6%) patients have bronchial asthma, 41(10.25%) have allergic bronchitis and 35(8.75%) have allergic rhinitis out of total 100 patients.

Table IV shows the most important result which revealed the frequency distribution of bronchospasm among both groups; 16(18%) of case group had bronchospasm (positive) while 84(84%) of case group had normal vesicular breathing after thiopental induction (negative), while in the control group no one develop bronchospasm. The total data, about 18% have had bronchospasm, this percentage is of statistically significance between both groups and the P value less than 0.05.

In table V, the frequency distribution of bronchospasm among different sex for the case group, reveals 10 (24.4%) of males had bronchospasm while 6(11.8%) of females were suffered bronchospasm, this result has no statistical significance among both genders (P value > 0.05).

In table VI, the frequency of bronchospasm among different types of hyper-reactive airway diseases of the case group was 14(58.3%) of patients having a

history of bronchial asthma had developed bronchospasm, 2 (2.9%) of patients with allergic bronchitis had bronchospasm while no one from those with allergic rhinitis has had a bronchospasm. This differences among different types of hyper-reactive airway diseases of the case group (disease group) is of statistically significant and the P-value is less than 0.05, specially highly significant for asthmatic patient in comparison with the other types of hyper-reactive airway diseases.

Discussion

This study is concerned with the evidence of bronchospasm in patients with hyper-reactive airway disease after induction of anesthesia by thiopental sodium. It revealed that thiopental precipitated bronchospasm in 16 patients (18%) of case group that included 100 patients with hyper-reactive airway diseases while 84 patients (82%) of case group did not developed bronchospasm. In control group, no one developed bronchospasm. This study showed as well, that bronchospasm among different types of HRAD of the case group is about 14(58.3%) of patients with bronchial asthma. Two (2.9%) patients with allergic bronchitis developed bronchospasm while those patients with allergic rhinitis no one presented as bronchospasm and this differences among different types of hyper-reactive airway diseases of the case group is statistically significant specially among asthmatic patients in comparison with the other types of hyper-reactive airway diseases. These results are comparable with many articles and matching with many other studies in other locations as mentioned by Wylie, WD. and Churchill-Davidson who mentioned that the thiopental Sodium produced transient apnea and may require supportive manual ventilation, laryngeal reflexes remain intact, coughing, laryngeal

spasm and mild bronchoconstriction can occur particularly in asthmatics patients¹³. This results are also comparable with other studies as mentioned by Clarke, R. S. J., Dundee, J. W. and Daw, who said that induction of anesthesia with thiopental, sometimes causes bronchospasm, although the mechanism by which thiopental induces bronchospasm may involve cholinergic stimulation, direct spastic effect and histamine release, the spastic effects of thiopental have not been comprehensively defined¹⁴⁻¹⁶.

This work also revealed that the development of bronchospasm after thiopental induction is unrelated to sex and age between different groups and between the same group, which is statistically of no significant difference and this is comparable with that mentioned by Stephen Raftery. Bristol Royal Infirmary^{17,18}.

Conclusion

There is a general Idea between anesthesiologist that thiopental sodium generally is contraindicated in all patients with HRAD while this study showed that HRAD its not only bronchial asthma but also include allergic rhinitis & allergic bronchitis, so thiopental is relatively contraindicated in patients with bronchial asthma & absolutely contraindicated in patient with brochospasm but neither in allergic bronchitis who do not have bronchospasm, nor in allergic rhinitis patients.

Recommendation

The anesthesiologist should distinguish & knows what is the meaning of HRAD in full details to enable him to choose the safe anesthetic induction agent for each disease belong to HRAD.

Table I: Gender distribution of both groups participating in this study

	Case group	Control group	Total
Female	51	47	98
	51%	47%	49%
Male	49	53	102
	49%	53%	51%
Total	100	100	200
	100%	100%	100%

Chi square (x) = 0.57, p value > 0.05 of no significance

Table II: The mean & SD difference of age among both groups

Group	Mean	Number	SD
Case group	30.6	100	8.29
Control group	30.3	100	9.95
Total	30.4	200	9.14

ANOVA test, P value > 0.05 of no significance

Table III: The frequency distribution of different types of hyper-reactive airway diseases among case group

Type of disease	Frequency	%
Bronchial asthma	24	6
Allergic rhinitis	35	8.75
Total	100	25

Chi square (x) = 0.57, p value > 0.05 of no significance

Table IV: The frequency distribution of bronchospasm among both groups

Bronchospasm	Case	Control	Total
Positive	16*	0	16
	18%		8%
Negative	84	100	184
	84%	100%	92%
Total	100	100	200
	100%	100%	100%

Fischer exact = zero. * P value less than 0.05 (significant value)

Table V: The frequency distribution of bronchospasm among different genders for case group

Bronchospasm	Female	Male	Total
Positive	6	10	16
	11.8%	20.4%	16%
Negative	45	39	84
	88.2%	79.6%	84%
Total	51	49	100
	100%	100%	100%

Chi-square = 0.239, P value > 0.05 of no significance

Table VI: The frequency distribution of bronchospasm among different types of hyper-reactive airway diseases of case group

Bronchospasm	Bronchial asthma	Allergic bronchitis	Allergic rhinitis	Total
Positive	14*	2	0	16
	58.3%	2.9%		16%
Negative	10	39	35	100
	41.7%	95.1%	100%	100%
Total	24	41	35	100

Chi-square = 0.2, * P value less than 0.05 of significance

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