

Comparison Among Complications of Common Intravenous Anesthetic Drugs During General Anesthesia for Patients Undergoing Surgery in Sulaimani City

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ABSTRACT

Background: A portion of patients exhibit subsequent cognitive impairment, including memory deficits, after undergoing anesthesia. Despite the wide use and long history of anesthesia, the mechanisms of action that cause loss of consciousness and some of the side-effects, such as temporary amnesia, are not understood.

Methodology: A descriptive cross-sectional study was conducted among patients undergoing surgery in Sulaimani city, and involved 368 patients. Data, in form of questionnaire, have been collected between October 15, 2021 to February 15, 2022. (SPSS) Version 22 was used to analyzed the data.

Results: In this study, 185 (50.3%) were males and 183 (49%) were females, respiratory problem in the form of apnea found in (30.3%) of patients who received (propofol, fentanyl, atracurium) compared to (6.4%) of those patients who received (propofol, (ketamine and fentanyl), atracurium) this difference was significant (P-value < 0.001), (30.3%) of patients who received (propofol, fentanyl, atracurium) (5.4%) of patients who received (thiopental, fentanyl, atracurium) and p value (< 0.001). (28.7 %) of patients who received (propofol, fentanyl, atracurium) recovered late compared to (2.3 %) of patients who received (propofol, (ketamine and fentanyl), atracurium) the difference was significant (P-value < 0.001). systolic blood pressure dropped to below 120 mmhg in (64%) patients and diastolic blood pressure dropped to below 80 mmhg in (62.8%) of patients, who received (propofol, (ketamine and fentanyl), atracurium) and compared to systolic blood pressure that dropped to below 120 mmhg in (74.3%) of patients (74.3%) of patients and diastolic blood pressure dropped to below 80 mmhg in (74.3%) of patients who received (Thiopental, fentanyl, atracurium), the differences were significant (P-value < 0.001). Finally, SpO₂ level of (24.3%) of patients, who received (Propofol, (ketamine and fentanyl), atracurium), dropped to below 95% while the SpO₂ level of (8.2 %) of patients who received (propofol, fentanyl, atracurium), dropped to below 95% whereas the SpO₂ level of (74.3%) of patients, who received (Thiopental, fentanyl, atracurium), dropped to below 95%, these differences were significant with (P-value < 0.001).

Conclusion: this study concluded that (propofol, fentanyl, atracurium) can cause respiratory problem in the form of apnea and delay recovery more than the other two sets of anesthetic drugs, while (Thiopental, fentanyl, atracurium) have effect on lowering SpO₂ level more than the others sets of anesthetic drugs.

Keywords: General anesthesia, Post-operative, SpO₂, and hallucination and delirium.

مقارنة بين مضاعفات أدوية التخدير الوريدي الشائعة أثناء التخدير العام للمرضى الذين يخضعون لعملية جراحية في مدينة السليمانية

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الخلاصة

الخلفية: نشارك تجربتنا مع بالون المعدة لتقييم السلامة والتحمل والفعالية لمرضى السمنة من الدرجة الأولى والثانية. **الأساليب:** من كانون الثاني ٢٠١٥ إلى كانون الثاني ٢٠١٧ ، تم إدخال بالون المعدة في ٨٥ من المرضى في وحدة التنظير التابعة لمستشفى س م س.

مؤشر كتلة الجسم ما بين ٣٠ إلى ٣٩ كجم / م ٢ وكانوا ضمن الفئة العمرية ١٧-٥٠ مع متوسط عمر ٢٩ سنة ، ضمت الدراسة ٥٥ أنثى ٣٠ مريضاً من الذكور ، وخضع المرضى للموافقة على التداخل واتباع الإرشادات. تم إدخال البالون عبر جهاز التنظير العلوي بعد دراسة تشخيصية ، تم ملئ البالون بـ ٥٥٠-٦٠٠ مللتر من المياه المالحة الملونة بصبغة الميثيلين الزرقاء. تم إعطاء مسكن ومضاد للقيء لجميع المرضى لمدة أسبوع ومثبطات مضخة البروتون المضادة للإفراز لمدة ٦ أشهر. كان النظام الغذائي و التمرين الرياضي جزءاً من مرحلة البرنامج والبروتوكول خلال فترة الدراسة. تمت إزالة البالون بعد ٦ أشهر. تمت متابعة المرضى خلال ٦ أشهر من وضع البالون و ٦ أشهر بعد الإزالة. تم توثيق انخفاض الوزن والمضاعفات والإبلاغ عنها.

النتائج : تم الحصول على خسارة مهمة للوزن في ٨٥ ٪ من المرضى بعد ستة أشهر و ٧٥ ٪ بعد ١٢ من وضع البالون على التوالي. خضع مريض واحد لإزالة البالون مبكراً بعد ٧ أيام من وضعه. مريض آخر أصيب بتسريب سائل البالون وانكماشه مما استلزم استبداله بآخر. كان الألم والقيء اللاحق للعمليات الجراحية في وقت مبكر لدى الجميع ولكنهما اختلفيا بنسبة ٩٠ ٪ خلال الأيام العشرة الأولى.

الخلاصة : في المرضى الذين يتم اختيارهم بشكل جيد ، يعد البالون المعدة أداة فعالة يمكن استخدامها لتحقيق فقدان الوزن مع الحد الأدنى من المضاعفات.

الكلمات المفتاحية : السمنة ، بالون المعدة ، النظام الغذائي .

INTRODUCTION

General anesthesia is used more than 60,000 times every day in the United States, and 235 million times worldwide.¹ and every year, a large number of people have surgery. General anesthesia is not without hazards and problems, despite the fact that it is becoming increasingly safe. Anesthesia-related death is uncommon and has decreased dramatically during the last five decades.^{2,3}

The most common problems are cardiovascular and respiratory. Myocardial infarction, interference with lung mechanics, and exacerbation of preexisting comorbidities can all occur. Acute renal impairment and the development of long-term postoperative cognitive dysfunction are two more significant risks. Postoperative nausea and vomiting, sore throat, and dental damage are all minor but important side effects of general anesthesia. Many of the risks associated with general anesthesia can be predicted and avoided by being aware of them⁴

Atelectasis, aspiration, and bronchospasm are anesthesia-related problems; worsening of pre-existing lung illness and infection are less important in the intraoperative period.⁵ Atelectasis is a risk factor for the development of pneumonia and acute lung damage, accounting for up to 70% of severe postoperative hypoxemia⁶ Mechanical compression of alveoli, reabsorption of alveolar gases, and paralysis cause diaphragm displacement within minutes following general anesthesia induction. Airway resistance is increased as functional residual capacity and lung compliance are diminished. V/Q mismatch (or shunt), poor gas exchange, hypoxemia, diaphragm dysfunction, reduced respiratory drive, and suppression of respiratory drive, inhibition of cough, and impaired mucociliary clearance can all occur during general anesthesia⁷.

The most prevalent cause of airway-related fatality during anesthesia is aspiration of stomach contents into the airway⁸. It affects 1:4000 patients getting general anesthesia, and 1:900 patients requiring emergency surgery. Intubation and extubation pose the biggest danger. The first step in preventing aspiration is to identify patients who are at risk. Bronchospasm is produced by bronchial smooth muscle contraction and edema, which if left untreated can lead to hypoxia, hypotension, and death⁹. It affects 0.2 percent of people who are put under general anesthesia. Preexisting airway disease, recent or active upper respiratory tract infection, smoking history, and atopy all increase risk. Airway catheterization or inhalational anesthetic drug delivery are the main triggers. Bronchospasm can also be caused by early surgical stimulation without proper depth of anesthetic, airway soiling, and drugs (e.g., b-blockers, neostigmine, morphine, atracurium)¹⁰.

Intravenous anesthetics are a class of fast-acting drugs that are used to induce a condition of drowsiness or decreased consciousness. Propofol, etomidate, ketamine, and barbiturates are some of the most commonly used intravenous anesthetics (e.g., thiopental). Propofol is the standard drug for induction of anesthesia and etomidate is most commonly used in cases of hemodynamic instability, Propofol, is most popular induction agent with its favorable characteristics of rapid and smooth induction and recovery, decrease incidence of nausea and vomiting, etc.¹¹. On the other hand, the principal disadvantages are decreased blood pressure, dose-dependent depression of breathing, and injection discomfort¹². Because of its strong dissociative, sympathomimetic, and analgesic effects, ketamine is used frequently in emergency care. Thiopental, a barbiturate, lowers intracranial pressure, making it beneficial in patients with high ICP and/or head

trauma. While the properties and adverse effects of intravenous anesthetics vary depending on the drug, they always have a significant hypnotic effect¹³. The purpose of our study is to compare complications of intravenous anesthetic drugs, including respiratory problems (apnea), delay recovery, blood pressure and SpO₂ level between the patient's groups who received various intravenous anesthetic drug sets, including (propofol, (ketamine and fentanyl), atracurium), (propofol, fentanyl, atracurium) and (thiopental, fentanyl, atracurium).

Materials and Methods

Study design:

This is a cross-sectional study.

Study population:

The current study involved 368 patients (185 males and 183 females) who had surgeries in four hospitals in Sulaimani city, one of the large cities of Iraqi Kurdistan region, position in the eastern north of Iraq, hospitals including (Shorsh teaching hospital, Teaching Hospital, Maternity Hospital, and Shar Hospital) in the period from October 2021 to October 2022.

Data collection:

Data of the patients were collected by self-administration questionnaire that include socio demographic variables such as age, sex, education level, marital status, address, history of previous operation, pre and postoperative pulse rate, blood pressure, blood sugar and complications of intravenous anesthetic drugs including (head ache, salivation, hypo or hypertension and other complications).

Data analysis:

The data of the patients were analyzed by using the SPSS-22 (Statistical Package for Social Sciences) which consisted of descriptive and analytic data; where the descriptive data included frequencies, percentages, and means, while in the analytic data included chi-square test, the level of significance was (P-value < 0.05).

Ethical approval:

Ethical approval was taken from the Sulaimani Polytechnic University/ College of Health and medical technology according to the document number CH 0043 dated 26 September, 2021. The patients informed about the objectives of the study and they were free to participate in the study. The confidentiality of the collected data was guaranteed.

RESULTS

The demographic characteristics of the participants of this study are shown in table (1), the mean age was 45.5 years, and nearly half of the participants were between 30 - 50 years old.

the frequency and percentage of patients who received anesthetic intravenous medications, were 46.7% of the patients received (propofol, (ketamine and fentanyl), atracurium), 33.2% of patients received (propofol, fentanyl, atracurium) and only 20.1% of patients received (thiopental, fentanyl, atracurium), as shown in figure (1).

we found that (30.3%) of patients who received (propofol, fentanyl, atracurium) have respiratory problem, in the form of apnea, which was the highest range while (6.4%) of those patients which who received (propofol, (ketamine and fentanyl), atracurium) and only (5.4%) of patients who received (thiopental, fentanyl, atracurium) have respiratory problem, the differences between the three were significant with p-value < 0.001, as it is shown in table (2).

also we found that (28.7%) of patients who received (propofol, fentanyl, atracurium) recovered late which was the highest frequency while (2.3%) of those patients who received (propofol, (ketamine and fentanyl), atracurium) recovered late and all of those patients who received (thiopental, fentanyl, atracurium) recovered normally, the differences between first and second was significant with p-value < 0.001, as it is shown in table (3) p-value are scientifically significant.

In addition our results showed that (20.9%) of patients have systolic blood pressure under 120 mmhg after receiving (propofol, (ketamine and fentanyl), atracurium) this frequency increased to (84.9%), (100%) of patients had systolic blood pressure over 120 mmhg after receiving (propofol, fentanyl, atracurium) this frequency decreased to (44.3%), and (82.4%) of patients had systolic blood pressure over 120 mmhg after receiving (thiopental, fentanyl, atracurium) this frequency decreased to (8.1%), p-value is scientifically significant and by comparing these results we noticed that dropping of blood pressure among third group is higher compared to second group, this difference was significant with p-value < 0.001, while the first group the frequency increased,

Furthermore, (29.1%) of patients have diastolic blood pressure under 80 mmhg after receiving (propofol, (ketamine and fentanyl), atracurium) this frequency increased to (91.1%), (0.8 %) of patients had diastolic blood pressure under 80 mmhg after receiving (propofol, fentanyl, atracurium) this frequency increased to (55.9%), and (17.6%) of patients had diastolic blood pressure under 80 mmhg after receiving (thiopental, fentanyl, atracurium) this frequency increased to (91.9%),

the p-values were significant, as shown in table (4) and (5)

Finally, (11%) of patients have SpO₂ level under 95% after receiving (propofol, (ketamine and fentanyl), atracurium) this frequency increased to (34.3%), while (45.1 %) of patients have SpO₂ level under 95% after receiving (propofol,fentanyl,

atracurium) this frequency increased to (53.3%), whereas (39.2 %) of patients have SpO₂ level under 95% after receiving (thiopental, fentanyl, atracurium) this frequency increased to (45.9%), the differences between the three groups were significant with p-values, as it shown in table (6).

Table 1: General characteristics of the patients. (n=368)

Characteristics		Number	Percent %
Gender	Male	185	50.3
	Female	183	49.7
Age group (in years)	<30	69	18.8
	30-50	183	49.7
	50-70	85	23.1
	>70	31	8.4
Marital status	Single	37	10.1
	Married	331	89.9
Education level	Illiterate	124	33.7
	Preparatory	175	47.6
	Diploma	52	14.1
	Bachelor	17	4.6
Alcohol consumption	Yes	1	0.3
	No	367	99.7
Cigarette smoking	No	288	78.3
	Yes	80	21.7
Group of BMI	<18	1	0.3
	18.5-25	246	66.8
	>25	121	32.9

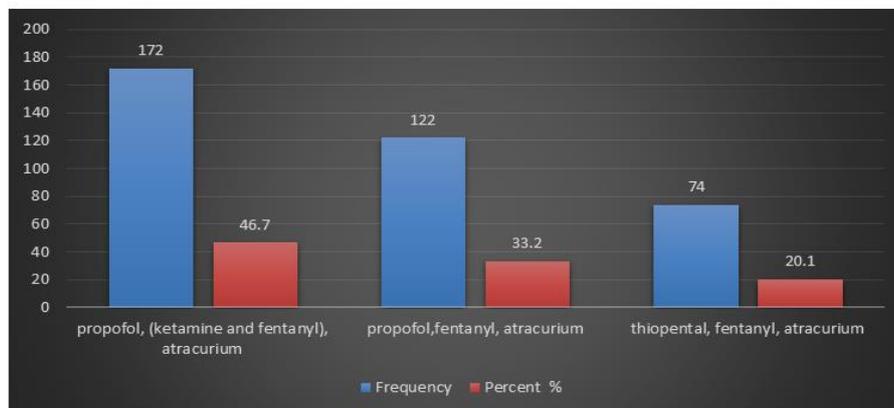


Figure 1: Frequency and percentage of patients who received the three intravenous anesthetic medications (n=368)

Table 2: the frequencies of patients who received intravenous medications and respiratory problem.

Type of taken intravenous medications:	Respiratory problem		P-value
	No	yes	
Propofol, (ketamine and fentanyl), atracurium	161 (93.6 %)	11 (6.4 %)	< 0.001
Propofol ,fentanyl, atracurium	85 (69.7%)	37 (30.3%)	
Thiopental, fentanyl, atracurium	70 (94.6 %)	4 (5.4 %)	

Table 3: the frequencies of patients who received intravenous medications and delay recovery.

Type of taken intravenous medications:	Delay recovery		P-value
	No	yes	
Propofol, (ketamine and fentanyl), atracurium	168 (97.7 %)	4 (2.3 %)	< 0.001
Propofol ,fentanyl, atracurium	87 (71.3 %)	35 (28.7 %)	
Thiopental, fentanyl, atracurium	74 (100%)	0 (0 %)	

Table 4: the frequencies of patients who received intravenous medications and postoperative systolic blood pressure.

Type of taken intravenous medications:	Preoperative systolic blood pressure			Postoperative systolic blood pressure		
	<120	>120	P-value	<120	>120	P-value
Propofol, (ketamine and fentanyl), atracurium	36 (20.9 %)	136 (79.1 %)	< 0.001	146 (84.9 %)	26 (15.1 %)	< 0.001
Propofol ,fentanyl, atracurium	0 (0 %)	122 (100 %)		68 (55.7 %)	54 (44.3 %)	
Thiopental, fentanyl, atracurium	13 (17.6%)	61 (82.4 %)		68 (91.9%)	6 (8.1 %)	

Table 5: the frequencies of patients who received intravenous medications and postoperative diastolic blood pressure.

Type of taken intravenous medications:	Preoperative diastolic blood pressure			Postoperative diastolic blood pressure		
	<80	>80	P-value	<80	>80	P-value
Propofol, (ketamine and fentanyl), atracurium	50 (29.1 %)	122 (70.9 %)	< 0.001	156 (90.7 %)	16 (9.3 %)	< 0.001
Propofol, fentanyl, atracurium	1 (0.8 %)	121 (99.2 %)		73 (59.8 %)	49 (40.2 %)	
Thiopental, fentanyl, atracurium	13 (17.6%)	61 (82.4 %)		68 (91.9%)	6 (8.1 %)	

Table 6: the frequencies of patients who received intravenous medications and postoperative spo2 level

Type of taken intravenous medications:	Preoperative spo2			Postoperative spo2		
	<95	>95	P-value	<95	>95	P-value
Propofol, (ketamine and fentanyl), atracurium	19 (11 %)	153 (89 %)	< 0.001	59 (34.3 %)	113 (64.7 %)	0.004
Propofol ,fentanyl, atracurium	55 (45.1 %)	67 (54.9 %)		65 (53.3%)	57 (46.7 %)	
Thiopental, fentanyl, atracurium	29 (39.2%)	45 (60.8 %)		34 (45.9%)	40 (54.1 %)	

DISCUSSION

In this study we compared the frequencies of some of postoperative complications (respiratory problems, delay recovery, blood pressure and SpO₂ level), after receiving intravenous anesthetic drugs, between three sets of anesthetic drugs which were (propofol + fentanyl + atracurium), ((propofol + (ketamine and fentanyl) +atracurium)) and (Thiopental + fentanyl + atracurium) among our patients who had surgeries.

the frequency of respiratory problem in the form of apnea was (30.3%) of patients who received (propofol, fentanyl, atracurium) compared to (6.4%) of those patients who received (propofol, (ketamine and fentanyl), atracurium) this difference was significant (P-value < 0.001), this finding is in agreement with the systematic review which was published in The American Journal of Emergency Medicine revealed that the study contained 18 clinical trials that satisfied our criteria. Pooling of data showed that ketofol is significantly effective for reduction of respiratory complication and with relative risk (RR) of 0.31 in 14 trials (95% confidence interval [CI], 0.47-0.7; P = .001)¹⁴, furthermore by comparing the frequency of respiratory problem in the form of apnea between patients who received (propofol, fentanyl, atracurium) which was (30.3%) and those patients who received (thiopental, fentanyl, atracurium) which was (5.4%), this difference was significant p-value (< 0.001) which showed that group of propofol had respiratory problems more than group of thiopental, this finding is in agreement with the study which had been done in Thiopentone in both doses was significantly less excitatory than propofol¹⁵.

Furthermore we have found that (28.7 %) of patients who received (propofol, fentanyl, atracurium) recovered late compared to (2.3 %) of patients who received (propofol, (ketamine and fentanyl), atracurium) the difference was significant (P-value < 0.001) and this finding was in agreement with the study which had been published in (African Health Sciences) the ketofol group, mean recovery duration were lower than in the propofol group without statistically significant difference (P value=0.143 and P value=0.187)¹⁵, but it was not in agreement with the study which had been done in (Department of Anesthesiology and Reanimation, Harran University Medical Faculty, Yenişehir Yerleşkesi, 63300, Şanlıurfa, Turkey), showed that ketamine might cause cardiotoxicity, psychotic episodes, and delayed recovery¹⁶.

In addition, our study found that systolic blood pressure dropped to below 120 mmhg in (64%) patients and diastolic blood pressure dropped to below 80 mmhg in (62.8%) of patients, who

received (propofol, (ketamine and fentanyl), atracurium) and compared to systolic blood pressure that dropped to below 120 mmhg in (74.3%) of patients (74.3%) of patients and diastolic blood pressure dropped to below 80 mmhg in (74.3%) of patients who received (Thiopental, fentanyl, atracurium), it was clear that the dropping of blood pressure among second group was higher compared to first group, and the differences were significant (P-value < 0.001), these finding was in agreement with the study which had been done in (Department of Anesthesia and Critical Care, Christian Medical College and Hospital, Ludhiana, Punjab, India) showed that there was less variation in the mean systolic blood pressure of patients in Group Ketamine as compared to patients in Group Thiopental¹⁷.

Finally, our study found that the SpO₂ level of (24.3%) of patients, who received (Propofol, (ketamine and fentanyl), atracurium), dropped to below 95% while the SpO₂ level of (8.2 %) of patients who received (propofol, fentanyl, atracurium), dropped to below 95% whereas the SpO₂ level of (74.3%) of patients, who received (Thiopental, fentanyl, atracurium), dropped to below 95% and it was clear there were differences between the three groups of patients as the third group showed higher percentage in those who experienced SpO₂ level below 95%, these differences were significant with (P-value < 0.001), these finding were in agreement with the study which had been done in Tehran, Iran, showed that SpO₂ was decreased significantly (P<0.05) throughout the experiment and returned to the level of initial control value after complete recovery¹⁸.

CONCLUSION

Different intravenous anesthetic medications can cause different complications. (propofol, fentanyl, atracurium) can cause respiratory problem in the form of apnea more than (propofol, (ketamine and fentanyl), atracurium). (Propofol, fentanyl, atracurium) cause delay recovery more than (Propofol, (ketamine and fentanyl), atracurium) and (Thiopental, fentanyl, atracurium). (Thiopental, fentanyl, atracurium) have effect on lowering blood pressure more than (Propofol, (ketamine and fentanyl), atracurium). (Thiopental, fentanyl, atracurium) have effect on lowering SpO₂ level more than (Propofol, (ketamine and fentanyl), atracurium).

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