

# Evaluation and Comparison the Effectiveness of Remifentanil, Nitroglycerin, Esmolol, and Nitroglycerin + Esmolol on Blood Pressure And Heart Rate During Rhinoplasty Surgery

Mohammad Aydin Abbas  (PhD)<sup>1</sup>, Orhan Uludag  (PhD)<sup>2</sup>

<sup>1</sup> Raparin Teaching Hospital, Erbil, Iraq

<sup>1,2</sup> Faculty of Pharmacy, Gazi University, Ankara, Turkey

## Abstract

### OPEN ACCESS

**Correspondence Address:** Mohammad Aydin Abbas

Faculty of Pharmacy , Gazi Üniversitesi  
Ankara, Ankara, Turkey

Raparin Teaching Hospital, Erbil, Iraq

**Email:** [pharmacistmuhamedaydin@gmail.com](mailto:pharmacistmuhamedaydin@gmail.com)

**Copyright:** ©Authors, 2022, College of Medicine, University of Diyala. This is an open access article under the [CC BY 4.0](http://creativecommons.org/licenses/by/4.0/) license

(<http://creativecommons.org/licenses/by/4.0/>)

**Website:**

<https://djm.uodiyala.edu.iq/index.php/djm>

**Received:** 19 October 2022

**Accepted:** 15 November 2022

**Published:** 25 December 2022

**Background:** Rhinoplasty is still one of the top five aesthetic surgeries performed and is considered one of the most challenging procedures in otorhinolaryngology surgery. Bleeding is one of the most important factors affecting an operation's success. The controlled hypotension method reduces bleeding; therefore, it provides a satisfying bloodless surgical field during operation.

**Objective:** To evaluate and compare the effectiveness of (Remifentanil, Nitroglycerin, Esmolol, and Nitroglycerin + Esmolol) on hemodynamic parameters and the effectiveness of these drugs in providing a satisfactory bloodless surgical field during rhinoplasty surgery.

**Patients and Methods:** 200 adults aged 20 to 45 years were randomly divided into four groups: Remifentanil (R), Nitroglycerin (N), Esmolol (E), Nitroglycerin + Esmolol (N+E). Systolic blood pressure, diastolic blood pressure, mean blood pressure, and heart rate (SBP, DBP, MBP, and HR) were recorded before anesthesia induction until the operation's end. The bleeding score and the visibility of the surgical field were rated by the surgeon as follows: (0) No bleeding, (1) Mild bleeding - no aspiration required, (2) Mild bleeding - intermittent aspiration is required, (3) Moderate bleeding - frequent aspiration is required, (4) Severe bleeding-constant aspiration is required, (5) Severe bleeding, operation stopped because of surgical field invisibility.

**Results:** As a result, during operation, decreased values of (SBP, DBP, and MBP) were statistically significant in all groups. At the same time, the value of HR showed a statistically significant decrease in the (E) and (R) groups, while there was a statistically significant increase in the (N) and (N+ E) groups. Patients in the (E) and (R) groups had a statistically significantly lower bleeding score than the patients in the (N) and (N + E) groups.

**Conclusion:** Patients had better Hemodynamic stability and surgical field visibility after applying Esmolol and Remifentanil.

**Keywords:** Controlled hypotension, Rhinoplasty, Esmolol, Remifentanil, Nitroglycerin, and Nitroglycerin + Esmolol, Bleeding score, Surgical field visibility.

## Introduction

Rhinoplasty is a surgical procedure that is used to reshape the nose. This surgery is one of the most challenging procedures in aesthetic surgery and otolaryngology [1-3]. The most important factor affecting the success of rhinoplasty operations under general anesthesia conditions is bleeding [4, 5]. Reduced intraoperative bleeding provides the surgeon with better visualization of the operative field, better analysis of tissues, and more comfortable use of preferred techniques [6-9]. Controlled hypotension anesthesia is a well-known and effective technique used to reduce blood loss and subsequently reduce the need for blood transfusions, as well as provide a satisfactory bloodless surgical field in many operations, allowing the surgeon to see the surgical area more clearly, better analyze the tissues, and apply their chosen procedures more efficiently [10, 11]. For this reason, many rhinoplasty surgeons prefer to operate with controlled hypotensive anesthesia [7].

There are many definitions for controlled hypotension, lowering systolic blood pressure to 80-90 mmHg, reduction in mean arterial pressure (MAP) to 50-70 mmHg, reducing MAP by 20-30% from baseline values, and maintenance at a reduced level throughout the surgery [4, 8, 12-14].

The main purpose of drugs used to achieve controlled hypotension is to provide the desired level of controlled hypotension without affecting the perfusion of living organs. This effect should be rapid and disappear quickly when the drug is discontinued without the formation of toxic

metabolites. Also, hypotensive agents are used to preventing hemodynamic changes during endotracheal intubation [15-18].

Many pharmacological agents are available to achieve controlled hypotension, allowing the surgeon to observe the surgical region more clearly, study the tissues more thoroughly, and perform their selected operations more quickly and efficiently [19]. In addition to agents that can be used successfully alone, some can be combined with other agents to limit dosage requirements and decrease the adverse effects of each agent [20, 21]. Commonly used agents to provide Controlled hypotension anesthesia; are inhalation anesthetics [22], sodium nitroprusside [23], nitroglycerine [15], beta-blockers (especially esmolol) [24, 25], a competitive non-selective  $\beta$ -adrenergic and a selective postsynaptic  $\alpha$ 1-adrenergic receptor blocker, alpha- and beta-adrenergic antagonists such as labetalol [26], and narcotics (especially fentanil and Remifentanil) [27, 28] are used to achieve controlled hypotension. In some operations like Arthroplasty and Caesarean and major trauma, intravenous antifibrinolytic is used to prevent or treat excessive blood loss during operation [29].

The aim of this study: To evaluate and compare the effectiveness of Remifentanil, Nitroglycerin, Esmolol, and Nitroglycerin + Esmolol on blood pressure and heart rate and to evaluate and compare the clinical effectiveness of providing controlled hypotension with Remifentanil, Nitroglycerin, Esmolol, and Nitroglycerin +

Esmolol. At the same time, to evaluate and compare these drugs to provide a satisfactory bloodless surgical field during rhinoplasty surgery to increase intraoperative visibility.

### Patients and Methods

This study included two hundred adult patients who underwent rhinoplasty operations in the Plastic and Reconstructive Surgery Department.

After the patient entered the operating room, the heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean blood pressure (MBP) values, ages, and genders of the patients were recorded. Anesthesia induction was achieved in all patients with 2 mg/kg propofol and 1 µg/kg fentanyl. After muscle relaxation was achieved with rocuronium (0.6 mg/kg), endotracheal intubation was performed, and Anesthesia was maintained with sevoflurane (2-3%).

Following the administration of the anesthetic (induction of anesthesia) and the endotracheal tube placement, the patients were given five minutes of quiet rest before continuing with the procedure. Then, T5 (T 5 minutes) hemodynamic values (baseline values) were measured, and a routine treatment protocol was started for the patients.

Medications were started to be given to provide controlled hypotension, 0.25 µg/kg/min remifentanyl to (R group), 5 µg/kg/min nitroglycerin to (N group), 200 µg/kg/min esmolol to (E group), and the same doses of nitroglycerin+esmolol to (N+E group) were given to the patient in each group and continued throughout the operation. The reduction in systolic arterial pressure was considered effective when the

required pressure of 80-95 mmHg was obtained. Drug doses were adjusted to maintain the mean arterial pressure 20-30% below the baseline value. The specialist anesthetist adapts the infusion rate to protect hypotension, maintain the desired blood pressure level, and achieve controlled hypotension during surgery. The infusion rates of the study drugs were titrated to maintain MBP at 60-80 mmHg.

To monitor and record any changes during the operation. Changes in HR, SBP, DBP, and MBP levels were monitored and recorded in all cases before anesthesia induction, 5 minutes after endotracheal intubation, and every 15 minutes until the end of the surgery.

### Participants

Rhinoplasty surgery was performed on two hundred normotensives (Healthy patient ASA I) patients. Patients aged between 20-45 years of both sexes were randomly divided into four groups by the specialist anesthetist.

- Remifentanyl group (n=50).
- Nitroglycerin group (n=50).
- Esmolol group (n=50).
- Nitroglycerin+Esmolol (n=50).

The anesthesiologist determined the dose of the drug. The data included in the study were recorded from the monitor.

Before surgery, all patients were asked to fast for at least 8 hours.

### Exclusion Criteria

Uncontrolled hypertension, severe renal or hepatic diseases, anemia, patients aged <20 and > 45 years, patients who refused to participate in this study, who are pregnant or may be become pregnant, have psychiatric disorders, have cardiovascular system disease, were not included in this study.

### Visibility of the Surgical Field

During the operation, operative field bleeding amount and visibility of the surgical field was subjectively (personally) and visually graded by the surgeon from the beginning of the operation to the end of the operation in the following manner, Categories for evaluating the visibility of the intraoperative surgical field:

- (0) No bleeding.
- (1) Mild bleeding - no aspiration required.
- (2) Mild bleeding - intermittent aspiration required.
- (3) Moderate bleeding - frequent aspiration required.
- (4) Severe bleeding - constant aspiration is required.
- (5) Severe bleeding, operation stopped because of surgical field invisibility.

### Statistical Analysis

The results were statistically evaluated using [Statistical Package for the Social Sciences (SPSS) version 24.0]. "Shapiro – Wilk" test was used to determine the normal distribution of the data. Patient

characteristics, hemodynamic variables (Systolic blood pressure, diastolic blood pressure, mean blood pressure, and heart rate), and visibility of the intraoperative surgical field were compared among four Groups. All data obtained are expressed as Mean ± Standard Deviation. Comparisons between groups were made with the "Duncan test." The mean and standard deviation of the bleeding score were statistically analyzed with the "Friedman test" to compare individual group pairs; the "Wilcoxon test" was used. When the results were ( $p > 0.05$ ), the changes were considered statistically insignificant; changes were considered statistically significant when the P-value was 0.05 or less.

### Results

#### Demographic Data of Patients

This study included 200 patients, 48 male (24%) and 152 female (76%); as shown in Table (1), there is no statistically significant difference between the four groups regarding gender distribution and average age.

**Table (1):** Comparison of demographic characteristics between groups

	Remifentanil		Nitroglycerin		Esmolol		Nitroglycerin + Esmolol	
	M	F	M	F	M	F	M	F
<b>SEX (no.&amp; %)</b>	13 26%	37 74%	12 24%	38 76%	12 24%	38 76%	11 22%	39 78%
<b>AGE</b>	30.86±6.47		30.96±6.43		30.92±6.43		31.10±6.20	

Ages are given as Mean±Standard Deviation (M: Male, F: Female, n=50,  $p > 0.05$ ).

### Pre-Operative HR and BP (SBP, DBP, and MBP) Values In Different Study Groups and Their Comparisons.

Before the operation, the HR and SBP values between different study groups were close to each other, and there was no significant

difference between the DBP and MBP values of the various study groups.

In the pre-operative period, Heart Rate levels in the Remifentanil group were found to be significantly higher (with a small difference) when compared to the

Nitroglycerin+Esmolol group; however, no difference was found in the Remifentanil group when compared to the Esmolol and Nitroglycerin groups, At the same time, no statistical difference was observed in the Nitroglycerin+Esmolol group compared to the Esmolol and Nitroglycerin groups, and no statistical difference was observed between Esmolol and Nitroglycerin groups.

In the pre-operative period, SBP levels were significantly higher (with a small difference) in the Remifentanil group compared to the Esmolol and Nitroglycerin

groups. In contrast, no significant difference was found when comparing the Remifentanil group to the Nitroglycerin+Esmolol group. No significant difference was observed between the Nitroglycerin+Esmolol group and the other groups, and no statistical difference was observed between Esmolol and Nitroglycerin groups.

There was no significant difference between the four study groups in the DBP & MBP measurements during the pre-operative period.

**Table (2):** Pre-Operative HR and BP (SBP, DBP, and MBP) Values in different study groups and their Comparisons

Before Operation	Remifentanil	Nitroglycerin	Esmolol	Nitroglycerin + Esmolol
HR (beats/min)	84.98±3.63*	83.64±4.07	82.84±5.12	82.30±4.80
SBP (mmHg)	131.70±3.66	128.44±4.34#	128.22±5.37#	130.04±4.31
DBP (mmHg)	80.62±3.96	80.26±4.77	81.8±4.58	81.13±4.23
MBP (mmHg)	97.64±3.66	96.30±4.28	97.26±4.40	97.88±3.34
Values are given as Mean±Standard Deviation (*Different from Nitroglycerin+Esmolol, # different from Remifentanil, n=50, p<0.05).				

Intra-Group (within the same group) HR and BP (SBP, DBP, and MBP) Values at Scheduled Intervals (T5, T15, T30, T45, T60) and Their Comparisons During The Controlled Hypotension Period For Each Study Group.

**Remifentanil**

In the Remifentanil group, the decrease in HR, SBP, DBP, and MBP Values during the Controlled Hypotension at T15, T30, T45, and T60 after drug administration was

statistically significant when compared to the T5 period.

In addition, HR and SBP values at the T30, T45, and T60 periods were statistically significantly lower than those at the T15 times.

The DBP value in the T45 period was significantly lower than the T15 values.

MBP values in the T45 and T60 periods were also significantly lower than T15 values.

**Table (3):** Remifentanil group HR and BP (SBP, DBP, and MBP) values at scheduled intervals (T5, T15, T30, T45, T60) and their comparisons during the Controlled Hypotension Period

Remifentanil	T 5	T15	T30	T45	T60
<b>HR (beats/min)</b>	77.06±5.04	62.24±4.60*	59.00±5.20*#	57.92±5.53*#	57.68±5.00*#
<b>SBP (mmHg)</b>	104.54±5.12	94.92±6.62*	88.78±6.97*#	89.62±6.50*#	88.74±6.89*#
<b>DBP (mmHg)</b>	69.70±4.52	60.60±5.19*	59.22±5.96*	56.80±5.58*#	58.08±5.72*
<b>MBP (mmHg)</b>	81.38±4.57	72.06±5.50*	69.08±6.10*	67.68±5.69*#	68.30±5.79*#

Values are given as Mean±Standard Deviation (\* different from T5, # different from T15, n=50, p<0.05).

### Nitroglycerine

In the Nitroglycerin group, HR values measured at T15, T30, T45, and T60 after drug administration was statistically significantly higher compared to the T5 . In addition, HR values at T30, T45, and T60 intervals were statistically significantly lower than those measured in the T15 time frame. SBP, DBP, and MBP measurements in the Controlled Hypotension period after drug

administration in the Nitroglycerin group were statistically significantly lower at T15, T30, T45, and T60 times compared to the T5 period. In addition, SBP values at the T30, T45, and T60 periods were statistically significantly lower than those measured in the T15 time frame. Also, DBP and MBP values at the T45 period were statistically significantly lower than those measured in the T15 time frame.

**Table (4):** Nitroglycerin group HR and BP (SBP, DBP, and MBP) values at scheduled intervals (T5, T15, T30, T45, T60) and their comparisons during the Controlled Hypotension Period

Nitroglycerin	T 5	T15	T30	T45	T60
<b>HR (beats/min)</b>	76.84±5.43	97.16±4.62*	92.98±3.72* #	91.92±2.43*#	94.28±2.03*#£
<b>SBP (mmHg)</b>	109.56±4.8 7	88.24±6.04*	82.82±7.90* #	81.48±9.34*#	82.14±9.38*#
<b>DBP (mmHg)</b>	72.18±5.14	58.68±5.72*	58.16±6.90*	54.56±8.16*#	56.26±8.53*
<b>MBP (mmHg)</b>	84.62±4.75	68.54±5.55*	66.36±6.86*	63.54±8.29*#	64.90±8.37*

Values are given as Mean±Standard Deviation (\* different from T5, # different from T15, £ different from T45, n=50, p<0.05).

### Esmolol

The decrease in HR, SBP, DBP, and MBP values in the Esmolol group during the Controlled Hypotension period was statistically significant at T15, T30, T45, and T60 intervals after drug administration when compared with the T5 period. In addition,

SBP values at the T30, T45, and T60 periods were statistically significantly lower than those measured in the T15 time frame, and MBP values at the T45 period were statistically significantly lower than those measured in the T15 period.

**Table (5):** Esmolol group HR and BP (SBP, DBP, and MBP) values at scheduled intervals (T5, T15, T30, T45, T60) and their comparisons during the Controlled Hypotension Period

Esmolol	T 5	T15	T30	T45	T60
<b>HR (beats/min)</b>	74.70±5.62	67.02±5.74*	64.82±5.20*	65.66±4.85*	64.32±4.41*
<b>SBP (mmHg)</b>	111.40±5.52	96.36±6.63*	92.04±6.30*#	90.40±6.14*#	91.42±6.13*#
<b>DBP (mmHg)</b>	70.20±4.53	61.84±5.19*	60.58±4.78*	60.06±5.19*	60.92±5.16*
<b>MBP (mmHg)</b>	83.92±4.49	73.40±5.02*	71.06±4.58*	70.18±4.87*#	71.06±4.67*
Values are given as Mean±Standard Deviation (*different from T5, # different from T15, n=50, p<0.05).					

**Nitroglycerin+Esmolol**

In the Nitroglycerin+Esmolol group during the Controlled Hypotension period, the increase in HR measurements at T15, T30, T45, and T60 intervals after drug administration was found to be statistically significant when compared with the T5 period.

In the Nitroglycerin+Esmolol group, the decrease in SAB, DAB, and MAP measurements in the Controlled Hypotension period, after drug administration, at T15,

T30, T45, and T60 intervals, when compared with T5 time, was statistically significant. In addition, the decrease in SBP, DBP, and MBP measurements in the Controlled Hypotension period, after drug administration, at T30, T45, and T60 intervals when compared with T15 time, was statistically significant.

DBP and MBP values were significantly lower in the T45 timeframes compared to the T30 timeframes.

**Table (6):** Nitroglycerin+Esmolol group HR and BP (SBP, DBP, and MBP) values at scheduled intervals (T5, T15, T30, T45, T60) and their comparisons during the Controlled Hypotension Period

Nitroglycerin + Esmolol	T 5	T15	T30	T45	T60
<b>HR (beats/min)</b>	75.96±5.66	79.70±4.98*	81.14±3.29*	80.10±2.49*	80.74±2.42*
<b>SBP (mmHg)</b>	109.22±4.34	86.60±4.61*	81.52±3.44*#	80.00±3.27*#	80.36±3.38*#
<b>DBP (mmHg)</b>	72.92±3.69	58.92±4.09*	56.42±3.89*#	54.22±3.80*#£	54.62±4.10*#
<b>MBP (mmHg)</b>	85.12±3.73	68.16±3.84*	64.78±3.33*#	62.86±2.99*#£	63.18±3.17*#
Values are given as Mean±Standard Deviation (*different from T5, # different from T15, £ different from T30, n=50, p<0.05).					

In this study, statistically significant and important decreases were observed in SBP, DBP, and MBP levels in all study groups after administering hypotensive agents to provide Controlled Hypotension during surgery. Concerning Heart Rate data, statistically significant decreases in heart rate were identified in the Esmolol and Remifentanil groups. In contrast, statistically significant increases in heart rate were seen in the Nitroglycerin and Nitroglycerin+Esmolol groups. In general, hemodynamic changes in the intraoperative period during surgery were significantly different from baseline measures in all patients and all groups.

**Heart Rate (HR) Values At Scheduled Intervals (T5, T15, T30, T45, T60) and Their Comparisons Between Study Groups**

**During The Controlled Hypotension Period**

HR values in the Remifentanil group were statistically significantly lower than in the Esmolol group, Nitroglycerin group, and Nitroglycerin+Esmolol group.

HR values in the Nitroglycerin group were statistically significantly higher than in the Remifentanil, Esmolol, and Nitroglycerin+Esmolol groups.

HR values in the Esmolol group were statistically significantly higher than in the Remifentanil group and significantly lower than in the Nitroglycerin and Nitroglycerin+Esmolol groups.

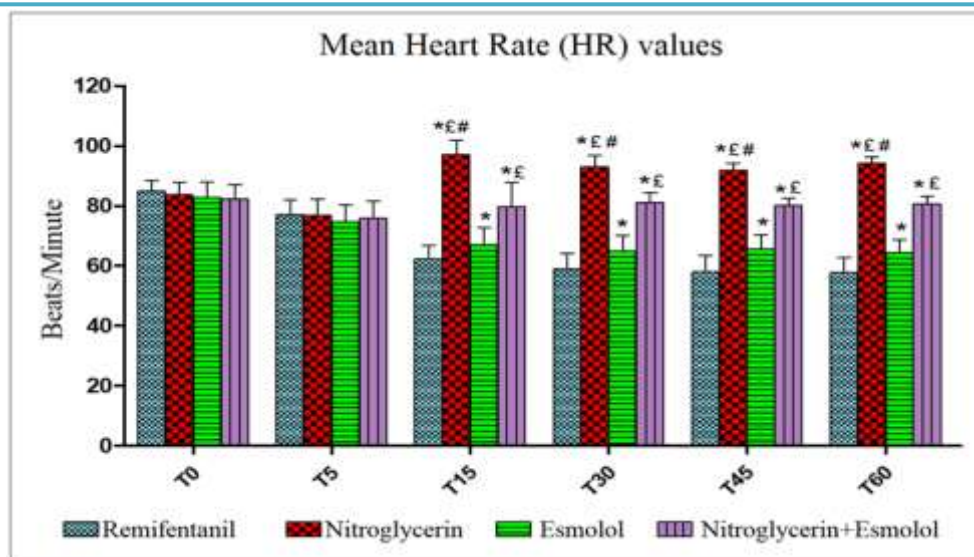
HR values in the Nitroglycerin+Esmolol group were statistically significantly higher than in the Remifentanil and Esmolol group while significantly lower than in the Nitroglycerin group.

**Table (7):** Heart Rate values at scheduled intervals (T5, T15, T30, T45, T60) and their comparisons between study groups during the Controlled Hypotension Period

HR	Remifentanil	Nitroglycerin	Esmolol	Nitroglycerin + Esmolol
T 5	77.06±5.04	76.84±5.43	74.70±5.62	75.96±5.66
T15	62.24±4.60	97.16±4.62*#£	67.02±5.74*	79.70±4.98*£
T30	59.00±5.20	92.98±3.72*#£	64.82±5.20*	81.14±3.29*£
T45	57.92±5.53	91.92±2.43*#£	65.66±4.85*	80.10±2.49*£
T60	57.68±5.00	94.28±2.03*#£	64.32±4.41*	80.74±2.42*£

Values are given as Mean±Standard Deviation (\*different from Remifentanil, £ different from Esmolol, # different from Nitroglycerin+Esmolol, n=50, p<0.05).





**Figure (1):** Mean heart rate (HR) values and comparisons between groups during the Hypotension period (Mean±Standard Deviation, \*different from Remifentanil, £ different from Esmolol, # different from Nitroglycerin+Esmolol, n=50, p<0.05)

**Systolic Blood Pressure (SBP) Values At Scheduled Intervals (T5, T15, T30, T45, T60) and Their Comparisons Between Study Groups During The Controlled Hypotension Period:** SBP values in the Nitroglycerin and Nitroglycerin+Esmolol groups were found to be statistically

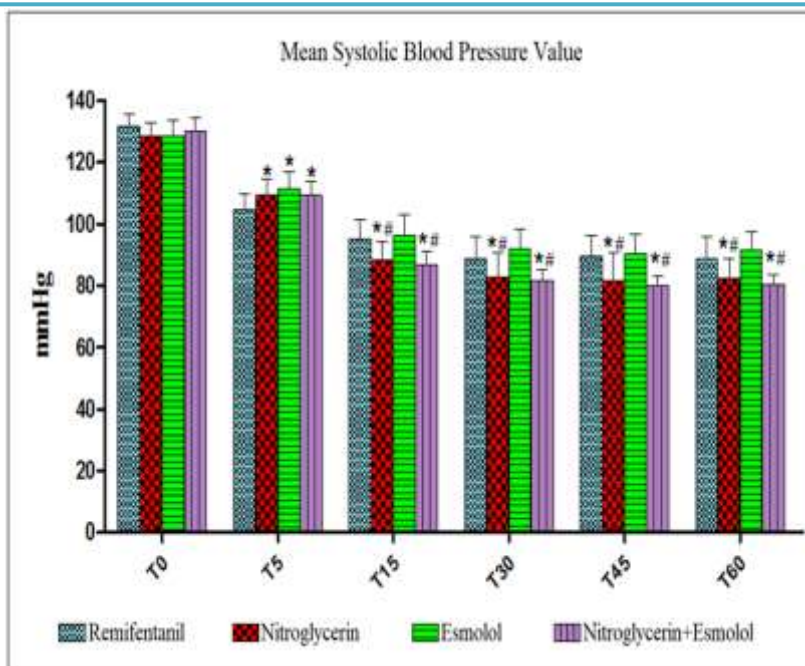
significantly lower when we compared to the Remifentanil and Esmolol groups.

At the same time, there was no difference in SBP values between Remifentanil and Esmolol groups, and there was no difference in SBP values between Nitroglycerin and Nitroglycerin+Esmolol groups.

**Table (8):** Systolic Blood Pressure (SBP) Values at scheduled intervals (T5, T15, T30, T45, T60) and their Comparisons Between Study Groups during the Controlled Hypotension Period

SBP	Remifentanil	Nitroglycerin	Esmolol	Nitroglycerin +Esmolol
T 5	104.54±5.12	109.56±4.87*	111.40±5.52*	109.22±4.34*
T15	94.92±6.62	88.24±6.04*#	96.36±6.63	86.60±4.61*#
T30	88.78±6.97	82.82±7.90*#	92.04±6.30	81.52±3.44*#
T45	89.62±6.50	81.48±9.34*#	90.40±6.14	80.00±3.27*#
T60	88.74±6.89	82.14±6.38*#	91.42±6.12	80.36±3.38*#

Values are given as Mean±Standard Deviation (\* different from Remifentanil, # different from Esmolol, n=50, p<0.05).



**Figure (2):** Change in Mean systolic blood pressure value and comparisons between groups during the Hypotension period (Mean±Standard Deviation, \*different from Remifentanyl, # different from Esmolol, n=50, p<0.05)

**Diastolic Blood Pressure (DBP) Values At Scheduled Intervals (T5, T15, T30, T45, T60) and Their Comparisons Between Study Groups During The Controlled Hypotension Period:**

No statistically significant difference was observed between Nitroglycerin, Nitroglycerin+Esmolol, and Remifentanyl groups in the mean DBP level during periods of Controlled Hypotension (T15-T60).

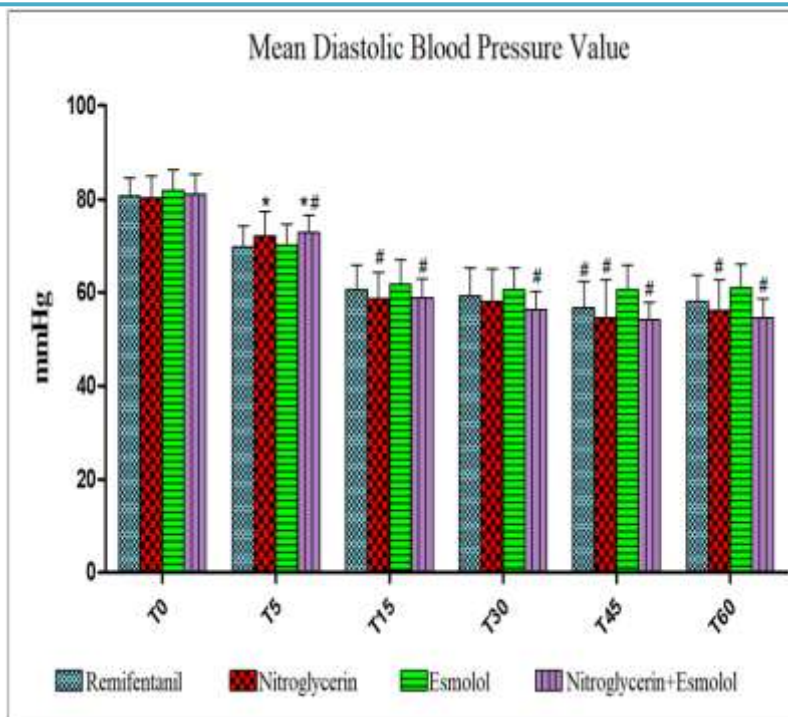
No statistically significant difference was observed between the Remifentanyl group and the Esmolol group in the mean DBP level during periods of Controlled Hypotension (T15-T60).

During periods of the Controlled Hypotension (T15-T60), DBP values showed a statistically significant decrease in Nitroglycerin and Nitroglycerin+Esmolol group when compared to the Esmolol group.

**Table (9):** Diastolic Blood Pressure (DBP) Values at scheduled intervals (T5, T15, T30, T45, T60) and their Comparisons Between Study Groups during the Controlled Hypotension Period

DBP	Remifentanyl	Nitroglycerin	Esmolol	Nitroglycerin +Esmolol
T 5	69.70±4.52	72.18±5.14*	70.20±4.52	72.92±3.69*#
T15	60.60±5.19	58.68±5.72#	61.84±5.19	58.92±4.09#
T30	59.22±5.96	58.16±6.90	60.58±4.78	56.42±3.89#
T45	56.80±5.58#	54.56±8.16#	60.60±5.19	54.22±3.80#
T60	58.08±5.72	56.26±6.53#	60.92±5.16	54.62±4.10*#

Values are given as Mean±Standard Deviation (\*different from Remifentanyl, # different from Esmolol, n=50, p<0.05)



**Figure (3):** Change in Mean Diastolic arterial pressure value and comparisons between groups during the Hypotension period. (Mean±Standard Deviation, \*different from Remifentani, # different from Esmolol, n=50, p<0.05)

**Mean Blood Pressure (MBP) Values At Scheduled Intervals (T5, T15, T30, T45, T60) and Their Comparisons Between Study Groups During The Controlled Hypotension Period :**

During periods of the Controlled Hypotension (T15-T60), MBP levels were found to be statistically significantly lower in

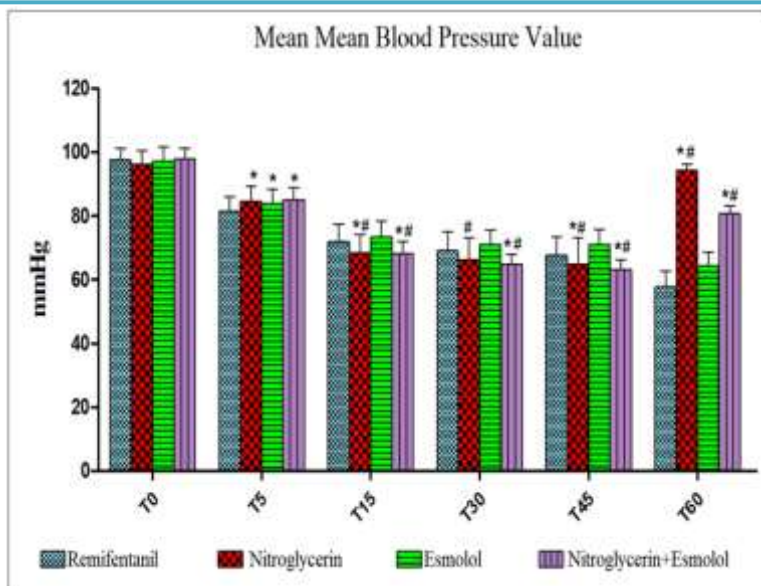
the Nitroglycerin and Nitroglycerin+Esmolol groups when compared to the Remifentani and Esmolol groups .

At the same time, there was no statistical difference between Remifentani and Esmolol groups, and no statistical difference was observed between Nitroglycerin and Nitroglycerin+Esmolol groups.

**Table (10):** Mean Blood Pressure (MBP) values at scheduled intervals (T5, T15, T30, T45, T60) and their comparisons between study groups during the Controlled Hypotension Period

MBP	Remifentani	Nitroglycerin	Esmolol	Nitroglycerin +Esmolol
T 5	81.38±4.57	84.62±4.75*	83.92±4.49*	85.12±3.73*
T15	72.06±5.50	68.54±5.55*#	73.40±5.02	68.16±3.84*#
T30	69.08±6.10	66.36±6.86#	71.06±4.58	64.78±3.33*#
T45	67.68±5.69	63.54±8.29*#	70.18±4.87	62.86±2.99*#
T60	68.30±5.79	64.90±8.37*#	71.06±4.67	63.18±3.17*#

Values are given as Mean±Standard Deviation (\*different from Remifentani, # different from Esmolol, n=50, p<0.05).



**Figure (4):** Change in Mean Mean Blood pressure value and comparisons between groups during the Hypotension period. (Mean±Standard Deviation, \*different from Remifentani, # different from Esmolol, n=50, p<0.05)

**Bleeding Score Values and Their Comparisons Between Study Groups During The Controlled Hypotension Period.**

In line with the data obtained from the study, the beneficial effect of Controlled hypotensive anesthesia is reflected in the surgical field visibility score.

The patients in the Esmolol group and those in the Remifentani group had similar

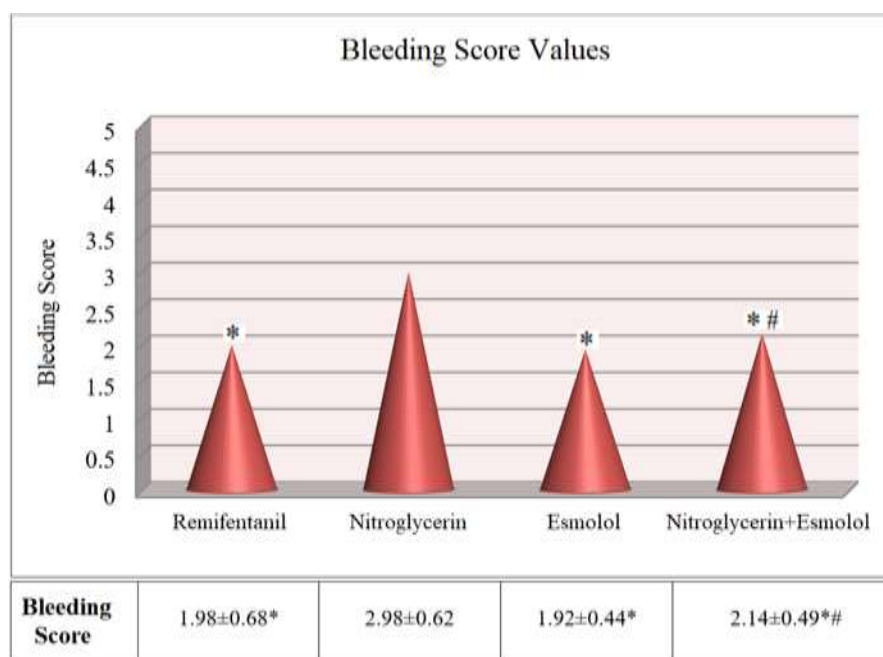
bleeding scores without significant differences. In addition, these values were found to be statistically significantly lower when compared with the patients in the Nitroglycerin and Nitroglycerin+Esmolol groups. These results showed that patients had better surgical field image quality after applying Esmolol and Remifentani to provide Controlled Hypotension during surgery.

**Table (11):** The difference in bleeding score values and their comparisons between study groups during the Controlled Hypotension Period

	Remifentani	Nitroglycerin	Esmolol	Nitroglycerin +Esmolol
<b>Bleeding Score</b>	1.98±0.68*	2.98±0.62	1.92±0.44*	2.14±0.49*#
Values are given as Mean±Standard Deviation (*different from nitroglycerin group, # different from Esmolol group, n=50, p<0.05).				

**Table (12):** Bleeding Score values Comparison Between Groups during the Controlled Hypotension Period

Bleeding Score Values and comparison	P-value
Esmolol- Nitroglycerin	0.0001
Esmolol- Remifentaniol	0.6
Esmolol- (Esmolol+ Nitroglycerin)	0.008
Remifentaniol- (Esmolol+ Nitroglycerin)	0.19
Remifentaniol- Nitroglycerin	0.0001
Nitroglycerin- (Esmolol+ Nitroglycerin)	0.0003



**Figure (5):** Difference in bleeding score values and comparisons between groups during Controlled Hypotension Period (Mean±Standard Deviation, \*different from nitroglycerin group, # different from Esmolol group, n=50, p<0.05)

### Discussion

Rhinoplasty is a surgical procedure performed to alter the nose's appearance, enhance breathing, or both. Rhinoplasty is considered a very complex operation in both aesthetic and reconstructive surgery. However, despite the difficulty of obtaining the desired result, a high degree of patient satisfaction can also be achieved [30, 31]. In

rhinoplasty surgery, even minor bleeding will make it challenging to work in the surgical field. Therefore, it is necessary to lower blood pressure in a controlled manner to obtain a bloodless surgical field [32, 33]. Controlled lowering of blood pressure to certain levels to reduce bleeding during surgery while maintaining good perfusion to organs is an important technique. These

procedures are the main event for controlled hypotensive anesthesia [34, 35].

In addition, it is of great importance in preventing severe complications that may occur and shortening the surgical time. For these reasons, controlled hypotensive anesthesia is one of the main methods to provide a suitable surgical field [36, 37]. Many studies have stated the advantages of using hypotensive anesthesia during rhinoplasty surgery [38].

Many studies have compared two medications to provide controlled hypotension, while research comparing three agents is limited. [39]. In our study, the evaluation and comparison of the effects of drugs from three different drug groups and their combination on 200 patients were discussed. No study with four groups covering such a large number of patients has been found in the literature.

Thus, considering the results of similar studies, in our research, the advantage of using Remifentanyl, Nitroglycerin, and Esmolol separately and Nitroglycerin+Esmolol combination to induce controlled hypotension during rhinoplasty surgery was examined.

In this study, the efficacy of the three most used drugs [remifentanyl (opioid receptor agonist), esmolol (short-acting-adrenergic receptor blocker), Nitroglycerin (vasodilator)] and nitroglycerin+esmolol combination, which are used to achieve controlled hypotension during rhinoplasty surgery and to provide visibility of the surgical field was evaluated and compared in terms of the hemodynamic response, operative field visibility, and the amount of bleeding during surgery.

When the demographic data of the patients participating in this study were examined, Gender distribution within all groups showed no statistical difference, and approximately 24% of the within-group distribution was male and 76% female. When the mean age was considered, it was approximately  $30 \pm 2$  without any significant difference between the different groups. This finding showed no difference between the patients would affect the study results.

The use of Remifentanyl (in patients in the remifentanyl group) has been shown to cause a significant decrease in SBP, DBP, MBP, and HR levels. The results of our study show that Remifentanyl provides appropriate surgical field visibility and controlled hypotension in patients undergoing rhinoplasty. These results are in agreement with the results of previously published studies [7, 16, 19, 21, 27, 40, 41].

In our study results, it was observed that the patients in the Nitroglycerin group had a significant decrease in SBP, DBP, and MBP levels; at the same time, reflex tachycardia was observed, which is a disadvantage of Nitroglycerin. We concluded that Nitroglycerin could be used safely to provide controlled hypotension in patients without cardiovascular problems during rhinoplasty surgery. These findings are consistent with the results of previous similar studies [2, 3, 42-44].

In the results of our research, there was a statistically significant decrease in the levels of SBP, DBP, MBP, and HR in the patients in the Esmolol group. It has been determined that Esmolol can be used effectively to provide controlled hypotension for rhinoplasty surgery, as well as it has been

shown to be effective in providing ideal surgical field visibility. Findings from previously published similar studies also support these results [45-51].

In line with surgical site visibility in our research (Nitroglycerin+Esmolol) has been shown to provide better surgical site visibility than Nitroglycerin but lower surgical site visibility than Remifentanyl and Esmolol.

It has been shown that the bleeding score is lower in patients after administering Esmolol and Remifentanyl. These results mean better visibility scores were observed in patients after administering Esmolol and Remifentanyl.

In the light of the data obtained with the results of our study, Esmolol and Remifentanyl seem to give better results than Nitroglycerin and Nitroglycerin+Esmolol in terms of the effect of hypotensive anesthesia method on surgical site bleeding and increasing surgical field visibility at a satisfactorily high level during rhinoplasty surgery. These results may be due to the absence of reflex tachycardia in the Esmolol and Remifentanyl groups, as in the Nitroglycerin group, which has been reported in many previous studies [52].

Esmolol and Remifentanyl provide hemodynamic stability and ideal surgical field visibility, and Nitroglycerin can be considered alternatives during rhinoplasty surgery. These findings are similar to the results of previous studies [3, 13,16, 20, 21, 39, 42, 46, 53-58].

## Conclusions

This study concluded that the application of controlled hypotension resulted in a beneficial reduction in blood loss and operative time and increased visibility in the

operation field in patients undergoing rhinoplasty surgery.

In light of all these findings, it can be said that after administering Esmolol and Remifentanyl to provide controlled hypotension, more stable blood pressure and heart rate values on hemodynamic changes and better surgical field visibility quality were achieved. In cases where controlled hypotension will be applied, Esmolol and Remifentanyl administration is superior to Nitroglycerin and Nitroglycerin+Esmolol administrations due to the better quality and ideal surgical field visibility obtained after Esmolol and Remifentanyl administration.

## Recommendations

Administration of Esmolol and Remifentanyl could reduce the bleeding during rhinoplasty surgery and improve the visualization of the operative field. For this reason, we recommend that Esmolol and Remifentanyl applications be preferred first.

We think that further studies with larger patient groups will contribute to finding the most appropriate intraoperative application method and treatment protocols for patients undergoing rhinoplasty surgery.

**Source of funding:** The current study was funded by our charges with no other funding sources elsewhere.

**Ethical clearance:** The approval was taken from the Scientific Research Division, with code 11265, on September 21, 2016.

**Conflict of interest:** Nil

## References

- [1] Brito, Í. M., Avashia, Y., & Rohrich, R. J. (2020). Evidence-based Nasal Analysis for Rhinoplasty: The 10-7-5 Method. *Plastic and Reconstructive Surgery–Global Open*, 8(2), e2632.

- [2] Ghodratty, M., Khatibi, A., Rokhtabnak, F., Maleki, M., & Parsa, F. (2017). Comparing Labetalol and Nitroglycerin on Inducing Controlled Hypotension and Intraoperative Blood Loss in Rhinoplasty: A Single-Blinded Clinical Trial. *Anesthesiology and pain medicine*, 7(5), e13677.
- [3] Guney, A., Kaya, F. N., Yavascaoglu, B., Gurbet, A., Selmi, N. H., Kaya, S., & Kutlay, O. (2012). Comparison of esmolol to Nitroglycerin in controlling hypotension during nasal surgery. *The Eurasian journal of medicine*, 44(2), 99.
- [4] Eftekharian, H. R., & Rajabzadeh, Z. (2016). The efficacy of pre-operative oral tranexamic acid on intraoperative bleeding during rhinoplasty. *Journal of Craniofacial Surgery*, 27(1), 97-100.
- [5] Medkamal, E. M. & Osman, S.M.(2015). Use of Remifentanil in comparison with sodium nitroprusside for controlled hypotension during rhinoplasty. *Egyptian Journal of anesthesia*, 2(31), 303-308.
- [6] Jacobi KE, Bohm BE, Rickauer AJ, Jacobi C, Hemmerling TM. (2000). Moderate controlled hypotension with sodium nitroprusside does not improve surgical conditions or decrease blood loss in endoscopic sinus surgery. *Journal of clinical anesthesia*, 12: 202–207.
- [7] Kosucu, M., Ömür, S., Besir, A., Uraloglu, M., Topbas, M., & Livaoglu, M. (2014). Effects of perioperative Remifentanil with controlled hypotension on intraoperative bleeding and postoperative edema and ecchymosis in open rhinoplasty. *Journal of Craniofacial Surgery*, 25(2), 471-475.
- [8] Quijada-Manuitt, M. A., Escamilla, Y., Vallano, A., Cardesín, A., Bernal-Sprekelsen, M., & Pontes, C. (2018). Use of  $\alpha$ 2-Adrenergic Agonists to Improve Surgical Field Visibility in Endoscopy Sinus Surgery: A Systematic Review of Randomised Controlled Trials. *Clinical therapeutics*, 40(1), 136-149.
- [9] Tuncel, U., Turan, A., Bayraktar, M. A., Erkorkmaz, U., & Kostakoglu, N. (2013). Efficacy of dexamethasone with controlled hypotension on intraoperative bleeding, postoperative oedema, and ecchymosis in rhinoplasty. *Journal of Cranio-maxillofacial Surgery*, 41(2), 124-128
- [10] Degoute, C. S. (2007). Controlled hypotension: a guide to drug choice. *Drugs*, 67(7), 1053-1076.
- [11] Erdem, A. F., Kayabasoglu, G., Tuna, A. T., Palabiyik, O., Tomak, Y., & Beyaz, S. G. (2016). Effect of controlled hypotension on regional cerebral oxygen saturation during rhinoplasty: a prospective study. *Journal of clinical monitoring and computing*, 30(5), 655-660.
- [12] Blau, W. S., Kafer, E. R., & Anderson, J. A. (1992). Esmolol is more effective than sodium nitroprusside in reducing blood loss during orthognathic surgery. *Anesthesia and analgesia*, 75(2), 172-178.
- [13] Jangra, K., Malhotra, S. K., Gupta, A., & Arora, S. (2016). Comparison of quality of the surgical field after controlled hypotension using esmolol and magnesium sulfate during endoscopic sinus surgery. *Journal of anaesthesiology, clinical pharmacology*, 32(3), 325.
- [14] Soghomonyan, S., Stoicea, N., Sandhu, G. S., Pasternak, J. J., & Bergese, S. D. (2017). The role of permissive and induced hypotension in current neuroanesthesia practice. *Frontiers in surgery*, 4, 1.



- [15] Cantarella, G., La, G. C., Di, P. M., Grasso, D. C., & Lanzafame, B. (2018). Controlled hypotension during middle ear surgery: hemodynamic effects of Remifentanil vs. Nitroglycerin. *Annali italiani di chirurgia*, 89(3), 283-286.
- [16] Degoute, C. S., Ray, M. J., Manchon, M., Dubreuil, C., & Banssillon, V. (2001). (Remifentanil and controlled hypotension; comparison with nitroprusside or esmolol during tympanoplasty. *Canadian journal of anaesthesia*, 48(1), 20-27.
- [17] Kawa Dizaye, Allaa M Yousif, & Muhamed Aydin (2011) The effect of Lidocaine with Fentanyl, or Midazolam on cardiovascular responses during Endotracheal intubation in hypertensive patients on Beta-blocker. *Middle East Journal of Internal Medicine* 4 (1), 19-28.
- [18] Langer, T., Santini, A., Zadek, F., Chiodi, M., Pugni, P., Cordolcini, V., & Marengi, C. (2019). Intraoperative hypotension is not associated with postoperative cognitive dysfunction in elderly patients undergoing general anesthesia for surgery: results of a randomized controlled pilot trial. *Journal of clinical anesthesia*, 52, 111-118.
- [19] Yun, S. H., Kim, J. H., & Kim, H. J. (2015). Comparison of the hemodynamic effects of nitroprusside and Remifentanil for controlled hypotension during endoscopic sinus surgery. *Journal of anesthesia*, 29(1), 35-39.
- [20] Bajwa, S. J. S., Kaur, J., Kulshrestha, A., Haldar, R., Sethi, R., & Singh, A. (2016). Nitroglycerin, esmolol and dexmedetomidine for induced hypotension during functional endoscopic sinus surgery: A comparative evaluation. *Journal of anaesthesiology, clinical pharmacology*, 32(2), 192.
- [21] Sajedi, P., Rahimian, A., & Khalili, G. (2016). Comparative evaluation between two methods of induced hypotension with an infusion of Remifentanil and Labetalol during sinus endoscopy. *Journal of research in pharmacy practice*, 5(4), 264.
- [22] Shaban, B., Attar, A. S., & Eshghpour, M. (2016). Concepts, application, and efficacy of hypotensive anesthesia in maxillofacial and orthognathic surgeries: a review of the literature. *Circulation*, 26, 28.
- [23] Drover, D. R., Hammer, G. B., Barrett, J. S., Cohane, C. A., Reece, T., Zajicek, A., & Schulman, S. (2015). Evaluation of sodium nitroprusside for controlled hypotension in children during surgery. *Frontiers in pharmacology*, 6, 136.
- [24] Das, A., Chhaule, S., Bhattacharya, S., Basunia, S. R., Mitra, T., Halder, P. S., & Mandal, S. K. (2016). Controlled hypotension in daycare functional endoscopic sinus surgery: A comparison between esmolol and dexmedetomidine: A prospective, double-blind, and randomized study. *Saudi journal of anesthesia*, 10(3), 276.
- [25] Lee, S. J., & Lee, J. N. (2010). The effect of perioperative esmolol infusion on the postoperative nausea, vomiting and pain after laparoscopic appendectomy. *Korean journal of anaesthesiology*, 59(3), 179-184.
- [26] Sanatkar, M., Sadrossadat, H., Goudarzi, M., Espahbodi, E., & Zangeneh, M. (2019). A Comparison of Labetalol and Nitroglycerin for The Management of Intraoperative Hypertension in Ambulatory Surgical Patients Who Underwent Cataract Surgery.

- Archives of Anesthesiology and Critical Care, 5(1), 15-17.
- [27] Aboseif, E. M. K., & Osman, S. M. (2015). Use of Remifentanil in comparison with sodium nitroprusside for controlled hypotension during rhinoplasty: Randomized controlled trial. *Egyptian Journal of Anaesthesia*, 31(4), 303-308.
- [28] Muhamed Aydin, Kawa Dizaye, & Allaa M Yousif (2011) The effect of Lidocaine with Fentanyl, or Midazolam on cardiovascular responses during Endotracheal intubation in hypertensive patients on Beta-blocker. *Middle East Journal of Internal Medicine* 4 (1), 19-28.
- [29] Abdulkadr, M., Sleman Sarkawt, S., & Kakai Omar A Karim. (2017). The Reduction of Blood Loss by Using of Tranexamic Acid During Total Knee Arthroplasty. *Diyala Journal of Medicine* 12 (2), 13-19.
- [30] Borujeni, L. A., Pourmotabed, S., Abdoli, Z., Ghaderi, H., Mahmoodnia, L., Sedehi, M., & Hasanpour Dehkordi, A. (2020). A comparative analysis of patients' quality of life, body image and self-confidence before and after aesthetic rhinoplasty surgery. *Aesthetic Plastic Surgery*, 44(2), 483-490.
- [31] Stark, H. L., Fries, C. A., & Mercer, N. S. (2020). Translational techniques from cleft to cosmetic rhinoplasty. *Archives of plastic surgery*, 47(1), 110.
- [32] Kosins, A. M., & Daniel, R. K. (2020). Decision making in preservation rhinoplasty: a 100 case series with one-year follow-up. *Aesthetic surgery journal*, 40(1), 34-48.
- [33] Parvizi, A., Haddadi, S., Habibi, A. F., Nemati, S., Akhtar, N., & Ramezani, H. (2019). Dexmedetomidine efficacy in quality of surgical field during endoscopic sinus surgery. *Iranian Journal of Otorhinolaryngology*, 31(106), 281.
- [34] Moin, S. A., & Ravi, T. (2019). Comparative Study of Nitroglycerin and Dexmedetomidine in Patients Undergoing Endoscopic Resection of Nasopharyngeal Fibroangioma. *INDIAN JOURNAL OF ANESTHESIA AND ANALGESIA*, 211.
- [35] Tewari, A., Singh, G., Mishra, M., Gaur, A., & Mallan, D. (2020). Comparative Evaluation of Hypotensive and Normotensive Anesthesia on LeFort I Osteotomies: A Randomized, Double-Blind, Prospective Clinical Study. *Journal of Maxillofacial and Oral Surgery*, 1-6.
- [36] Jones, J., & Ahmad, F. I. (2020). Anesthesia for Free Flap Reconstruction After Head and Neck Surgical Resection. *Oncologic Critical Care*, 1693-1707.
- [37] Nurullah, M., Bhuyan, M. A. H., Islam, S. A., & Alam, M. S. (2018). Role of Hypotensive Anaesthesia in Functional Endoscopic Sinus Surgery in Private Practice. *Bangladesh Journal of Otorhinolaryngology*, 24(1), 8-13.
- [38] Marlino, S., Cagli, B., Vitale, A., Boccia, A., Avvedimento, S., Madonna, G., & Santorelli, A. (2020). Bleeding in Plastic–Aesthetic Surgery: A Prognostic Pathway with Clinical Application. *Aesthetic Plastic Surgery*, 44(1), 201-206.
- [39] Alkan, A., Honca, M., Alkan, A., Güleç, H., & Horasanlı, E. (2019). The efficacy of esmolol, Remifentanil, and Nitroglycerin in controlled hypotension for functional endoscopic sinus surgery. *Brazilian journal of otorhinolaryngology*, 85 (5).
- [40] Lee, J., Kim, Y., Park, C., Jeon, Y., Kim, D., Joo, J., & Kang, H. (2013). Comparison

between dexmedetomidine and Remifentanyl for controlled hypotension and recovery in endoscopic sinus surgery. *Annals of Otolaryngology, Rhinology & Laryngology*, 122(7), 421-426.

[41] Richa, F., Yazigi, A., Sleilaty, G., & Yazbeck, P. (2008). Comparison between dexmedetomidine and Remifentanyl for controlled hypotension during tympanoplasty. *European journal of anaesthesiology*, 25(5), 369-374.

[42] EL-Shmaa, N. S., Ezz, H. A. A., & Younes, A. (2017). The efficacy of Labetalol versus Nitroglycerin for induction of controlled hypotension during sinus endoscopic surgery. A prospective, double-blind and randomized study. *Journal of clinical anesthesia*, 39, 154-158.

[43] Dongre, H., Sharma, V., Premendran, B., Dongre, A., & Tikde, S. (2012). The efficacy of esmolol and Nitroglycerin in creating dry operative field by producing controlled hypotension in spinal surgeries. *IOSR J Pharm*, 2, 26-33.

[44] Shoukry, R. A., & Mahmoud, A. E. S. (2017). Controlled hypotension for functional endoscopic sinus surgery: a Comparative study between magnesium sulfate and Nitroglycerin. *Ain-Shams Journal of Anaesthesiology*, 10(1), 91.

[45] Ahmed, H. M., Mohamed, A. A., & Abo-Zaid, E. H. (2003). Efficacy of controlled hypotension during microsurgery of the middle ear: Comparative study between esmolol and prostaglandin-E1. *Egypt Journal of Anesth*, 19, 25-31.

[46] Ahmed, M. E. M., Elsayed, M. M., Sarhan, N. A., & Fathallah, M. A. (2019). Surgical Field Visibility during Functional Endoscopic Sinus Surgery: esmolol-induced hypotensive anesthesia versus hypotensive

total intravenous anesthesia. *International Journal of Medical Arts*, 1(2), 110-118.

[47] Badawy, A.A., Abdel Mawgood, A. and Abdallah, I. (2003): Haemodynamic and metabolic effects of controlled hypotension during rhinoplasty: Comparative study between esmolol and magnesium sulphate. *Egyptian Journal of Anaesthesia*, 19(4), 453-460.

[48] Rajesh, B. (2015). A Comparative Study of Dexmedetomidine and Esmolol in Induced Hypotension for Functional Endoscopic Sinus Surgery (Doctoral dissertation, Chengalpattu Medical College, Chengalpattu).

[49] Saleh, Z. T., El-Sawy, A. H. M., Gabr, A. A. A., & Mageed, H. M. A. (2015). controlled hypotension in endoscopic sinus surgery: a comparative study between the efficacy of esmolol, sodium nitroprusside, and magnesium sulfate. *Zagazig University Medical Journal*, 17(4).

[50] Shaheen, M. S. A., Chowdhury, A. N., Sardar, K., Rahman, M., Biswas, S. S., & Taous, A. (2018). Controlled Hypotension for Functional Endoscopic Sinus Surgery: A Comparative study of Dexmedetomidine and Esmolol. *Bangladesh Journal of Otorhinolaryngology*, 24(1), 37-49.

[51] Shen, P. H., Weitzel, E. K., Lai, J. T., Wormald, P. J., & Ho, C. S. (2011). Intravenous esmolol infusion improves surgical fields during sevoflurane-anesthetized endoscopic sinus surgery: a double-blind, randomized, placebo-controlled trial. *American journal of rhinology & allergy*, 25(6), e208-e211.

[52] Yamaguchi, S., Nakamura, K., Kobayashi, O., Takahashi, Y., Sato, K., & Shimabukuro, M. (2018). Protective effect of

Remifentanil on blood loss in endoscopic subcutaneous mastectomy: a retrospective study. *Ain-Shams Journal of Anesthesiology*, 10(1), 8.

[53] Basyoni, M. A., & Alsarraf, A. J. (2013). Induced Hypotension for Nasal Surgery: Remifentanil versus Esmolol. *Otolaryngology—Head and Neck Surgery*, 149(2), 131.

[54] Celebi, N., Artukoglu, F., Dal D, S. F., Celiker, V., & Aypar, U. (2007). Effect of hypotensive anesthesia on cognitive functions. *Saudi Medical Journal*, 28(9), 1357-1361.

[55] Lavere, P. F., Rana, N. A., Kinsky, M. P., Funston, J. S., Mohamed, S. S., & Chaaban, M. R. (2019). Blood Loss and Visibility with Esmolol vs. Labetalol in Endoscopic Sinus Surgery: A Randomized Clinical Trial. *Clinical Medicine Insights: Ear, Nose and Throat*, 12, 1179550619847992.

[56] Srivastava, U., Dupargude, A. B., Kumar, D., Joshi, K., & Gupta, A. (2013). Controlled hypotension for functional endoscopic sinus surgery: Comparison of esmolol and Nitroglycerin. *Indian Journal of Otolaryngology and Head & Neck Surgery*, 65(2), 440-444.

[57] Turan, G., Dincer, E., Ozgultekin, A., Uslu, C., & Akgun, N. (2008). Comparison of dexmedetomidine, Remifentanil, and esmolol in controlled hypotensive anaesthesia: 4AP7-8. *European Journal of Anaesthesiology (EJA)*, 25, 65-66.

[58] Zaky, M. B., & Saleh, A. K. (2017). Hypotensive anesthesia during functional endoscopic sinus surgery: a comparative study of Remifentanil versus magnesium sulfate infusion. *Ain-Shams Journal of Anaesthesiology*, 10(1), 124.

## تقييم ومقارنة فعالية الريميفنتانيل والنيتروجليسرين والإسمولول والنيتروجليسرين + الإسمولول على ضغط الدم ومعدل ضربات القلب أثناء عملية جراحة تجميل الأنف

د.محمد ايدين عباس<sup>١</sup> ، د.أورهان أولوداغ<sup>٢</sup>

### الملخص

**خلفية الدراسة:** تظل عملية تجميل الأنف واحدة من أفضل خمس عمليات تجميل يتم إجراؤها وتعتبر واحدة من أكثر العمليات صعوبة في كل من الجراحة التجميلية وجراحة الأنف والأذن والحنجرة. يتم إجراء عملية تجميل الأنف لتغيير مظهر الأنف أو تحسين التنفس أو كليهما و يعتبر النزيف من أهم العوامل التي تؤثر على نجاح عملية تجميل الأنف. لذلك طريقة خفض ضغط الدم الخاضع للرقابة يقلل النزيف وكذلك يقلل من فقدان الدم. لذلك ، فإنه يوفر مجالاً جراحياً غير دموي مرضي أثناء العملية.

**اهداف الدراسة:** لتقييم ومقارنة فعالية (الريميفنتانيل ، النيتروجليسرين ، الإسمولول ، النيتروجليسرين + الإسمولول) على ضغط الدم ومعدل ضربات القلب أثناء جراحة تجميل الأنف ولتقييم ومقارنة فعالية هذه الأدوية لتوفير مجال جراحي غير دموي مرضي أثناء جراحة تجميل الأنف لزيادة الرؤية أثناء العملية.

**المرضى والطرائق:** تم تقسيم ٢٠٠ مريض تتراوح أعمارهم بين ٢٠ و ٤٥ عامًا من كلا الجنسين بشكل عشوائي إلى أربع مجموعات متساوية: الريميفنتانيل (R) ، النيتروجليسرين (N) ، الإسمولول (E) ، النيتروجليسرين + الإسمولول (N + E). تم تسجيل ضغط الدم الانقباضي ، وضغط الدم الانبساطي ، ومتوسط ضغط الدم ، ومعدل ضربات القلب (SBP ، و DBP ، و MBP ، و HR) في جميع الحالات قبل اعطاء التخدير ، وخمس دقائق بعد التنبيب الرغامي ، وكل ١٥ دقيقة حتى نهاية عملية. خلال العملية الجراحية ، تم تصنيف درجة النزيف في المجال الجراحي وإمكانية رؤية المجال الجراحي بصرياً من قبل الجراح على النحو التالي: (٠) لا يوجد نزيف ، (١) نزيف خفيف - لا يتطلب شفت ، (٢) نزيف خفيف - يتطلب شفت متقطع ، (٣) نزيف معتدل - يتطلب شفت متكرر ، (٤) نزيف حاد - يتطلب شفت مستمر ، (٥) نزيف حاد ، توقفت العملية لأن النزيف يغطي المجال الجراحي بالكامل.

**النتائج:** في فترة أثناء العملية انخفاض مستوى قيم ضغط الدم الانقباضي ، وضغط الدم الانبساطي ، ومتوسط ضغط الدم ، كان ذلك ذا دلالة إحصائية في جميع المجموعات. بينما أظهرت قيمة معدل ضربات القلب انخفاضاً معتدلاً به إحصائياً في المجموعتين (E) و (R) ، بينما كان هناك زيادة ذات دلالة إحصائية في المجموعتين (N) و (N + E) كانت درجة النزيف لدى المرضى في المجموعتين (E) و (R) أقل إحصائياً بشكل ملحوظ من المرضى في المجموعتين (N) و (N + E).  
**الاستنتاجات:** أشارت هذه النتائج إلى أن المرضى كان لديهم استقرار ديناميكي أفضل و كانت ورؤية المجال الجراحية أفضل بعد تطبيق الريميفنتانيل، الإسمولول.

**الكلمات المفتاحية:** انخفاض ضغط الدم المتحكم فيه ، تجميل الأنف ، إسمولول ، ريميفنتانيل ، نيتروجليسرين ، نيتروجليسرين + إسمولول ، درجة النزيف ، رؤية المجال الجراحي

البريد الإلكتروني: [pharmacistmuhamedaydin@gmail.com](mailto:pharmacistmuhamedaydin@gmail.com)

تاريخ استلام البحث: ١٩ تشرين الأول ٢٠٢٢

تاريخ قبول البحث: ١٥ تشرين الثاني ٢٠٢٢

<sup>١</sup> مستشفى رابرين التعليمي - اربيل - العراق  
<sup>٢</sup> كلية الصيدلة - جامعة غازي - انقرة - تركيا