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Research Article

Evaluation of the Effect of Atenolol on Bleeding in Rhinoplasty Surgery

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ABSTRACT

Introduction: Intraoperative bleeding is one of the most important factors during rhinoplasty which can leads to visibility reduction of surgeon and result some complications in this circumstances.Atenolol is considered as a best way to reduce bleeding during surgery. In this study, we assessed the effect of this drug to relief this problem.

Material and method: 60 patients of both sexes (aged 18 to 45-year-old) candidate for rhinoplasty were divided into two groups of 30 each. The study group was treated by Atenolol 25mg and the control group received 25 mg of placebo. Blood cell count, urea, serum creatinine and prothrombin coagulation tests were performed for all patients. A teammate, blinded to the both of case and control group, measured the systolic, diastolic pressure and patient's heart rate during the operation. Then their average was analyzed.

Results: In the age group above 30, there was a significant difference between the two groups only in heart rate before surgery. There were significant differences in systolic blood pressure, number of consumed gases and volume of blood inside the suction in the subjects under 30 years of age. In our study, the surgical time in the two groups was significantly different. The reduction in the duration of operation in the Atenolol consumer group compared to the control group could be due to a reduction in bleeding and the consumption of suction and gas sterile.

Conclusion: Atenolol can be considered as a suitable drug to reduce the bleeding.

Keywords: Rhinoplasty, blood pressure, Atenolol, bleeding

INTRODUCTION

Rhinoplasty is one of the most common types of cosmetic surgeries around the world[1]. Despite many progresseshave been made in rhinoplasty, but there are somedeterminative factors in this type of surgery yet.Among them, one of the most important factors is intraoperative bleeding during surgery which leads to visibility reduction of surgeon.As a consequent not only surgery time increases,but also, the operation can result some complications in this circumstances[2].Lowering of blood pressure intentionally is a best way to reduce bleeding during surgery, which is called decreasing controlled mean arterial pressure.In some surgeries that demand high accuracy such as rhinoplasty, by using this method during anesthesia, intraoperative bleeding reduces,complications improve and ultimately patient and physician's satisfaction is acquired[2, 3].Although there are many strategies to reduce the controlled blood pressure however, in general they can be divided into two main methods.In traditional methods, in order to proper monitoring and ensuring airways, patients are kept in hypotension state by using a ganglion blocker or drug vasodilators directly and a slight anesthesia.Concurrent use of a beta-blocker is given priority in this method[4]. In the second one, blood pressure is controlled without any drugs through adequate ventilation, a deep

level of anesthesia and proper body position[5]. Application of inhalation anesthesia or intravenous anesthetic drugs to reduce blood pressure not only increase dosage and high concentration of these drugs but also lead longer recovery time for patient. Therefore anesthesiologists prefer to utilize high blood pressure medicines besides the anesthetic drugs to decrease blood pressure[6].There are a wide range medications to reduce controlled blood pressure, including vasodilatorsα (Nitroprusside, Nicardipine), α_2 receptors agonists (Clonidine, Dexmedetomidine) beta-adrenergic antagonists(Inderal, Esmolol) and alpha and beta antagonist (Labetalol)[7-9].Atenolol is relatively new category in beta-blockers, improve long-term outcomes of coronary heart as well as reduce the amount of bleeding during surgery.Possible mechanisms of beta blockers action to reduce bleeding are,weaken the impact of a sudden increase in Catecholamineduring operation.It is supposes that changes in the physiological response to stress, via beta-blockers usage, can improve coronary heart condition and stabilize the patient's hemodynamic[10, 11].Since Atenolol has cardio selective effect and contain only effective kind of beta, so it has neither desirable effects of non-beta blocker occasionally nor some complications such as Arrhythmia, hypotension, bradycardia and tachycardia. It is also available and inexpensive.In this study we examined the effect of Atenolol on reducing the amount of bleeding during surgery.

METHODS

This study is a double blind clinical trial which is took place on 60 patients of both sexes aged 18 to 45-year-old candidate for rhinoplasty (tip plasty, hump reduction and osteotomy) in Beheshti Hospital over a period of 4-6 months.These patients were divided in 1-2 classes based on the American Society of Anesthesiologists classification (weight between 40-100 kg). A candidate who needs septorhinoplasty was not included in this study. Patients who have pathology cardiovascular system, kidney disease, pathology system, anemia, hemoglobin <10 and coagulation disorders, aspirin or medicines bleeding consumers, and those with systolic blood pressure >160 mm Hg and diastolic >90 mmHg are also excluded.

All patients received surgical consent, and blood cell count, urea, serum creatinine and prothrombin coagulation tests wereperformed. The open surgery was conductedon all patients. During the operation, one of our teammate, who is blind to the case group and control group, measured the systolic, diastolic pressure and patient's heart rate every 15 minutes. Then in the course of the statistical evaluation, their average was analyzed.Besides, to measure the amount of bleeding, by number of gas and amount of blood in the suction, the surgeon's satisfaction, the Boezzart and Formm scale was also used to assess the quality of surgery.Using this scale: No bleeding(0 points), short bleeding without suctioning(1point), short bleeding but sometimes requires suction (2 points), bleeding is low but often requires suction and the area of operation is only visible for a few seconds after suction (3 points),Moderate bleeding: often requires suction and the area of operation is visible until immediately after suction (4 points),Severe bleeding: Suction is used permanently in the area of operation and even bleeding is more severe than suction, in some cases it is even impossible to continue surgery (5 points). The surgical time is calculated from the beginning of local anesthetic injection until the end of the operation. Quantitative data are compared with independent T-test and the meanings are compared with each other. Finally, the significance or non-relevance of the data will be checked by the Chi-square test.

RESULTS

The group aged between 18 to 45 years old included 60 patients who referred to the educational department of Beheshti hospital in Babol, Iran for rhinoplasty. They were divided into two groups. The study group consisted of 30 patients who were treatedby Atenolol 25mg and the control group(C) with 30 patients received25 mg of placebo. A questionnaire containing information about the patient's characteristics including age, weight, history of disease or drug abuse, preoperative blood test results and heart rate, systolic and diastolic

blood pressure before and during operation, number of consumed gases, gases weight, use of Remifentanil during surgery, Buzzard criteria determines the degree of surgeon's satisfaction, the amount of bleeding during surgery, based on the volume of blood in the suction, the duration of surgery and the degree of restlessness in the recovery was provided based on the Richmond criterion. The criteria used in this study were divided into two groups: 1- demographic and clinical criteria, 2- preoperative and clinical criteria during operation. In table 1, the demographic and clinical criteria were assessed and recorded before the operation. Based on the results, the mean age of the patients in the study group was 27.83 ± 4.45 and 28.4 ± 4.9 in the control group. There was no statistically significant difference between the two groups in terms of age (P-value >0.05). The mean weight of the patients in the case group was 68.36 ± 12.05 and 74.23 ± 10.02 in the control group, which was statistically significant (P <0.05). Systolic and diastolic blood pressure were recorded and compared before anesthesia. Accordingly, there was no significant difference between the two groups in terms of the criteria mentioned (P-value >0.05).

Table1. Demographic and clinical variables in the two groups of Atenolol and controls before the surgery

Variables	Case study (mean±SD)	Ctrl (mean±SD)	P-valu
Age	4.45±27.83	4.95±28.40	0.6
Weight	12.05±68.36	10.10±74.23	0.04
Systolic pressure	6.85±121.33	6.42±124.70	0.06
Diastolic pressure	5.51±79.86	5.28±83.66	0.06

In table 2, the systolic and diastolic blood pressure during operation, the number of consumed gases, the average gases, the duration of surgery, and the volume of blood inside the suction during the operation were analyzed and compared. Based on the results, the systolic blood pressure during the operation in the case group was 91.33 ± 7.90 and in the control group was 97.77 ± 1.6, which was statistically significant (P-value =0.001). However, there was no significant difference in diastolic blood pressure between the two groups. The amount of bleeding during surgery was calculated based on the amount of blood accumulated in the suction. The mean of blood collected in the case group was 92.33 ± 23.33 and in the control group was 163.26 ± 27.86. The rate of bleeding in the two groups was statistically different (p-value = 0.00). Duration of surgery was recorded in two groups. The duration of surgery in the case group was 10.66 ± 16.39 minutes and in the control group was 1286.8 ± 12.51 minutes. The difference in length of surgery in the two groups was not statistically significant (P-value>0.05). The number of consumed gases during the operation in the study group was 3.6 ± 0.78 and in the control group was 5.36 ± 0.71, which was statistically significant but there was no significant difference between the two groups in the gases weight.

Table2. Clinical variables in two Atenolol and control groups during surgery

Variables	(mean±SD) Case study group	Ctrl (mean±SD)	P-value
Heart rate	5.37±81.36	3.22±84.53	0.008
Systolic pressure during surgery	7.90±91.33	6.16±97.70	0.001
Diastolic pressure during surgery	5.26±60.03	3.14±60.16	0.9
The number of gas	0.78±3.06	0.71±5.36	0.00
Gas weight	0.57±14.41	0.66±14.66	0.1
Action time	16.39±108.66	12.51±112.86	0.2
Blood volume of suction	23.33±92.33	27.86±163.26	0.00

In this study, based on the hypothesized goals, we compared the criteria of age and the subjects of the study were placed in two groups (>30 and <30 years old) and the criteria of the research was recorded and reviewed. Weight, systolic blood pressure, diastolic blood pressure and heart rate before and after induction of anesthesia were recorded and compared. Accordingly, there is a statistically significant difference between systolic, diastolic and heart rate in the group under the age of 30 years (P-value <0.05), while there is no significant difference in weight between the two groups. In patients older than

30 years of age, there was a significant difference between heart rate in the case group and the control group but there was no significant difference in weight, systolic and diastolic blood pressure.

Table 3. Demographic and clinical variables in both Atenolol and control groups based on age before the operation

Variables	Age group	Case study group	control	p-value
Weight	Under 30 years old n=38	12.9±66.1	10.44±75.10	0.2
Systolic blood pressure		6.9±119.84	5.30±125.57	0.007
Diastolic blood pressure		± 4.679.15	5.07±84.94	0.001
heart beat		4.3±82.05	2.8±84.63	0.03
Weight	Above 30 years old n=22	± 9.65 72.27	9.8±72.72	0.9
Systolic blood pressure		6.2±123.90	8.07±123.18	0.8
Diastolic blood pressure		6.7±81.09	5.1±81.45	0.8
heart beat		6.9±80.18	3.9±84.36	0.09

In Table 4, the intraoperative variables were recorded and compared in two groups of age fewer than 30 and over 30 years old. Although, There was a significant difference between the systolic blood pressure, the number of consumed gases and the suction volume in the age group under 30 years old (P-value<0.05). However, there was not any significant difference between weight of gases,diastolic blood pressure and the duration of operation. In the age group over 30, there was a significant difference between the number of consumed gas and the volume of blood inside the suction between the two groups.

Table4.Clinical variables in two groups of Atenolol and control group during surgery based on age

Variables	Age group	Case study group	control	p-value
Systolic blood pressure	Under 30 years old n=38	9.1±90.05	5.6±97.94	0.003
Diastolic blood pressure		5.3±59.42	2.7±60.31	0.5
Number of consumed gas		0.6±2.84	0.6±5.3	0.00
Average weight of gas		± 0.514.39	0.6±14.57	0.3
Duration of surgery		18.2±109.21	11.82±112	0.5
Blood volume in suction		19.02±89.21	25.5±168.3	0.00
Systolic blood pressure	Above 30 years old n=22	4.8±93.54	7.1±97.27	0.1
Diastolic blood pressure		5.1±61.09	3.8±59.9	0.5
Number of consumed gas		0.93±3.45	0.8±5.3	0.001
Average weight of gas		±0.514.45	0.7±14.8	0.2
Duration of surgery		± 13.4107.7	14.08±114.3	0.2
Blood volume in suction		29.6±97.72	±30.07154.5	0.001

Table5. Surgical environment based on the scale of the Buzzard

Satisfaction rate	Case study group	control	p-value	Sum
Short bleeding without needing suction	24(80%)	2 (6.7%)	0.00	26
Short bleeding sometimes requires suction	6 (20%)	10 (33.3%)	0.000	16
Low bleeding often requires suction	0	18 (60%)	0.00	18
	30	30		60

Table 6 shows the rate of restlessness in recovery based on the Richmond scale. Based on the results, 50% of the subjects who received Atenolol were in restful and alert in recovery and 50% were restless, but in the control group, 70% were restless and only 30% were restful and alert.

Table 6 - Restless recovery rate of operation based on the Richmond scale.

Restlessness after surgery	Case study group	control	p-value	Sum
Calm and alert	15 (50%)	9 (30%)	0.01	24
Restless	15 (50%)	21 (70%)	0.01	36
	30	30		60

DISCUSSION

One of the main factorsduring cosmetic nose surgery is intraoperative bleeding which leads to visibility reduction of surgeon because the mucosa of the surgical area is very vascular. Bleeding can be capillary, venous or arterial,

and serious complications may be due to inadequate vision during surgery. Atenolol is a member of beta-blockers family that can be used orally to reduce blood pressure and subsequently bleeding during surgery. This study was designed to evaluate the effect of Atenolol on reducing bleeding during nose surgery. In this study, 30 patients used orally 25 mg of Atenolol and 30 other patients receive no medicine. In this study, the number of heart rates, systolic and diastolic blood pressure at the time before and after anesthesia was determined and compared. According to the results, there was no significant difference between systolic and diastolic blood pressure before surgery, while there was a significant difference between systolic blood pressure in the Atenolol group and the control group during the operation, which was statistically significant. Diastolic blood pressure shows no significant difference between the two groups during operation. These finding areaccordance to the findings of Na Young Kim in 2015. They conducted a study on the effects of administration of Atenolol and Enalapril orally on the reduction of bleeding and blood pressure in Orthognathic surgery. The results showed that there was a decrease in systolic blood pressure in the Enalapril and Atenolol groups compared to the control group, but this reduction was higher in the Enalapril recipient group than in the Atenolol group[12] and also, the number of heart rate in the Atenolol group was significantly different from the control group during the operation. This finding is in line with the findings of Devandra Gupta and colleagues in 2016. A study comparing the pre-adjuvant study of atenolol and clonidine in cardiovascular responses during trans-scaphoid surgery to remove pituitary adenoma showed that during the operation, the heart rate increased, while in other groups this finding was not observed. In fact, based on their findings, it was hypothesized that oral administration of Clonidine and Atenolol before surgery could be a suitable method for reducing hemodynamic responses during trans-sphenoid surgery[10]. Since heart rate and average arterial pressure are effective on bleeding during the surgery, therefore, in the present study, we compared these two groups in terms of heart rate, blood pressure and bleeding rate with the volume of intravascular suction. The results indicated that the volume of blood inside the suction is less than in the Atenolol group compared to the control group and there is a significant difference between the two groups regarding the amount of bleeding. In the present study, in addition to examining the demographic and clinical criteria, the mean of the surgical site quality was calculated and determined based on the Buzzard criterion. According to the results, it was shown that the differences between the two groups were statistically significant in terms of aforementioned criteria. In this study, the rate of hemorrhage was (6.7%) 2 persons, (33.3%) 10 persons and (60%) 18 persons in the control group and (80%) 24 persons, (20%) 6 persons and (0) in Atenolol group and was called as grade 1, 2 and 3, respectively. Since the mean quality of the surgical site in terms of bleeding in the control group was 2.5 ± 0.6 and in the group receiving Atenolol was 0.2 ± 0.4, this difference was statistically significant. Since the effects of Atenolol on blood transfusions have not been studied before, there are no comparable studies in this regard, but our findings are consistent with the study of the effect of other blood pressure-lowering drugs on the amount of intraoperative hemorrhage. In the study of Dr. Jebel Ameli and his colleagues was used Tranexamic Acid locally, a condition for reducing bleeding in endoscopic sinus surgery.In this study, the quality of the surgical environment was determined in terms of the rate of hemorrhage according to the Buzzard scale. In this study, the degree of hemorrhage was 3.33% (1 person), 26.7% (8 patients) and 70% (21 persons) in the control group and 19.2% (5 subjects) 53% (14 people) were second degree and 26.9% (7 persons) were grade three.Therefore, the mean quality of the surgical site was 2.53 ± 0.15 in the control group and 2.31 ± 0.2 in the Tranexamic group, which was statistically significant. Also, the average amount of bleeding during the surgery was calculated. The average rate of hemorrhage in the placebo group was 229.1 ± 23.8 and 174 ± 10.6 ml in the Tranexamic group. Therefore, the difference between the two groups was statistically significant (P-value< 0.05)[13]. In

this study, in addition to examining demographic and clinical criteria before and after operation, these criteria were evaluated in two groups of patients receiving Atenolol and control who werefewerandabove 30 years old. The results of this study showed that there was a significant difference between systolic, diastolic and pre-operative heart rate (P-value <0.05). In the age group above 30, there was a significant difference between the two groups only in heart rate before surgery. Other criteria such as weight, systolic and diastolic blood pressure were not statistically significant. There were significant differences in systolic blood pressure, number of consumed gases and volume of blood inside the suction in the subjects under 30 years of age. Although, there was a significant difference in systolic blood pressure, the number of consumed gas and the volume of blood in the suction between the control group and the case study group under 30 years oldbut there was a significant difference in the number of consumed gas and the volume of blood in the suction was statistically significant in both groups above 30 years of age.In our study, the surgical time in the two groups was significantly different. Of course, in other studies with other drugs, no effect has been observed. For example, in a study by Dr. Motaghi conducted on Tranexamic acid, no difference was observed during surgery.The reduction in the duration of operation in the Atenolol consumer group compared to the control group could be due to a reduction in bleeding and consequently a reduction in bleeding, the consumption of suction andgas sterile. Therefore, not only visibility and accessof surgeon can increase but also the speed and the duration of surgery reduce.In this study, the rate of restlessness was investigated in a Richmond Scale recovery. The results showed that in the study group, 50% of patients are restful and alert and 50% were restless, but in the control group, only 30% of the subjects were calm and alert, and 70% were restless, and there was a significant difference between the two groups. This finding is consistent with the increase in surgical duration in the control group which can be attributed to increased pain and subsequently restlessness after surgery and recovery.

CONCLUSION:

In regard to the significant reduction in bleeding in the study group compared to control group, Atenolol can be considered as a suitable drug in this field. To this purpose, similar studies can be done with a larger number of samples.

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