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Cardiovascular complications of nasal packing after septoplasty. A randomized clinical trial.

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Key words: nasal packing; nasal packing with airway; cardiac complication, hypertension, cardiac arrhythmia.

Abstract. A common method employed in nasal surgery is the anterior nasal packing. One of the complications debated today is about the cardiovascular effects due to the use of this method. The purpose of this study was to evaluate some cardiac parameters in different groups of patients subjected to septoplasty, to identify the safest way to use nasal packing in postoperative treatment and to minimize its cardiovascular complications. In this clinical trial, 104 candidates for septoplasty were initially screened, of which, 14 patients were excluded and 90 patients were selected by block randomization. Different assessors monitored blood pressure, heart rate and cardiac rhythm three times before surgery. Then a classic septoplasty was performed in all patients, after which patients were randomly divided into three groups: 1) without nasal packing, 2) with nasal packing, and 3) with nasal packing that had an airway. Blood pressure and heart rate were monitored, following surgery, by a 24-hour Holter. The monitoring data were analyzed and interpreted by a cardiologist. The significance criteria of data were assumed as p-values ≤ 0.05. Mean diastolic blood pressures after surgery in groups 1-3 was: 73.4 ± 7.3 mmHg, 76.4 ± 5.8 mmHg and, 80.9 ± 6 mmHg, respectively, showing lower values in patients without nasal packing and a significant difference in patients that had nasal packing with an airway ($p=0.03$). Mean heart rates after surgery in groups 1-3 were 71.8 ± 11.3, 77.7 ± 7.9 and 79.1 ± 6.7, respectively, showing a significant difference of the first group with respect to group 3 ($p=0.043$). This research showed that the use of anterior nasal packing with or without airway leads to cardiovascular changes such as increased diastolic blood pressure and heart rate. More studies should be conducted for a definitive conclusion, so the balance of its risks and benefits must be considered, when using nasal packing after septoplasty surgery.

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Complicaciones cardiovasculares del empaque nasal después de una septoplastia. Un ensayo clínico aleatorio.

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Palabras clave: empaque nasal; empaque nasal con vía aérea; complicación cardíaca; hipertensión; arritmia cardíaca.

Resumen. El empaque nasal es un método común utilizado en la cirugía de la nariz. Una de las complicaciones que se discuten en la actualidad son las posibles complicaciones cardiovasculares producidas por este método. El propósito de este estudio fue evaluar algunos parámetros cardíacos en diferentes grupos de pacientes sometidos a septoplastia, la manera más segura de utilizar el empaque nasal en el tratamiento postoperatorio y minimizar sus complicaciones cardíacas. En este ensayo clínico se examinaron, inicialmente, 104 candidatos a septoplastia, de los cuales se excluyeron 14 y se seleccionaros 90 pacientes, divididos en bloques de forma aleatoria. Diferentes asesores evaluaron la presión arterial, la frecuencia y el ritmo cardíacos en tres oportunidades, antes de la cirugía. Posteriormente se realizó una septoplastia a todos los pacientes seleccionados y se dividieron en tres grupos al azar: 1) sin empaque nasal, 2) con empaque nasal y 3) con empaque nasal y vía aérea. La presión arterial y la frecuencia cardíaca fueron monitoreadas durante 24 horas después de la cirugía, mediante un Holter. Los datos obtenidos mediante este método fueron analizados e interpretados por un cardiólogo. El criterio de significancia para estos datos se asumió como $p \leq 0.05$. Las presiones arteriales diastólicas medias en los grupos 1-3 fueron: 73.4±7.3 mmHg, 76.4±5.8 mmHg y 80.9±6 mmHg, respectivamente, ocurriendo los valores más bajos en pacientes sin empaque nasal y con una diferencia significativa en pacientes con empaque nasal con vía aérea ($p=0.03$). Las frecuencias cardíacas media después de la cirugía en los grupos 1-3 fueron: 71.8±11.3, 77.7±7.9 and 79.1±6.7, respectivamente; existiendo una diferencia significativa entre el primer grupo y el grupo 3 ($p=0.043$). Este estudio demostró que el uso de empaque nasal anterior, con o sin vía aérea, conduce a cambios cardiovasculares, tales como aumento de la presión arterial diastólica y la frecuencia cardíaca. Se deben realizar estudios adicionales para llegar a una conclusión definitiva y se deben considerar los riesgos y beneficios de utilizar el empaque nasal después de una septoplastia.

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INTRODUCTION

The nose is the main breathing route of the body that has a critical role in dampening, heating, and ventilating inhaled air, and regulates breathing through the nasopulmonary reflex (1). A common method to control nose bleeding after septoplasty, rhinoplasty, and endoscopic sinus surgeries is the use of anterior nasal packing (2). Anterior nasal packing consists of closing the nasal cavity and posterior choana (3). In different studies, various complications such as epiphora, sleep disorders, damage to the nasal mucosa, pain, unpleasant feelings during swallowing, and even aspiration

and asphyxia have been pointed out about this procedure (4).

One of the complications that is debated today is the cardiovascular effects after nasal packing. Some studies have mentioned increased heart rate following bilateral nasal packing (1,5), some other mentioned decreased heart rate (6), and other studies have pointed to the significant increase or decrease in blood pressure in patients with nasal packing (7,8).

Various reasons have been proposed for increased heart rate and blood pressure such as increased airway resistance, hypoxia, and hypercapnia (1,5,7). Several studies consider pressure on nasal mucosa and neural stimulation as the main reasons for cardiovascular changes (9), and another study has related these changes to the complications of anesthesia (10).

Since the cardiovascular effects of nasal packing are not exactly clear and considering that there is a widespread application of this therapeutic method in different patients, this study aims to evaluate the possible cardiac changes in different groups and investigate potential reasons.

METHODS

This randomized clinical trial, was conducted between 2015-2017. The study protocol was registered at the ethics committee (Ref. No: IR.BMSU.REC.1395.346). (Fig. 1).

One hundred four patients candidates for septoplasty were selected using a random sampling method and assessed for eligibility. Patients without hypertension, pulmonary disorders, renal failure, diabetes and other metabolic diseases, thyroid dysfunction, smoking, alcohol consumption, as well as using medications since a month ago were included in the trial. Patients with blood pressure or heart rate disturbances in pre-operative monitoring, cardiovascular disorders during anesthesia or bleeding after surgery, were excluded from trial and analysis.

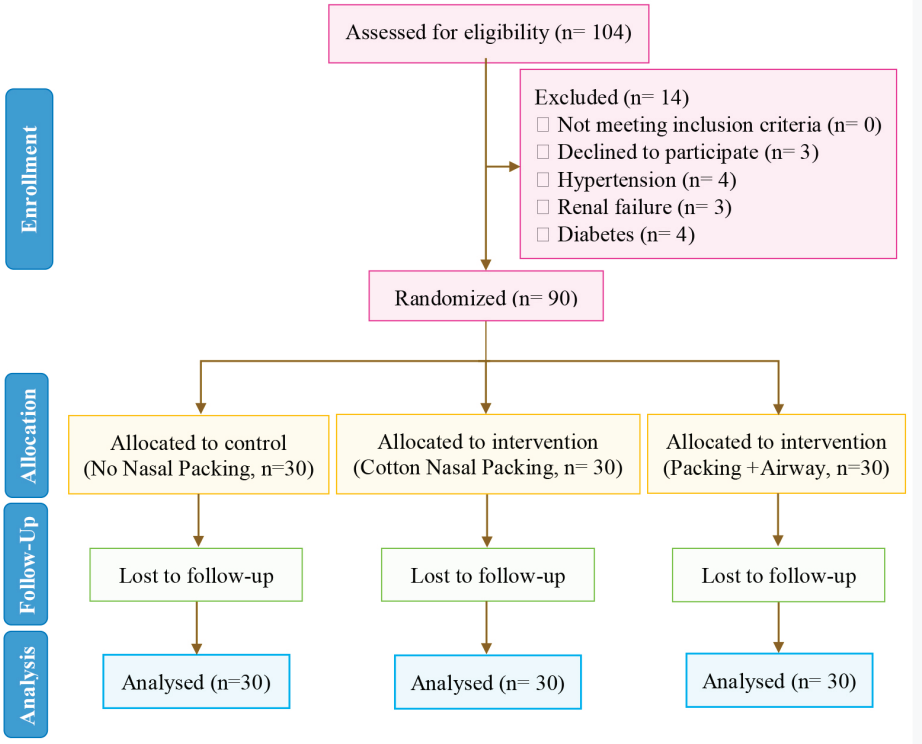

Fig.1. The flowchart of the trial.

Patients were randomly allocated to three groups using block randomization in a 1:1:1 ratio. The first group had no nasal packing after surgery. The second group underwent bilateral cotton nasal packing after septoplasty. Patients in the third group had bilateral nasal packing with bilateral airways after septoplasty.

All surgeries were done by the same surgeon and anesthesia team, also similar drugs including antibiotics and analgesics were prescribed for all patients post-operatively.

Blood pressure (BP), heart rate (HR) and cardiac rhythm were monitored by different assessors three times before surgery. Then, a classic septoplasty was performed. It included: hemi transfix incision and correction of septal deviation and at the end, suture and quilting was done for all patients. After surgery, bleeding was controlled carefully.

Then, 24 hours after surgery, blood pressure and heart rate were monitored by a 24-hour Holter. All patients were monitored by MOBILOGRAPH and Carditte devices, recording blood pressure and heart rate, respectively. The monitoring results were interpreted by a cardiologist.

Data was analyzed using SPSS software version 21 (SPSS Inc., Chicago, IL) for Microsoft Windows. Normal distributed variables (approved by 1-sample Kolmogorov-Smirnov test) were compared using independent sample *t* test between the groups. The chi square test was used to compare categorical variables in the two groups. P-values less than 0.05 were considered significant.

RESULTS

Eventually, 90 patients, 63 male and 27 female underwent analysis. The age range was 16 to 69 and the mean age was 35.7±12.7 years old. No significant differences were observed among research groups in terms of demographic characteristics ($p>0.05$).

The mean systolic blood pressure (SBP) was 122.1±6.2 mmHg in group 1 (patients without nasal packing) before surgery, in group 2 (patients with bilateral nasal packing) this was 123 ± 6.2mmHg, and in group 3 (patients with nasal packing with airway) this was 121.2 ± 7.1 mmHg. There were no significant differences between groups for pre-operative mean systolic blood pressure ($p>0.05$).

Mean SBP was 120.7±9.5 mmHg in group 1 after surgery, in group 2 this was 123.1±10.8 mmHg, and 126.4±8.6 mmHg in group 3. There were no significant differences between them regarding post-operative mean SBP ($p>0.05$).

Mean diastolic blood pressure (DBP) was 78.8±5.2 mmHg in group 1 before surgery. In addition, it was 80.5±6.3 mmHg in group 2, and 78±4.2 mmHg in group 3. No significant differences were observed between them for pre-operative mean DBP ($p>0.05$).

Mean DBP was 73.4±7.3 mmHg in group 1 after surgery. Also it was 76.4±5.8 mmHg in group 2, and 80.9±6 mmHg in group 3. This value was lower in patients without nasal packing and showed a significant difference with patients with nasal packing with airway ($p=0.03$).

Mean heart rate (HR) was 76.2±9.7 in group 1 before surgery. Also it was 79.6±14.1in group 2, and 76.6±9.2 in group 3, and there was no significant difference between them ($p>0.05$).

Mean HR was 71.8±11.3 in group 1 after surgery. While it was 77.7±7.9 in group 2, and 79.1±6.7 in group 3. Patients in the first group showed a significant difference with those in group 3 ($p=0.043$).

In pre-operative monitoring, no cardiac arrhythmia was detected. According to the monitoring after the surgery, one patient (3.3%) in group 1 showed sinus tachycardia (ST) and one patient (3.3%) showed sinus ventricular tachycardia (SVT). In group 2, two patients (6.6%) showed SVT and one patient (3.3%) showed ST. Among patients in group 3, two patients (6.6%) showed SVT. However, there were no significant differences between these groups ($p>0.05$).

Comparison of mean SBPs during day and night did not show any significant difference between the groups postoperatively. However, mean DBP was lower in group 1 in comparison with other groups and had a significant difference compared with group 3 (Table I and Table II).

Monitoring the heartbeats of patients for 24 hours after surgery showed that the patients in group 1 had 95900.7±29996.4 beats, group 2 had 107143.3±15352.1 beats, and group 3 had 103716.4±14376 beats. Patients without nasal packing had lower heartbeats compared to patients with full nasal packing (p=0.05).

None of the outcome measures mentioned in this section, had significant difference between patients with bilateral nasal packing and patients with nasal packing with airway.

None of the groups had post operation bleeding or septal hematoma.

DISCUSSION

In this study, the mean of DBP during night in patients without nasal packing was lesser than other groups. In addition, the mean of DBP during day in patients without nasal packing was lower than other groups

TABLE I
MEAN OF SYSTOLIC AND DIASTOLIC BLOOD PRESSURE PARAMETERS DURING DAY AND NIGHT.

		Mean of SBP after Surgery		Mean of DBP after Surgery	
		Day Mean± SD	Night Mean± SD	Day Mean± SD	Night Mean± SD
Groups	1	121.9±9.9	115.9±8.3	73.5±7.2	70.5±6.3
	2	124.2±10.5	118.3±16.2	76.9±5.6	72±7.8
	3	126.9±8.6	123.6±8.7	81.6±6.6	79.5±6.2
Between group p-Value		p=0.31	p=0.14	p=0.002	p=0.001

TABLE II
COMPARISON MEAN OF DBP DURING DAY AND NIGHT.

	Comparison		
Comparison mean of DBP during day	group 1	group 2	0.238
		group 3	0.001
	group 2	group 1	0.238
		group 3	0.085
	group 3	group 1	0.001
		group 2	0.085
Comparison mean of DBP during night	group 1	group 2	0.912
		group 3	0.027
	group 2	group 1	0.912
		group 3	0.069
	group 3	group 1	0.027
		group 2	0.069

and a significant difference was observed between this group and the group without airway. The mean of HR was lesser in patients without nasal packing, compared to other groups and this difference was significant compared to the group with nasal packing with airway. No significant difference was observed among patients with full nasal packing and patients with nasal packing with airway.

Consistent with this study, Ogretmenoglu et al. stated that patients with bilateral nasal packing showed increased BP and HR compared to those without nasal packing (1). Investigations in this context show that patients with bilateral nasal packing experience decreased O_2 saturation and increased PCo_2 and this stimulates environmental chemoreceptors and creates nasopulmonary reflex and increases sympathetic activity, BP, and HR (11).

Gupta et al. (7) in their study pointed to hypoxia following the application of bilateral nasal packing and increased BP and HR and proposed that the application of nasal packing with airway decreases the complications. This study showed that this will not decrease cardiovascular complications (6). In this case, the result of a study by Yu et al. (12) showed that the use of nasal packing with airway did not create any difference in decreasing O_2sat. Also, BP and HR among patients with full nasal packing and those with nasal packing with airway did not show any significant difference and even patients with nasal packing with airway experienced more pain, that pain can increasing HR and BP.

Kurtaran et al. in their study mentioned that the use of nasal packing with airway does not create hypoxia (13). Consistent with this, Zayan et al. (9) proposed that the use of nasal packing with airway maintains Co_2 at normal level and does not create any significant change at blood gases, but bilateral nasal packing decreases Hco_3 and Pco_2 and does not create any significant change in PO_2, O_2, and pH. However, in both groups, patients did not show any significant difference regarding the mean of HR, but compared to the condition before the surgery, HRmax decreased and HRmin increased and it has been concluded that hypoxia cannot create these changes, but the use of nasal packing has stimulated the vagus nerve and created vasodilation that lead to these changes. It is recommended that to decrease hypoxia in patients, nasal packing with airway should be used. Adhikari et al. (6) pointed to this mechanism and proposed that the use of nasal packing decreases BP and HR following the stimulation of the vagus nerve. While in the present study, patients with nasal packing showed higher HR mean compared to those without nasal packing. In addition, the heart rate of patients without nasal packing during 24 hours was less than others and this difference was significant and positive. This is not consistent with the results of the above study. Furthermore, the use of nasal packing with airway did not create any significant change compared to patients with full nasal packing.

Since the use of nasal packing has not indicated any established effect in preventing complications after the surgery such as bleeding, hematoma, and adhesion (14), and since the lack of nasal packing creates more comfort and life quality after the surgery (15), it is recommended that, use of nasal packing be considered on the balance of its risks and benefits. Therefore, among the presented reasons in previous studies, the stimulation of the vagus nerve following pressure on the mucosa cannot justify cardiac changes in patients. Considering the totality of published studies and this research, the best reason to justify cardiovascular changes of patients is hypoxia following the use of nasal packing. As well as the patients' pain factor can be the sympathetic stimulant and the cause of cardiovascular changes event.

This study showed that the use of anterior nasal packing with and without airway leads to cardiovascular changes, such as increased DBP and HR, but more studies are needed to obtain definitive conclusions. So it is better that the use of nasal packing should be considered on the balance of its risks and benefits.

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REFERENCES

1. **Ogretmenoglu O, Yilmaz T, Rahimi K, Aksoyek S.** The effect on arterial blood gases heart rate of bilateral nasal packing. Eur Arch Otorhinolaryngol Suppl 2002;259:63-66.
2. **Flint P W, Haughey B H, Lund V, Niparko J K, Thomas Robbins K, Regan Thomas J, et al.** Cummings otolaryngology head and neck surgery. 6th ed. Philadelphia: Sunders Elsevier 2015;684-778.
3. **Rekabi H, Sarfaraz M, Masoumi SA, Fasihi A.** The effect of nasal packing on arterial O2 saturation. *JSMJ* 2008;57:175-80.
4. **Weber R, Keerl R, Hochapfel F, Draf W, Toffel PH.** Packing in enodonasal surgery. Am J Otolaryngol 2001;22:306-320.
5. **Fan W H, Ko J H, Lee MJ, Xu G, Lee G S.** Response of nasal airway and heart rate variability to controlled nasal breathing. Eur Arch Otorhinolaryngol Suppl 2011;268:547-553.
6. **Adbikari P, Pramanik T, Roychowdhary P.** Vasovagal, Attack during Anterior Nasal Packing in Patients with Epistaxis. Int Arch Otorhinolaryngol 2008;12:406-408.
7. **Gupta M, Singh S, Chauhan B.** Comparative study of complete nasal packing with and without airways. B-ENT 2011;7: 91-96.
8. **Deniz Yilmaz M, Onrat E, Altuntas A, Kaya D, Kahveci O, Derekoy S, et al.** The effect of nasal packs on systemic blood pressure after septoplasty. KBB-Forum 2004;3:122-125.
9. **Zayyan E, Bajin MD, Aytemir K, Yılmaz T.** The effects on cardiac functions and arterial blood gases of totally occluding nasal packs and nasal packs with airway. Laryngoscope Investig Otolaryngol 2010;120:2325-2330.
10. **Bayar Muluk N, Apan A, Ozcakir S, Arikan OK, Koc C.** Risk of respiratory distress in the patients who were applied nasal packing at the end of nasal surgery. Auris Nasus Larynx 2008;35:521-535.
11. **Cook TA, Komorn RM.** Statistical analysis of the alterations of blood gases produced by nasal packing. Laryngoscope Investig Otolaryngol 1973;83:1802–1809.
12. **Yu SS, Mei KD, Lin YS.** Does airway integrated nasal packing after septal surgery improve body oxygenation? Rhinology 2013;51:243-248.
13. **Kurtaran H, Ark N, Sadikoglu F, Ugur KS, Yilmaz T, Yildirim Z, Aktas D.** The effect of anterior nasal packing with airway tubes on pulmonary function following septoplasty. Turk J Med Sci 2009;39:537-540.
14. **Banglawala SM, Gill M, Sommer DD, Psaltis A, Schlosser R, Gupta M.** Is nasal packing necessary after septoplasty? A meta-analysis. Int Forum Allergy Rhinol 2013;3:418-424.
15. **Kayahan B, Ozer S, Suslu AE, Ogretmenoğlu O, Onerci M.** The comparison of the quality of life and intranasal edema between the patients with or without nasal packing after septoplasty. Eur Arch Otorhinolaryngol Suppl 2017;274:1551-1555.