

# Effect of Endoscopic Correction on the Blood Pressure of Hypertensive Patients with Deviated Nasal Septum Symptoms

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**Introduction:** The objective of the study is to evaluate the effect of endoscopic correction of the septum on blood pressure in patients with deviated nasal septum symptoms and to assess positive changes that occur between deviated nasal septum and hypertension.

**Materials and Methods:** The study was conducted and data have collected in the department of ENT, different hospitals at Madinah Munawarah, Saudi Arabia. A total of sixty-eight adults medically examined at the age range between 20 to 45 years, with symptomatic nasal septal deviation, newly detected untreated hypertension (mean BP 140/90 mmHg), undergoing septoplasty operation and submucosal diathermy of the hypertrophied inferior turbinate (when present), were included. Postoperative follow up for ENT examination and BP measurement was done at 1<sup>st</sup>, 6<sup>th</sup> month, and the end of the year.

**Results:** There are 68 patients were taken for this study from various hospitals in the department of ENT, Madinah Munawarah region, Saudi Arabia. Among 68 patients 42 Male and 26 Female patients at the mean age of 35.23±2.15 years with a range of 29 to 44 with respective of male and female. Age distributed in the group as 19% of patients were in 25-30, 43% of patients in 31-35, 22% of patients in 36- 40, and 16% of patients were in 41-45, major fall in the age group of 31-35 years.

**Conclusion:** We concluded from our study that control of blood pressure in patients with nasal septal deviation can be achieved by surgical correction effectively and safely. Consequently, patients with symptomatic septal deviation should be assured of the prevention of secondary cardiovascular problems due to high blood pressure.

**Keywords:** Nasal obstruction, deviation, hypertension, blood pressure, nasal septum, ear nose throat

## Introduction

The opening of the nose is separated into two passages by the nasal septum. Typically septum is present in between the nostrils. Hence the openings of the nose are proportioned. Deprived drainage from the sinuses can be the effect of the diverged septum of the nose. The blockage in the upper respiratory tract identical

to diverged nasal septum and obstruction can lead to respiratory depression. Numerous researchers studied the development of circulatory complications in pulmonary arterial hypertension. Now general population 75 to 80% are predicted to have some types of nasal deformity. Apart from the actual sustenance system of the nose and the main factor of its

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figure, the distance and the lateral walls and the septum of the nasal passage controls the breathing and flow of air in the nose (1, 2).

Deviation in the nasal septum is the most frequent reason for nasal obstruction conferred with a decline in airflow of the nose and chronic irritability in the mucosa (3). Thus anomalous blockage of upper airway could lead to the progression of blood pressure (4). The present classification and definition of hypertension, established on the seventh report of the joint national committee on prevention, detection, evaluation, and treatment of hypertension (JNC 7), stipulates the verge for description (BP) Blood pressure as  $\geq 140/90$  mmHg. Finding efficient management of high blood pressure which reduces the pericardial failure, chronic renal disease, cerebrovascular accident, and myocardial infarction (5,6).

There is a well-documented correlation stated first in 1960 of chronic obstruction of the upper airway in children and infants with pulmonary hypertension and right ventricular dysfunction (1). In the research, the outcome of chronic obstruction of upper airways such as adenoid vegetation, hypertrophied tonsils, and nasal polyps on the cardiopulmonary system has existed in studies. However, the outcome of the classic nasal deviation on the cardiovascular system has not been specifically studied. In this study, we aimed to assess the blood pressure of the patients with the deviated nasal septum, who was to be undertaken for endoscopic septoplasty.

## Materials and Methods

### Ethical Statement & Study Design

An observational study was done from May 2016 to November 2019, at various hospitals in the department of ENT, Madinah Munawarah,

Saudi Arabia, the ethical approval of the ethics committees of hospitals were taken following standards of ethics. The informed written consent was taken from sixty-eight adults. The inclusion criteria of the study were of both genders male and females aged 20-45 years, suffering from Symptomatic deviation of nasal septal and recently identified high blood pressure (BP  $\geq 140/90$  mmHg).

Exclusion criteria were individuals agonized before surgery and after surgical period due to many adenoidal /nasal disorders (sinonasal malignancies, septal hematoma, synechiae, nasopharyngeal mass granulomatous disease, allergic rhinitis, chronic or acute infection of the paranasal sinuses or nose, polyps, hypertrophied middle turbinate, perforated septum, septal hematoma, chonchabullosa), had a prior history of septal or nasal operation, had the craniofacial syndrome, received head and neck radiotherapy, endocrine disorders like acromegaly and hypothyroidism, pregnancy, OSA or its hazards like hypertrophy of adenoid or tonsil enlargement, were recognized hypertensive or on any antihypertensive medication, pulmonary pathologies, uncontrolled asthma, hazards for high blood pressure for instance smoking, tobacco chewing, high salt intake, alcohol consumption, sedentary lifestyle, familial history of hypertension or cardiovascular disease.

Once the complete patient history was taken, medical examination and nasal endoscopic examination was done for preoperative evaluation. Deformities of nasal septum were classified according to the Dreher scale as following: 0=None i.e. no deviation, 1=Mild deviation i.e. deviation less than half of the total distance to the lateral wall, 2=Moderate deviation i.e. deviation greater than half of the

total distance to the lateral wall but not touching it, 3=Severe deviation i.e. deviation touching the lateral wall.

It was noted when there was compensatory hypertrophy of inferior turbinate. Subjects were relaxed before the measurement of blood pressure. The position for the measurement of blood pressure was half lying/supine, the right arm was used to put the cuff of customary mercury sphygmomanometer and BP was measured three times at the intervals of 10 minutes. The charted three readings were averaged. "Hypertension" was demarcated as (SBP)  $\geq 140$  mmHg systolic blood pressure and (DBP)  $\geq 90$  mmHg Diastolic blood pressure.

A preoperative regular workup was done. All subjects were given prophylactic antihypertensive orally on the night-time before and morning before the endoscopic septoplasty surgery for the reduction of blood pressure and decrease the chances of bleeding during the operation. After the surgery, the subjects were given analgesics and antibiotics for 1 week and 10 days anti-allergic. Subsequently, the nasal pack removal, two weeks of nasal douching was instructed. The follow up of the subjects was done postoperatively after 1 month, 6 months, and at year-end. During every appointment, ENT and a general medical examination were done and as that of preoperative three readings of blood pressure were recorded.

## Results

There are 68 patients were taken for this study from the various hospital in the department of ENT, Madinah Munawarah region, Saudi Arabia. Among 68 patients 42 male and 26 female patients at the mean age of  $35.23 \pm 2.15$  years with a range of 29 to 44 with respective of male and female (Table 1). Age distributed in

a group as 19% of patients were in 25-30, 43% of patients in 31-35, 22% of patients in 36-40, and 16% of patients were in 41-45, major fall in the age of 31-35. The nasal septal symptoms are subject to suffered by the patients' duration of 1 to 10 years, the mean of  $4.2 \pm 1.8$  years. The patients have 3 to 6 years with symptoms of 68%, 1 to 2 years with symptoms of 17%, and 15% of 7 to 8 years.

**Table-1.** Study Characteristics

Patients (n:68)	N	%
Male	42	61.76
Female	26	38.24
Mean Age	$35.23 \pm 2.15$	

According to this study, anterior deviation of septal symptoms was found in 68% of patients, posterior deviation of septal symptoms in 14% of patients, and 18% of patients in both septal symptoms. 26% of patients were with mild septal deviation, while 51% of patients were with moderate septal deviation, and 22% of patients were with severe septal deviation. Among 68 patients 15% of patients were observed and undergone compensatory hypertrophy with respective of 9% male and 6% female.

The mean Systolic BP of pre-septal correction operation was  $139.7 \pm 1.5$  mmHg and Diastolic BP of pre-septal correction operation was  $92.08 \pm 1.3$  mmHg. After correction of nasal septum with obstruction, blood pressure was controlled in 80% of the patients and recorded highly significant ( $p < 0.001$ ) by t-test in Spss, decrease in Systolic BP, and Diastolic BP. That is 10-15 mmHg decreases in Systolic BP and 5-10 mmHg decreases in Diastolic BP (Table -2). In a further study, 22% of patient's blood pressure remains not controlled followed with surgical correction of septal nasal obstruction, 14% of patient's blood pressure remains unchanged and 7% of

**Table-2.** Blood Pressure Changes after Septal Correction - \* $p < 0.001$  – high significance

Subjects Analysis	Systolic BP				Diastolic BP			
	Min-Max	Mean $\pm$ SD	Comparison Pre -Post		Min-Max	Mean $\pm$ SD	Comparison Pre -Post	
			T value	P-value			T value	P-value
Pre-Septal Correction	135-150	139.7 $\pm$ 1.5	-	-	90-94	92.08 $\pm$ 1.3	-	-
Post-Septal Correction								
30 Days	130-145	132.6 $\pm$ 6.5	17.25	0.0001*	85-98	84.2 $\pm$ 3.5	18.1	0.0001*
180 Days	125-140	128.3 $\pm$ 7.5	15.98	0.001*	82-98	83.1 $\pm$ 4.2	16.8	0.0001*
365 Days	120-150	127.8 $\pm$ 1.5	14.23	0.000*	75-100	85.1 $\pm$ 4.9	14.2	0.001*

patient's blood pressure increased after a year follow-ups. There is a significance found in between the Nasal septum deviation and the variation of blood pressure after surgical correction ( $p < 0.001$ ) with moderate septum deviation is highly responsive. Although 12% of patients have no big variation difference between pre and post-surgical correction blood pressure values. Blood pressure and age are also associated and shown insignificance ( $p < 0.001$ ) as 58.5% of patient's blood pressure is in high after symptoms correction, most of the fall in at the age group of 36-40 years. No significant difference found between blood pressure and Gender ( $p > 0.01$ ;  $p = 0.25$ ). There was no complication were seen in this study like septal perforation, deformity, septal hematoma, etc., soon after septum correction or delayed during the follow-ups.

## Discussion

The nasal cavity has foothold architecture in the middle called the nasal septum. The blockage in the nose is prevalent due to anatomical anomaly in the septum of the nose (2) and it is the maximum prevalent reason for the blockage of the upper respiratory tract.

Diverged septum of the nose along with the blockage has a serious impact on our anatomy aggregately (7). Therefore, there is a disturbance in our normal breathing due to obstruction in the nose, thus limiting airflow towards the lungs (1). The Heart rate and respiratory rate are elevated due to the reduction of ventilation or oxygenation in the lungs. Furthermore, the elevation of rate in the respiration does not permit the adequate interchange of gases in subjects with the diverged septum of the nose.

Substantial changes in intrathoracic pressure, hypercapnia, and hypoxia occur due to the mechanical obstructive changes in the upper airway and diverged nasal septum. This may disturb autonomic cardiac reactions due to stimulation of the sympathetic and parasympathetic system(7). Heart rate elevation occurs due to sympathetic stimulation. In the brainstem, the autonomic neural system controlling region for the respiratory system and heart rate are near to each other, so there is uninterrupted communication among these regions (8). Such instances in the patients of the diverged septum of nose can lead to numerous cardiovascular and pulmonary conditions<sup>[7]</sup>.

The effect in the vessels is thought to be due to carbon dioxide variations in blood and vasomotor center activation. There can be reverse actions of pathways, tougher central effect, which is complete vasoconstriction due to higher levels of carbon dioxide and its effect on vasomotor centers, although there is a direct action of vasodilation. Therefore, Blood pressure can increase because of the inhalation of carbon dioxide(9). In subjects with a serious deviation of septum have persistent contact of mucosa and irritation of mucosa by activation of the afferent path of the trigeminal nerve leading to complicated biological reaction comprising of vasoconstriction, bradycardia, apnea, and respiratory drive inhibition, through the afferent pathway by innervated fibers of somatic receptors, baroreceptors, and chemoreceptors (3).

High blood pressure is a cardiovascular disorder originating from the etiology of interconnectedness and multiple factors. When the subject crosses the verge of well-established blood pressure mark HTN is diagnoses. As per the international guidelines, hypertension is defined as an increase in blood pressure >140 mmHg of systolic and >90 mmHg diastolic pressure (6). The standard guidelines have been used in this study for hypertension. Prevention and treatment of high BP with earlier diagnosis reduces the threat of heart failure, Myocardial infarction, stroke, and chronic kidney disease (5). In this research we included adults below 45 years, studies show that there is a higher risk of essential HTN after this stage. We have included subjects with symptomatic obstruction of the nose as per our study, many researchers have revealed anatomical appearance were related severity of obstruction of nose posteriorly and anteriorly

(10). Physical assessment with endoscopy of the nose is a precise diagnostic technique for evaluating the patient with a septal deviation of nose requiring septoplasty surgery. There was a limited value as a diagnostic tool for rhinomanometry due to limited capacity to diagnose only major deviations of the septum in the anterior aspect (2). Consequently, our examination followed careful rectification of nasal septum by septoplasty, lack of a benchmark group is because there is no viable interchange treatment for digressed nasal septum, and morally a placebo treatment couldn't be completed because of acknowledged treatment guidelines for septal deviation. The research exhibited a noteworthy reduction in nasal opposition and a critical increment in most reduced oxygen saturation following resection of veered off nasal septum (11-15). Yuritas et al. in their study found a reduction in autonomic dysfunction that occurred because of nasal septal deviation was found to diminish after careful amendment i.e surgical incisions of the veered off septum (7). Similar outcomes were illustrated in our research, which showed (80%) of subjects profited significantly from endoscopic surgical correction, therefore reduced the mean blood pressure towards normal standards after surgery. The partial airflow limitation is due to the nasal valve which affects the blood pressure (1). Therefore maximum vulnerable is the frontal part of the nose and the critical can be the variance of 1 mm in the lumen (16). Researchers have revealed that the posterior aspect of the nasal cavity can hold an important deviation of the septum, which is deprived of considerable escalation in the resistance of the airway. In distinction with the nasal valve deviation area, there is extra folded resistance

in the nose. The rhinomanometry works and the surveillance of subjects are in agreement with our anterior nasal septal deviation correction of septum surgery (17). These observations coincided with our research as we had 68% Of anterior septal deviation patients and both types of deviance after nasal septal correction surgically revealed control in blood pressure, while the patients with posterior deviance are 14% with the control in blood pressure after surgery. A study by Stamler *et al.* revealed that with the increase in age blood pressure also increases (18). Likewise, our research revealed 7% of patients found with regular increase in blood pressure after the surgery during follow up period, subjects aged from 36 to 40 years were 58.5% and revealed a relationship in blood pressure and age group.

### Conclusion

We conclude from our study that control of blood pressure in patients with nasal septal deviation can be achieved by surgical correction effectively and safely. Consequently, patients with symptomatic septal deviation should be assured of the prevention of secondary cardiovascular problems due to high blood pressure.

### Conflict of Interest

The author declares no competing interests.

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