

# Effect of Septoplasty on Mean Platelet Volume in Patients of Deviated Nasal Septum.

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## ABSTRACT

**Background:** Mean platelet volume corresponds to average size of platelets and studies proved that large platelets are enzymatically and metabolically more active and have prothrombotic potential. Chronic upper airway like marked nasal septal deviation leads to higher Mean platelet volume and vice versa septoplasty operation lowers the volume of the platelets over a period of time and hence reduces other associated comorbidities. **Objectives:** This study was done with an aim to analyze the effect of Septoplasty on Mean Platelet Volume Levels in patients with Marked Nasal Septal Deviation. **Methods:** A prospective study was done in a total of 50 patients who were selected from ENT OPD and ENT Ward of Jawaharlal Nehru Medical College and Hospital, Aligarh Muslim University, Aligarh after proper history and examination. **Results:** Data obtained from preoperative and postoperative blood investigation were analysed using paired t-test and it was statistically proved that after Septoplasty, Mean Platelet Volume was significantly lowered in patients who had Marked Nasal Septal Deviation. **Conclusion:** Septoplasty plays an important role in reducing the MPV value in cases with Marked nasal septal deviation and thus other comorbid conditions can be prevented by doing septoplasty in these patients.

**Keywords:** Nasal septal deviation; septoplasty; mean platelet volume.

## INTRODUCTION

Nasal septal deviation (NSD) is a common etiology of the nasal obstruction<sup>[1]</sup>, although nasal obstruction can be caused by other conditions like turbinate hypertrophy, adenoid hypertrophy, and nasal polyposis. Approximately eighty percent of the general population is estimated to have some type of nasal deformity.<sup>[2]</sup>

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Ideally, the septum should run down the center of the nose. When it deviates into any one of the cavities, it narrows that cavity and impedes the airflow. Surgical correction of a deviated septum i.e. Nasal Septoplasty is the definitive treatment for septal deviation. Septoplasty is a corrective surgical procedure done to straighten the nasal septum, the partition between the two nasal cavities. After the septum is straightened then it may be stabilized temporarily with small plastic tubes, splints, gauge packs or sutures internally which are removed in a due course of time.<sup>[3]</sup>

Mean platelet volume (MPV) is a machine-calculated measurement of the average size of platelets found in blood and is typically included in blood tests as part of the Complete Blood Count (CBC).

A typical range of platelet volumes is 9.7–12.8 fL (femtolitre), equivalent to spheres 2.65 to 2.9 µm in diameter. Normal range is given as 7.5–11.5 fL.

MPV is higher when there is destruction of platelets. This may be seen as in immune thrombocytopenic purpura (ITP), and in myeloproliferative diseases, Bernard-Soulier syndrome and various obstructive diseases of the airway.<sup>[4]</sup>

Marked NSD (MNSD) causes chronic upper airway obstruction (UAO) which can lead to alveolar hypoventilation, cor-pulmonale, and pulmonary hypertension. UAO leads to chronic hypoxia and hypercarbia because of alveolar hypoventilation.<sup>[5]</sup> Chronic hypoxia and hypercarbia show tendency for hypercoagulopathy.

Mean platelet volume (MPV), the most commonly used measure of platelet size, is a potential marker of platelet reactivity and metabolism. Large platelets that contain more dense granules and are enzymatically and metabolically more active and have greater prothrombotic potential. Enhanced platelet activation plays an important role in the development of atherosclerosis. Studies proved that

increased MPV was demonstrated in cardiovascular and cerebrovascular diseases such as hypertension, unstable angina pectoris, myocardial infarction, and stroke.<sup>[6]</sup>

## MATERIALS AND METHODS

The following prospective study was conducted from October 2012 to September 2014. A total of 50 patients were included in the study in the age range of 10-50 years old. The cases were selected from the ENT OPD and ENT Ward after proper history and examination. An informed consent was obtained from all the patients. All procedures performed in the study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The blood samples of the selected patients were sent in EDTA vial for preoperative Mean Platelet Volume (MPV) before septoplasty and were reevaluated for MPV again postoperatively after the period of 4,8 and 12 weeks.

### Inclusion criteria:

The study included cases of marked deviated nasal septum refractory to conservative medical treatment with long term nasal obstruction and headache. The diagnosis of patients with MNSD was based on anterior rhinoscopy, endoscopic nasal examination and radiological investigation (Non contrast CT scan of nose and paranasal sinuses). All the patients underwent septoplasty while under local or general anesthesia. Blood samples were collected before septoplasty, and follow up samples were collected after 4-12 weeks after operation. The study population was also investigated for evidence of any diseases that would be exclusion criteria for study.

### Exclusion criteria:

The study excluded any patient with evidence of coronary artery disease, chronic heart failure,

thrombocytopenia, diabetes mellitus, renal or hepatic dysfunction, hematologic disease, cancer, hypothyroidism and hyperthyroidism, autoimmune disease, antithrombotic agent or serotonin reuptake inhibitor drug use, chronic or systemic inflammatory diseases such as bronchial asthma, rheumatoid arthritis, and psoriasis.

All the patients were properly assessed with complete detailed history, general examination, respiratory system examination and detailed ENT examination. All patients underwent diagnostic endoscopic examination and preoperative complete blood count investigation which includes MPV. The patients underwent both conventional and endoscopic septoplasty and patients were again evaluated after period of 4-12 weeks for MPV values.

## RESULTS

Among 50 patients studied 34(68%) cases were male and 16(32%) were female showing a male preponderance over female cases. The youngest patient included in the study was 12 years old and eldest patient was 46 years old. Male to female ratio was 2.1:1. All the patients were grouped in four groups A (10-20yr), B (21-30yr), C (31-40yr) and D (>40yr). The maximum numbers of patient belonged to Group A. The mean age group of our study was 24 years. The age incidence in our study mostly belonged to second to fourth decade of life. The most common symptom in our study was nasal obstruction (100%) in all the patients as all the patients had MNSD. Complaint of Nasal obstruction was followed by nasal discharge (58%), headache (48%), sneezing (32%), nasal bleeding (14%), snoring (14%) and anosmia (6%). Following septoplasty most marked improvement was in nasal obstruction as reported by the cases during follow up.

**Table 1: Preoperative MPV: No. of patients in respective age groups with MPV**

Age Group	MPV (<8)	MPV (8.1-9.0)	MPV (9.1-10.0)	MPV (10.1-11.0)	MPV(11.1-12.0)	MPV (>12)
Group A	-	-	7	7	6	7
Group B	-	-	5	4	2	2
Group C	-	-	-	3	2	4
Group D	-	-	-	-	1	-
Total	0	0	12	14	11	13

**Table 2: Post-Operative MPV at 4th, 8th and 12th week**

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Age Gp	No. of Patients with MPV (<8)			No. of Patients with MPV (8.1-9.0)			No. of Patients with MPV (9.1-10.0)			No. of Patients with MPV (10.1-11.0)			No. of Patients with MPV (11.1-12.0)			No. of Patients with MPV (>12)		
	Post-op week			Post-op week			Post-op week			Post-op week			Post-op week			Post-op week		
	4w	8w	12w	4w	8w	12w	4w	8w	12w	4w	8w	12w	4w	8w	12w	4w	8w	12w
A	-	-	-	-	1	1	6	8	8	10	9	11	8	6	6	3	3	1
B	-	-	-	1	1	-	4	7	8	5	4	4	2	-	1	1	1	-
C	-	-	-	-	-	-	-	-	2	4	7	5	-	1	1	2	1	1
D	-	-	-	-	-	-	-	-	-	2	-	-	2	1	1	-	-	-
Total	0	0	0	1	2	1	10	15	18	21	20	20	12	8	9	6	5	2

**Table 3: Comparison of MPV, Platelet count and WBC count**

Blood Parameter	Preoperative Mean with SD	Postoperative Mean with SD		
		4 <sup>th</sup> week	8 <sup>th</sup> week	12 <sup>th</sup> week
MPV	11.0±1.1	10.7±1.05	10.5±1.06	10.3±0.95
Platelet count	261±49 x10 <sup>3</sup>	263±55 x10 <sup>3</sup>		
WBC count	7.7±1.7 x10 <sup>3</sup>	7.9±1.7 x10 <sup>3</sup>		

We have compared 3 variables Preoperatively and Postoperatively after Septoplasty. MPV was recorded before septoplasty and after 4, 8 and 12 weeks of operation. The Platelet Count and WBC count was recorded before and 12 weeks after septoplasty operation.

**Preoperatively:**

- Maximum number of patients had MPV level between 10.1 to 11.0 fL
- The highest MPV levels lie in Group A(7 cases) followed by Group C(4 cases) and Group B(2 cases).
- The lowest MPV levels also lie in Group A(7 cases) followed by Group B(5 cases).

**Postoperatively:**

- Maximum number of patients had MPV level between 10.1fL to 11.0 fL in all the tables at 4,8 and 12 weeks.
- The highest MPV levels lie in Group A in all the tables at 4,8 and 12 wks.

Mean of platelet count preoperatively: 261±49 x10<sup>3</sup>

Mean of WBC count postoperatively: 7.9±1.7 x10<sup>3</sup>

Mean of platelet count postoperatively: 263±55 x10<sup>3</sup>

Mean of White Blood Cell(WBC) count preoperatively : 7.7±1.7 x10<sup>3</sup>

MPV was found to be higher in patients of MNSD. Most of the patients had MPV in the range between 10-13 fL (76%) preoperatively. Preoperative mean of MPV was found to be 11.0 fL with SD of 1.1.

At 4th week after septoplasty maximum number of cases i.e. 33(66%) had MPV in range of 10.1-12.0 fl. Mean MPV was calculated to be 10.7 fl with 1.05 SD

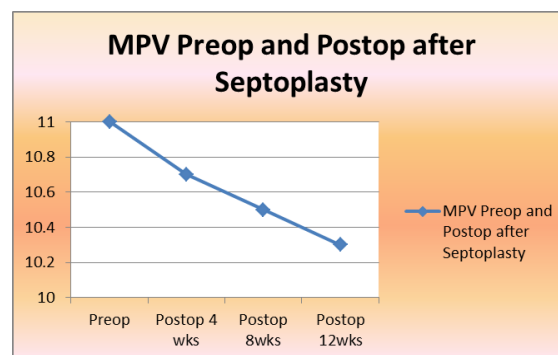
At 8th week after septoplasty maximum number of cases i.e. 35(70%) had MPV in range of 9.1-11.0 fl.

Mean MPV was calculated to be 10.5 fl with 1.06 SD

At 12th week after septoplasty maximum number of cases i.e. 38(76%) had MPV in range of 9.1-11.0 fl. Mean MPV was calculated to be 10.3 with 0.95 SD.

It was observed that almost all the cases had Platelet count within the normal range 150,000 to 400,000 per cubic millimetre.<sup>[7]</sup> Preoperatively the Mean of Platelet count was 261x10<sup>3</sup> with S.D of 49 and postoperatively 263x10<sup>3</sup> with S.D of 65.

WBC count was also observed to lie in the normal range 4500 to 11000 per cubic millimeter. Preoperatively the mean of leucocyte count was found to be 7.7x10<sup>3</sup> with S.D of 1.7 and the postoperative at 12th week was found to be 7.9x10<sup>3</sup> with S.D of 1.7.



**Figure 1: Showing decline of MPV values after Septoplasty.**

The data entries were entered into SPSS software and paired t test was applied.

1) The p value between pairs of Preoperative MPV and Postoperative MPV at 4,8 and 12 weeks, all were found to be significant. (p value<0.001).

2) The p value for correlation of preoperative and postoperative platelet count was 0.805 which is insignificant. (p value>0.001)

3) The p value for correlation of preoperative and postoperative WBC count was 0.250 which is insignificant. (p value>0.001).

The above calculations suggested that there was significant fall in MPV value after septoplasty operation. But with same calculations in same cases there was no significant change in Platelet and WBC count levels after Septoplasty.

## DISCUSSION

Nasal obstruction is a common presenting symptom in otolaryngology practice. NSD is a very common cause of recurrent and chronic nasal obstruction. Chronic nasal obstruction causes increased upper respiratory tract resistance, and also upper respiratory tract resistance leads to chronic hypoxia and hypercarbia because of hypoventilation. The effects of chronic obstructive disorders of the upper airways like tonsillar and adenoid hypertrophy and extensive nasal polyposis on the cardiopulmonary system have been studied.<sup>[8]</sup>

Hypercapnia and hypoxia caused by obstructive hypoventilation results in respiratory acidosis which in turn leads to pulmonary arterial vasoconstriction, increased right ventricular work, and cardiac hypertrophy. The cumulative effect of chronic airway obstruction, sustained pulmonary hypertension, right ventricular failure, and cor-pulmonale, systemic hypertension and increased pulmonary arterial pressure are seen in patients with upper airway obstruction.

MPV is an important biological variable and that larger platelets have higher thrombotic potential.<sup>[9]</sup> It is already proved that larger platelets are denser, aggregate more rapidly with collagen, have higher thromboxane A2 level, and express more glycoprotein Ib and IIb/IIIa receptors.<sup>[10]</sup>

In this study patients undergoing septoplasty were evaluated preoperatively and postoperatively for MPV, Platelet count and WBC count. The aim of the study was to assess how much role does septum deviation influence airflow through the nasal cavity which affects the oxygen content in blood leading to hypercarbia which in turn leads to increase in MPV in due course of time.

The first study of effect of septoplasty on MPV level was studied by Mustafa Sagit et al (2012) with a total of 60 cases and their study proved elevated levels of MPV in patients of MNSD which after septoplasty, decreased significantly.<sup>[11]</sup> They suggested that MPV, a determinant of platelet activation, is elevated in patients with MNSD. Increased platelet activation may be related to increase in cardiovascular complications in patients with MNSD. The increase in MPV levels of the cases with MNSD could be treated by correction of the septum by Septoplasty.

V.K. Poorey et al, in their study in GMCH Bhopal 2014, suggested that MPV was maximum in

Impacted type of DNS and in decreasing order in obstructive and simple types. They also emphasized on the concept that MPV is increased in chronic nasal obstruction due to DNS and this increase is in accordance with severity of DNS.<sup>[12]</sup> Among the cases as well as controls MPV was higher in females.

In our study Preoperative MPV values were paired with postoperative MPV at 4,8 and 12 weeks individually and paired t test was applied, p value was found to be 0.000 in all the three pairs. Here p value is found to be significant, this means that there is certainly a significant decrease in MPV after septoplasty. This proves our study that septoplasty played an important role in reducing the MPV value in cases with MNSD and thus reducing the incidence of other comorbid conditions by doing septoplasty in these patients.

## CONCLUSION

Septoplasty plays an important role in reducing the MPV value in cases with Marked nasal septal deviation and thus other comorbid conditions can be prevented by doing septoplasty in these patients.

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