Research Article

Evaluation of rhinomanometrical and clinicoradiological differences of nasal airflow in deviated nasal septum

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ABSTRACT

Background: Deviated nasal septum (DNS) is a comment cause of nasal obstruction may lead to the makeable changes in airflow, mucociliary clearance, nasal, and sinus mucosa. Rhinomanometry is an objective test for quantitative measurement of nasal patency which is helpful tool to a patient expecting surgery. **Objectives:** To evaluate rhinomanometrical and clinicoradiological differences of nasal airflow in DNS related to lateral nasal wall pathology. **Materials and Methods:** The present prospective study has 50 patients attending the ear, nose, and throat outpatient department were recruited. All patients were undergone for detailed clinical examination, hemogram, nasal airflow by rhinomanometry, and radiological examination by doing X-ray paranasal sinus (PNS) OM (Ociipitomental view) view and CT-PNS screening. **Results:** In the rhinomanometric test, 56% cases had significant difference in the nasal airflow, 12% cases had highly significant obstruction due to DNS, and 16 cases did not have significant change in air flow. Haziness in maxillary sinus is the most common finding in radiological examination followed by frontal and ethmoidal sinus. The values revealing anterior DNS is more common in both males and females than posterior DNS. **Conclusion:** Rhinomanometric analysis showed significant decrease in airflow due to DNS that too in the patients having anterior deviations. Post-operative rhinomanometric analysis showed that there was significant improvement in airflow that had anterior DNS.

KEY WORDS: Deviated Nasal Septum; Rhinomanometry; Computed Tomography Scan; X-ray

INTRODUCTION

Nasal septum is an important supporting and physiological structure of the nose.[1] Deviated nasal septum (DNS) is the most common cause of nasal obstruction. Nasal septal deviations are due to direct trauma but lead to nasal dysfunction.[2-4]

DNS may cause nasal obstruction and symptoms of rhinosinusitis such as nasal discharge and epistaxis.[5] The DNS is considered as secondary to trauma during development, at birth, or trauma sustained at any time in life.[6] Multiple reasons lead to DNS including birth molding of septum during delivery, developmental anomalies of septum and trauma. DNS may cause epistaxis, nasal discharge, nasal obstruction, and in smell sensation. Septal deviation is divided into anterior and posterior type on the basis of its location related to pyriform aperture. DNS is associated with chronic sinusitis. Significant differences in middle turbinate and lateral nasal wall abnormalities were noted contralateral to the direction of septal deviation.[7]

CT scan provides accurate information regarding paranasal sinuses in surgical emergencies. It helps to delineate extent of pathology depth of invasion. The rhinomanometric analysis is a quantitative estimation of nasal patency. Rhinomanometry measures the nasal patency utilizing the physics of airflow.

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Air flows through a tube which has pressure differences on it ends. It is helpful to the surgical elected patients. Functional nasal airway measurement is important in the understanding of nasal physiology and is a useful diagnostic tool in patient with nasal disorders.

With above literature support, the present study was conducted to evaluate the rhinomanometrical and clinicoradiological differences in DNS.

MATERIALS AND METHODS

The present prospective study was conducted in the Department of ear, nose, and throat, MNR Medical College and Hospital, Sangareddy, during April 2015–December 2016. A total of 50 patients attending the ear, nose, and throat outpatient department were recruited. The patients with nasal obstruction, headache, recurrent sinusitis, and epistaxis were included, and patients with previous facial trauma, paranasal sinus (PNS) malignancy, chronic granulomatous disease, clinical evidence of sinusitis of dental origin, and previous major nasal surgery were excluded.

All patients were undergone for detailed clinical examination, hemogram, nasal airflow by rhinomanometry, and radiological examination by doing X-ray PNS-OM view and CT-PNS screening. The patients were divided into following groups such as Group 1 with anterior DNS with or without lateral wall pathology, Group 2 with posterior DNS with or without lateral wall pathology, Group 3 with anterior and posterior DNS with or without lateral wall pathology, and Group 4 with control subjects. The nasal airflow studies were conducted by rhinomanometer as per the recommendations of "international committee for standardization of rhinomanometry."

A total of 50 patients who were selected for septoplasty were examined rhinomanometrically after decongestion by topical xylometazoline. Each nostril was measured individually during quite inspiration. Three consecutive values were taken, mean was calculated, and results were compared by applying Student's *t*-test. The patient response was measured by grading method, i.e., 1 - poor, 2 - moderate, 3 – good, and 4 - very good.

RESULTS

Among 50 patients 34 (68%) were males and 16 (32%) were females. The difference seems to be due to social factors rather than the pathology of DNS being more common in males. In sex wise distribution of DNS type, 21 males and 6 females belonged to anterior DNS and 18 males and 5 females came under posterior DNS. Unilateral DNS was noticed in 20 males and 6 females whereas bilateral DNS was seen in 16 males and 8 females. Unilateral DNS is more common in males wherein females bilateral DNS is common.

According to age wise distribution of cases, DNS was common in age group 21–30 years [Figure 1]. Whereas anterior and posterior, DNS was common in age group 21–30 years. Unilateral DNS was common in age group 21–30 years, whereas bilateral DNS common in 10–20 years age.

The most common symptoms related to anterior DNS nasal obstruction are nasal discharge and headache. Whereas in posterior DNS, headache is the most common symptom in 41% followed by vertigo (18%), postnatal depression (PND) (18%), and mastoid pain (16%). In the view of shape of DNS, C-shaped DNS (38%) is the most common followed by S-shaped DNS (31%) and anterior spur with opposite DNS (19%). Among the patients, 15 cases had the right side DNS, 32 cases had the left side DNS, and 3 cases had irregular DNS on to both sides.

Unilateral headache due to DNS is more common than bilateral headache. Temporal headache is common than frontal and eye headache. 18 patients had headache with vomiting.

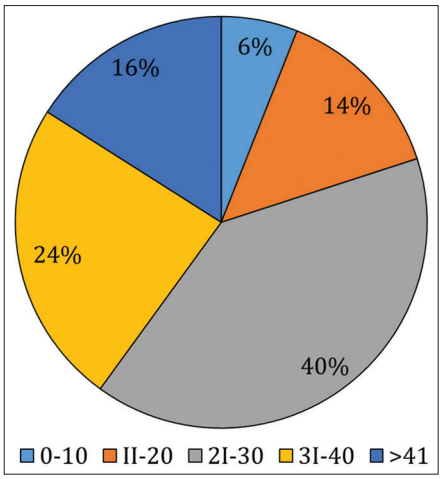

Figure 1: Distribution of cases according to age

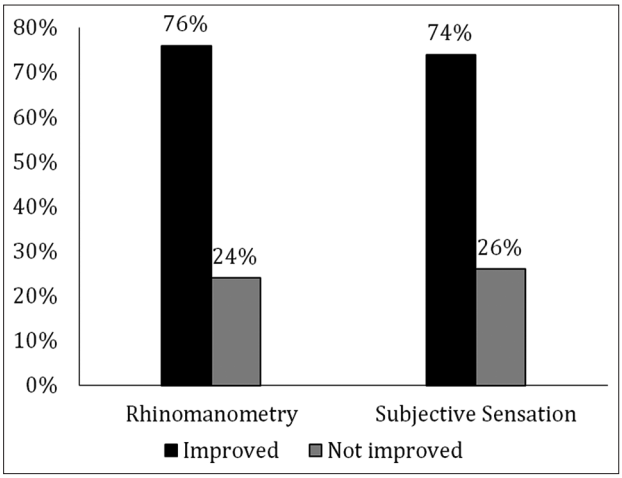

Figure 2: Comparison between subjective sensation and rhinomanometric findings

In the test of significance, 28 cases had significant difference in the nasal airflow due to DNS, 6 cases had highly significant obstruction due to DNS, and 16 cases did not had significant change in air flow.

DISCUSSION

In the present study out of fifty patients, 20 patients had deviation of septum in the anterior part while the remaining 11 patients had posterior DNS. The commenst symptoms related to anterior DNS nasal obstruction is nasal discharge and headache. Whereas in posterior DNS head ache is most common symptom in 41% followed by Vertigo (18%), PND (18%), mastoid pain (16%). In this study, maxillary sinusitis (16%) common associated nasal pathology with DNS followed by bilateral ITH (14%) (Table 1). In the present study, unilateral headache due to DNS is more common than bilateral headache.

Table 1: Findings of DNS and its associated pathology during nasal examinations

Pathology	Total patients
	n (%)
Bilateral ITH	7 (14)
Compensatory ITH	6 (12)
Concha bullosa	4 (8)
Maxillary sinusitis, pansinusitis	8 (16)
Enlarged bulla ethmoidalis	3 (6)
Enlarged uncinate process	3 (6)

DNS: Deviated nasal septum, ITH: Inferior Turbinate Hypertrophy

Table 2: Radiological findings of DNS

Findings	Total cases
	Number of cases (%)
Maxillary sinus haziness	22 (44)
Frontal sinus haziness	9 (18)
Ethmoidal haziness	6 (12)
Loss of scalloping in frontal sinus	3 (6)
Demineralization of boundaries of sinuses	2 (4)
Haziness of nasal passage	8 (16)

DNS: Deviated nasal septum

Table 3: Radiological findings of lateral wall pathology associated with DNS

Findings	Total cases
	Number of cases (%)
ITH compensatory	5 (10)
Bilateral ITH	6 (12)
Concha bullosa	4 (8)
Maxillary sinusitis/pansinusitis	10 (20)
polyposis	6 (12)

DNS: Deviated nasal septum, ITH: Inferior Turbinate Hypertrophy

Temporal head ache is common than frontal and eye headache. 18 patients had headache with vomiting.

On radiological evaluation haziness in sinuses, loss of scalloping of frontal sinus, demineralization of boundaries of sinuses, and haziness of nasal passage was formed in association with the DNS. We found haziness in maxillary sinus followed by frontal and ethmoidal sinus as the most common pathology (Table 2). It may be due to chronic sinusitis with fluid level or polypoid changes or mucosal hypertrophy. We also found the loss of scalloping in frontal sinus in two patients which suggest mucocele of the frontal sinus. Demineralization of boundaries of sinuses also seen due to chronic sinusitis leading to the dissolution of bone.

The rhinomanometry after decongestion is a useful tool in selecting patients whom one may expect to benefit from septal surgery. The present study emphasizes on the fact that addition of a simple investigation like rhinomanometry seems to be very useful for either selecting or excluding patients undergo surgery (Figure 2).[8] On rhinomanometric evaluation, in the test of significance, 28 cases had significant difference in there nasal airflow due to DNS, 6 cases had highly significant obstruction due to DNS, and 16 cases did not had significant change in air flow. Post-operative rhinomanometric evaluation showed 80% had significant and highly significant improvement in nasal airflow (Table 5). This might be due to long-standing obstruction desensitizes the nose for the sensation of air flow. There was good correlation between rhinomanometric results and improvement in subjective airflow sensation in DNS without lateral nasal pathology (Table 4).[9]

Table 4: Association of rhinomanometric findings with lateral wall pathology

Pathology	Findings (cm of water)
Anterior DNS	0.2–0.4
Posterior DNS	0.7–1.0
Only spur	0.4–0.6
DNS with spur	0.5–0.6
With ITH	0.2–0.3
With concha bullosa	0.5–0.7
With enlarged uncinate process	0.3–0.6
With enlarged ethmoid bulla	0.4–0.6

DNS: Deviated nasal septum, ITH: Inferior Turbinate Hypertrophy

Table 5: Air flow reduction due to DNS and rhinomanometric improvement after surgery

P	Airflow reduction	Rhinomanometric improvement
	Number of cases (%)	Number of cases (%)
< 0.05	28 (56)	33 (66)
<0.01	6 (12)	7 (14)
>0.05	16 (32)	10 (20)

CONCLUSION

The present study showed that the critical resistive area in the nasal cavity is the anterior part of nose, even small septal deviation in this area can cause significant nasal obstruction. Anterior DNS causing more nasal obstruction than posterior DNS. The commenst symptoms related to anterior DNS nasal obstruction is nasal discharge and headache. Rhinomanometric analysis showed significant decrease in airflow due to DNS that too in the patients having anterior deviations. Post-operative rhinomanometric analysis showed that there was significant improvement in airflow that had anterior DNS. The result of the present study reemphasized the concept that obstruction at ostiomeatal complex and anterior ethmoids as the key factor for causation of chronic sinusitis, which is secondary to septal deviation.

REFERENCES

1. Bahar K, Kayhan O, Deniz U. Is there any relationship between nasal septal deviation and concha bullosa. Eur J Gen Med 2010;7:359-64.
2. Renner GJ. Management of nasal fractures. Otolaryngol Clin North Am 1991;24:195-213.
3. Kelley BP, Downey CR, Stal S. Evaluation and reduction of nasal trauma. Semin Plast Surg 2010;24:339-47.
4. Murray JA, Maran AG. The treatment of nasal injuries by manipulation. J Laryngol Otol 1980;94:1405-10.
5. Neskey D, Eloy JA, Casiano RR. Nasal, septal, and turbinate anatomy and embryology. Otolaryngol Clin North Am 2009;42:193-205, vii.
6. Daghistani KJ. Nasal septal deviation in Saudi patients: A hospital based study. J King Saud Univ Med Sci 2002;10:39-46.
7. Lanza DC, Kennedy DW. Adult rhinosinusitis defined. Otolaryngol Head Neck Surg 1997;117:S1-7.
8. Bailey B. Nasal functions and evaluation, nasal obstruction. Otorhinolaryngology. 2nd New York NY: Lippincott-Raven; 1998. p. 335-44.
9. Mladina R, Cujic E, Subaric M, Vukovic K. Nasal septal deformities in ear, nose, and throat patients: An international study. Am J Otolaryngol 2008;29:75-82.

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