ORIGINAL RESEARCH PAPER

Volume-8 | Issue-6 | June-2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ENDOSCOPIC SINUS SURGERY IN CHRONIC RHINOSINUSITIS AND NASAL POLYPOSIS: A COMPARATIVE STUDY

Medical Science

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ABSTRACT

Introduction: This prospective interventional study was carried out to compare the effect of Endoscopic Sinus Surgery on Chronic Rhinosinusitis as compared to Nasal Polyposis

Materials & Methods- Sample size were 70 (patients attending ENT OPD of a tertiary care hospital in Kolkata ,India from August 2014 to July 2015, aged between 18-65 years, among them 44 were CRS and 26 were NP. The parameters studied were - pre and post-operative assessment of symptom severity score, preoperative Lund Mackay CT scan score, pre and postoperative Lund Kennedy nasal endoscopy score.

Results- The cases were followed up to 18 months. In our study both the groups showed significant improvement after ESS with the symptomatic improvement of NP group reducing on long follow up.

Conclusion- ESS is equally effective in both Chronic Rhinosinusitis and Nasal Polyposis patients that means the effect of difference of outcome of ESS on CRS and NP is not statistically significant.

KEYWORDS

Endoscopic sinus surgery, nasal polyposis , chronic rhinosinusitis.

INTRODUCTION

Chronic rhinosinusitis (CRS) is a common health problem which leads to frequent visits to primary care physicians and ear, nose, throat specialists. CRS is defined as a group of disorders associated with inflammation of mucosa of nose and paranasal sinuses(PNS) of at least 12 months duration. This definition was put forth in 1996 by the Rhinosinusitis Task Force (RSTF) which was established by American Academy of Otorhinolaryngology.

Nasal polyposis (NP) are common presentations in patients of CRS and are considered to be associated with more severe form of disease with poor treatment outcome. Nasal polyposis (NP) are mucosal sacs containing oedema, fibrous tissue, inflammatory cells and glands. NP is considered as a subgroup of CRS with an incidence of 4% in general population and 25-30% in patients suffering from CRS.(6)

In spite of recent advances, the aetiology, pathogenesis and treatment of CRS is a matter of debate. Though studies in literature suggest that patients of NP as a distinct entity but the present investigation and treatment modality do not distinguish CSR from NP(2)

In this study we have analysed the demographics, clinical features and treatment outcomes in a group of patients with chronic rhinosinusitis(CRS) and nasal polyposis(NP). The presentation and treatment outcome after endoscopic sinus surgery in patients of CRS and NP is analysed. In this study the patients of CRS are classified into two groups depending on presence and absence of NP. 1st group is patients of CRS without NP which will be referred as CRS and 2nd group is patients of CRS with NP which will be referred as NP. The two groups are evaluated using subjective (patient complaints) and objective(CT scan and endoscopy scores) criteria. Preoperative data is compared with data obtained 18 months post endoscopic sinus surgery.

Study design : Prospective interventional study

MATERIALS AND METHODS-

The study entitled **"Endoscopic Sinus Surgery in Chronic Rhinosinusitis and Nasal Polyposis: A Comparative Study"** was conducted in the department of ENTin a tertiary care Hospital, Kolkata. The study was done on 70 patients. Out of these 44 patients were of chronic rhinosinusitis(CRS) i.e. chronic rhinosisnusitis without nasal polyposis and 26 patients were of nasal polyposis(NP) i.e. chronic rhinosisnusitis with nasal polyposis. All the 70 patients attended the ENT OPD of SSKM Hospital with signs and symptoms suggestive of chronic rhinosinusitis underwent diagnostic nasal endoscopy(DNE) and CT scan of nose and paranasal sinusis(PNS). After establishing the diagnosis as per the clinical, radiological and nasal endoscopic criteria, all the patients underwent endoscopic sinus surgery(ESS). ESS was carried out as per standard techniques under general anaesthesia. The extent of surgery was determined by the disease and included a minimum of uncinectomy and middle meatal antrostomy. Anterior or posterior ethmoid sinus, frontal sinus and sphenoid sinus were explored in cases of involvement. Following surgery the patients were followed up to a maximum of 18 months. All patients of allergy were given topical nasal steroids for 6 months.

STUDY POPOULATION

All patients attending ENT OPD of a tertiary care hospital in Kolkata , India, from Feburary 2014 to August 2015(1year 6 months.) Hospital who had been diagnosed of chronic rhinosinusitis and nasal polyposis both clinically and by radiological investigation and nasal endoscopy.We included patients with Established diagnostic criteria of CRS as per Rhinosinusitis Task Force 1997., patients diagnosed as Nasal Polyposis(NP) based on presence of polyps on endoscopic examination , age greater than 16 years , with confirmatory radiological diagnosis of CRS and also revision cases. Patients with comorbidities were excluded .Total study population was taken as 70 .

SAMPLE DESIGN:

All the selected patients examined clinically, diagnostic nasal endoscopy had been done, radiological assesment of nose and PNS had also been done. In all cases other routine investigation had also been done.

PARAMETERS STUDIED:

1. Severity of disease in five points scale of 0-4(no symptoms, mild, moderate, moderately severe and severe symptom). [symtom severity score].
2. Preoperative Lund Mackay CT Scan score.
3. Pre and postoperative Lund Kennedy nasal endoscopy score.
4. Change in patient symptoms(worse, no change, better).

Severity of symptoms in CRS and NP [symptom severity score 0-4]

Symptoms CRS	No (0)	Mild (1)	Moderate (2)	Moderately severe (3)	Severe (4)
1. Nasal blockage 2. Nasal discharge 3. Reduced sence of smell 4. Headache & facial pain 5. Post nasal discharge					

Symptoms NP	No (0)	Mild (1)	Moderate (2)	Moderately severe (3)	Severe (4)
1. Nasal blockage 2. Nasal discharge 3. Reduced sence of smell 4. Headache & facial pain 5. Post nasal discharge					

Preoperative Lund Mackay CT scan score:

Sinus system	Left side	Right side
Maxillary (0,1,2)		
Anterior ethmoids (0,1,2)		
Posterior ethmoids (0,1,2)		
Sphenoid (0,1,2)		
Frontal (0,1,2)		
Ostiomeatal complex (0 or 2 only)		
Total points		

Maxillary (0,1,2)Anterior ethmoids (0,1,2)Posterior ethmoids (0,1,2)Sphenoid (0,1,2)Frontal (0,1,2)Ostiomeatal complex (0 or 2 only)Total points[0= no abnormality; 1= partial opacification; 2= total opacification]
[For Ostiomeatal complex: 0= not obstructed, 2= obstructed]
A total score of 0-12 per side is possible, with the higher no. reflecting more severe rhinosinusitis and polyposis.
Post–operatively, CT scan is advised in recurrent cases only.

Endoscopic examination was performed pre-operatively and at each post-operative visit. We used endoscopic staging proposed by Lund Kennedy endoscopy score to assess the following parameters:

Lund Kennedy nasal endoscopy score:

Characteristics	Baseline and follow up
Polyp left (0,1,2,3)	
Polyp right (0,1,2,3)	
Oedema left (0,1,2)	
Oedema right (0,1,2)	
Discharge left (0,1,2)	
Discharge right (0,1,2)	
Post-operative scores to be used for outcome assessment only	
Scarring left (0,1,2)	
Scarring right (0,1,2)	
Crusting left (0,1,2)	
Crusting right (0,1,2)	
Total points	

Polyps: 0= absence of polyps; 1= polyps in middle meatus only; 2= polyps beyond middle meatus but not blocking the nose completely; 3= polyps completely obstructing the nose

Oedema: 0= absent; 1= mild; 2= severe
Discharge: 0=no discharge; 1= clear, thin discharge; 2= thick, purulent discharge

Scarring: 0=absent; 1=mild; 2= severe
Crusting: 0=absent; 1=mild; 2= severe.

RESULT AND ANALYSIS

1st group is chronic rhinosinusitis without polyp referred to as CRS, which include 44 patients. 2nd group is chronic rhinosinusitis with polyp referred to as NP which include 26 patients. The two groups are compared preoperatively as well as postoperatively using chi square(X^2) test. The preoperative data is compared postoperative data for each group using student t test (paired t test) to assess how effective the surgery(ESS) is.

PREOPERATIVE ANALYSIS

1.AGE: We found that percentage prevalence of NP is more in age group above 40 years as compared to CRS. Whereas the percentage prevalence of CRS is more as compared to NP in age group below 40 years.

2.SEX: The prevalence of CRS is higher in females whereas prevalence of NP is higher in male

3.ALLERGY AND ASTHMA : In the study we found that , percentage of allergy in CRS = 13.6%, Percentage of asthma in CRS = 6.8%, percentage of allergy in NP = 30.8%, Percentage of asthma in NP = 19.2%

4.SYMPTOMATOLOGY: the 5 main symptoms of the patients have been described in table-1 and table-2.

TABLE-1

	CRS (n = 44)					NP (n = 26)				
Symptoms	No.(%)	Mild(%)	Moderate (%)	Moderately severe (%)	Severe (%)	No. (%)	Mild (%)	Mode-rate (%)	Moderat-ely sever (%)	Severe (%)
Nasal blockage	75	11.4	9	4.5	0	11.5	19.2	23	19.2	26.9
Nasal discharge	47.7	13.6	15.9	3.6	9.1	42.3	7.7	11.5	19.2	19.2
Reduced sense of smell	84.2	13.6	2.3	0	0	34.6	7.7	15.4	15.4	26.9
Headache and facial pain	22.7	9	18.2	29.5	20.5	84.6	11.5	3.8	0	0
Postnasal discharge	65.9	18.2	2.3	9	4.6	57.7	7.7	3.8	11.5	19.2

TABLE-2

	CRS (n =44)					NP (n = 26)				
Symptoms	No.	Mild	Moderate	Moderately severe	Severe	No.	Mild	Moderate	Moderately severe	Severe
Nasal blockage	33	5	4	2	0	3	5	6	5	7
Nasal discharge	27	6	7	6	4	1	2	3	5	5
Reduced sense of smell	37	6	1	0	0	9	2	4	4	7
Headache and facial pain	10	4	8	13	9	22	3	1	0	0
Postnasal drip	29	8	1	4	2	15	2	1	3	5

The data in table-1 are in percentage which will be presented graphically for comparison (Figure-1) whereas the data in table-2 are the actual number of cases which will be compared with the help of Pearson's chi-square (X2) test. We regarded P-value smaller than 0.05 as significant.

Now we will compare each of the 5 symptoms between two groups are after another.

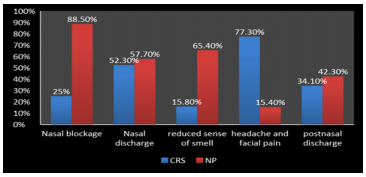

FIGURE-1

a. Nasal blockage : Nasal blockage is significantly higher (P-value < 0.05) in NP as compared to CRS

b. Nasal discharge : There is no significant difference (P-value > 0.05) in nasal discharge between the CRS and NP.

c. Reduced sense of smell : In our study we found that reduced sense of smell is significantly higher (P-value < 0.05) in NP as compared to CRS

d. Headache and Facial Pain :
Headache and facial pain is significantly higher (P-value < 0.05)in CRS as compared to NP.

e. Post nasal discharge : There is no significant difference (P-value > 0.05) in posterior nasal discharge between the CRS and NP.

5. CT SCAN AND SCORE: the distribution as per Lund MacKay CT Scan score is distributed in table-3

TABLE-3

		Maxillary sinus (0,1,2)	Anterior ethmoidal sinus (0,1,2)	Posterior ethmoidal sinus (0,1,2)	Sphenoid sinus (0,1,2)	Frontal sinus (0,1,2)	Ostiomeatal complex (0,2)
CRS n = 44	Right	8	5	7	2	3	12
	Left	6	2	5	1	5	9
	Both	30	27	7	2	8	2
	Total	44	34	19	5	16	23
	Percent	100%	77.3%	43.2%	11.4%	36.4%	52.3%
NP n = 26	Right	2	2	3	1	4	8
	Left	4	3	2	1	2	7
	Both	20	19	14	5	7	10
	Total	26	24	19	7	13	25
	Percent	100%	92.3%	73.1%	26.7%	50%	96.1%

I. The mean Lund Mackay CT Scan score of CRS = 7.73
ii) The mean Lund Mackay CT Scan score of NP = 12.27 the mean Lund Mackay score of CRS and NP is compared Graphically in figure-2

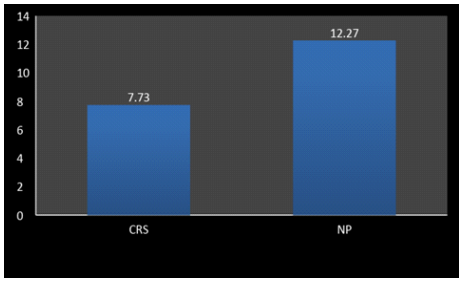

Figure-2

Analysis of Lund Mackay CT Scans scores of the two groups and determination of statistical. Significance with help of student test for independent samples.

Let us suppose NP is Group A and CRS is Group B.
We use the following formula to calculate the t-value or ratio
t=MA - MB√∑x2- ∑x2NA+∑y2- ∑y2NBNA+NB-21NA + 1NB

Where =summation of score
MA=mean of Group A= 31926
MB=Mean of Group B= 34044

x=score in Group A= [19,11,16,7,17,11,9,18,11,7,16,1216,10,8,11,16, 6,14,5,10,11,13,7,18,20,]

y=score in Group B= [10,4,10,5,11,4,5,7,5,7,3,6,16,7,5,7,5,7,8,5,7, 10,6,6,510,9,6,13,11,8,8,8,10,4,8,11,5,6,6,12,6,14,6,]
NA=number of scores in Group A=26
NB=number of scores in Group B=44

Now putting the data in the above formula we get
t=5.003
Degree of freedom (df) = $(N_A - 1) + (N_B - 1)$
df = (26 – 1) + (44 – 1) = 68
with t = 5.003 and df = 68
the P-value is < 0.00001 which is < 0.05
hence the null hypothesis is rejected

So, the Lund Mackay CT Scan score of NP is significantly higher (p-value < 0.05) than that of CRS.So, the analysis of CT Scan score between CRS and NP revealed:

I. The mean Lund Mackay CT Scan score of NP (12.27) is significantly higher than that of CRS (7.73) (P-value < 0.05)
ii. Higher bilateral disease with involvement of multiple sinus in NP as compared to NP.
iii. In all cases of NP and CRS the maxillary sinus is involved.
iv. Percentage of anterior ethmoid, posterior ethmoid, sphenoid and frontal sinus involment is higher in NP as compared to CR.

6. NASAL ENDOSCOPY AND SCORE :

Analysis of Lund Kennedy nasal endoscopy and determination of statistical significance with the help of student t test for independent samples.

Let us suppose NP is Group A and CRS is Group B.
We will use the following formula to calculate t value
t=MA - MB√∑x2- ∑x2NA+∑y2- ∑y2NBNA+NB-21NA + 1NB

Where =summation of score
MA=mean of Group A= 22626=8.69
MB=Mean of Group B= 25344=5.75

x=score in Group A= [10,7,9,10,6,10,10,8,12,912,10,6,9,9,8, 12,6,10,7,7,6,12,7,10,4,]

y=score in Group B= [6,7,8,6,6,5,6,5,5,7,7,8,6,4,66,7,5,5,8,4,5,6, 8,2,6,4,3,6,6,6,4,7,7,6,4,7,4,7,5,6,6,6,5,]
NA=number of scores in Group A
NB=number of scores in Group B

Now putting the data in the above formula we get
t=7.27448
Degree of freedom (df) = $(N_A - 1) + (N_B - 1)$
df = (26 – 1) + (44 – 1) = 68
with t = 7.27448 and df = 68
the P-value is < 0.00001
hence the null hypothesis is rejected

So, the Lund Kennedy nasal endoscopy score of NP is significantly higher (p-value < 0.05) than that of CRS.

ANALYSIS OF SURGERY PERFORMED

All the patients of CRS and NP underwent endoscopic sinus surgery (ESS) as per standard technique under general anesthesia. The extent of surgery was determined by the disease included a minimum of uncinectomy and middle meatal antrostomy (Table 4).

Table-4

	Anterior ethmoidectomy	Posterior ethmoidectomy	Frontal Recess Surgery	Sphenoidectomy
CRS n = 44	38 (86.3%)	20 (45.5%)	16 (36.4%)	5 (11.4%)
NP n = 26	25 (96.1%)	19 (73%)	13 (50%)	7 (26.9%)

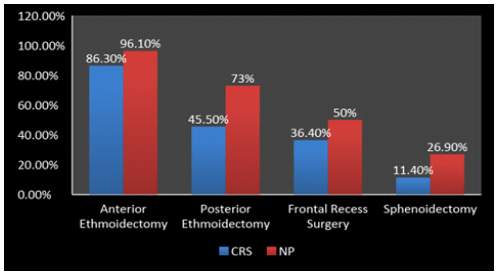

Figure-3

From the above table (Table-4) and figure (Figure-3). It is clear that the extent of surgery performed is greater in NP as compared to CRS as because the extent of disease (Symptomatology, mean CT scan score and mean nasal endoscopy score) was greater in NP as compared to CRS.

The percentage of posterior ethmoidectomy performed in NP (73%) is significantly greater than CRS (45.5%) with P-value < 0.5 (Table-5)

TABLE-5

	Posterior ethmoidectomy performed	Posterior ethmoidectomy not performed	Total
CRS	20	24	44
NP	19	7	26
Total	39	31	

2= 20*7-24*1927044*26*39*31=5.05

With $\chi 2 = 5.05$ and df = 1
The P-value is 0.0246
The result is significant at $P < 0.05$

POST OPERATIVE ANALYSIS

1) SYMPTOMATOLOGY: After surgery, the cases are followed upto 18 months. The change in the symptoms of cases at the end of our study period is tabulated in table 6

TABLE-6

Symptoms post-surgery	CRS n = 44				NP n = 26			
	Failure		Success		Failure		Success	
	Worse	No change	Better	Success percent	Worse	No change	Better	Success percent
Nasal blockage	0	2	9	81.8%	1	1	21	91.3%
Nasal discharge	0	3	20	86.9%	2	3	10	66.7%
Reduced sense of smell	0	1	6	85.7%	3	5	9	52.9%
Headache and facila pain	2	6	28	76.5%	0	1	3	75%
Post nasal discharge	0	2	13	86.7%	1	2	8	72.7%

a) Determination of statistical significance of post-operative improvement in symptoms severity score of CRS with help of 'Paired t test':The post-operative improvement in symptomatology of CRS is statistically significant (P-value < 0.05)

b) Determination of statistical significance of post-operative improvement in symptom severity score of NP with the help of 'Paired t test'.The post-operative improvement in symptomatology of NP is statistically significant (P-value < 0.05).

Post endoscopic sinus surgery (ESS) patients of both the group showed significant improvement in symptomatology in (P-value < 0.05) except for improvement of smell perception among the NP patients.

CRS patients showed a higher percentage of post ESS improvement in symptoms as compared to NP

Nasal blockage was found to have a higher improvement in NP.

2)LUND-KENNEDY NASAL ENDOSCOPY SCORE :

a) Determination of statistical signification of post-operative improvement in nasal endoscopy score with the help of 'Paired t test, the post-operative improvement in endoscopy score of CRS is statistically significant (P < 0.05)
b) Determination of statistical significance of post-operative improvement in nasal endoscopy score of NP with the help of 'Paired t test'

So, the post-operative improvement in endoscopy score of NP is statistically significant (P-value < 0.05)

DISCUSSION

During study 70 cases of CRS were selected based on major and minor clinical criteria and radiological investigation. All the 70 cases of CRS underwent nasal endoscopy and based on nasal endoscopy, 26 out of 70 cases were diagnosed as nasal polyposis(NP).

NP is considered as a subgroup of CRS with a prevalence of 2-4% in general population [1] and 25-30% in patients suffering from CRS [2]. In our study we have found that out of 70 cases of CRS, 26 had nasal polyp i.e. 37.1 % prevalence. Hedman et al have found the prevalence of NP is 4% in general population, 7-15% in asthmatics and up to 36-60% in patients of Samters triad[2].

In the study we have found higher higher percentage of allergy and asthma in NP as compared to CRS. In our study 30.8% of NP and 13.6% of CRS cases gave history and symptoms suggestive allergy where as 6.8% of CRS 19.2% of NP had asthma. One study has found the incidence NP of 7-15% in asthmatics[14].

In our study we have found increased symptoms of headache and facial pain in patients of CRS, whereas increased symptoms of nasal blockage and anosmia in patients of NP. Ling FT et al have described the top three symptoms of CRS which are nasal obstruction, facial congestion and postnasal drip in terms of prevalence and severity[15]. Kountakis et al has demonstrated worse results of QOL in patients of NP and hypothesized it due to mass effect of polyp causing blockage(15), reduced mucociliary clearance, retained secretion, increase mucosal oedema and inflammation and reduced sense of smell [15]. The mean Lund Mackay CT scan score of NP(12.27) was significantly higher than that of CRS(7.73) (P-value < 0.005). The mean Lund Kennedy endoscopy score of NP(8.7) was significantly higher than that of CRS(5.7) (P-value < 0.005). In our study we have found higher bilateral disease with involvement of multiple sinuses in NP as compared to CRS. Toros SZ et al. have observed significantly higher CT scan and endoscopy scores in patients of NP as compared to CRS [13].

In our study there was a statistically significant improvement in both subjective and objective parameters in the patients of CRS and NP after surgery. Post ESS patients of both groups showed significant improvement except for improvement in smell perception among the NP patients. CRS patients showed a higher percentage of post ESS improvement in symptoms as compared to NP. Nasal blockage was found to have a higher improvement in NP. Although the initial improvement in the NP group was substantial, the positive effects in symptoms and endoscopic scores were found to reduce on follow up. In patients of CRS these effects were found to be sustained and also showed improvement during the follow up period.

The endoscopy scores according to Lund Kennedy scoring showed significantly higher preoperative scores in NP as compared to CRS. Both the groups had significant improvement in endoscopy scores after ESS. Nores JM et al. in their study of 152 patients of nasal polyps found that many patients of NP have the tendency to recur and are found refractory to treatment after successful surgery [12]. Though the exact mechanism of recurrence in these patients of NP are not well understood, certain factors like allergy, asthma, hereditary and fungus have been implicated [8]. In our study the NP group had a significantly higher percentage of patients with asthma, allergy recurrence and revision surgery.

CONCLUSION

On review of literature there is varied data on the symptomatology, severity of disease, effects on Quality Of Life and post-operative improvement of patients of CRS and NP. Though the universal rationale of management by adequate drainage and ventilation of sinus is similar in both groups, there exists a growing perception among otolaryngologist regarding the differences between the two entities. In our study both the groups showed significant improvement after ESS with the symptomatic improvement of NP group reducing on long follow up. Further studies are necessary to determine effective management of NP patients with sustained improvement of symptoms.

Compliance with Ethical Standards

Conflict of interest the authors declare that there is no conflict of interest.

Ethical Approval all procedures performed in studies involving human participants 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.

Informed consent informed consent was obtained from all individual participants included in the study

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