

Is Chronic Rhinosinusitis and Status of Pharyngeal End of Eustachian Tube Link-Up: All Smoke No Fire?

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ABSTRACT

Introduction: Chronic Rhinosinusitis is one of the commonly encountered problems in otorhinolaryngology practice. Aim was to study the effect of Chronic Rhinosinusitis on pharyngeal end of Eustachian tube opening by nasal endoscopy, and to emphasize the need for proper diagnostic endoscopic evaluation in Eustachian tube dysfunction.

Material and Methods: Eighty three patients of Chronic Rhinosinusitis, in the age group of 18-65 years, were identified. Eighty three patients were selected as control group having asymptomatic deviated nasal septum and no subjective or objective evidence of chronic rhinosinusitis. The changes at the pharyngeal end of the Eustachian tube were assessed by endoscopy, according to the types of changes, graded from I to V.

Results: Evaluation revealed that Chronic Rhinosinusitis causes changes at the pharyngeal end of the Eustachian tube in 81.92% (68/83) cases. Type I (normal Eustachian tube) was seen in 18.08% (15/83). Type II changes were seen in 71% (59/68) cases, type III changes were seen in 13.23% (9/68) cases. In control group normal ET orifice was seen in 74.69%, Type II changes were seen in 18.07% and type III changes in 7.22% cases.

Conclusion: Chronic Rhinosinusitis cause changes at the pharyngeal end of Eustachian tube, in the form of congestion, mucosal oedema and blockage of tube. This in turn can lead to middle ear disease. Nasal endoscopy should be done in all the cases of chronic rhinosinusitis, to examine nose, nasopharynx and pharyngeal end of Eustachian tube.

Keywords: Chronic rhinosinusitis, Pharyngeal orifice of Eustachian tube

INTRODUCTION

Chronic rhinosinusitis (CRS) is one of the commonly (16.3%) encountered problem in Otorhinolaryngological practice.¹ Various diseases of the nose and paranasal sinuses may affect function of Eustachian tube (ET) and consequently the middle ear. Sinus inflammation causes alterations in normal pathways for secretions out of sinus system. The normal secretion pathways usually bypass the orifice of Eustachian tube in the nasopharynx. Excessive or infected mucus can be transported directly over the tubal orifice to cause its obstruction and promote ascending infections in the middle ear. Messerklinger was able to demonstrate that there are two major routes for secretions from the paranasal sinuses. The mucus streams from out of the frontal, maxillary and anterior ethmoidal sinuses pass through the frontal recess and the ethmoidal infundibulum. This mucus is then transported over the posterior free margin of the uncinate process onto the medial surface of the inferior turbinate. This stream normally passes anterior and inferior to the tubal orifice.

This secretion route is then also joined by the mucus coming from septal mucosa. The second route for secretions combines the mucus from the posterior ethmoidal cells and the sphenoid sinuses. These are drained posterior and superior to the tubal orifice.² The secretions then pass along the lateral pharyngeal gutter and pyriform fossa.

In sinusitis the quality and quantity of mucus is altered to either mucopurulent or purulent. Secretions pass over the pharyngeal end of ET and it can lead to inflammation of ET, hypertrophy of lymphoid tissue collection (tubal tonsil hypertrophy). This results in obstruction of ET leading to various middle ear pathologies.

The study was under taken to know the condition of pharyngeal end of ET in patients having CRS. The nasal endoscopy allows a direct visualization of the tubal orifice. The evaluation of pharyngeal end of ET was done with the help of nasal endoscope.

MATERIAL AND METHODS

This is a prospective, comparative diagnostic study, carried out at a tertiary care center after taking informed consent. All the cases of CRS were diagnosed clinically using AAO – HNS 2007 criteria.³

Inclusion criteria

1. Patients of Chronic Rhino Sinusitis, on the basis of detailed history and clinical examination, who were not responding to 12 weeks of medical treatment.
2. Patients who were suffering from at least two of the following symptoms.
 - Nasal obstruction
 - Anterior and /or posterior nasal discharge
 - Headache / facial pain
 - Abnormalities of smell

Exclusion criteria

1. Subjects less than 10 years of age
2. Previous history of sinonasal surgery
3. Sinonasal malignancy
4. Cystic fibrosis
5. Known case of autoimmune disease
6. Known case of debilitating disease
7. Patients who declined to participate

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To add objectivity to the diagnosis, certain measures were added to the above selected patients. Inflammation documented by one or more of the following findings –

1. Purulent (not clear) mucus or edema in middle meatus or ethmoidal polyp,
2. Polyp in nasal cavity or middle meatus, and /or
3. Radiographic imaging demonstrating inflammation of paranasal sinuses.

Sample: Eighty three patients who fulfilled the subjective and objective criteria were included in this study. All selected patients were subjected to Nasal Endoscopy and CT Paranasal sinuses.

Control Group- 83 patients were selected as control group. These were the patients having asymptomatic deviated nasal septum and no subjective or objective evidence of CRS (as per AAO-HNS 2007 criteria).

For our study, we used Maxer’s rigid 4 mm Endoscope with deflection angles of 0 degree to 70 degrees with Maxer’s Endovision Telecam deluxe camera system with monitor. Topical decongestant 4 % Xylocaine with 1 in 1 Lac adrenaline solution was used on cottonoid strips which were inserted in both nasal cavities.

Diagnostic Nasal Endoscopy was performed in three passes. Presence of discharge, polyp, edema, or Scarring, and various anatomical variations were noted. The Eustachian tube opening was examined for following changes, as described by Jose Evandro Andrade Prudente de et al (2007)⁴

- Type 1 Normal Eustachian tube opening
- Type 2 Inflammatory ostium, congested edematous mucosa, (In allergy- pale mucosa), mucopurulent secretions at tubal orifice
- Type 3 Tubal ostium has a lymphoid accumulation of tissue, which forms tubal tonsil.
- Type 4 Hypoplastic ostium.
- Type 5 Cicatricial ostium.

STATISTICAL ANALYSIS

Data collected and transferred to SPSS statistical software package for analysis. Descriptive statistics were used to interpret results.

RESULTS

A total of 83 patients of CRS were selected for this study during

| ET status | CRS group (n=83) | Control group (n=83) |
|---|------------------|----------------------|
| Type I | 18.08% (15) | 74.69% (62) |
| Type II | 71% (59) | 18.07%(15) |
| Type III | 10.8%(9) | 7.22%(6) |
| Changes are statistically significant $p < 0.005$ | | |
| Table-1: ET Changes in CRS and Control group | | |

the study period of one year. There were 47 males and 36 female aged between 18 to 65 years. In this study, we wanted to ascertain the role of chronic rhino sinusitis in causing changes at pharyngeal end of the Eustachian tube.

Diagnostic Nasal Endoscopy was done in all 83 cases of chronic rhino sinusitis 55 patients had unilateral sinusitis and 28 had bilateral sinusitis.

Nasal Endoscopic findings were as follows-

- Septal deviation was the most common anatomical variant- 61(73.5%) cases
- Enlarged Bulla with prominent agar nasi- 29(35%) cases
- Concha bullosa- 23(27.7%) cases
- Paradoxical middle turbinate- 23(27.7%) cases
- Polypi in middle meatus- 15(18%) cases
- Medialised uncinate process- 13(15.6%) cases
- Accessory ostium- 17(20.5%) cases
- Discharge in middle meatus- 50(60.24%) cases
- Enlarged bulla- 3(3.6%) cases

Status of Pharyngeal End of ET in CRS patients- Changes at the pharyngeal end of Eustachian tube were seen in 81.92% (68/83) cases. The Eustachian tube showed:

- Type I Normal Eustachian tube was seen in 15 (18.07%) cases.
- Type II changes in 59 (71.1%) cases, out of which-
 - Inflamed, congested and/ or oedematous opening in 48 (57.8%) cases,
 - Secretions at tubal orifice with blockage of tubal opening in 11(13.25%)
- Type III Changes in the form of tubal tonsillar enlargement in 9 cases (10.8%)

Status of pharyngeal end of ET in control group

Finding of ET orifice (pharyngeal end) on nasal endoscopy were as follows:

- Type I (Normal) - 74.69 % (62/83)
- Type II 18.07% (15/83)
- Type III 7.22% (6/83)

Comparison of ET status in CRS group and control group is depicted in table-1

Otoscopy Findings and ET Ostium condition: In CRS group bilateral ear discharge was present in 20 patients (40ears) and unilateral ear discharge in 6 patients. Total number of discharging ear was 46. On examination 26 (31.32%) patients had a central perforation in tympanic membrane while 23 (27.7%) patients had a retracted tympanic membrane. Alterations of ET Ostium in forty six discharging ears were as follows:

- Type I (Normal ostium) – 30.43% (14/46)
 - Type II (inflamed, oedematous ostium) – 60.86% (28/46)
 - Type III (Tubal tonsil hypertrophy) – 8.69% (4/46)
- Bilateral retraction was present in thirteen patients (26 ears) and unilateral retraction was present in 10 patients. Total number of

| ET condition | Present Study | | Jose et all study | |
|--|---------------|-----------------|-------------------|-----------------|
| | COM (46) | Retraction (36) | COM (42) | Retraction (29) |
| Type I (normal) | 30.43% | 25% | 67% | 55.2% |
| Type II (inflamed) | 60.86% | 63.88% | 7% | 13.8% |
| Type III (tubal tonsil) | 8.69% | 11.11% | 19% | 24% |
| Type IV (hypoplastic) | 0 | 0 | 2% | 6.8% |
| Table-2: Alteration in ET ostium in Jose et al study and present study. | | | | |

ears having retracted drum were thirty six. Alterations of ET in these thirty six ears were as follows:

Type I 25% (9/36)

Type II 63.88% (23/36)

Type III 11.11% (4/36)

CT scan PNS Findings

- Deviated nasal septum - 61 (73.5%) patients.
- Prominent agar cells -30 (36%) patients,
- Concha bullosa - 24 (28.9%) patients,
- Polyp in middle meatus- 15 (18%) patients,
- Medialized uncinat process with mucosal thickening - 14 (16.8%) patients,
- Enlarged bulla - 4 (4.8%) patients,
- Maxillary sinus haziness was seen in 62.25%, ethmoid sinus haziness in 54.50%, frontal sinus haziness in 24.50% and sphenoid sinus haziness in 19.75% patients.

All the patients were appropriately treated for CRS with FESS and medical management.

DISCUSSION

In chronic inflammation, there is an increase in size and number of goblet cells. The mucus secreted by the paranasal sinuses is cleared by motility of the cilia, which are 50 – 200 per cell and they beat at the rate of 700 to 800 beats per minute, moving at the rate of 1cm per minute.²

In patients with CRS, the etiology being anatomical variants (leading to stasis of secretions), allergy, viral, bacterial and fungal infections, there is alteration in the quality and quantity of the secretions.

In CRS the purulent or mucopurulent discharge leads to alteration of the mucosal lining of pharyngeal end of ET with edema and inflammation of subepithelial lymphoreticular network, leading to blockage and obstruction of ET. This leads to reduced ventilation and changes in mucosal lining of the middle ear cleft. In present study normal ET orifice was seen in 18.07% cases of CRS, while in control group normal ET orifice was present in 74.69% subjects.

Jose Evandro Andrade Prudente de et al also did nasal endoscopy to study pharyngeal orifice of ET in patients having ear disease. Comparative chart showing alteration in ET ostium in Jose et al study and present study is depicted in table-2.

In present study all the patients were having CRS and that could be the reason for more number of subjects having changes at pharyngeal end. Status of nose and paranasal sinuses is not mentioned in their study.

Xia Z, Wang Z et al⁵ performed videolaryngoscopy to see morphological changes of pharyngeal ostium of the ET. In patients of CRS abnormal ostium was found in 80% cases.

Takahashi et al⁶ studied pharyngeal end of ET in secretory otitis media by nasal endoscopy in children and adults. In adults he found edema of the orifice (type II) in 26.9% cases, edema with mucopurulent discharge at orifice (type II) in 23.1 % cases and atrophy of orifice in 10.3% cases. While in children type II ostium, edema and discharge in 72.7% and only edema in 10.4%. Hypertrophy of peritubal tonsil (type III) in 16.9% children. Status of nose and PNS is not mentioned in his study also. We did not find any study mentioning direct relation of rhinosinusitis and morphological changes in pharyngeal end of ET.

Nasal endoscopy was repeated after treatment of CRS.⁷ In patients who came for follows up. We could not provide exact data regarding alterations at pharyngeal orifice of ET after treatment as number of patients were less at follow-up.

CONCLUSION

Chronic Rhinosinusitis is the most important focal sepsis causing changes at the pharyngeal end of Eustachian tube, in the form of mucosal edema, congestion and tubal tonsil hypertrophy. This results in blockage of tube. This in turn can lead to middle ear disease. Nasal endoscopy should be done in all the cases of CRS, to examine nose, nasopharynx and pharyngeal end of ET. This study does not encompass other diagnostic tests for Eustachian tube dysfunction, we suggest that Tympanometry should be done in all the cases in which changes of pharyngeal end of Eustachian tube is seen. We also recommend repeat nasal endoscopy after appropriate management of CRS. We conclude that chronic rhinosinusitis does alter the status of pharyngeal end of Eustachian tube.

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