The nasal endoscopic features of postnasal drip among rhinitis patients- A Cross-sectional study

Aneeza Hamizan [1], Nur Eliana Ahmad Tarmizi[2], Salina Husain[2], Marina Mat Baki[2], Farah Zahedi[2], Sai Guan Lum[2], Hardip Singh Gendeh[2], and Chong Sian Ng[3]

[1]Universiti Kebangsaan Malaysia Medical Centre
[2]Universiti Kebangsaan Malaysia Fakulti Perubatan
[3]Hospital Universiti Kebangsaan Malaysia

April 16, 2024

Abstract

ABSTRACT Background: Nasal endoscopic features of post nasal drip (PND) is well described but not formally studied. This study aims to assess the nasal endoscopic features of PND among rhinitis. Design: Cross-sectional study Settings: Otorhinolaryngology (ORL) outpatient clinic at a tertiary referral center. Participants: Adults (18 years and older) with chronic rhinitis grouped into either "Rhinitis with PND" or "Rhinitis only". Main outcome measures: The endoscopic features of PND were scored as: Secretions in the posterior nasal cavity (Yes/no), erythema in the nasopharynx (none, roof only, diffuse), hemorrhagic spots (yes/no) and granular posterior pharyngeal wall(patchy/diffuse) and compared between groups. Results: There were 98 patients included (age 32.32±11.33, 61.2 % female, 61.2% PND). Presence of secretions in the posterior nasal cavity was associated with PND ("Rhinitis with PND" vs "Rhinitis only", 78.3 v 55.3%, p=0.02). This gave 78.3% sensitivity and likelihood ratio positive of 1.41 to predict bothersome PND among rhinitis patients. The other nasal endoscopic features were not associated with PND. Conclusion: Secretions in posterior nasal cavity supports PND among rhinitis patients. Further studies to assess the endoscopic features of PND in other patient populations are needed. Keywords: laryngopharyngeal reflux, postnasal drip, rhinitis, nasal endoscopic, bothersome, inflammation, reflux symptoms index, reflux findings score Key points: rhinitis, nasal endoscopic features, postnasal drip sign, secretions posterior nasal cavity, quality of life

ABSTRACT

Background: Nasal endoscopic features of post nasal drip (PND) is well described but not formally studied. This study aims to assess the nasal endoscopic features of PND among rhinitis.

Design: Cross-sectional study

Settings: Otorhinolaryngology (ORL) outpatient clinic at a tertiary referral center.

Participants: Adults (18 years and older) with chronic rhinitis grouped into either "Rhinitis with PND" or "Rhinitis only".

Main outcome measures: The endoscopic features of PND were scored as: Secretions in the posterior nasal cavity (Yes/no), erythema in the nasopharynx (none, roof only, diffuse), hemorrhagic spots (yes/no) and granular posterior pharyngeal wall(patchy/diffuse) and compared between groups.

Results: There were 98 patients included (age 32.32±11.33, 61.2 % female, 61.2% PND). Presence of secretions in the posterior nasal cavity was associated with PND ("Rhinitis with PND" vs "Rhinitis only", 78.3

v 55.3%, p=0.02). This gave 78.3% sensitivity and likelihood ratio positive of 1.41 to predict bothersome PND among rhinitis patients. The other nasal endoscopic features were not associated with PND.

Conclusion: Secretions in posterior nasal cavity supports PND among rhinitis patients. Further studies to assess the endoscopic features of PND in other patient populations are needed.

Keywords: laryngopharyngeal reflux, postnasal drip, rhinitis, nasal endoscopic, bothersome, inflammation, reflux symptoms index, reflux findings score

Key points : rhinitis, nasal endoscopic features, postnasal drip sign, secretions posterior nasal cavity, quality of life INTRODUCTION

Postnasal drip (PND) is the feeling of mucus secretion at the back of the throat. It was first defined as a sense of fullness deeply seated in the back of the nose with cough on intervals, frequent hawking and spitting pellets of mucus [(1)]. PND has also been referred to as chronic inflammation of the lining membrane of the nasopharynx, giving rise to a viscid secretion, causing disagreeable sensation, and make patients hawking and clearing the throat[(2)]. Conditions associated with PNDs are rhinitis (allergic or non-allergic), chronic rhinosinusitis (CRS) and laryngopharyngeal reflux (LPR) [(3)].

Rhinitis patients are not routinely evaluated for PND as the physicians are focused on the other cardinal symptoms of rhinitis. Determining the cause of PND may be challenging as it may also be due to LPR. Furthermore, the diagnosis of LPR is ambiguous and mostly relies on the reflux symptom index (RSI), reflux finding score (RFS) and trial of proton pump inhibitor (PPI) in the everyday clinical setting[(4,5)]. Physicians need to be aware that PND may also be due to rhinitis itself but there are not enough clues to help physicians determine presence of PND among rhinitis.

Nasal endoscopy is a tool widely used by rhinologists. The nasal endoscopic feature of PND has been described as redness of the nasopharynx, secretions in the choana, hemorrhagic spots in the nasopharynx and granular posterior pharyngeal wall[(6,7)]. However, these features that are seen via endoscopes have not been formally studied among rhinitis. These clinical signs may be useful to support the symptom of PND.

The present study aims to assess the usefulness of nasal endoscopy to determine the signs of PND among rhinitis. This may guide clinicians to identify the nasal endoscopic signs of PND in relation to rhinitis, ultimately guiding appropriate therapy.

MATERIALS AND METHODS

Study Design

This was a cross-sectional study conducted at the Otorhinolaryngology (ORL) outpatient clinic at a tertiary referral center. Ethics approval and informed consent was obtained (FF-2020-009) from all patients.

Study Population

Adults (18 years and older) newly referred for chronic rhinitis were consecutively recruited. Patients were included if they had at least two nasal symptoms (either nose block, runny nose, sneezing or itchy nose) for at least three months. These rhinitis patients were grouped into either "Rhinitis with PND" group or "Rhinitis only" group based on presence or absence of PND symptoms. Patients were excluded if there was a previous history of nasal surgery, who has underlying systemic condition that affect the nasal mucosa such as autoimmune diseases, Wegener's Granulomatosis, Cystic Fibrosis, Systemic Lupus Erythematosus. Pregnant patient, recent URTI/nasal infections, patients who have chronic rhinosinusitis with nasal polyps and nasal tumors are also excluded.

All recruited patients underwent assessment for rhinitis and scored the severity of their nasal symptoms for the past 1 week using the visual analogue score (0-100mm). They were defined to have allergic rhinitis if there was suggestive history (presence of a trigger, other allergic comorbidities, family history) supported by either a positive skin prick test or serum specific immunoglobulin E towards aeroallergens.

Assessment for postnasal drip

All patients answered a series of self-answered yes/no questions regarding postnasal drip. The patients were asked if they had experienced symptoms of feeling drip in the throat, fullness in the nasopharynx, hawking or intermittent cough and if they were bothersome. PND is define as presence of at least one PND symptoms AND the patient indicated it as bothersome. Those with these criteria were grouped as "rhinitis with PND" while those who did not fulfil these criteria were grouped as "Rhinitis only".

Assessment for laryngopharyngeal reflux

All patients answered the RSI question independently[8] and underwent 70-degree angled endoscopy to assess the laryngeal findings utilizing the RFS tool [9]. The recorded endoscopy video was reviewed and scored by two ORL specialists independently and the main assessor repeated the scoring 8 weeks later. LPR is diagnosed if patients had an RSI of more than 13 and RFS of more than 7[8,9]. Inter-observer and intra-observer reliability for RFS score were then analyzed.

Nasal endoscopy assessment

Patient's nose was decongested with co-phenylcaine forte spray 2 sprays each nostril for 15 minutes prior to nasal endoscopic assessment. The endoscopy was done using Hopkins II straight telescope 0 degree with a diameter of 4mm and a length of 18 cm. The nasal endoscopy was advanced till the nasopharynx to visualize the features of PND including secretions at posterior nasal cavity, redness at the roof of nasopharynx and presence of hemorrhagic spots at nasopharynx. The larynx was viewed using a 70-degree scope with a diameter of 4mm and a length of 18 cm. The granular posterior pharyngeal wall was assessed, and features of reflux were scored based on the RFS tool [9]. All nasal endoscopies were recorded, and the videos were anonymized. Two experienced rhinologists reviewed and graded the images guided by the reference images (Figure 1-4). The assessors were blinded to the PND status of the patient and their presenting symptoms. These two independent assessors reviewed a group of patients for interobserver reliability. For intra-observer reliability, the main assessor also rescored the same group 8 weeks later.

Secretions at posterior nasal cavity

Secretion at posterior the nasal cavity is defined as the presence of thick whitish or clear mucus in the posterior nasal cavity tracking down from the choana (Figure 1). The rater will grade either yes or no depending on the presence of secretions at the posterior nasal cavity.

Redness roof of the nasopharynx

Redness of the nasopharynx is defined as erythematous mucosa over the nasopharynx. It has been graded as Grade 0: no redness of the nasopharynx. Grade 1 (roof only): redness involving the only roof of the nasopharynx, (roof is defined as the level above the upper 1/3rdedge of torus tubarius). Grade 2 (diffuse): redness extending beyond the roof of the nasopharynx (Figure 2).

Presence of hemorrhagic spots

Hemorrhagic spots are defined as multiple reddish spots at the nasopharynx. It was documented either as absent or present (Figure 3).

Granular posterior pharyngeal wall

Granular posterior pharyngeal wall is defined as irregular pinkish to reddish nodules at the posterior pharyngeal wall above the level of epiglottis. It was graded as Grade 1 (patchy): multiple nodules surrounded by normal mucosa and Grade 2 (diffuse): multiple nodules without surrounding normal mucosa (Figure 4). If there were both patchy and diffuse areas within the same participant, the Grade 2 was used.

Statistical Analysis

Statistical analysis was done using SPSS version 26. Descriptive data for the proportions and percentages were calculated for categorical variables. Association between nasal endoscopic features and rhinitis with or

without PND groups was analyzed using the Chi-Square test and Kendall's tau b. Mean VAS was compared using the T-Test. The interrater reliability for endoscopic scores was analyzed by Cohen's kappa and for RFS was analyzed using intraclass correlation. A P-value of <0.05 was considered statistically significant. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), likelihood ratio positive (LR+) and likelihood ratio negative (LR-) was calculated for endoscopic features which proved to have an association with PND.

RESULTS

There were 98 participants, of which 61.2% were female with a mean age of 32.32±11.33 years. Among these rhinitis patients, 81.6% were diagnosed to have allergic rhinitis, 56.1% had persistent rhinitis, 74.5 % reported rhinitis to disturb their sleep and daily activity and 39.8 % had rhinitis symptoms for more than 10 years. The overall VAS for rhinitis is 57.8±27.11. Among the participants, 28.6% were diagnosed to have asthma by another practitioner and 7.1% were using intranasal steroids.

Rhinitis with Postnasal Drip Group

Among the 98 participants, 61.2% were grouped as "rhinitis with PND" while 38.8% were grouped as "rhinitis only". The visual analogue scale for PND is58.87±26.14. The most common PND symptoms reported were feel drip (65.3%), followed by the fullness of nasopharynx (57.1%), hawking (51%) and intermittent cough (42.9%). The "rhinitis with PND" group has more participants with moderate to severe AR (85% vs 57.9%, p<0.01) and more severe VAS (65.82±23.94 vs 44.58±27.0, P<0.01). There were no significant differences between these two groups in terms of age, gender, duration, asthma, and usage of intranasal corticosteroids. (Table 1).

Assessment of LPR among Rhinitis

Among all participants, there were 10 patients (10.2%) with LPR (RSI>13 and RFS>7). There was no difference in LPR between these two groups (13.3 v 5.3%, p=0.20). The "rhinitis with PND" group had higher RSI score compared to "rhinitis only" group (14.70±11.99vs 6.58±6.14, P < 0.01) but with similar RFS score (5.0±4.23 v 4.82±4.34, p=0.84).

Nasal Endoscopic Features of Rhinitis

There were 69.4 % of participants who had secretions in the posterior nasal cavity. Among the participants, 62.2 % had diffuse redness of the nasopharynx, 29.6 % had only redness at the roof and 8.2 % had no redness. There were 14.3% of participants who had hemorrhagic spots in the nasopharynx. On assessment for granular posterior pharyngeal wall, 66.3% of participants were graded as diffuse and 33.7 % patchy.

Association Between Nasal Endoscopic Features and PND

Secretions in posterior the nasal cavity were higher among the "rhinitis with PND" group compared to "rhinitis only" (78.3% vs 55.3%, P= 0.02). Redness of nasopharynx between "rhinitis with PND" compared to "rhinitis only" are as follows: none (10 vs 5.3%) , roof only, , (36.7 v 18.4) and diffuse redness ((53.3% vs 76.3%) , P=0.02). There presence of hemorrhagic spots were similar between "rhinitis with PND" compared to "rhinitis only" (11.7 v 18.4, p=0.35). There is also no difference between group for granular posterior pharyngeal wall (63.3v 71.1, p=0.43).

The presence of secretions is 78.33% sensitive, 44.74% specific, 69.11% positive predictive value (PPV) and 56.67% negative predictive value (NPV), with a likelihood ratio positive 1.41 and likelihood ratio negative 0.48 to predict PND among rhinitis. This is calculated in the 2 by 2 table (Table 2).

Inter-rater and intra-rater reliability

The inter-rater and intra-rater reliability for grading of redness of nasopharynx was 0.84 (95% CI: 0.68-0.99, P<0.01) and 0.80 (95% CI: 0.64-0.96, P<0.01) respectively. The inter-rater and intra-rater reliability for granular posterior pharyngeal wall was 0.72 (95% CI: 0.52-0.91, P<0.01) and 0.79 (95% CI 0.61-0.96,

P<0.01) respectively. The inter-rater and intra-rater score for the RFS was 0.63(95% CI :0.31-0.80, P<0.01) and 0.99 (95% CI:0.98-0.99, P <0.01).

DISCUSSION

There were more than half of patients who complained of bothersome PND among patients with rhinitis and this is related to the severity of rhinitis symptoms and the presence of secretions in the posterior nasal cavity. It is well known that rhinitis impairs the quality of life (QoL)[10] but PND is often overlooked. This is comparable to Jaruvongvanich et al [11] which reported that 56.3% of patients with allergic rhinitis had at least moderately severe postnasal drip.

.

The presence of secretions was associated with the PND group among this rhinitis population and is 78% sensitive with a likelihood ratio positive of 1.41%. This suggests that the secretions in the posterior nasal cavity are contributing to the PND sensation bothering the patients and should alert ORL doctors to treat the associated PND. This can be done with routine intranasal steroids [11] and nasal douching but its efficacy for PND needs further study[12].

Surprisingly, redness of the nasopharynx was found to be higher among patients with rhinitis only compared to the postnasal drip group. This would suggest that the erythema in the nasopharynx is due to inflammation associated with rhinitis itself [13]rather than irritation from PND. This inflammation may also lead to hyposensitivity of the inflamed mucosa. It was previously reported that patients with PND have nasopharyngeal hyposensitivity secondary to inflamed mucosa which may also explain why certain patients with secretions in the posterior nasal cavity do not complain of postnasal drip [14]. The presence of hemorrhagic spots and the granular posterior pharyngeal wall was equally present among rhinitis patients with or without PND. These endoscopic features are likely due to other stimulating factors such as rhinitis itself, LPR, and breathing in dry air [7,15].

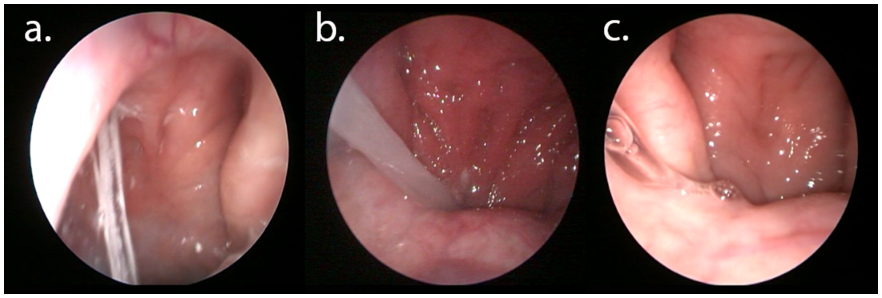
Among these rhinitis participants, LPR was only present in 10.2% in the whole study population and the proportion of LPR was not significantly different (13 v 5%, P=0.2). This suggests that LPR may not play a major role for the symptoms of PND among rhinitis patients. Physicians should not be too hasty to prescribe anti- reflux medications for PND among rhinitis. These patients should be treated with intranasal steroids and nasal douching first. Secretions found in the posterior nasal cavity may potentially be a useful sign that the PND is due to rhinitis and not LPR. Although the RSI is higher in the PND group, this is not surprising as RSI also assess for symptoms similar to PND. Furthermore, RSI has been reported to be associated with more severe rhinitis symptoms[16]. Therefore, RSI should not be used as standalone to diagnose LPR among rhinitis patients and should always be combined with RFS.

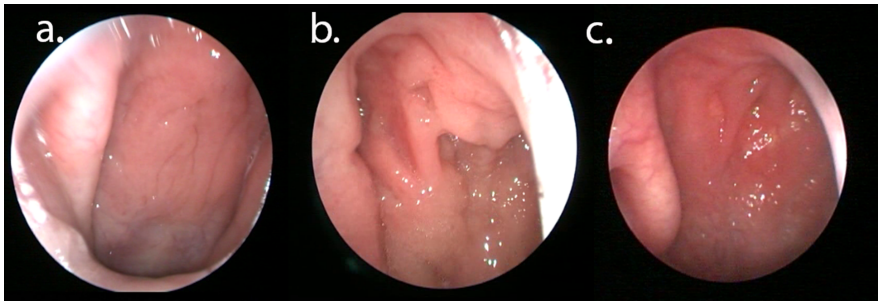
The redness of the nasopharynx and granular posterior pharyngeal wall that was assessed appeared to have good test characteristics. Both inter-and intra-observer Cohen's Kappa and ICCs were good and, likely that the use of reference images and predefining the appearance of redness and granularity of posterior pharyngeal wall contributed to this finding. The limitation of this study is the lack of a Hypopharyngeal-Esophageal Multichannel Intraluminal Impedance with dual pH probe (HEMII-pH) testing which is considered as gold standard to confirm the diagnosis of LPR. Although RSI and RFS have been proposed as a diagnostic tool for LPR, there is still debate about this since both tools are subjective in nature. Future studies in investigating the relationship of postnasal drip with LPR should include this test[17]. Another limitation is that diffuse redness of the nasopharynx was not further graded according to the severity (mild, moderate to severe) and this is best performed using specifically designed software. Redness of nasopharynx and hemorrhagic spots without secretions may be more suggestive of LPR, but this requires further study which separates LPR, rhinitis only and healthy control.

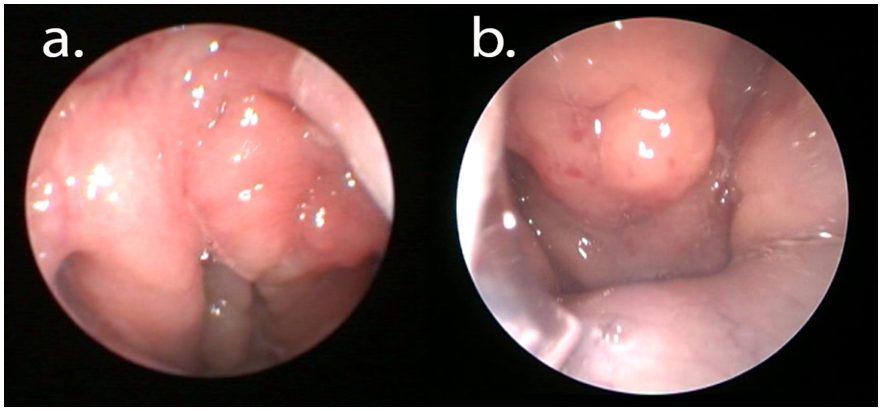
In conclusion, majority rhinitis patients suffer from PND which is bothersome. Secretion seen in posterior nasal cavity may be a useful sign to support presence of PND among rhinitis patients. These nasal endoscopic features should be studies in other patient population to further define its diagnostic utility for PND.

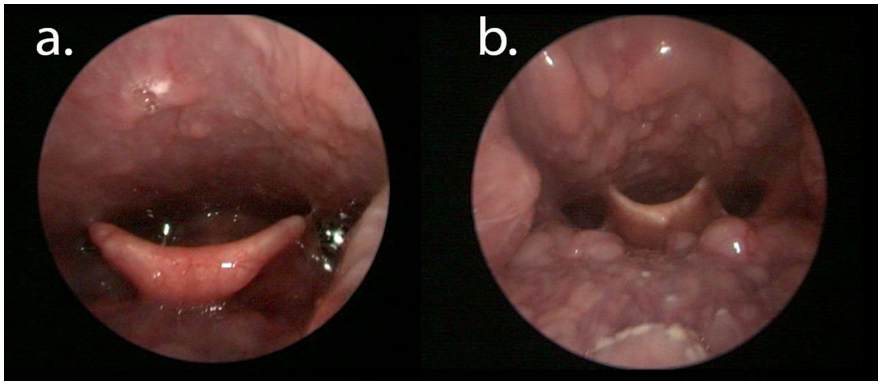
REFERENCES

1. Dobell H. Appendix. Postnasal catarrh. In: On Winter Cough, Catarrh, Bronchitis. 1st ed. London, England: Kessinger Publishing; 1866:172-174.
2. Mackenzie M. Diseases of the throat and nose. London: J. & A. Churchill 1884. Section IV. Diseases of the nasopharynx, chronic catarrh of the nasopharynx, pages 482-493.
3. Forer M, Ananda S. The management of postnasal drip. Aust.Family Physician. 1999;64:55-68.
4. Deborah C. Sylvester, Petros D. Karkos, Casey Vaughan, James Johnston, Raghav C. Dwivedi, Helen Atkinson, Shah Kortequee. Review Article. Chronic cough, reflux, Postnasal Drip Syndome and the Otolaryngologist. Hindawi PublishingCorporation.International Journal of Otolaryngology.Volume 2012,Article ID 564852.
5. Masaany, M., Marina, M., Sharifa Ezat, W., & Sani, A. (2011). Empirical treatment with pantoprazole as a diagnostic tool for symptomatic adult laryngopharyngeal reflux. *The Journal of Laryngology & Otology, 125* (5), 502-508. doi:10.1017/S0022215111000120.
6. Yu JL, Becker SS. Postnasal dripand postnasal drip-related cough. CurrOpinOtolaryngol Head Neck Surg. 2016 Feb;24(1):15-9. doi: 10.1097/MOO.0000000000000226. PMID: 26731683.
7. La Mantia, I, Andaloro C. Cobblestone Appearance of the Nasopharyngeal Mucosa. Eurasian J Med 2017; 49: 220-
8. Belafsky PC, Postma GN, Koufman JA. Validity and reliability of the reflux symptom index (RSI).J Voice. 2002 Jun; 16(2): 274-7.
9. Belafsky PC, Postma GN, Koufman JA. Validity and reliability of the reflux symptom score (RFS).Laryngoscope. 2001 Aug; 111(8):1313-7
10. Stuck BA, Czajkowski J, Hagner A-E, Klinek L, Verse T, Hormann K, et al.Changes in daytime sleepiness, quality of life, and objective sleep patterns in seasonal allergic rhinitis: a controlled trial. J Allergy Clinical Immunology 2004;113:663-8.
11. Jaruvongvanich, Veeravich & Mongkolpathumrat, Pungjai & Chantaphakul, Hiroshi & Klaewsongkram, Jettanong. (2016). Extranasal symptoms of allergic rhinitis are difficult to treat and affect quality of life. Allergology International. 65. 10.1016/j.alit.2015.11.006.
12. Sarina Bucher, MMed; Peter Schmid-Grendelmeier, MD; and Michael B. Soyka, MD. Altered Viscosity of Nasal Secretions in Postnasal Drip.2019 Oct; 156(4):659-666.
13. Min, Y.-G. (2010). The Pathophysiology, Diagnosis and Treatment of Allergic Rhinitis. Allergy, Asthma and Immunology Research, 2(2), 65.
14. Janet Rimmer, Johan Hellgren, Richard J. Harvey. Simulated postnasal mucus fails to reproduce the symptoms of postnasal drip in rhinitics but only in healthy subjects. Rhinology 53: 129-134, 2015. DOI:10.4193/Rhino14.210
15. Stewart R. Leason, Henry P. Barham, Gretchen Oakley, Janet Rimmer, John M. DelGaudio6, Jenna M. Christensen, Raymond Sacks, Richard J. Harvey. Association of gastro-oesophageal reflux and chronic rhinosinusitis: systematic review and meta-analysis**.**Rhinology 55: 3-16, 2017.
16. Hamizan AW, Choo YY, Loh PV, Abd Talib NF, Mohd Ramli MF, Zahedi FD, Husain S. The association between the reflux symptoms index and nasal symptoms among patients with non-allergic rhinitis. J Laryngol Otol 2021;135:142–146.
17. Horvath, L.; Hagmann, P.; Burri, E.; Kraft, M. Evaluation of Oropharyngeal pH-Monitoring in the Assessment of Laryngopharyngeal Reflux. J. Clin. Med. **2021** , 10, 2409.https://doi.org/10.3390/jcm10112409









Hosted file

tables edit.docx available at https://authorea.com/users/735888/articles/711920-the-nasal-endoscopic-features-of-postnasal-drip-among-rhinitis-patients-a-cross-sectional-study