CORRELATION OF CLINICAL SYMPTOMS AND COMPUTER TOMOGRAPHY SCAN FINDINGS WITH HISTOPATHOLOGY IN PATIENTS WITH CHRONIC RHINOSINUSITIS

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Abstract

Objectives: To determine the correlation between clinical symptoms, computer tomography scan (CT-scan), and histopathologic findings of chronic rhinosinusitis (CRS). ***Methods:*** A prospective, case-by-case study on 33 patients with CRS who were diagnosed and treated by functional endoscopic sinus surgery at the Department of Otolaryngology, Military Hospital 103 from January 2022 to August 2022. ***Results:*** There was an inverse correlation between sex and the number of Eosinophil cells/HPF cells, with $p < 0.05$; a moderate correlation between the SNOT-20 score and HPF cells ($r = 0.4$) and the degree of inflammation ($r = 0.39$), with $p < 0.05$; a moderate correlation between sneezing symptoms and smell disorders with HPF cells, $r = 0.33$ and $r = 0.39$ ($p < 0.05$); a low or moderate correlation between other functional symptoms and histopathological indicators ($p < 0.05$); a moderate correlation between the Lund-Kennedy score and the inflammation of the mucosa with $r = 0.47$, $p < 0.05$; a correlation between the degree of nasal polyps and histological indicators, but not statistically significant $p > 0.05$; a correlation between the average level of Lund-Mackay score and the degree of inflammation ($r = 0.35$), $p < 0.05$. Lund-Mackay score is positively correlated with HPF cells and negatively correlated with epithelial layer thickness, but not statistically significant $p < 0.05$. ***Conclusion:*** Mucosal eosinophilia moderately correlates with signs, but there was no correlation with the Lund-Kennedy score or Lund-Mackay score. Levels of inflammation are moderately correlated with objective disease severity as clinical symptoms, Lund-Kennedy score, and Lund-Mackay score.

Keywords: Chronic rhinosinusitis; Histopathologic; Eosinophil cells.

INTRODUCTION

Chronic rhinosinusitis is one of the most common diseases in otolaryngology. The primary pathogenesis of CRS is the obstruction of the osteo-metal complex (OMC), which is clinically manifested by the main symptoms of nasal congestion, rhinorrhoea, facial pain, sneezing, nasal itching, and loss of smell. The diagnosis of CRS is based on clinical symptoms, endoscopic images, and CT-scan images [1].

Based on the presence of nasal polyps, clinicians classify CRS into two types, including CRS without nasal polyps and CRS with nasal polyps [2]. This classification is mainly based on clinical symptoms rather than histopathology. On histopathology, based on the eosinophil count, some clinicians classify: Eosinophilic CRS (ECRS) and non-eosinophilic CRS (non-ECRS) [3]. Many studies show that ECRS is associated with the severity of symptoms and accomplished asthma, allergies, etc [4, 5]. Thus, there is a relationship between clinical symptoms and histopathology of CRS [6]. There are some studies on this correlation in Vietnam, but there is no comprehensive study on the correlation between clinical symptoms, CT-scan, and histopathologic findings. Thus, we perform this research: *To determine the correlation between clinical symptoms, CT-scan, and histopathologic findings of CRS.*

MATERIALS AND METHODS

1. Subjects

33 patients with CRS who were diagnosed and treated by functional endoscopic sinus surgery at the Department of Otolaryngology, Military Hospital 103 from January 2022 to August 2022.

* Inclusion criteria: Patients who were diagnosed with CRS according to the criteria of EPOS 2020; patients who underwent endoscopic sinus surgery and took the sample of mucus membrane sinus at OMC for biopsy during surgery; histopathological examination of the nasal mucosa at the Department of Pathology, Military Hospital 103; full of medical records and research records; patients consented to participate in the study.

* Exclusion criteria: Patients who were diagnosed with CRS according to EPOS 2020, but no indication for surgery; using other methods of surgery.

2. Methods

Research design: A prospective, case-by-case study.

Study sample size:

- Sample size: Convenient sample selection.

- Sample selection: Patients aged ≥ 18 years who were diagnosed with CRS and underwent endoscopic sinus surgery at the Department of Otolaryngology, Military Hospital 103.

Variables, research targets:

- Age, sex

- Histopathology of CRS follow Soler's: Eosinophil cells (HPF - A high-power field), epithelial layer thickness, degree of inflammation.

- Signs: SNOT-20, stuff nose, sneezing, sinus pain, eye symptoms, smell disorder.

- Symptoms: Level of polyp, Lund-Kennedy score.

- CT-scan image: Lund-Markay score.

Statistical analysis: Data were collected, entered by Microsoft Excel software and processed according to medical statistical algorithms using SPSS 23.0 software. The correlation shows the relationship between two variables. To determine the strength or weakness of this relationship, the Pearon correlation coefficient (symbol: r) is used.

3. Ethics

This study was approved by the Ethics Committee of Military Hospital 103, Vietnam Medical Military University (Number 192/HDDD, date 15/6/2022).

RESULTS

1. The correlation between clinical symptoms and histopathology

Table 1. The correlation between characteristics and Eosinophil cell count (/HPF).

	Age		Sex		History of allergies	
	r	p	r	p	r	p
Eosinophil	-0.12	> 0.05	-0.38	< 0.05	0.19	0.29

There was an inverse correlation between sex and the number of Eosinophil cells, with $p < 0.05$. There was no correlation between age and allergy history with Eosinophil cell count.

Table 2. The correlation between clinical signs and Eosinophil cell count (/HPF), epithelial layer thickness and degree of inflammation (n = 33).

Symtoms	Eosinophil cells		Epithelial layer thickness		Degree of inflammation	
	r	p	r	p	r	p
SNOT-20	0.40	< 0.05	-0.39	> 0.05	0.39	< 0.05
Stuffy nose	-0.42	> 0.05	0.05	> 0.05	-0.42	> 0.05
Sneezing	0.33	< 0.05	-0.19	> 0.05	-0.27	> 0.05
Sinus pain	-0.189	> 0.05	0.09	> 0.05	0.05	> 0.05
Eye symptoms	-0.12	> 0.05	-0.1	> 0.05	-0.21	> 0.05
Smell disorder	0.39	< 0.05	-0.2	> 0.05	0.12	> 0.05

There is a moderate correlation between SNOT-20, the number of Eosinophil/HPF cells (r = 0.4) and the degree of inflammation (r = 0.39). This correlation is statistically significant, with p < 0.05. Among the functional symptoms, there was a moderate correlation between sneezing symptoms and smell disorders with Eosinophil/HPF cell counts with correlation coefficients r = 0.33 and r = 0.39. This correlation is statistically significant with p < 0.05. There is also a low or moderate correlation between other functional symptoms and histopathological indicators, but this correlation has not been statistically significant, with p < 0.05.

2. The correlation between endoscopic images and histopathology

Table 3. The correlation between endoscopic image and Eosinophil cell count, epithelial thickness and degree of inflammation (n = 33).

Endoscopic images	Eosinophil		Epithelial layer thickness		Degree of inflammation	
	r	p	r	p	r	p
Level of polyp	0.26	> 0.05	-0.08	> 0.05	0.3	> 0.05
Lund-Kennedy	0.29	> 0.05	0.004	> 0.05	0.47	< 0.05

There is a moderate correlation between the Lund-Kennedy score and the inflammation of the mucosa, with r = 0.47. This correlation is statistically significant, with p < 0.05. There is a correlation between the degree of nasal polyps and histological indicators, but this correlation is not statistically significant, with p > 0.05.
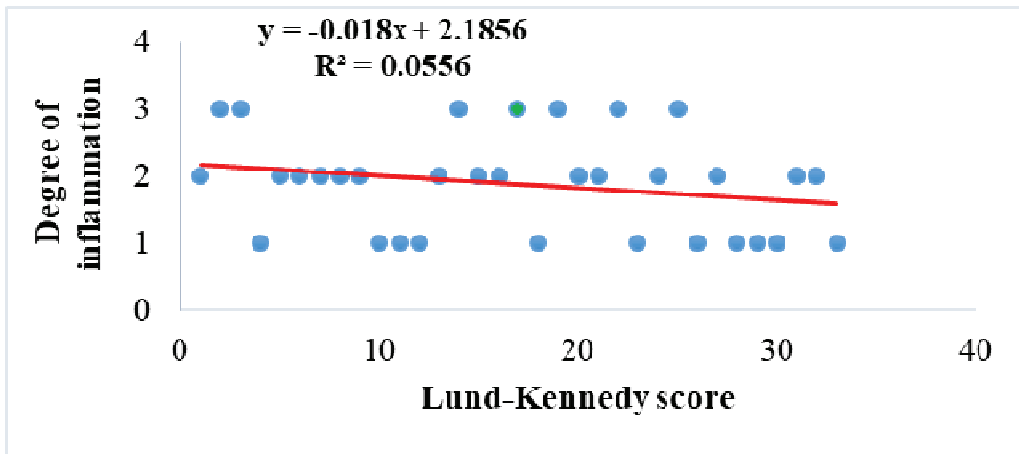

Chart 1. The correlation between the Lund-Kennedy score and the degree of inflammation.

3. The correlation between CT-scan and histopathology

Table 4. The correlation between CT-scan images with Eosinophil cell count, epithelial thickness and degree of inflammation (n = 33).

CT-scan image	Eosinophil		Epithelial layer thickness		Degree of inflammation	
	r	p	r	p	r	p
Lund-Mackay	0.24	> 0.05	-0.92	> 0.05	0.35	< 0.05

There is a correlation between the average level of Lund-Mackay score and the degree of inflammation (r = 0.35). This correlation is statistically significant with p < 0.05; Lund-Mackay score is positively correlated with the number of Eosinophil cells (/HPF) and negatively correlated with epithelial layer thickness, but this correlation is not statistically significant, with p < 0.05.
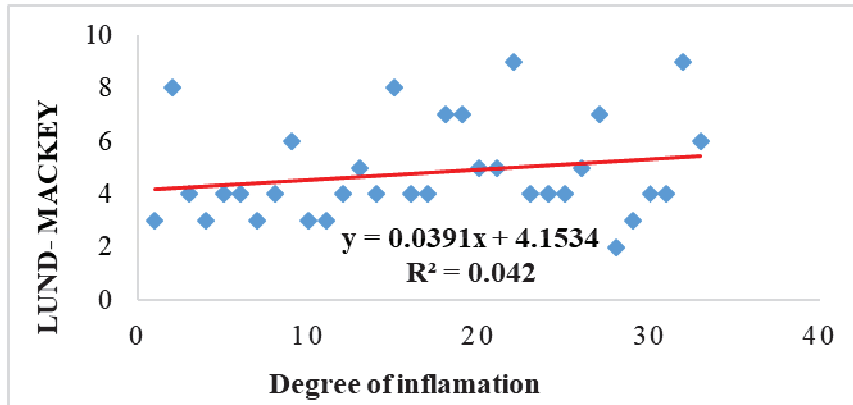
Chart 2. The correlation between the Lund-Kennedy score and the degree of inflammation.

DISCUSSION

1. The correlation between clinical symptoms and histopathology

When comparing the anthropometric characteristics with histopathological characteristics, we found an inverse correlation between sex and the number of Eosinophil cells ($p < 0.05$), but there was no correlation between age and history of allergy with Eosinophil cell counts. Furthermore, according to the study of Zachary M Soler (2009), there is no correlation between the number of Eosinophil cells, Lymphocytes, and mast cells with age, sex, history of endoscopic sinus surgery, and history of other diseases. Allergic diseases included asthma, allergic rhinitis, and aspirin allergy [6].

Many recent studies show an association between asthma and CRS. Both diseases share a similar pathogenesis, with mucosal sensitivity to irritants and eosinophils playing an essential role in this response [2, 4]. Therefore, steroid therapy is considered an effective method in treating CRS, especially in cases with nasal polyps. Steroids relieve symptoms by down-regulating the production of cytokines and lowering the number of eosinophils [4].

In our study, there was a moderate correlation between the number of Eosinophil cells with SNOT-20 score, sneezing symptoms, and smell disorder with the correlation coefficient $r = 0.4$, $r = 0.33$, and $r = 0.39$, respectively. In addition, there was a positive correlation between the SNOT-20 score and the degree of inflammation with $r = 0.39$. This study also showed no correlation between histopathological features (Eosinophil cell count, epithelial layer

thickness, and degree of inflammation) and other clinical symptoms (nasal congestion, nasal discharge, sinus pain, and eye symptoms).

2. The correlation between endoscopic images and histopathology

There is a positive correlation between the Lund- Kennedy score and the degree of inflammation on histopathology, with r = 0.47; however, there is no correlation between the nasal polyps and the Lund-Kennedy scores with the number of Eosinophil cells, epithelium thickness, and degree of inflammation.

In a study by Vo Van Khoa (2000) on the clinical and histopathological characteristics of CRS [7], the rate of headache predominates in the highly active form and the lowest in the less active form, this difference is statistically significant; the rate of stuffy nose is highest in the highly active form and the lowest in the less active form, this difference is statistically significant. However, there was no statistically significant difference between the incidence of nasal polyps at levels of inflammatory activity.

Tomislav Baudoin (2006) performed a study to predict the value of histopathology in the response of CRS by functional endoscopic sinus surgery [8]. The results of the study indicated that there was no correlation between the number of Eosinophil cells and the improvement of functional symptoms.

According to Zachary M Soler's study (2009) on the relationship between clinical symptoms and histopathology of CRS [6], there is no statistically significant correlation between the number of Eosinophil cells, the number of Neutrophil cells, Lymphocytes with demographic characteristics (age, gender) as well as allergy history of the patient; however, the author also showed that there is a correlation between the number of Eosinophil cells with the presence of nasal polyps (r = -0.367), the degree of stromal oedema (r = 0.313), and the severity on endoscopy (r = 0.376).

The results of Figen Aslan's study indicate a correlation between the Lund-Kennedy score and the number of eosinophils (r = 0.444 and p = 0.001) [9].

Thus, other studies have shown a correlation between functional symptoms and endoscopic severity with eosinophil counts. However, the results of our study are in contrast to the results of previous authors. This may be explained by the effect of previous corticosteroid administration on the migration and activation of eosinophils, which significantly affects tissue even at low blood concentrations. The number of eosinophils is a

vital indicator of classifying CRS with eosinophilia or CRS without eosinophilia. However, how tissue eosinophilia is calculated, and its upper limit can be a matter of controversy (eosinophilic count > 70 cells/HPF, > 10 cells/HPF, > 5 cells/HPF).

3. The correlation between CT-scan and histopathology

There was a positive correlation between the Lund-Mackay score and the degree of inflammation on histopathology with $r = 0.35$ and was not correlated with the number of Eosinophil cells (/HPF), epithelial layer thickness, stromal oedema, and heterochromia.

In the study of Zachary M Soler [6], there was a correlation between the severity of the CT-scan with the number of Eosinophil cells and the degree of stromal oedema with the correlation coefficient $r = 0.414$, respectively; $r = 0.366$. In this study, the group of patients with nasal polyps did not correlate with the severity on the CT-scan images and the number of Eosinophil cells, the group of patients with nasal polyps correlated, with $r = 0.324$. According to the study of Figen Aslan, there is a correlation between the Lund-Mackay score and the number of eosinophils ($r = 0.353$; $p = 0.01$) [9].

CONCLUSION

A total of 33 subjects were enrolled with histologic samples available for analysis, there were:

- An inverse correlation between sex and the number of Eosinophil cells, with $p < 0.05$. No correlation between age and allergy history with Eosinophil cell count.

- A moderate correlation between SNOT-20 score and the number of Eosinophil/HPF cells ($r = 0.4$) and the degree of inflammation ($r = 0.39$), with $p < 0.05$. Among the functional symptoms, a moderate correlation between sneezing symptoms and smell disorders with Eosinophil/HPF cell counts with correlation coefficients $r = 0.33$ and $r = 0.39$ ($p < 0.05$); a low or moderate correlation between other functional symptoms and histopathological indicators ($p < 0.05$).

- A moderate correlation between the Lund-Kennedy score and the inflammation of the mucosa with $r = 0.47$; $p < 0.05$. A correlation between the degree of nasal polyps and histological indicators, but not statistically significant $p > 0.05$.

- A correlation between the average level of Lund-Mackay score and the degree of inflammation ($r = 0.35$); $p < 0.05$; Lund-Mackay score is positively correlated with the number of Eosinophil cells (/HPF) and

negatively correlated with epithelial layer thickness, but not statistically significant, $p < 0.05$.

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