# Asthma and Allergic Rhinitis in Surgical Outcomes of Chronic Rhinosinusitis

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## Abstract

**Objective:** The study aimed to assess a possible association between allergic rhinitis and asthma and surgical management of chronic rhinosinusitis.

**Methods:** A retrospective study was carried out to review the clinical charts of adult patients who underwent functional endoscopic sinus surgery as a surgical treatment for chronic rhinosinusitis. Data regarding clinical symptoms, endoscopic findings, and radiological findings were considered.

**Results:** The studied population included 74 patients. An average Lund–Mackay score of 10.59 ± 5.427 was identified with no statistically significant difference between the presence or absence of allergic rhinitis or asthma. There was a statistically significant association between the presence of sneezing attacks, nasal itching, and hyposmia before surgery and the presence of asthma previously diagnosed. There is no statistically significant difference between the Lund–Mackay score before the surgery or the presence of nasal polyposis, asthma, or allergic rhinitis. Overall, we verified a reduced prevalence of symptoms after functional endoscopic sinus surgery with no difference between the groups with and without allergic rhinitis or asthma.

**Conclusions:** There was a statistically significant association between the presence of sneezing attacks, nasal itching, and hyposmia before surgery and the presence of asthma previously diagnosed. We did not find a statistical difference between the degree of regression of nasal polyposis in the sub-samples of patients with allergic rhinitis or asthma. Our findings are also in line with the literature which shows that symptoms improved significantly in both asthmatics and non-asthmatics postoperatively.

**Keywords:** Asthma, chronic rhinosinusitis, inflammation, nose, rhinitis

## INTRODUCTION

Chronic rhinosinusitis (CRS) is one of the most common chronic inflammatory diseases in the world and has a relevant impact on the quality of life, potentially affecting all age groups.[1-4]

It affects about 5%-12% of the world population and is defined, in adults, as inflammation of the nose and sinuses characterized by a set of signs and symptoms—in relation to symptomatology, it is defined by 2 or more symptoms, 1 of which is blockage/obstruction/nasal congestion or anterior/posterior rhinorrhea; the presence of facial pain/pressure and/or hyposmia/anosmia is frequently associated in a time window above 12 weeks.[5] Chronic rhinosinusitis can be classified, using nasal endoscopy, into (1) CRS with nasal polyps (CRSwNP): endoscopic visualization of bilateral polyps in the middle meatus or endoscopic visualization of bilateral pedicled lesions and (2) CRS without nasal polyps (CRSsNP): no visible polyps in the middle meatus, even after nasal vasoconstriction.[1] Endoscopic signs of nasal polyps, mucus-purulent discharge from the middle meatus and/or edema, or nasal obstruction with primary origin of the middle meatus are frequent. On imaging examination, we can observe the presence of changes in the mucosa in the osteo-meatal complex and sinuses.

Patients with CRSwNP often have coexisting asthma under the concept of being the combination of both diseases, which is one of the most challenging phenotypes to treat; although it remained poorly characterized. There is increasing epidemiological evidence linking chronic rhinosinusitis and asthma, but a good understanding of the pathophysiology and the combined management is still lacking.[6]

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The role of allergy in CRS has long been debated and remains controversial. The 2 diseases frequently co-occur; however, direct causality has never been proven. The literature is largely mixed and this is in large part due to heterogeneity in the definitions of allergy and of CRS.[6]

Over the last few years, the evidence of factors like the effect of nasal allergen exposure on lower airways and the effect of lower-airway allergen exposure on nasal mucosa have strengthened the evidence of links between allergic rhinitis (AR) and asthma.[7]

With this study, we intend to see the impact of the presence of asthma and AR with regard to the recurrence of nasal polyposis and the symptoms presented by patients after the performance of functional endoscopic sinus surgery (FESS).

## MATERIALS AND METHODS

### Study Design

This retrospective study was carried out at a ENT department of a tertiary center to review the clinical files of patients above 18 years who underwent FESS as a surgical treatment for CRS. Data regarding clinical symptoms, endoscopic findings, and radiological findings were considered. The patients who underwent FESS between December 2016 and January 2018 were considered. Informed consent was waived because of the retrospective nature of the study and the analysis used anonymous clinical data. Ethical approval was waived by the local Ethics Committee of DEFI - CHUPorto Center in view of the retrospective nature of the study and all the procedures being performed were part of the routine care.

### Study Population

- Inclusion criteria: Diagnosis of CRS, age over 18 years, FESS, time between December 2016 and January 2018, absence of previous FESS.
- Exclusion criteria: Incomplete registration of variables, other surgical indication rather than CRS, revision FESS.

### Variables Evaluated

The following factors were analyzed: sex, age, presence of AR, and asthma. The presence of septal deviation and bullous concha and the presence of nasal polyps on nasal endoscopy were recorded.

The diagnosis of AR is likely when 2 or more of the classic AR symptoms of nasal congestion, rhinorrhea, sneezing, and itching are present for more than 1 hour on most days. Findings on anterior rhinoscopy may reveal an erythematous mucosa with swollen turbinates. The turbinates may appear to have the traditional bluish mother-of-pearl hue; however, this may be seen in non-AR as well.[8]

## Main Points

- *In the sample evaluated, no statistically significant difference was seen between the Lund–Mackay score or the presence of nasal polyposis and the presence of asthma or allergic rhinitis.*
- *In the population evaluated, no statistical difference was seen between the degree of regression of nasal polyposis in the sub-samples of patients with allergic rhinitis or asthma after endoscopic sinus surgery.*
- *Rhinologic symptoms improved with endoscopic sinus surgery in both asthmatics and non-asthmatics. The presence of these pathologies does not relate to poorer outcomes in the timeline evaluated.*

Patients with allergic rhinitis were followed up in consultation ENT at our center and followed up in an immunoallergology consultation.

According to the literature, the diagnosis of asthma was considered when there was (1) a history of respiratory symptoms such as wheezing, shortness of breath, chest tightness, and cough that vary in intensity and severity over time and (2) variable expiratory airway obstruction or airflow limitation, used interchangeably in the literature. Spirometry with bronchodilator reversibility testing remains the mainstay of asthma diagnostic testing for children and adults.[9]

Patients considered diagnosed with asthma were followed up in a pulmonology consultation at our center.

Endoscopic findings were graded according to the Meltzer score (Table 1).

Computed tomography (CT) scan of paranasal Sinuses with 2-3 mm thick slices was ordered in the coronal, sagittal, and axial planes, from the Neuroradiology department of our center. Imaging findings were classified according to the Lund–Mackay score (Table 2).

Follow-up was maintained for a minimum period of 6 months, analyzing the presence of symptoms such as nasal obstruction, rhinorrhea, sneezing attacks, nasal itching, hyposmia, headache, and facial pressure, as well as anterior rhinoscopy with visualization of the nasal mucosa, in 2 times:

**Table 1.** Meltzer Score[9] Used for Endoscopic Staging of Nasal Polyposis Extension

| Endoscopic Findings |
|---|
| 0—no polyps |
| 1—small polyps in the middle meatus/edema |
| 2—blocked middle meatus |
| 3—polyps extending beyond the middle meatus, without complete obstruction |
| 4—massive nasal polyposis |

**Table 2.** Lund–Mackay Score Used for the Radiological Staging of the Extension of Chronic Rhinosinusitis

| Lund–Mackay CT Scan Assessment |
|---|
| Paranasal sinus |
| Maxillary (0, 1, 2) |
| Anterior ethmoid (0, 1, 2) |
| Posterior ethmoid (0, 1, 2) |
| Sphenoid (0, 1, 2) |
| Frontal (0, 1, 2) |
| Osteomeatal complex (0, 2)* |
| Total |
| 0—with no abnormalities |
| 1—partial opacification |
| 2—total opacification |
| *0, without obstruction; 2, obstructed.<br>CT, computed tomography. |

the first period—1 month after the surgical intervention and a second period—6 months after the surgical intervention.

### Surgical Technique of Functional Endoscopic Sinus Surgery

The procedure started with decongestion of the nose and infiltration of lidocaine with epinephrine (1% lidocaine with 1:100 000 epinephrine). If the possibility of septoplasty exists, it has also been infiltrated. Through the extension of the inflammatory process, uncinectomy, maxillary antrostomy, anterior and posterior ethmoidectomy, enlargement of the natural os of the sphenoid sinus and frontal sinus were performed.

### Statistical Analysis

All analyses were performed in the software Statistical Package for Social Sciences version 24 (IBM Corp., Armonk, NY, USA), and *P*-values below .05 were considered statistically significant. A descriptive analysis of patient characteristics was performed considering absolute and relative frequencies (for categorical variables) and mean and standard deviation (for continuous variables). Normal distribution was checked using skewness and kurtosis. The statistical association between the presence/absence of polyposis and asthma or AR was tested by the chi-square association test and we are comparing medium values of scale of polyps and Lund–Mackay between the presence and absence of asthma or AR.

## RESULTS

The study population comprised 74 patients; 29 females and 45 males with a mean age of 47.93 ± 14.87 years.

Septal deviation was found in 33 patients and bullous concha in 11 patients (Table 3).

About 15 patients had previously been diagnosed with asthma, and 18 patients had previously been diagnosed with AR (Table 3).

In the sample considered, the presence of chronic rhinosinusitis without polyps in 30 patients and chronic rhinosinusitis with polyps in 44 patients was identified. We found a mean degree of bilateral pre-surgical polyposis of 2 ± 1, with the exception of the subgroup that had a diagnosis of Diabetes Mellitus (DM) II in which there was a mean degree of polyposis of 2 on the left and a mean degree of polyposis of 3 on the right. The average degree of nasal polyposis at presentation and endoscopic evaluation in the first month and the sixth month did not show any significant association with the presence of asthma or AR (Table 3).

We found an average Lund–Mackay score of 10.59 ± 5.427 with no statistically significant difference between the presence or absence of asthma or AR previously diagnosed (Table 3).

There was a statistically significant association between the presence of sneezing attacks, nasal itching, and hyposmia before surgery and the presence of asthma that was previously been diagnosed (Table 4).

Regarding other evaluated factors, we found a decrease in the prevalence of the same.

Regarding nasal obstruction, of the 65 patients (87.8% of the sample) with this symptom before surgery, 58 (92.1%) lost their symptoms 1 month after surgery and 5 maintained it (2 cases were absent). At the 6-month

**Table 3.** Endoscopic and Radiological Findings

| | Asthma | | | Allergic Rhinitis | | |
|---|---|---|---|---|---|---|
| | No (n = 59) | Yes (n = 15) | *P* | No (n = 56) | Yes (n = 18) | *P* |
| Polyps before surgery | | | | | | |
| No | 28 (90.3%) | 3 (9.7%) | .079 | 23 (74.2%) | 8 (25.8%) | 1.000 |
| Yes | 31 (72.1%) | 12 (27.9%) | | 33 (76.7%) | 10 (23.3%) | |
| Septal deviation | | | | | | |
| No | 23 (71.9%) | 9 (28.1%) | .389 | 24 (75%) | 8 (25) | .775 |
| Yes | 27 (81.8%) | 6 (18.2%) | | 26 (78.8%) | 7 (21.2%) | |
| Concha bullosa‡ | | | | | | |
| Sem | 34 (79.1%) | 9 (20.9%) | 1.000 | 33 (76.7%) | 10 (23.3%) | .448 |
| Com | 9 (81.8%) | 2 (18.2%) | | 7 (63.6%) | 4 (36.4%) | |
| Meltzer score of nasal polyps before surgery (average) | | | | | | |
| Left | 2 ± 1 | 2 ± 1 | .613 | 2 ± 1 | 2 ± 1 | .173 |
| Right | 2.5 ± 1 | 2 ± 2 | .211 | 2 ± 1 | 2 ± 2 | .298 |
| Meltzer score of nasal polyps 1 month surgery (average) | | | | | | |
| Left | - | - | - | - | - | - |
| Right | - | - | - | - | - | - |
| Meltzer score of nasal polyps 6 month surgery (average) | | | | | | |
| Left | 1 ± 0 | - | .617 | 1 ± 0 | - | .617 |
| Right | 1 ± 0 | 1.5 | .156 | 1 ± 0 | 1.5 | .345 |
| Lund–Mackay score (average) | 10.42 ± 5.56 | 11.27 ± 5.01 | .595 | 10.46 ± 5.42 | 11.00 ± 5.58 | .718 |

**Table 4.** Comparison of Symptoms Presented Pre-surgically and During Follow-Up, with the First Period Being 1 Month After Surgery and the Second Period 6 Months After Surgery

| | 1 Month After Surgery | | | 6 Months After Surgery | | |
|---|---|---|---|---|---|---|
| Before surgery | No | Yes | *P* | No | Yes | *P* |
| Nasal blockage | | | | | | |
| No (9; 12.2%) | 1 (100%) | 0 (0.0%) | .001 | 1 (50%) | 1 (50%) | .002 |
| Yes (65; 87.8%) | 58(92.1%) | 5 (7.9%) | | 55 (90.2%) | 6 (9.8%) | |
| Anterior rhinorrhea | | | | | | |
| No (34; 45.9%) | 0 (0%) | 1 (100%) | .002 | 0 (0%) | 1 (100%) | .004 |
| Yes (40; 54.1%) | 37 (92.5%) | 3 (7.5%) | | 31 (91.2%) | 3 (8.8%) | |
| Posterior rhinorrhea | | | | | | |
| No (57; 77%) | - | - | .001 | 0 (0%) | 2 (100%) | ,002 |
| Yes (17; 23%) | 15 (88.2%) | 2 (11.8%) | | 10 (71.4%) | 4 (28.6%) | |
| Sneezing attacks | | | | | | |
| No (57; 77%) | - | 1 (100%) | .001 | 0 (0%) | 1 (100%) | .001 |
| Yes (17; 23%) | - | 16 (100%) | | 14 (100%) | 0 (0%) | |
| Nasal itching | | | | | | |
| No (67; 90.5%) | 2 (100%) | - | .002 | 1 (50%) | 1 (50%) | .003 |
| Yes (7; 9.5%) | 7 (100%) | - | | 5 (100%) | 0 (0%) | |
| Hyposmia | | | | | | |
| No (51; 68.9%) | 3 (100%) | 0 (0%) | .004 | 2 (50%) | 2 (50%) | .004 |
| Yes (23; 31.1%) | 19 (82.6%) | 4 (17.4%) | | 17 (85%) | 3 (15%) | |
| Frontal headache | | | | | | |
| No (44; 59.5%) | - | - | .004 | - | - | .004 |
| Yes (30; 40.5%) | 26 (86.7%) | 4 (13.3%) | | 23 (85.2%) | 4 (14.8%) | |
| Facial pressure | | | | | | |
| No (57; 77%) | - | - | .004 | - | - | .004 |
| Yes (16; 21.6%) | 15 (93.8%) | 1 (6.3%) | | 11 (91.7%) | 1 (8.3%) | |

follow-up, there were 55 patients without the symptoms (90.2%) and 1 patient with the symptom (9.8%).

In the case of previous rhinorrhea, of the 40 patients who had this symptom (54.1% of the sample), 37 lost it at 1-month follow-up (92.5%), while 3 maintained it (7.5%); 6 months after surgery, there were 31 patients without symptoms (91.2%) and 3 with symptoms (8.8%) (Table 5).

Of the 17 patients with posterior rhinorrhea (23% of the sample), 15 (88.2%) lost the symptom 1 month after the surgery and 2 (11.8%) maintained it. In the 6-month follow-up, there were 3 patients who had the symptom before surgery and maintained it and 1 patient who acquired it in sixth month (Table 5).

Of the 17 patients with sneezing attacks (23% of the sample), 16 maintained the symptom 1 month after surgery and 14 six months after. At each moment, 1 of the patients acquires the symptom (he did not present it before the surgery) (Table 5).

Of the 7 patients with nasal itching (9.5% of the sample), all lost the symptom in the follow-up of 1 month; at the end of the 6 months, there was one patient who acquired the symptom (Table 5).

Of the 23 patients with hyposmia (31.1% of the sample), 19 did not have the symptom after 1 month (82.6%), a number that decreased at 6 months to 17 patients (85%); of the patients without hyposmia before surgery, 2 had acquired the symptom after 6 months (Table 5).

Frontal headache was observed in 30 patients (40.5% of the sample) of whom, 26 (86.7%) lost the symptom and 4 (13.3%) maintained it after 1 month; in the 6-month follow-up, there were 23 patients without the symptom (85.2%) and 4 with the symptom (14.8%) (Table 5).

Of the 16 patients with facial pressure (21.6% of the sample), 15 lost the symptom (93.8%) and 1 maintained both in the follow-up periods of 1 month and 6 months (Table 5).

No statistical evidence was obtained to verify an association between the presence of asthma and AR and an improvement or worsening in the symptoms after the surgery ($P > .05$) (Table 6).

## DISCUSSION

Chronic rhinosinusitis is one of the most diagnosed pathologies worldwide, representing an important share of global health costs.

**Table 5.** Symptoms Before Surgery

| | Asthma | | | Allergic Rhinitis | | |
|---|---|---|---|---|---|---|
| | No | Yes | *P* | No | Yes | *P* |
| Nasal blockage | | | | | | |
| No | 6 (66.7%) | 3 (33.3%) | .375 | 6 (66.7%) | 3 (33.3%) | .679 |
| Yes | 53 (81.5%) | 12 (18.5%) | | 50 (76.9%) | 15 (83.3%) | |
| Anterior rhinorrhea | | | | | | |
| No | 30 (88.2%) | 4 (11.8%) | .093 | 27 (79.4%) | 7 (20.6%) | .591 |
| Yes | 29(72.5%) | 11 (27.5%) | | 29 (72.5%) | 11 (27.5%) | |
| Posterior rhinorrhea | | | | | | |
| No | 47 (82.5%) | 10 (17.5%) | .313 | 44 (77.2%) | 13 (22.8%) | .748 |
| Yes | 12 (70.6%) | 5 (29.4%) | | 12 (70.6%) | 5 (29.4%) | |
| Sneezing attacks | | | | | | |
| No | 49 (86.0%) | 8 (14%) | .034 | 44 (77.2%) | 13 (22.8%) | .748 |
| Yes | 10 (58.8%) | 7 (41.2%) | adjusted residuals =2.4 | 12 (70.6%) | 5 (29.4%) | |
| Nasal itching | | | | | | |
| No | 56 (83.6%) | 11 (16.4%) | .028 | 52 (77.6%) | 15 (22.4%) | .350 |
| Yes | 3 (42.9%) | 4 (57.1%) | adjusted residuals =2.6 | 4 (57.1%) | 3 (42.9%) | |
| Hyposmia | | | | | | |
| No | 44 (86.3%) | 7 (13.7%) | .059 | 39 (76.5%) | 12 (23.5%) | 1.000 |
| Yes | 15 (65.2%) | 8 (34.8%) | adjusted residuals =2.1 | 17 (73.9%) | 6 (26.1%) | |
| Frontal headache | | | | | | |
| No | 36 (81.8%) | 8 (18.2%) | .769 | 32 (72.7%) | 12 (27.3%) | .585 |
| Yes | 23 (76.7%) | 7 (23.3%) | | 24 (80%) | 6 (20%) | |
| Facial pressure | | | | | | |
| No | 46 (80.7%) | 11 (19.3%) | .636 | 42 (73.7%) | 15 (26.3%) | .329 |
| Yes | 13 (81.2%) | 3 (18.8%) | | 14 (87.5%) | 2 (12.5%) | |

After the failure of conservative therapy, nasosinusal endoscopic surgery is the preferred method for treating CRS, with documented improvement in the patient's quality of life.

According to the systematic review conducted by Chester et al[10] nasosinusal sinus surgery has documented improvement in the symptoms of nasal obstruction, posterior rhinorrhoea, hyposmia, and facial pressure. Factors that may contribute to an unsuccessful FESS are still unknown. However, it is possible that the systemic diseases associated with systemic inflammation may play a role in the persistence of nasal symptoms after FESS.

The prevalence of asthma has been shown to be increased in patients with CRS. From the Global Allergy and Asthma European Network survey in Europe, the median prevalence of asthma in all 19 centers was 8.6% and ranged from 5.2% to 16.8%, and asthma was found to be less common in the older age group (age, 65-74 years). There was a strong association between asthma and CRS, which was even stronger in those who reported both CRS and AR.[11]

Those with CRS without nasal allergies had lower rates of early onset asthma and higher rates of late-onset asthma. Likewise, the results of studies demonstrated a high prevalence of CRS in patients with asthma. In 1 study, all the patients with severe asthma had an abnormal sinus CT compared with 88% of the patients with mild-to-moderate asthma. Patients with severe asthma had worse sinus disease both symptomatically and radiographically.[12]

Another study of patients with severe asthma showed that 84% of patients with severe asthma had an abnormal sinus CT.[13]

According to the literature, the pre-operative patient factors which predicted a poor quality of life (QoL) outcome after FESS were smoking, allergy, and asthma,[14] although a scale was not applied to assess the impact on the QoL of the surgery performed, due to the retrospective nature of the study (such as SNOT-22); historically, the success of FESS has been categorized as a marked improvement in symptoms.[15,16]

More objective measures, such as quality-of-life indicators, decreases in medical resource use, and the revision rate, have also been used as measures for success—unfortunately, there was no possibility to evaluate the same.

Excellent previous reports have documented the effect of CRS on QoL and the improvements in quality of life after FESS.[17] However, given that the diagnosis of CRS is predicated on patients' symptoms, measures of

**Table 6.** Symptoms at First and Sixth Month After Surgery

| | Asthma | | | Allergic Rhinitis | | |
|---|---|---|---|---|---|---|
| | No | Yes | *P* | No | Yes | *P* |
| Nasal blockage | | | | | | |
| 1 month | 4 (80%) | 1 (20%) | 1.000 | 4 (80%) | 1 (20%) | 1.000 |
| 6 months | 6 (85.7%) | 1 (14.3%) | 1.000 | 5 (71.4%) | 2 (28.6%) | .646 |
| Anterior rhinorrhea | | | | | | |
| 1 month | 2 (50%) | 2 (50%) | .288 | 2 (50%) | 2 (50%) | .288 |
| 6 months | 2 (50%) | 2 (50%) | .218 | 2 (50%) | 2 (50%) | .218 |
| Posterior rhinorrhea | | | | | | |
| 1 month | 2 (100%) | 0(0%) | 1.000 | 2 (100%) | 0 (0%) | 1.000 |
| 6 months | 4 (66.7%) | 2 (33.3%) | 1.000 | 4 (66.7%) | 2 (33.3%) | .604 |
| Sneezing attacks | | | | | | |
| 1 month | 0(0%) | 0(0%) | - | 0 (0%) | 0 (0%) | - |
| 6 months | 1 (100%) | 0(0%) | 1.000 | 1 (100%) | 0 (0%) | 1.000 |
| Nasal itching | | | | | | |
| 1 month | 0(0%) | 0(0%) | - | 0 (0%) | 0 (0%) | - |
| 6 months | 0(0%) | 1 (100%) | 1.000 | 0 (0%) | 1 (100%) | 1.000 |
| Hyposmia | | | | | | |
| 1 month | 4 (100%) | 0(0%) | .263 | 4 (100%) | 0 (0%) | .546 |
| 6 months | 4 (80%) | 1(20%) | 1.000 | 5 (100%) | 0 (0%) | .544 |
| Frontal headache | | | | | | |
| 1 month | 3 (75%) | 1 (25%) | 1.000 | 2 (50%) | 2 (50%) | .169 |
| 6 months | 4 (100%) | 0(0%) | .545 | 3 (75%) | 1 (25%) | 1.000 |
| Facial pressure | | | | | | |
| 1 month | 1 (100%) | 0(0%) | 1.000 | 1 (100%) | 0 (0%) | 1.000 |
| 6 months | 1 (100%) | 0(0%) | 1.000 | 1 (100%) | 0 (0%) | 1.000 |

success in the treatment of CRS should be primarily based on these same diagnostic symptoms. Our findings confirm the FESS as valid option and a method of the treatment of medically refractory rhinosinusitis.

According to our findings, we did not find a statistical difference between the degree of regression of nasal polyposis in the sub-samples of patients with AR or asthma. It is known the association between asthma and nasal polyposis. Our findings are in line with the literature: some authors have reported that asthma does not represent a predictor of poor symptomatic outcome after primary FESS.[18,19]

According to the literature, the presence of allergy does not predict poorer outcomes after sinus surgery, which is also in line with our findings.[20]

Our findings are also in line with the literature that refers that symptoms improved significantly in both asthmatics and non-asthmatics postoperatively.[21-23]

Certain clinical phenotypes, such as CRS associated with asthma, were significant in the univariate screening of predictors of QoL outcomes—our findings do not agree with that. The reduced dimension of the sample might be a possible factor that could contribute to these apparently contradictory conclusions with the current literature.

It was not possible, as it was a retrospective study of the impact assessment on the patient's QoL. Endoscopic findings, namely the use of the Lund–Kennedy score, were not considered due to the existence of incomplete records of the variables—a limitation inherent to the retrospective character of the study. The failure to perform local biopsies did not allow the immunohistochemical characterization of each of the phenotypes of the studied groups, and in this sense, it is considered a study limitation.

Prospective randomized studies should be carried out, ideally with a larger study population, with a view to comparing the impact on QoL in patients with AR and asthma undergoing functional endoscopic surgery.

Other variables such as the adhesion to the treatment prescribed and the degree of asthma, which may have an influence on the results obtained, should be considered in future studies.

## CONCLUSION

There is no statistically significant difference between the Lund–Mackay score or the presence of nasal polyposis and the presence of asthma or AR.

Overall, we verified a reduced prevalence of symptoms after FESS.

There was a statistically significant association between the presence of sneezing attacks, nasal itching, and hyposmia before surgery and the presence of asthma that has previously been diagnosed.

We did not find a statistical difference between the degree of regression of nasal polyposis in the sub-samples of patients with AR or asthma.

Our findings are also in line with the literature that refers that symptoms improved significantly in both asthmatics and non-asthmatics postoperatively and the presence of these pathologies does not relate to poorer outcomes.

The findings allow for better therapeutic orientation and framing of the complaints presented by the patients after FESS.

**Ethics Committee Approval:** Ethical approval was waived by the local Ethics Committee of DEFI - CHUPorto Center in view of the retrospective nature of the study and all the procedures being performed were part of the routine care.

**Informed Consent:** Informed consent was waived because of the retrospective nature of the study and the analysis used anonymous clinical data.

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