Heredity of nasal polyps*

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Abstract

Background: Nasal polyps is a common disease but little is known about its' pathogenesis. Our hypothesis was that there are genetic factors involved in the development of this disease. The aim of this study was to examine close relatives of patients with nasal polyps and comparing them with a general population with regard to prevalence of polyps.

Methodology: Patients with nasal polyps who attended the clinic were recruited to the study and were asked whether they had any close adult relatives (siblings, parents or children). We intended to recruit two relatives per patient, one of each gender, for nasal endoscopy. The prevalence of nasal polyps in these relatives was compared with the prevalence of nasal polyps in a general population.

Results: During a 4-year period, 368 patients and 410 relatives were recruited to the study. Although we were unable to recruit two close relatives for every patient, we were able to calculate nasal polyp prevalence within families as being 19.2%. Compared with the prevalence of nasal polyps among individuals in a general Swedish population from the same geographical area, the relative risk for polyps among relatives was almost five times higher.

Conclusion: This study strongly indicates that heredity is a factor of importance for development of nasal polyps.

Key words: nasal polyps, genetics, humans, adults, sex

Introduction

Nasal polyps (NPs) are a symptom of chronic rhinosinusitis, which often requires both medical and surgical treatment. Still, in spite of treatment the polyps often recur. Therefore, NPs are a common clinical problem in otorhinolaryngology. The disease is characterized by benign polyps, usually found bilaterally in the middle meatus, with symptoms of nasal blockage, reduced sense of smell, and nasal secretion. In a Swedish population-based study of 1900 adult individuals stratified for age and gender, the prevalence of NP at endoscopy was 2.7% (95% confidence interval (CI) 1.9–3.5%). Nasal polyps were more frequent in men (with 2.2 men for every woman with NPs), the elderly (5% at ≥60 years of age) and asthmatics [(1)]. The disease was only known in 29% of the participants prior to the study, which suggests that NP may occasionally be found several years before symptoms occur and the disease is established (i.e. clinically silent NP (unpublished data)).

The aetiology of chronic rhinosinusitis with NPs remains obscure. According to the European Position Paper on Rhinosinusitis and Nasal Polyps 2012, there are many hypotheses on its aetiology (e.g. the fungal hypothesis, the staphylococcal superantigen hypothesis, the immune barrier hypothesis, and a hypothesis connected to biofilms). It is likely that the aetio-

logy is multifactorial and that, as is so often the case, genes are involved [2].

The aim of this study was to investigate first-degree relatives of patients with NPs by means of nasal endoscopy to evaluate the importance of heredity in development of NP disease.

Materials and methods

Patients

A total of 368 patients with NP were recruited for the study. They were asked if they had any close adult relatives (siblings, parents or children). If so, we wished to investigate two of them, one of each gender. The patients were asked to contact their relatives regarding participation in the investigation. An appointment was made for those who agreed to participate, 410 individuals in total. The study was carried out in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the University of Gothenburg, Sweden.

A total of 778 patients and relatives were investigated in the same manner. Rhinoscopy was conducted by experienced otolaryngologists using a 2.7 mm rigid endoscope (Storz-30°, Karl Storz, Tüttlingen, Germany). Nasal polyps were identified as pale, glassy protuberances of the nasal mucosa [3].

Patients and relatives were compared with a general population as described in a previous study [1]. In that study, a random sample of 1,900 adults, stratified for age and gender, were drawn from a municipal register of Skövde, West Sweden, 1,387 (73%) of whom were investigated. They all underwent rigid nasal endoscopy as used in the present study. This enables direct comparison with the test subjects in the present study.

Statistical analysis

Descriptive statistics such as means, standard deviation (SD) and frequencies are presented. Confidence intervals (CI) for interval estimation, calculated by conventional method, are presented where appropriate. Comparisons of prevalence between the groups were done either by chi-square test or by calculating relative risk (RR) with CI. All analyses were performed with the statistical package IBM SPSS version 21 (SPSS Inc., Chicago, IL, USA).

Results

During a 4-year period, 368 patients with NPs were recruited for the study, 68% men and 32% women. Out of these 368 patients, we were unable to recruit a relative for 82 patients, resulting in complete data from 286 patients/families. One first-degree relative each was recruited for 162 patients, and two relatives of different genders for 124 patients, thus making 410 relatives in total (Table 1).

Table 1. Descriptive statistics for patients and their relatives.

	Total	Gender		Age
		Males (n)	Females (n)	mean (SD)
Total No. of recruited patients	368	251	117	57.1 (14.5)
Patients with any relatives	286	191	95	57.8 (13.8)
Total No. of relatives recruited	410	190	220	49.8 (17.3)

Out of 286 patients with first-degree relatives, NPs were found in 55 individuals (relatives), 38 (69%) men and 17 (31%) women (Table 2). There was never more than one relative with NPs in any family. The calculated prevalence of NPs among families was therefore 19.2% (55/286), with 95% CI 14.7–23.8. Of those 355 relatives without NPs, 152 (43%) were men and 203 (57%) women. If we calculate prevalence based on all relatives instead of families, this yields a prevalence of 13.4% (55/410) with a 95% CI of 10.1–16.7. Prevalence among male relatives was higher, 20% (38/190) compared with 7.7% (17/220) among female relatives ($p < 0.001$). There was an increase in prevalence among relatives with age ($p < 0.001$) and the increasing trend seemed to be more distinct among males (Figure 1).

Compared with an NP prevalence of 2.7% among the general Swedish population from the same geographical area [1], the RR for NPs among relatives was almost five times higher (RR = 4.9; 95% CI 3.3 – 7.3). Also, the gender-specific RR was higher for both male relatives (RR = 5.3; 95% CI 3.3 – 8.5) and female relatives (RR = 4.5; 95% CI 2.2 – 9.3).

Discussion

A genetic factor in the pathogenesis of NPs has been suggested before and previous studies have shown that a family history of NPs is more frequent among patients with NPs than in controls [4-7]. However, in these studies the family history was obtained by questionnaires and the presence of NPs was not confirmed by endoscopic investigation, which is mandatory for a diagnosis. These studies are therefore burdened by a clear risk of over- as well as underestimation of the potential importance of genetic factors for the pathogenesis. Existence of NPs, as confirmed by a nasal examination, would therefore enable a more adequate assessment.

A weakness of this study is that we were unable to recruit two close relatives for each patient. There were several reasons for this, e.g. lack of close relatives; or that some patients had no

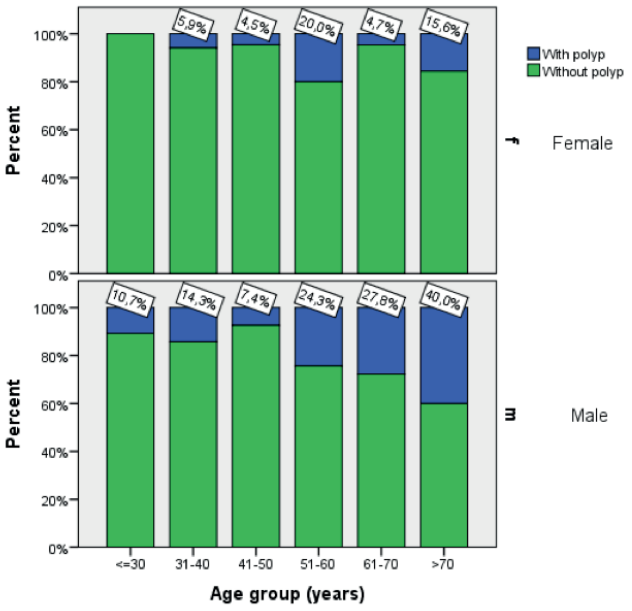

Figure 1. Prevalence of nasal polyps (NPs) among relatives, by gender and age group.

Table 2. Age and number of patients and their close relatives, included in the study.

	Total		With polyps	
	n (%)[1]	Age mean (SD)	n (%)	Age mean (SD)
Patients	368	57.1 (14.5)	3682	–
Father	29 (7.1%)	68.2 (9.5)	11 (20%)	71.5 (7.1)
Mother	46 (11.2%)	66.8 (11.1)	3 (5.5%)	62.3 (20.8)
Brother	72 (17.6%)	57.7 (12.2)	18 (32.7%)	56.4 (13.5)
Sister	73 (17.8%)	59.7 (12.9)	8 (14.5%)	67.1 (10.1)
Son	89 (21.7%)	36.3 (9.9)	9 (16.4%)	39.9 (9.2)
Daughter	101 (24.6%)	35.8 (10.9)	6 (10.9%)	50.3 (10.6)
All relatives	410 (100%)	49.8 (17.3)	55 (100%)	57.9 (15.2)

[1] % = proportion of all relatives; [2] by definition all patients had nasal polyps (NPs); SD = standard deviation

relations with their relatives and did not want to contact them. Also, some relatives could not participate for health reasons, or because they were too busy, not interested, or living abroad. There was probably also a selection bias in that relatives with nasal symptoms were more likely to participate in the study. Therefore, we assume that there were no relatives with NPs among those who declined or were unable to participate, suggesting that the overall prevalence of NPs in the families would be about 15% (55 out of 368 families).

The negative influence of these factors on the true prevalence of heredity of NPs is minimized by the large number of patients and relatives included in this study. Furthermore, diagnosis of NPs was not based on a questionnaire but confirmed by nasal endoscopy. Finally, we compared our material with a general population randomly drawn from a municipal register, stratified for age and gender and recruited from the same region. Therefore, our results point to an important hereditary factor influencing the development of NPs. However, it is also possible that familiarly factors (like environmental factors, e.g. infections) may be of importance for the results in this study.

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Authorship contribution

AB: Study design, data collection, paper drafting; MO: Study design, data collection paper drafting; KH: Data collecting LJ: Study design, data collecting; EM: Study design; SN: Study design, statistical analysis, paper drafting; ÅTN: Study design statistical analysis?; MB: Study design, data collecting, paper drafting.

Conflicts of Interest

None

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