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Nasal polyps

A clinical study of endoscopic score systems and epidemiology

by

Leif Johansson

Skövde and Göteborg, 2003

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Nasal polyps

A clinical study of endoscopic score systems and epidemiology

AKADEMISK AVHANDLING

som för avläggande av medicine doktorsexamen vid Göteborgs Universitet kommer att offentligen försvaras i Aulan, Sahlgrenska Universitetssjukhuset, Göteborg, fredagen den 10 oktober 2003, kl 9.00

av

Leif Johansson
Leg. Läk.

Fakultetsopponent: Docent Peter Graf, Huddinge Universitetssjukhus, Karolinska Institutet, Stockholm

Avhandlingen baseras på följande delarbeten:

I Johansson L, Åkerlund A, Holmberg K, Melén I, Stierna P, Bende M
Evaluation of methods for endoscopic staging of nasal polyposis
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Ann Otol Rhinol Laryngol 2003;112:625–9

IV Johansson L, Brämerson A, Holmberg K, Melén I, Åkerlund A, Bende M
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ABSTRACT

Nasal polyps

A clinical study of endoscopic score systems and epidemiology

Leif Johansson, MD

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Introduction: Nasal polyps are a common disease, the etiology and pathogenesis of which are still unclear. For diagnosis, a nasal endoscope is essential, while for follow-up treatment, a reliable score system is necessary. The existing score systems consist of few score steps and measure only large changes in polyp size. The question is whether a score system with a continuous scale will provide more reproducible, and sensitive results. The epidemiology of nasal polyps in the general population is not known. The main aims of this work were; to develop a sensitive and reliable method for assessing the size and extension of nasal polyps, and to determine the prevalence of nasal polyps in a general population.

Methods: Different score systems, three newly developed and two established, were compared with regard to their ability to assess polyp size and detect changes during medical treatment. A total of 150 adult patients with nasal polyps were investigated in these studies. The new score systems used were: lateral imaging (LI), assessment of polyp obstruction, and nasal airway patency. The established score systems were *ad modum* Lildholdt *et al.* and *ad modum* Lund and Mackay. The score systems were compared with the patients' subjective symptoms. A nasal endoscope was used to get a good view of polyps in the entire nasal cavity. One investigator examined the patients twice, whereafter three otorhinolaryngologists examined 30 patients independently of each other, using the same technique and performing the investigations under the same conditions. Thereafter, the different methods of polyp staging were compared. The sensitivity of LI in comparison with the Lildholdt *et al.* score system was tested by measuring early (i.e., within 14 days), and small, changes in polyp size during treatment with a topical corticosteroid. In the epidemiological study, 1,900 adult subjects were randomly drawn from a small town register. Of these, 1,387 were examined with a nasal endoscope, tested for smell impairment, and questioned with regard to relevant medical conditions. Health-related quality of life (HRQL) was investigated among individuals diagnosed with nasal polyps and compared with that of individuals without nasal polyps and patients with symptomatic nasal polyps.

Results: The reproducibility of all five score systems was good and the reliability between different investigators was significantly better for score systems LI, Lildholdt *et al.*, and assessment of polyp obstruction than for the other two. The LI was significantly more sensitive and better able than the Lildholdt *et al.* score system to detect early changes in polyp size. The symptom score showed significant improvement after 3 days. The prevalence of nasal polyps in adults was 2.7%, and was more frequent among men and asthmatics, as well as with increasing age. The individuals with nasal polyps experienced the same frequency of asthma and reduced sense of smell as patients, and had impaired HRQL.

Conclusion: Lateral imaging, evaluated by nasal endoscopy, has been shown to have good reproducibility and to be a reliable method for detecting early changes in polyp size. The prevalence of nasal polyps was 2.7% in the general adult population studied. Nasal polyps lead to reduced HRQL. Nasal polyps are a manifestation of a mucosal disease including both the upper and the lower airways.

Key words: nasal polyps, score system, endoscope, epidemiology, airways, HRQL.

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Conclusion: Lateral imaging, evaluated by nasal endoscopy, has been shown to have good reproducibility and to be a reliable method for detecting early changes in polyp size. The prevalence of nasal polyps was 2.7% in the general adult population studied. Nasal polyps lead to reduced HRQL. Nasal polyps are a manifestation of a mucosal disease including both the upper and the lower airways.

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To Elisabeth, Sara, Elin, Frida

This thesis is based on studies reported in the following papers, which will be referred to in the text by their Roman numerals:

I Johansson L, Åkerlund A, Holmberg K, Melén I, Stierna P, Bende M
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Contents

ABBREVIATIONS

ANOVA	analysis of variance
CI	confidence interval
CT	computerized tomography
ENT	ear, nose, and throat
HRQL	health-related quality of life
IgE	immunoglobulin E
LI	lateral imaging
MRT	magnetic resonance tomography
n	number
OR	odds ratio
PNIF	peak nasal inspiratory flow
QoL	quality of life
SEM	standard error of the mean
SF-36	short form 36 health survey questionnaire
SOIT	Scandinavian Odor Identification Test
VAS	visual analog scale

DEFINITIONS

Nasal polyp – pale glassy protuberance of the nasal mucosa

Nasal polyposis – condition which comes with nasal polyps, and which requires medical or surgical intervention

Peak nasal inspiratory flow – maximal voluntary flow of air through the nose during forced nasal inspiration

Turbinate – mucosa-lined bony pouches of the lateral wall in the nasal cavity

Visual analog scale – a continuous scale for measuring symptoms

Prevalence – frequency of a condition in a population

Middle meatus – area above the inferior turbinate and lateral to the middle turbinate in the nasal cavity

Odds ratio – quotient between two odds (= probabilities)

Upper airways – airway from the nose to the larynx

Lower airways – airway of the trachea, and lungs

INTRODUCTION

Nasal polyposis is a common disease not known to shorten life expectancy. The main symptoms are nasal blockage and olfactory impairment; also, nasal secretion and sneezing frequently accompany the condition. Nasal polyposis is often associated with other diseases, such as asthma, aspirin intolerance, chronic rhinosinusitis, dental infections, cystic fibrosis, the Churg-Strauss syndrome, Kartagener's syndrome, and Young's syndrome. The relationship to asthma is most frequently investigated. Among patients with non-allergic asthma, nasal polyps are found in 13% and in 5% of allergic asthma, and among patients with nasal polyps, asthma has been reported in 70% (1–7). The prevalence of nasal polyps has been estimated to be 1–4% by several groups (8–10). In a retrospective study of patient files from an allergy clinic, the prevalence was 4.2% (1). In a Russian questionnaire study, the prevalence was 1.3–5.6% (11) and in a Finnish population-based questionnaire study from 1999, the prevalence was reported to be 4.3% (12). In addition, Larsen and Tos reported the incidence of nasal polyps to be 0.6% (13).

The etiology of nasal polyps is not fully understood and no single cause has been found. Nasal polyposis is sometimes classified as an allergic disorder, but no association with immunoglobulin E (IgE)-mediated allergy has been found (14). Polyps are considered to be an inflammatory process, and various mediators are thought to be involved in the pathogenesis (15–16).

The nasal airway lumen is divided into two separate cavities by the nasal septum. The airway lumen comprises three turbinates, the upper, the middle, and the lower turbinate. Nasal polyps are generally found in the middle meatus, but occasionally they can originate from the upper part of the nose (17–19). Polyps are usually pale glassy protuberances of the nasal mucosa, with few blood vessels and sensory nerves (20–21). Histologically, they are often difficult to distinguish from the mucosal epithelium. It is common that polyps are characterized by an edematous stroma, hyperplastic goblet cells and, eosinophils and mast cells in the stroma (22).

Until the late 1970s, nasal polyps were exclusively treated by surgery. Since then, however, a large number of controlled studies have verified the positive effect of topical corticosteroids for nasal polyps (23–38). Also, the development of endoscopy has improved the surgical results (39–40). In spite of effective treatments, nasal polyps frequently recur, and up to now,

nasal polyposis is a chronic disease, which repeatedly causes patients to consult the medical profession (41–43).

For correct diagnosis and staging of nasal polyps, endoscopy is essential (44–46), while in evaluation of efficacy of treatment of nasal polyps, score systems are often used for staging. Most of these consist of three or four steps, expressing the vertical extension of the polyps (26, 27, 47). Published data on validity, and assessment of the sensitivity, of these methods are lacking, but the score systems seem to have some credibility following repeated use (26–28, 30, 31, 34). Radiology, including computerized tomography (CT) and magnetic resonance tomography (MRT), has been proposed to be an objective method for assessing pathology in the nasal sinus complex. It gives additional information on the extension of polyps and sinus involvement, but has the disadvantage that it cannot distinguish between mucosal congestion and polyps (48). Following the outcome of treatment, physiological techniques for investigating airflow and nasal geometry are also useful, e.g., peak nasal inspiratory flow (PNIF), rhinomanometry, and acoustic rhinometry (49–50). Patients' experience of treatment effects can be assessed with various symptom scores. Long-standing nasal polyposis has been shown to be associated with impaired sense of smell (51).

PRESENT INVESTIGATIONS

Aims

In many respects, nasal polyposis is a still unexplored disease and it is not known for certain whether the incidence is increasing or decreasing. Therefore, it is of certain importance to study the epidemiology of nasal polyps. As nasal endoscopy is the gold standard for diagnosis and assessment of nasal polyps, staging is fundamental to polyp research.

The main aims of this work were to –

1. develop a sensitive and reliable method for assessing the size and extension of nasal polyps
2. determine the prevalence of nasal polyps in a general population

Endoscopic staging study (Papers I and II)

A total of 150 adult patients with nasal polyps (hereafter referred to as 'patients'), 108 men and 42 women, aged 19–79 years, were investigated in these studies.

Score systems

Different score systems, three newly developed and two established, were compared with regard to their ability to assess polyp size and detect changes in polyp size during medical treatment. In all systems, nasal endoscopy was used to define the extension of the polyps and no local anesthesia or decongestion was used. With endoscopy, it was possible to get a good view of polyps in the entire nasal cavity, with the exception sometimes of the upper, posterior part of the nose. A pilot study was performed, in which all investigators used the same technique and performed the investigations under the same conditions. The score systems were compared with the patients' subjective symptoms scored on a visual analog scale (VAS), where 0 = no nasal blockage, and 100 = a completely blocked nose (52).

The score systems used were –

1. *Lateral imaging (LI).* The nasal polyps were defined and their size was assessed in a vertical and a horizontal plane. The extension of the nasal polyps was drawn on a standard schematic picture of the lateral wall of each nasal cavity (Fig. 1) and expressed in per cent of the lateral wall of the nasal cavity. The drawing was done using a computer program, with automatic calculation of the polyp area (Fig. 2).
2. *Assessment of polyp obstruction.* The proportion of the total nasal cavity volume occupied by polyps was assessed. In the assessment, 0 = "no polyps", while 100 = "nasal cavity completely filled with polyps".
3. *Nasal airway patency.* The proportion of the patent airway lumen in relation to an imaginary maximal nasal airway lumen was assessed, disregarding the presence of polyps and nasal mucosal swelling. In the results, 0 = "no lumen for ventilation", while 100 = "airway lumen ventilation as wide as possible", i.e., limited only by the static anatomical structures of the nose.
4. *Score system* ad modum *Lildholdt* et al. The degree of nasal polyps in relation to the inferior turbinate was classified in four steps (0–3), where 0 = "no polyps"; 1 = "small polyps not reaching the upper edge of the inferior turbinate"; 2 = "medium-sized polyps reaching between the upper and the lower edges of the

inferior turbinate"; and 3 = "large polyps reaching below the lower edge of the inferior turbinate".

5. *Score system* ad modum *Lund and Mackay.* The size of nasal polyps was estimated in three steps, where 0 = "no polyps"; 1 ="polyps confined to the middle meatus"; and 2 = "polyps beyond the middle meatus".

Figure 1. Schematic picture of the lateral wall of the nasal cavity

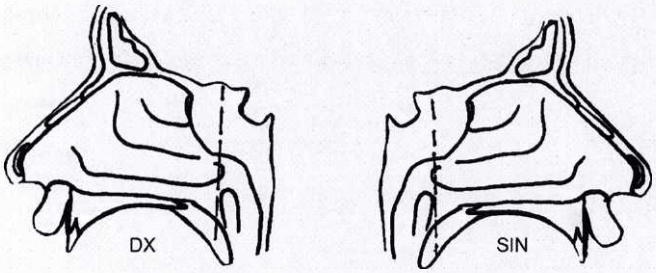
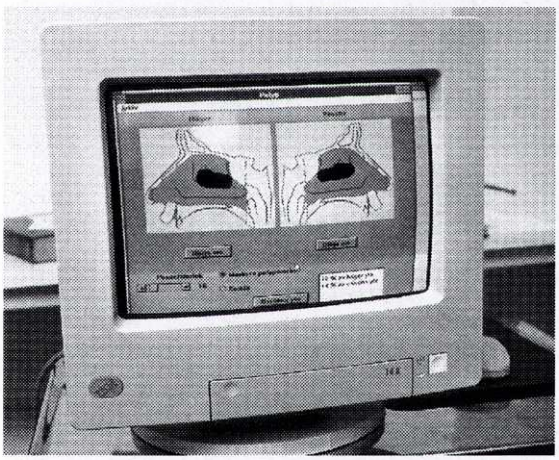


Figure 2. Computer-aided calculation of polyp size (extension of polyps in black).

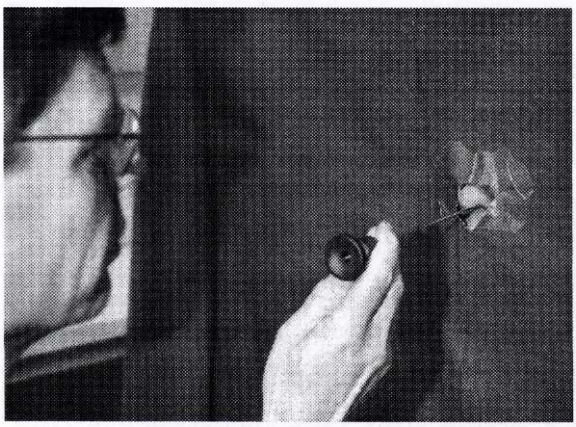


Method

In the first part of the study, one investigator examined the same 22 patients twice, with 2-hour intervals between examinations, to compare the different methods of polyp staging. At the second examination, the patients were covered with a sheet with only a hole for the nose in order to be blinded to the investigator (Fig. 3).

In the second part of the study, three otorhinolaryngologists examined 30 patients independently of each other. Thereafter, the sensitivity of LI was compared with that of the Lildholdt *et al.* score system, a symptom score (VAS), and PNIF, by measuring early (i.e., within 14 days) and small changes in polyp size during treatment with a topical corticosteroid (budesonide). With all five score systems, polyp size was calculated as a mean of the left and right side of the nasal cavity.

Figure 3. Draped patient during nasal endoscopy



Results

In repeated assessments with one investigator, significant positive correlations between the first and the second assessment were found with all five methods used to score nasal polyps. The highest correlations were obtained with LI, followed by assessment of polyp obstruction and Lildholdt *et al.*'s score system.When three physicians examined the same patient, good

agreement was found, as indicated by the absence of statistically significant differences between the investigators' way of scoring using LI, nasal airway patency, and the score system *ad modum* Lildholdt *et al.* However, analysis of variance (ANOVA) revealed a significant difference between the physicians using the score system assessment of polyp obstruction and that of Lund and Mackay. Patients' symptoms of nasal blockage were poorly correlated to the extension of the polyps.

Based on previous experience, the sensitivity of LI was compared with that of Lildholdt *et al.*'s score system. Whereas LI was able to detect significant changes in polyp size after 14 days, no changes in polyp size could be detected with the score system of Lildholdt *et al.* during the 2-week period. Patients experienced symptomatic improvement after 3 days, measured using a VAS. However, the PNIF score did not show any significant changes in nasal flow during 14 days.

Epidemiological study (Papers III and IV)

Method

Based on the lowest estimated prevalence of nasal polyps, of 1%, altogether 1,900 individuals aged 20 years and older, stratified for age (using 10-year intervals) and gender, were randomly drawn from the Skövde population register. They were invited for a nasal examination including a smell test. The subjects' medical history was gathered in a standardized manner by means of a structured interview designed to pick up relevant medical conditions like nasal blockage and secretion, asthma, aspirin intolerance, and smell impairment.

Nasal endoscopy was performed in all individuals to detect nasal pathology and extension (LI) of found polyps. The sense of smell was measured by a qualitative test, the Scandinavian Odor Identification Test (SOIT), and nasal airflow was measured by PNIF (49, 50, 53, 54).

Individuals found with nasal polyps in the population-based study (hereafter referred to, simply, as 'individuals'), together with patients and matched controls from the population-based study, later participated in a study of signs and symptoms from the nose and the lower airways, and health-related quality of life (HRQL). In this part of the study, the short form 36

health survey questionnaire (SF-36) was used. This generic questionnaire contains 36 questions measuring general aspects of HRQL (55–57) (see Table 1).

Table 1. Description of health concepts in the SF-36 questionnaire

Measure	Number of items	Definition
Physical function (PF)	10	Extent to which health interferes with a variety of specific physical activities, such as sports, carrying groceries, climbing stairs, walking
Role physical (RP)	4	Extent to which health interferes with usual daily activities, such as work, housework, or school
Bodily pain (BP)	2	Extent of bodily pain experienced in the past 4 weeks
General health (GH)	5	Overall rating of current health in general
Vitality (VT)	4	Energy or tiredness
Social function (SF)	2	Extent to which health interferes with normal social activities, such as visiting friends, during the past month
Role emotional (RE)	3	Extent to which health interferes with usual daily social activities (e.g., accomplished less than would have liked to)
Mental health (MH)	5	General mood or affect, including depression, anxiety, and physiological wellbeing, during the past month
Health transition (HT)	1	Evaluation of general perception of health during the past year
Physical component summery (PCS)		Summery index of the physical scales
Mental component summery (MCS)		Summery index of the mental scales

Results

In total, 1,387 volunteers (73% of the sample) were investigated. The sample size was adequate, with a good fit to the total population and representative to the Swedish population (Table 2). The dropouts were from among the youngest (20–30 years of age) and the oldest subjects (>70 years). Reasons for subjects dropping out of the study varied; in the youngest group, most dropouts had relocated, while in the oldest group, the incidence of dropout was due to incapacity or death.

Table 2. Comparison of study population and inhabitants in Sweden

Group/age (year)		20-29	30-39	40-49	50-59	60-69	70-79	80+
Skövde	Inhabitants/ Strata (%)	18	19	17	18	12	10	6
	Women/ Strata (%)	48	48	50	50	52	56	63
Sweden	Inhabitants/ Strata (%)	16	19	17	18	12	10	7
	Women/ Strata (%)	49	49	49	49	51	56	65

Nasal polyps were found in 38 subjects (26 men and twelve women), which represents an overall prevalence of 2.7% (95% confidence interval (CI) 1.9;3.5%) in adults. Polyps were more common in men than in women (male:female ratio 2.2:1, mean age 62 years), with an odds ratio (OR) of 2.70 (95% CI 1.33;5.50).

The prevalence increased with age: up to 40 years, the prevalence was <1%, while from 60 years on, the prevalence approached 5%. Polyps were more common in asthmatics, with an OR of 5.20 (95% CI 2.48;10.89). Subjective symptoms of aspirin intolerance did not increase the OR for nasal polyps.

The 38 individuals with nasal polyps were further compared with age- and gender-matched controls from the population and with 44 patients (**IV**). The size of the nasal polyps was significantly larger among the patients than among the individuals. Smell impairment was equal in the two groups. Individuals and patients had asthma in 30% of cases, which was significantly higher than for the controls (5%). Peak nasal inspiratory flow was reduced in individuals, but not to the same extent as among patients. Nasal blockage was more frequent among the patients than it was in the individuals, but there was no significant difference in blockage symptom between individuals and controls (Table 3).

Table 3. Data of the individuals with nasal polyps, patients, and controls.

Variable	**Individuals**	**Patients**	**Controls**	**Individuals vs. Patients**	**Individuals vs. Controls**
Number	38	44	38		
Men (n)	26	33	26		
Mean age (yrs)	62	52	62		
Symptoms					
Blockage (n)	19	40	11	P<0.001	n.s.
Secretion (n)	6	15	4	n.s.	n.s.
Sneezing (n)	8	12	6	n.s.	n.s.
Reduced sense of smell (n)	18	33	6	P<0.05	P<0.001
Asthma (n)	12	16	2	n.s.	P<0.01
Aspirin intolerance (n)	2	4	0	n.s.	n.s.
Examinations					
Polyp size (mean LI %)	11.2	32.2	0	[5.8–16.6] vs. [24.5–39.8]	
PNIF mean (l/min)	153	108	163	[132–174] vs. [87–130]	[132–174] vs. [142–184]
SOIT outcome (mean)	11.8	11.3	13.4	[10.6–13.0] vs.[9.9–12.6]	[10.6–13.0] vs. [12.5-14.3]

There was a statistically significant impaired quality of life (QoL) for the SF-36 domains PF, RP and PCS for individuals, and for the domains PF, GH, VT, and PCS for patients compared with the normal values for the general Swedish population (58) (Table 4).

Table 4. Difference in mean-score compared to Swedish norm

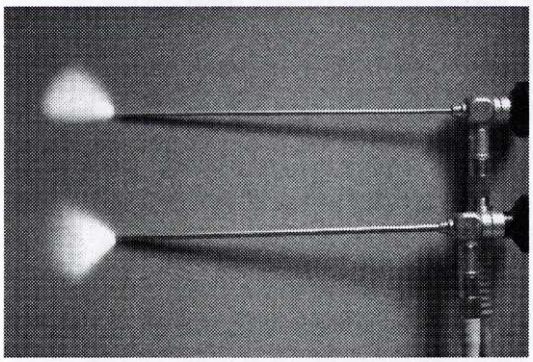
Domain	**PF**	**RP**	**BP**	**GH**	**VT**	**SF**	**RE**	**MH**	**PCS**	**MCS**
Swedish norm	87,9	82,3	74,8	75,8	68,8	88,6	85,7	80,9	50	50
Individuals	75,3	68,4	69,8	69,4	66,8	85,3	80,4	82,6	45,0	54,5
Swedish norm - Individuals	***12,6***	***13,9***	***5***	***6,4***	***2***	***3,3***	***5,3***	***-1,7***	***5***	***-4,5***
p-value Swedish norm – Individuals	***0.0059***	***0.053***	***0.28***	***0.15***	***0.62***	***0.43***	***0.34***	***0.59***	***0.018***	***0.011***
Patients	80,3	77,2	70,9	61,6	59,4	89,2	80,3	79,3	46,4	52,4
Swedish norm -patients	***7,6***	***5,1***	***3,9***	***14,2***	***9,4***	***-0,6***	***5,4***	***1,6***	***3,6***	***-2,4***
p-value Swedish norm -Patients	***0.016***	***0.37***	***0.36***	***0.0005***	***0.019***	***0.80***	***0.31***	***0.54***	***0.022***	***0.10***

DISCUSSION

Nasal polyps have been defined in different ways. Our definition is based on Lund's (21) and Clement's definition (20). This definition does not include the mucosal pathology often seen by radiological examinations of the nose and sinuses. Rather, we chose to define polyps within the nasal cavity, whose extension can be examined by endoscopy. The diagnosis nasal polyposis has been used entirely for patients with a clinically significant disease.

In Paper **I**, a rigid endoscope with a 4 mm diameter and an optical angle of 0° was used, while in Papers **II–IV**, we used an endoscope of 2.7 mm diameter, and a 30° angle. However, both endoscopes have a fairly wide angle (Fig. 4). Our experience is that the 2.7 mm endoscope is easier to handle. The avoidance of nasal anesthesia and decongestants has both pros and cons. Without nasal decongestants, we could see nasal polyps in their natural condition and thus assess the patients' nasal symptoms and measure their nasal airflow. Decongestion increases the view into the nose, but may lead to reduced polyp size. Anesthesia has no influence on polyp size, but it could influence the patient's experience of nasal blockage and, possibly, the olfactory function. It is possible that in some cases, we could have benefited from anesthesia and decongestants, especially in the middle meatus, but mostly, there was no need for local anesthesia. Furthermore, avoidance of pretreatment considerably saves time.

Figure 4. Comparison of the 2.7 mm, optic angle 30°, with the 4 mm, optical angle 0°, endoscope



Endoscopic staging study (Papers I and II)

The LI score system measures the polyp size in two directions, giving the vertical and the horizontal extension. The score systems with three or four score steps only measure the vertical extension. Furthermore, one of the steps in these scores, score = 0, does not grade any polyps at all. Recently, a new score system was developed, which consists of a schematic picture of the nasal cavity with five score steps in vertical extension (46). The use of mean values for nasal polyps on the left and right side was based on the common way to calculate polyp size using the score system *ad modum* Lildholdt *et al.*, although this score system is stepwise and is an ordinal scale. A comparison of mean and median values in our results revealed only slight differences which did not influence the outcome. For endoscopic staging of nasal polyps, no existing score method has been validated previously.

Epidemiological study (Papers III and IV)

This is the first study that shows the prevalence of nasal polyps following endoscopy in a general population of adults. The Skövde population-based study is considered to be representative of the Swedish population. However, it cannot be excluded that the prevalence of nasal polyps in adults, as well as its distribution among gender and age, varies in different countries. The differences in age between individuals with polyps in the population study and our patients could be explained by the fact that the patient material was not randomized (**IV**). Questions were presented in a structured interview. Structured interviews permit elucidation of questions where needed and are therefore preferable to a questionnaire. It is, however, of outmost importance that the questions have high specificity. Questions about asthma have previously been validated by Torén *et al.* (59). In that study, the question, "Have you had asthma or shortness of breath during the last 12 months?" was compared with physician diagnoses, with a specificity of 92% and a sensitivity of 62% (59). The questions about nasal polyps have previously been used in an epidemiological study, but we added the words "as an adult" to prevent misdiagnosis of the adenoid vegetations in children (12). The question about aspirin intolerance has also been used in the same study (12).

The question that remains, however, is; What is the clinical significance of small, sometimes unilateral, polyps occasionally found during a general population-based study? These polyps seem to represent the same kind of disease as seen in patients with manifested polyposis (**IV**). However, we cannot be sure whether these polyps represent an early stage, a beginning of the

polyp disease, or perhaps an end of it. This is a question for a follow-up study of individuals with nasal polyps, e.g., after 5 years.

In the present study, health-related quality of life, measured with a general health questionnaire (SF-36), showed significant differences between individuals and patients, and Swedish normal values in three and four domains respectively. This is in contrast to a French study, which reported significant HRQL differences (SF-36) between patients with nasal polyps and healthy controls in all eight domains (57). That study had a different design, including untreated patients with nasal polyps, while patients in our study were under medication with topical corticosteroids. In the French study, there was an improvement in all domains of SF-36 after treatment with a topical corticosteroid (57).

CONCLUSION

The LI score system, with evaluation by nasal endoscopy, has been shown to be a reliable method with good reproducibility and sensitivity for detecting early, and small, changes in polyp size. It can therefore be recommended for scientific purposes; however, for ordinary clinical use, it is often sufficient to trust the patient's symptoms and perform endoscopy.

In the present study, the prevalence of nasal polyps was 2.7% in a general population of adults; and nasal polyps were seen to be more frequent at middle age and above, in asthmatics, and among men. Nasal polyps lead to nasal blockage and often, to reduced sense of smell. Nasal polyps are a manifestation of a mucosal disease including both the upper and the lower airways.

STATISTICAL METHODS

Paper I For comparing different score methods and repeated investigations by one doctor, Pearson's coefficient of correlation was used. For interindividual comparisons between three investigators, ANOVA was used.

Paper II Power calculation was based on an 80% chance of detecting a difference of 1.4 score steps by the Lildholdt *et al.* score scale. The differences between the two treatment groups were calculated by means of ANOVA.

Paper III Based on the lowest estimated prevalence of 1%, on 95% CIs, and on an estimated dropout rate of 20%, 1,900 individuals were randomly selected from the Skövde community register. The OR was calculated. Multiple logistic regression analysis was used to select explanatory variables for nasal polyps.

Paper IV The chi^2 test and ANOVA were used for comparing the different groups. In comparing different groups in SF-36 student-test were used.

SAMMANFATTNING PÅ SVENSKA

Näspolyper är en kronisk inflammatorisk sjukdom i nässlemhinnan och förenad med nästäppa samt luktnedsättning. De bakomliggande orsakerna är inte är fullständigt klarlagda. Koppling till astma, aspirinintolerans och cystisk fibros är väldokumenterade, men något orsakssamband med allergi har inte kunnat fastställas. Kunskapen om förekomsten av näspolyper ökar eller minskar, samt om yttre faktorer kan bidra till uppkomsten, saknas. Sjukdomens epidemiologi är dåligt känd, men den kliniska erfarenheten visar att den är vanligast bland män och ovanlig hos barn. Ett syfte med denna undersökning har varit att studera hur vanliga (prevalensen) näspolyper är i den vuxna befolkningen.
Näspolyper behandlas kirurgiskt och/eller med nasala kortisonpreparat. Trots förbättrad behandling återkommer ofta polyperna efter en tid. För att kunna diagnostisera och mäta effekten av behandling av polyper används fiberendoskop i ökad omfattning, med vilket djupare partier i näsan kan studeras. Radiologiska och fysiologiska undersökningmetoder kan ge information om polypsjukdomens utbredning men kan ej visa polypernas storlek.
Ett annat syfte med studien var att jämföra ett nytt graderingsystem (Lateral imaging) med existerande graderingssystem för näspolyper i avsikt att se vilket som är känsligast.
Studien består av två delar, en *metodologisk* del och en *epidemiologisk* del. I den metodologiska delen undersöktes totalt 150 vuxna patienter med näspolyper och i den epidemiologiska 1387 slumpvis utvalda vuxna individer från normalbefolkningen. Tre nya egna scoresystem och två etablerade jämfördes och reproducerbarheten vid upprepade mätningar och mellan olika bedömare undersöktes. Lateral imaging, en metod, där man projicerar polypernas utbredning i näsan på en skiss av näsan i en dator, som räknar ut polyputbredningen i procent, visade sig ha god reproducerbarhet. Jämfört med en av de etablerade scoremetoderna (ad modum Lildholdt et al) hade Lateral imaging en bättre känslighet, då denna metod kunde mäta tidig effekt av en medicinsk behandling med nasal kortisonspray. Prevalensen för näspolyper bestämdes till 2,7 % [95-% konfidensintervall: 1.9-3.5 %],. Risken för att ha näspolyper var högre för män och astmatiker. Frekvensen av näspolyper ökade med stigande ålder. En livskvalitetsstudie visade att näspolyper leder till försämrad livskvalitet, både bland individer med polyper från populationsundersökningen och bland patienter med symtomgivande näspolyper. Näspolyper leder till nästäppthet och subjektivt försämrat luktsinne, men också till symtom från de nedre luftvägarna.

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