Evaluation of Methods for Endoscopic Staging of Nasal Polyposis

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INTRODUCTION

Nasal polyposis is a common disease of unknown aetiology, for which no single cause has been found. Inflammatory causes have been discussed and many patients experience progress after upper airway respiratory infections. Nasal polyposis is sometimes classified as an allergic disorder, but no association with IgE-mediated allergy has been found. Polyposis is often related to asthma, NSAID intolerance and cystic fibrosis, indicating that inflammatory mediators are essential in the pathogenesis, as summarized in textbooks (1, 2).

The treatment alternatives are endonasal surgery and/or medical treatment with topical or systemic corticosteroids, but in the long-term, recurrences of polyps are frequent. To evaluate the efficacy of treatment, we must have a reliable technique for assessing nasal polyps. The effect of treatment is usually judged by the physician, using a polyp score. CT-scan, MRT, rhinomanometry, acoustic rhinometry or nasal peak-flow have also been used, but all these measurements, including the patient’s own experience of symptoms, have the disadvantage that they cannot distinguish between mucosal congestion and polyps. Therefore, the physician’s judgement is most important and for this purpose various systems have been proposed to score nasal polyps, although it is not always easy to differentiate between polyps and normal nasal mucosa. Most of them consist of only 3 or 4 steps, which makes it difficult to detect small differences in polyp size (3–12). Published data on validity and assessment of the sensitivity of these methods are lacking, but they seem to have some credibility following repeated use. We studied two established methods and related them to three new methods for staging nasal polyposis.

The aim of this study was to evaluate the reproducibility of various score systems for staging nasal polyposis in order to find the score systems with the best reproducibility for clinical use.

MATERIALS AND METHODS

Patients with bilateral polyps attending the outpatient clinic were recruited for the study. Before the examinations, they were acclimatized to the indoor environment for at least 30 min. The investigations were performed in a sitting position by anterior rhinoscopy with a rigid endoscope (4 mm, Storz-0°, Germany). Decongestion or local anaesthesia were not used. The mass of the polyps in each nostril was assessed separately using three new methods to score nasal polyps (numbers 1–3), developed by the authors. For purpose of comparison, we chose one score system with 4 steps (number 4, ad modum Lildholdt et al. (9)) and one system with 3 steps (number 5, ad modum Lund and Mackay (7)). In addition, the patients were asked to assess their symptoms of nasal blockage on each side of the nose on a visual analogue scale of 100 mm (from 0 = “no nasal blockage” to 100 = “completely blocked...
The investigation consisted of two parts. In the first, a single physician (LJ) examined the patients twice to determine the reproducibility. In the second part, three physicians (LJ, IM, MB) examined the same patient to determine the variations between different investigators.

In the first part of the study, 22 patients (16 men and 6 women, age range 23–65 years, mean age 51 years) participated. After a first rhinoscopy, assessments were repeated after 2 h. On the second examination, the patient could not be identified by the investigator. An assistant had draped the patient in a covering sheet with only a hole for the nose (Fig. 1). Eleven patients per day were investigated. In the second part of the study, three experienced otorhinolaryngologists, independently of one another, examined 30 patients (22 men, 8 women, age range 19–79 years, mean age 52 years). Five score systems were used.

Score system 1: lateral imaging
The investigator drew the extension of the polyps, as interpreted by anterior rhinoscopy, on a standard schematic picture of the lateral wall of each nasal cavity. The projection of the polyps was expressed as a percentage of the schematic picture of the lateral wall of the nasal cavity and could not exceed 100% (Fig. 2). The drawing was performed with a computer programme, with automatic calculation of the polyp area, available free of charge (http://www.artech.se/~bende/).

Score system 2: assessment of polyp obstruction
The investigator assessed the proportion of the total basal cavity volume occupied by nasal polyps. The assessment was estimated on a visual analogue scale of 100 mm from 0 = “no polyps” to 100 = “nasal cavity completely filled by polyps”.

Score system 3: nasal airway patency
With this method the patency of the nasal airway lumen in patients with nasal polyps was assessed. The proportion of the patent airway lumen in relation to an imaginary maximal nasal airway lumen, disregarding the presence of polyps and nasal mucosal swelling, was determined by the investigator and recorded on a visual analogue scale of 100 mm from 0 = “no lumen for ventilation” to 100 = “airway lumen ventilation as wide as possible”, i.e. limited only by the static anatomical structures of the nose.

Score system 4: ad modum Lildholdt et al.
This method for assessment of polyp size was used by Lildholdt et al. (9), but has been used by others, with small modifications (6, 12). The degree of nasal polyps is classified in relation to fixed anatomical landmarks in four steps (0–3), where 0 = “no polyposis”, 1 = “mild polyposis (small polyps not reaching the upper edge of the inferior turbinate)”, 2 = “moderate polyposis (medium sized polyps reaching between the upper and lower edges of the inferior turbinate)”, and 3 = “severe polyposis (large polyps reaching below the lower edge of the inferior turbinate)”.

Score system 5: ad modum Lund and Mackay
This method was described by Lund and Mackay (7). The size of nasal polyps is estimated with three steps, where 0 = “none”, 1 = “confined to middle meatus”, 2 = “beyond middle meatus”.

Statistical analysis
The nasal cavities were scored independently of each other. The reproducibility, the agreement between the various score systems, and the correlation between the endoscopic scores and the patient’s symptoms of...
blockage were tested by Pearson’s coefficient of correlation as a mean of the right and left sides. In the evaluation of the inter-examiner variation, analysis of variance was used (ANOVA).

RESULTS

In repeated assessments with one investigator, significant positive correlations were found between the first and second assessments, with all five methods used to score nasal polyposis. The highest correlations were obtained with lateral imaging (number 1), followed by assessment of polyp obstruction (number 2) and the score system ad modum Lildholdt et al. (number 4). The coefficients of correlation are presented in Table I.

There were likewise significant correlations in between the various methods (Table II).

Inter-examiner variation

When three physicians examined the same patient, good agreements were found, as indicated by the absence of significant difference between the investigators’ way of scoring, using the score systems numbers 1, 3 and 4. However, there was a significant difference (ANOVA) between the physicians using score systems numbers 2 and 5 (Table III).

Table I. Pearson’s coefficient of correlation between double measurements (one investigator). Number 1 = lateral imaging, number 2 = assessment of polyp obstruction, number 3 = nasal airway patency, number 4 = score system ad modum Lildholdt et al., number 5 = score system ad modum Lund and Mackay

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*** p<0.001; ** p<0.01.

Table II. Correlations between various methods of scoring nasal polyposis. Repeated measurements by a single investigator. All correlations are significant (p < 0.001). Number 1 = lateral imaging, number 2 = assessment of polyp obstruction, number 3 = nasal airway patency, number 4 = score system ad modum Lildholdt et al., number 5 = score system ad modum Lund and Mackay

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Table III. Agreement of three physicians examine the same patient. The inter-examiner evaluation showed no significant difference using the score systems 1, 3 and 4, but a significant difference (ANOVA) between the physicians using score systems 2 and 5. p-values are given in the Table. (Number 1 = lateral imaging, number 2 = assessment of polyp obstruction, number 3 = nasal airway patency, number 4 = score system ad modum Lildholdt et al., number 5 = score system ad modum Lund and Mackay)

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Subjective symptoms

The patient’s symptoms of nasal congestion (mean of left and right sides) correlated significantly (p < 0.001) to all score systems. The correlations were weak, indicating that symptoms of nasal obstruction are not good indicators of the volume of polyp tissue. However, patients with large polyps (mean value ≥ 2 in score system number 4) showed a higher correlation between the symptoms of blockage and the score systems than patients with small ones (mean value < 2), as seen in Table IV.

DISCUSSION

A score system should be easy to use in clinical practice, be reproducible and sensitive enough to detect even small differences in polyp size. All methods for endoscopic staging of nasal polyposis in this study showed good reproducibility in the double measurements by a single investigator concerning the mass of the polyps. However, conformity was not seen between the investigators using methods numbers 2 and 5. Although we did not evaluate the sensitivity in the present study, this factor presumably varies with the different methods of scoring. Symptoms of nasal blockage showed a poor correlation to the mass of polyps, especially when the polyps were small, indicating that symptoms of nasal blockage are dependent on factors other than the mass of the polyps. Symptom-scoring systems are still clinically valid variables, but the patient’s symptoms are not entirely reliable when evaluating, e.g. the effect of treatment of nasal polyposis, especially if the polyps are small. This means that when some degree of nasal obstruction is present, i.e. larger polyps, this and other methods comparing subjective and objective nasal obstruction can be of clinical value.

Staging of nasal polyposis should be done with use of an endoscope. In a pilot study, where we all
learned to use all the scores, we found that polyps were not detected without endoscopic examination. Furthermore, decongestion should be avoided, since adrenergic drugs not only decongest the mucosa and improve sight, but also shrink the polyps to some extent.

All five methods that we compared for staging nasal polyposis, have advantages and disadvantages. Our experience with conventional score systems is that they are not sensitive enough to detect small but clinically relevant changes in polyp mass. This was why we developed new methods with greater variations than three or four steps.

With lateral imaging (number 1), the view of the polyps is transformed into a two-dimensional plane. Thus polyps can be seen very well in depth and vertically in the nose, but one cannot assess the lateral extension of the polyp tissue. Lateral imaging can be drawn by hand on a paper or with a computer, with the same accuracy. Its reproducibility was among the best of the methods in this study; it correlated well with other methods and with the patients’ symptoms of nasal congestion.

Assessment of polyp obstruction (number 2) is a method for relating the volume of the polyps to the entire size of the nasal cavity. One disadvantage of this method may be that the anatomical location of the polyps is not shown. The reproducibility, the comparison with other methods, and the correlation with symptoms were good. However, the significant disagreement staging by between different physicians invalidates this method.

Nasal airway patency (number 3) is supposed to correlate better than other methods with the patients' experience of nasal obstruction, and this was confirmed by the present study. It registers the “inverted degree” of polyposis, i.e. the value of the score decreases with more polyps. This could be a disadvantage, especially when using visual analogue scales. The inter-examiner agreement was good.

The score system ad modum Lildholdt et al. (number 4) was found to be reproducible and simple to use. Polyps on sites not near the middle meatus and inferior turbinate may be slightly difficult to score. This method is similar to a method previously described by Johansen et al. (6), but the latter also includes an evaluation of the obstruction due to the polyps.

The score system ad modum Lund and Mackay (number 5) with three steps shows the poorest correlation in repeated measurements. It does not evaluate polyps outside the area of the middle meatus. However, most polyps originate from the area of the middle meatus, according to many authors, (13–15). As with assessment of nasal polyps (number 2), we found significant disagreement between different physicians in scoring with this method.

In conclusion, the reproducibility of the methods used to score nasal polyposis was overall acceptable. However, the agreement between the investigators differed significantly for two of the methods (numbers 2 and 5). Symptoms of nasal obstruction did not reflect the degree of polyposis very well. Based on the results of this study, we plan to evaluate the sensitivity for endoscopic staging of nasal polyposis of two of the methods, i.e. lateral imaging and that of Lildholdt et al. in the purpose to be able to recommend one method for polyp scoring in clinical use in the future. We predict that the physician’s assessment of nasal polyposis will also be most important in the future. Staging is fundamental for clinical research and necessary for studying pharmacological effects of nasal polyposis.

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REFERENCES


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