

Allergy in patients with acute maxillary sinusitis

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The occurrence of allergy was studied in 224 patients with verified acute maxillary sinusitis by means of an allergy questionnaire, skin testing, and nasal smears. Allergy was found in 56 patients (25%). In addition, allergy was considered probable in 14 patients (6.5%). The corresponding percentages in the control group were 16.5 and 3, respectively. The difference is statistically significant ($P < 0.05$). However, the frequency of allergy is lower in the present series than in those previously reported on chronic sinusitis. There were no differences between allergic and non-allergic patients in the number of prior acute sinusitis episodes or of previously performed sinus irrigations. Bacteriological and radiological findings did not differ significantly between the groups.

Key words: acute maxillary sinusitis; allergy.

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In acute maxillary sinusitis, inflammation of the upper respiratory tract causes ostial dysfunction and disturbances in mucociliary activity. Gas exchange is reduced and drainage of the secretion produced by the antral mucosa is slowed down or completely arrested. With the retention of secretion in the sinus lumen, clinically significant maxillary sinusitis has developed.

Anatomic abnormalities of the nose, such as septal deformity, or disorders of the nasal mucosa may predispose to sinusitis. Pathological changes in the nasal mucosa due to allergy have been shown to increase the morbidity of chronic maxillary sinusitis (6, 14, 17, 19). We know much less about the role of allergy as an underlying factor in acute sinusitis (3, 5). The purpose of the present study was to establish the occurrence of allergy in a group of patients with acute maxillary sinusitis.

PATIENTS AND METHODS

The series consisted of 224 young adults in whom clinically diagnosed acute maxillary sinusitis (at least two of the following symptoms: fever, cough, upper respiratory tract infection, sinus tenderness or pain, purulent secretion

from the nose) was verified radiologically as described by Axelsson & Runze (2) and by sinus aspiration as defined by Carenfelt (4). The patients were mainly army conscripts, aged 18–28 years (mean 20.5 years), treated at the Central Military Hospital, Helsinki, in 1983–1986. The duration of symptoms was less than 3 weeks in all patients and none of them had received antimicrobial treatment in the 2 weeks prior to the study. Patients in whom concomitant root canal infection suggested a dental origin of the sinusitis symptoms, were excluded from the present study.

For comparison, a group of young adults without any symptoms of acute maxillary sinusitis were included in the study. This control group consisted of 103 consecutive army conscripts, aged 18–21 years (mean 19.5 years), treated at the Central Military Hospital because of acute acoustic trauma from firearm shooting. The control group and the sinusitis group were matched with regard to age distribution.

Long-acting antihistamines were not used by any of the patients and short-acting antihistamines were omitted 72 h prior to skin testing.

History was taken both in patients with acute

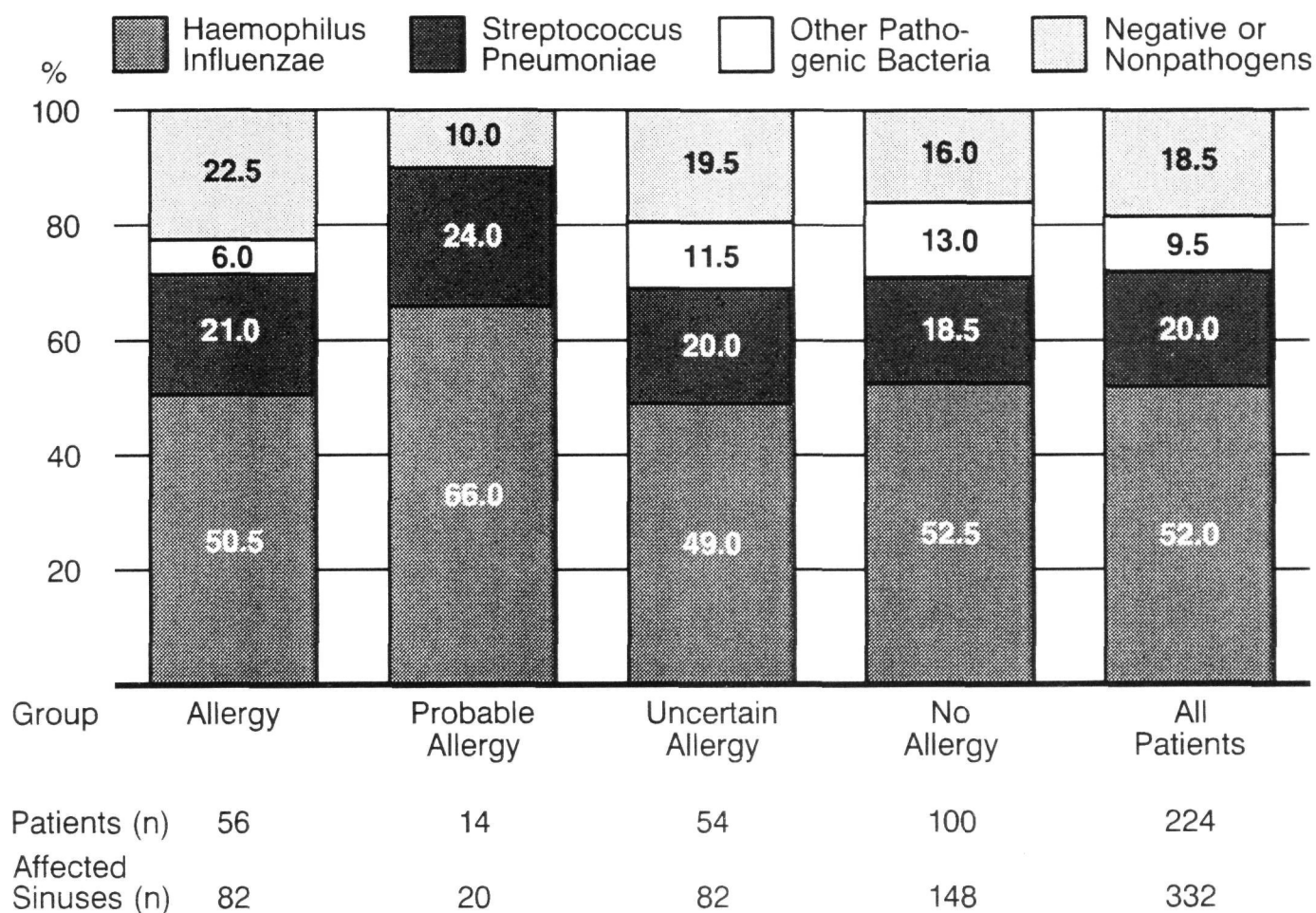


Fig. 1. Bacteriological findings in 224 patients with acute maxillary sinusitis, grouped according to allergological evaluation.

maxillary sinusitis ($n = 224$) and in controls ($n = 103$) with special attention to past and present symptoms indicative of allergy, viz. infantile eczema, atopic dermatitis, seasonal or perennial allergic rhinitis, allergic conjunctivitis and asthma. The patients were also asked about the occurrence of these symptoms in relatives, viz. grandparents, parents, siblings, and their own children.

On inclusion in the study, skin testing was performed on all maxillary sinusitis patients and controls with the prick technique. Extracts with an activity of 5 or 10 HEP units were used of the following allergens: birch, alder, timothy, orchard grass, mugwort, cat, dog, house dust, house dust mite, *Alternaria*, *Cladosporium* and *Aspergillus* (Allergologisk Laboratorium, Copenhagen). Control tests were performed with the diluent for negative reference and with histamine chloride, 5 or 10 mg/ml, for positive reference. The test was con-

sidered negative (-), if the weal diameter was smaller or as large as that caused by the diluent. The test results was scored + + +, if the weal was of the same size or larger than the size of histamine reaction, or if the weal shape was irregular with pseudopodia. A reaction half the size of histamine reaction was scored + +. The symbol + was used for a reaction whose weal was larger than the weal caused by the negative control test but smaller than that of the + + reaction mentioned above. The + + or stronger reactions were considered positive according to recommended practice in Scandinavia (1).

A nasal secretion sample for cytological examination was taken from both nasal cavities by wiping the surface of the inferior turbinate with a cotton-tipped applicator. The sample was rolled on to a glass-slide, air-dried, and stained with eosin methylene blue according to the method described by Holo-

painen (10). Cellular findings were classified as follows: negative (-) = < 5% of the leucocytes are eosinophils; slight eosinophilia (+-) = < 10% eosinophils; moderate eosinophilia (+) = < 50% eosinophils and marked eosinophilia (++) = > 50% eosinophils. The values + and ++ were considered pathological findings in patients suggestive of allergic rhinitis as recommended by Mygind (15).

The diagnosis of allergy was based on history and skin test reactions as described by v Dis-

hoeck & Franssen (6), and on eosinophilia of the nasal secretion as defined by Mygind (15). The patients were classified into one of four categories as follows:

1) *Allergy*. The patient reported past or present allergic symptoms (asthma, seasonal or perennial allergic rhinitis, eye or skin symptoms) from exposure to allergens which produced positive reactions on skin testing, or the patient had a positive history and marked (++) secretion eosinophilia but did not react positively to allergens used in the present study, or the patient had positive skin test reactions and marked (++) secretion eosinophilia but subjective allergic symptoms had not occurred or been recognized.

2) *Probable allergy*. Marked (+++) skin test reactions to at least two allergens were observed but the patient reported no subjective symptoms of allergy (16).

3) *Uncertain allergy*. The patient reacted positively (++) to several allergens but reported no history of allergy, or the patient reported subjective allergic symptoms and a family history of some allergic disorder but skin tests were negative.

4) *No allergy*. The patient did not fulfil any of the above criteria.

Table 1

History of allergic symptoms in 224 patients with acute maxillary sinusitis (AMS) and the control group (n = 103).

	AMS patients	Control group
Rhinitis	34	17
pollen allergy	26	14
perennial	8	3
Asthma	9	1
Asthma and rhinitis	9	2
pollen allergy	5	1
perennial	4	1
Atopic dermatitis	8	2
Rhinitis and/or atopic dermatitis	13	2
and/or conjunctivitis		
Rhinitis, asthma and atopic dermatitis	2	-
No allergic symptoms	149	79

Table 2

Correlations between history of allergy and skin test results in 224 patients with acute maxillary sinusitis (AMS) and in the control group (n = 103)

History of allergy	Positive + + +		Skin test results		Negative	
	n	%	Positive + +		n	%
			n	%		
Positive						
AMS 75 (33.5%)	43	19	10	4.5	22	10
Control group 24 (23%)	12	11.5	5	5	7	6.5
Negative						
AMS 149 (66.5%)	14	6.5	35	15.5	100	44.5
Control group 79 (77%)	3	3	14	13.5	62	60.5
Total						
AMS 224	57	25.5	45	20	122	54.5
Control group 103	15	14.5	19	18.5	69	67

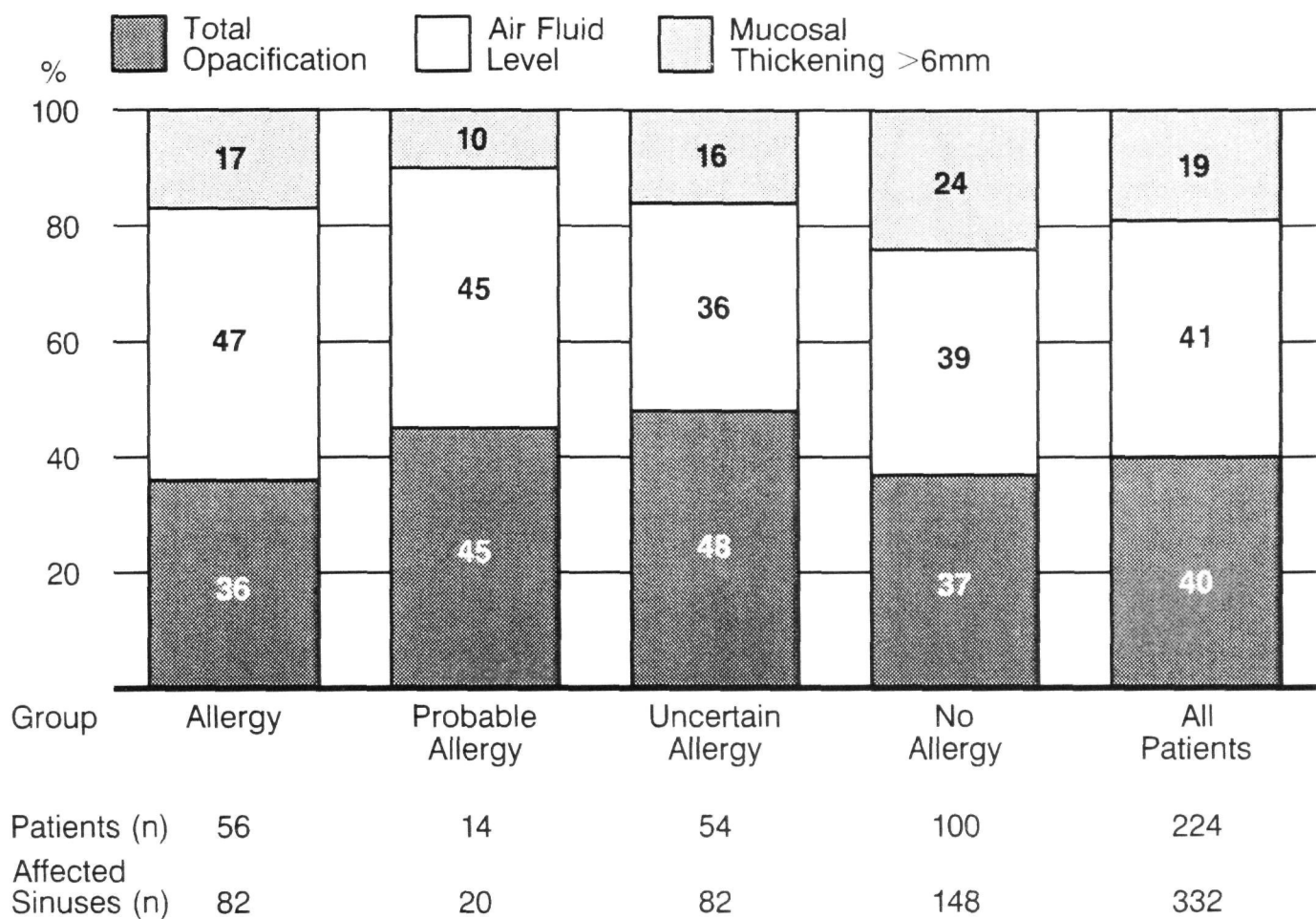


Fig. 2. X-ray findings in 224 patients with acute maxillary sinusitis, grouped according to allergological evaluation.

Septal deformities and nasal polyps were recorded at anterior rhinoscopy. Septal deviation associated with subjective ipsilateral symptoms of obstruction was considered clinically significant.

In addition, information was collected from the sinusitis group on susceptibility to upper respiratory infections, prior episodes of maxillary sinusitis, and previously performed sinus irrigations. To determine bacteriological etiology, sinus secretion was aspirated by antral puncture (4) from all affected sinuses, and the samples were cultured for aerobic and anaerobic bacteria (11). Sinus radiography included 4 projections : occipitomental, occipitofrontal, lateral and axial. X-ray findings were classified into 3 groups by a scoring system described by Axelson & Runze (2): group 1 includes scored 6 = complete opacification of the sinus; group 2 findings scored 4-3 = visible fluid levels; group 3 findings scored 2 = thickening of sinusal mucosa > 6 mm.

Statistical analysis

The chi-square test was used to determine the significance of differences between groups. P-values below 0.05 were considered significant.

RESULTS

Allergic symptoms were reported by 75 of the patients with acute maxillary sinusitis. Of the controls, a smaller proportion, 24 out of 103, reported allergic symptoms, but the difference between the sinusitis group and the control group is not significant (P > 0.05). The reported allergic disorders are described in Table 1.

The skin tests gave positive reactions in 102 of the patients with maxillary sinusitis and in 34 of the controls. The difference between the groups is statistically significant (P < 0.05).

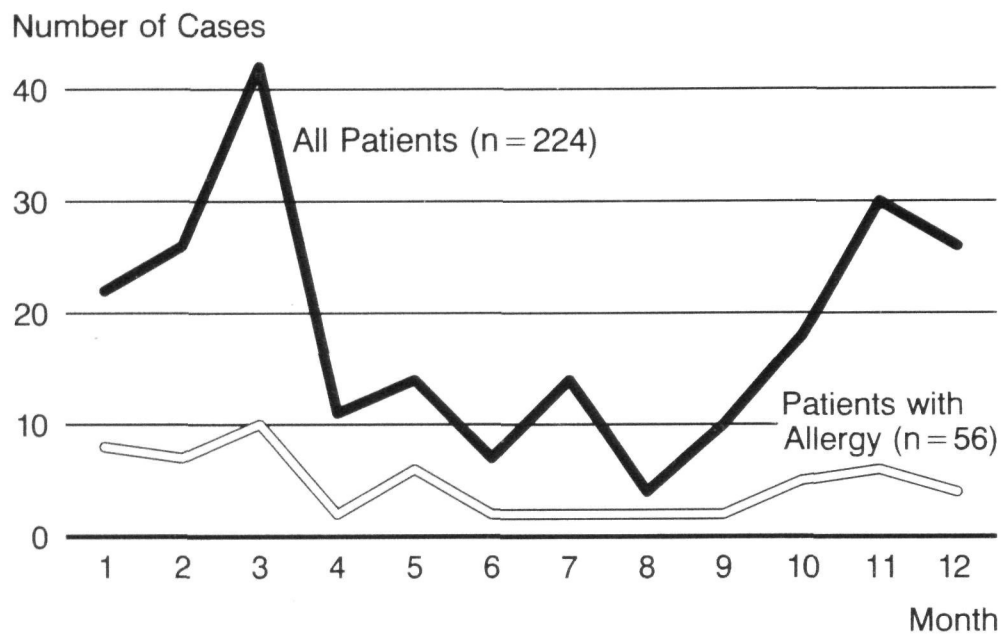


Fig. 3. Distribution of acute sinusitis cases seen in 1983–86 according to months of onset. Month-to-month figures are given for the whole series ($n = 224$) and for allergic patients ($n = 56$).

Marked (+ + +) reactions to at least two allergens were observed in 57 sinusitis patients and in 15 controls ($P < 0.05$) (Table 2).

The allergens to which positive reactions were most frequent among sinusitis patients were timothy (45), birch (44), alder (43), mugwort (43), cat (36) and dog (35). In the control group, positive reactions were most frequently recorded for orchard grass (18 patients), cat (15), timothy (14), birch (13), alder (9), mugwort (7) and dog (7).

The skin test result correlated with a positive or negative history of allergic symptoms as shown in Table 2, both for acute maxillary sinusitis patients and for controls.

Eosinophilia was seen in the nasal smears of

10 patients (4.5%) in the sinusitis group. One of these had subjective symptoms of allergy and positive skin test reactions, one reported subjective allergic symptoms but skin tests were negative, and two reacted positively to skin tests but reported no allergic symptoms. The remaining six patients with secretion eosinophilia had no symptoms or signs of allergy. In the control group, marked (+ + +) eosinophilia was found in the nasal smear of one subject with positive history and positive skin test result.

By the criteria of allergy used in this study, 56 of the patients with acute maxillary sinusitis were allergic. Allergy was probable in another 14 patients. In contrast, 17 of the controls were classed as allergic and three as probably allergic ($P < 0.05$) (Table 3).

On clinical examination, deviation of nasal septum was found in 59 patients (26%) in the sinusitis group. The deviation was associated with unilateral nasal obstruction in 46 of them (19%). Two patients (< 1%) had nasal polyposis. Rhinoscopy revealed septal deviation in 18 controls (17.5%), but only 9.5% had significant deviation associated with obstruction, as compared with 19% in the sinusitis group. This difference is statistically

Table 3
Occurrence of allergy in patients with acute maxillary sinusitis (AMS) and in the control group

	AMS $n = 224$	Controls $n = 103$
Allergy	56	17
Propable allergy	14	3
Uncertain	54	21
No allergy	100	62

* $P < 0.05$

significant ($P < 0.025$). None of the controls had nasal polyps.

Regarding susceptibility to respiratory infection, 125 patients with acute maxillary sinusitis (56 %) reported that they contracted at most one common cold annually, 58 (26 %) experienced 2 or 3, and 41 patients (18 %) had 4 or more episodes of common cold each year. Sinusitis had been diagnosed previously in 41.5 % and treated by sinus irrigation in 19.5 % of the patients. There were no significant differences between allergic and non-allergic patients in regard to prior sinusitis episodes and sinus irrigations.

Fig. 3 shows the distribution of the present sinusitis cases by the month of onset of sinusitis for the whole series and for the allergic group. In May, which is the birch pollen season in southern Finland, sinusitis was contracted relatively more frequently by the allergic patients, seven out of 56 compared with 14 out of 224 in the whole series, but the differences between the groups are not statistically significant during any month of the year.

Pathogenic bacteria were cultured from 81.5 % of all affected sinuses: *Haemophilus influenzae* (52 %), *Streptococcus pneumoniae* (20 %), *Streptococcus pyogenes*, *Branhamella catarrhalis*, and a mixed flora of anaerobic bacteria. Nonpathogenic bacteria occurred in 4.5 % of sinuses, and cultures were negative in 14 %. Bacteriological findings in these sinuses have been discussed in detail in a previous report (11). A comparison of bacteriological findings in the various study groups is presented in Fig. 1. Negative cultures or nonpathogen-positive cultures were more frequent in patients with allergy than in the other groups but the difference did not reach statistical significance.

Radiography revealed pathological changes in 332 sinuses (out of 448). Total opacification was noted in 133 sinuses (40 %), 135 (41 %) showed fluid level, and 64 (19 %) > 6 mm thickening of sinus mucosa. Fig. 2 shows the distribution of pathological X-ray findings in the various groups. There were no significant differences.

DISCUSSION

The present study was conducted in a group of young adults, mainly army conscripts, aged

18–28 years. In the majority, maxillary sinusitis was verified for the first time and symptoms had persisted for 3 weeks at most. A series of 103 age-matched conscripts was used as a control group. In both the sinusitis group and the control group, the percentage of subjects with a history of asthma was only half as high as the prevalence of asthma in the normal population. The obvious reason for this is the exemption of asthmatics from military service. In connection with the calling-up examination prior to military service, 28–32.5 % of young men who have respiratory allergies are exempted from military service on the grounds of asthma (Laitinen, L. A., Lindholm, H. & Haahtela, T.; unpublished data), and of those with respiratory allergy who start their military training, 33 % are unable to complete their full term of service because of asthma (12).

The incidence of acute sinusitis was lowest in the summer months, i.e. during the pollen season. According to the results of the present study, a greater liability to contract acute sinusitis cannot be observed during the pollen season in patients with seasonal allergy.

Past or present history of allergic symptoms, positive skin test reactions, and nasal secretion eosinophilia were used as criteria of allergy (6, 15). However, marked or moderate eosinophilia was seen in only 10 of the patients with acute sinusitis. Nasal smears are of little value in an allergy evaluation of acute sinusitis patients, because a possible eosinophilia is masked by the neutrophils which appear in abundance in response to the infection.

By the criteria of allergy used in this study, one fourth (25 %) of the patients were found to be allergic and, in addition, allergy was considered probable (9, 16) in 6.5 %. In contrast, the proportions of controls classed as allergic and probably allergic were 16.5 % and 3 %, respectively. The difference between the sinusitis group and the controls is statistically significant at the level of $P < 0.05$. The frequency of allergy in the present control group is of the same magnitude as the prevalence of allergy in a Finnish population sample of similar age range (19 % or 134 of 706) (8).

Earlier studies indicate that allergic rhinitis

and chronic maxillary sinusitis are closely linked (6, 7, 13, 17, 19). According to these studies, allergy is an underlying factor in 40–67 % of chronic sinusitis, both in children and adults, and in bilateral sinusitis in as many as 80 % of cases (7).

It has generally been assumed that an atopic disposition also enhances susceptibility to acute sinusitis (18, 20). However, very little evidence in support of this view can be found in the literature. In a questionnaire study by Catlin et al. (5), 20 % of 52 patients with acute maxillary sinusitis reported a history of allergy as compared with 10 % of the controls. Berg et al. (3) found allergic or vasomotor rhinitis in 46 % of 50 sinusitis patients in a similarly conducted study based on history and clinical findings without laboratory tests and allergological investigations. However, their series of patients was heterogeneous with regard to duration of symptoms, and a number of chronic sinusitis cases were included.

CONCLUSION

According to the present study, acute sinusitis seems to be more common in allergic than in non-allergic individuals, and allergy may, though not to the extent as earlier described for chronic sinusitis (7, 14, 17, 19), be a predisposing factor to acute sinusitis. In addition to clinical, radiological and bacteriological investigations, skin testing may therefore be indicated in acute sinusitis patients, especially in recurrent disease, as a simple test for detecting a possible allergy or an atopic disposition.

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