

Pediatric acute and chronic rhinosinusitis: comparison of clinical characteristics and outcome of treatment

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Summary

Background: Rhinosinusitis (RS) is a common problem in children. There are very few published studies comparing acute rhinosinusitis (ARS) and chronic rhinosinusitis (CRS) in children.

Objective: To determine the clinical manifestations in children with ARS and CRS.

Methods: One hundred and fifty-four patients with a clinical diagnosis of RS were enrolled. ARS was defined as persistent symptoms for more than 10 days but less than 4 weeks and CRS was defined as persistent symptoms for longer than 8 weeks. Patients were interviewed to obtain demographic and clinical data. Physical findings and medications were recorded. All patients underwent radiographic studies. Allergy and immunological testing were done in selected case. All data were compared between the ARS and CRS groups.

Results: One hundred and three patients were classified as having ARS and fifty-one had CRS. Their mean (\pm SD) age was 5.9 ± 3.3 years. Allergic rhinitis was common in the chronic rhinosinusitis group. The most common main complaints in acute and chronic rhinosinusitis were cough and rhinorrhea. There was no significant difference in symptoms between both groups, except for periorbital pain and sleep

apnea which were found more frequently in the chronic group. Sixty five percents of ARS and 58.8% of CRS had abnormal x-ray findings. Adenoid hypertrophy was found in the CRS group. There was overall improvement after 14.6 ± 3.82 days and 22.35 ± 5.04 days (mean) of antibiotic treatment in the ARS and CRS groups, respectively. None of the patient underwent sinus surgery.

Conclusion: The most common RS symptoms were rhinorrhea and cough. Patients with allergic rhinitis had a higher risk of developing chronic rhinosinusitis. Patients with ARS and CRS were successfully treated with medical treatment. (*Asian Pac J Allergy Immunol 2012;30:146-51*)

Key words: acute rhinosinusitis, chronic rhinosinusitis, children, allergic rhinitis, sinus radiography

Introduction

Rhinosinusitis is a common problem in children with upper respiratory tract infections. In a study of 1- to 5-year-old children with persistent upper respiratory symptoms, 9.3% met the clinical criteria of acute rhinosinusitis (i.e. ≥ 10 days of nasal congestion, discharge or cough)¹, while chronic rhinosinusitis was found in 19% of children with more than 12 weeks of upper respiratory symptoms.² Rhinosinusitis is still often under-diagnosed in pediatric practice. Recognition of history and symptoms are important to establish a diagnosis of rhinosinusitis.

Clinical manifestations of rhinosinusitis in children are different from those in adults. There are also different manifestations between acute and chronic rhinosinusitis. In the existing studies of rhinosinusitis in children, nasal discharge and cough are more common symptoms in acute rhinosinusitis³ while facial pain/ discomfort or nasal congestion are found more in chronic rhinosinusitis.⁴ Underdiagnosis or delayed treatment of acute rhinosinusitis may lead to chronic rhinosinusitis or many complications such as intracranial extension of infection, thrombo-

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phlebitis, osteomyelitis or orbital complications.⁵ Some allergic conditions such as allergic rhinitis, asthma and inhalant allergen sensitization have been associated with acute and chronic rhinosinusitis in children;⁶ other risk factors are genetic factors, immune deficiencies and gastroesophageal reflux disease.

There are limited studies comparing acute and chronic rhinosinusitis in children, especially with respect to presenting symptoms and treatment outcomes. The objective of this study was to compare the clinical manifestations in children with acute and chronic rhinosinusitis. Atopic and other conditions which may affect the occurrence of rhinosinusitis were also recorded and compared between both groups of rhinosinusitis patients. Medication used and outcome of treatment were also compared between the groups.

Methods

Patients and sinus radiographs

All Children (age between 1-15 years) with a clinical diagnosis of rhinosinusitis, based on the presence of signs and symptoms, were recruited from both the pediatric allergy clinic and the pediatric outpatient clinic of Thammasat University Hospital between January to December 2010. Approval for the study was granted by the Institutional Ethics Committee of the Faculty of Medicine, Thammasat University. Acute rhinosinusitis was defined as persistence of upper respiratory symptoms more than 10 days but less than 4 weeks.⁷ Chronic rhinosinusitis was defined as persistence of upper respiratory symptoms longer than 8 weeks.⁸ Physical examination and anterior rhinoscopy using an otoscope were performed by the investigator. For confirmation of diagnosis, radiographies of the paranasal sinuses (Waters, Caldwell, and lateral views) were performed. All radiographic films were evaluated by a co-investigator radiologist who was blinded to the patients' information. The criterion for radiographic diagnosis of rhinosinusitis were either thickening of mucoperiosteum more than 4 mm, the presence of an air-fluid level or total opacification of a sinus.⁹⁻¹⁰ The presence of adenoidal hypertrophy was also evaluated using the lateral skull radiographs which were also obtained in all cases. The criterion for adenoidal hypertrophy was more than 50% narrowing of the nasopharyngeal airway.¹¹

Patients and their caregivers were interviewed by using a questionnaire to describe demographic data, personal and family history of allergic diseases and medical conditions, environmental exposure and otolaryngologic problems. The patient's main complaint, upper respiratory tract symptoms, characteristics of cough and nasal discharge and physical examination findings were recorded and compared between the acute and chronic groups. The medication used and the duration of treatment were also recorded. The type and duration of antibacterial and adjunctive medication were based on the judgment of treating physician.

Skin prick testing and Immunology Testing

Skin prick testing was done in selected cases that had clinical suspicion of allergic rhinitis with no response to allergy treatment. The selected common aeroallergens for skin prick testing were house dust mite, cockroach, grass, cat pelts, molds and dog epithelium. Positive result was defined as a wheal size of 3 mm greater than that in a negative control.¹² Immunologic testing (serum immunoglobulin and IgG subclass level) were performed in chronic rhinosinusitis patients whose symptoms did not resolve with oral antibiotics within 28 days.

Statistical analyze

Data were analyzed using the descriptive module of the STATA program. Comparison of the symptoms, signs, radiographic findings in the paranasal sinuses and treatment outcomes between the acute and chronic groups was performed using Chi Squared and Fisher's exact tests when appropriate. Significance level was $P < 0.05$, using a two tail test.

Results

Patient data

One hundred and fifty-four patients (94 boys and 60 girls) were enrolled. Their mean age was 5.9 ± 3.3 years (\pm SD). One hundred and three patients were classified as having acute rhinosinusitis and fifty-one had chronic rhinosinusitis. Patient data from both groups are shown in Table 1. There was no significant difference between the groups in terms of age, sex, family history of atopic diseases and environmental exposure. One hundred and thirty-six patients (88.3%) reported personal atopic diseases. A clinical history of allergic rhinitis was found in 123 cases (79.9%) with significantly more of these being in the chronic rhinosinusitis group

Table 1. Demographic data of patients with acute and chronic rhinosinusitis.

	Acute (n= 103)	Chronic (n=51)	P value*
Age in years (mean ± SD)	6 ± 3.2	5.7 ± 3.4	0.71
Age range (years)	1.1 – 14.2	1.3 – 14.4	
Sex			
Male	60 (58.2%)	34 (66.7%)	0.38
Female	43 (41.7%)	17 (33.3%)	
Median duration of illness (days)	14 (interquartile range 14-30 days)	90 (interquartile range 60-150 days)	
Family history of atopy	60 (58.3%)	33 (64.7%)	0.44
Family member who had cold or sinusitis within the past month	32 (31.1%)	12 (23.5%)	0.35
Home exposure to tobacco smoke	30 (29.1%)	13 (25.5%)	0.64
Home exposure to fur pet	29 (28.2%)	19 (37.3%)	0.25
History of barotrauma/ swimming	29 (28.2%)	17 (33.3%)	0.51
Associated personal atopy	90 (87.4%)	46 (90.2%)	0.61
-Allergic rhinitis	77 (74.8%)	46 (90.2%)	0.03
-Asthma	38 (36.9%)	12 (23.5%)	0.10
-Atopic dermatitis	6 (5.8%)	2 (3.9%)	0.62
-Food allergy	2 (1.9%)	0	0.32
History of antibiotic use in the previous 3 months	65 (63.1%)	38 (74.5%)	0.16

*P value estimates determined using Chi-Square test.

(acute 74.8% vs. chronic 90.2%, $P = .03$). Eighty-eight patients underwent skin prick testing. Eighty-five patients (96.6%) had a positive result for aeroallergens. The percentage of positive skin prick test results was similar in both the acute (54/56; 96.4%) and chronic (31/32; 96.9%) groups ($P = 0.91$). The three most common sensitized allergens were house dust mite (73/88; 83%), cockroach (51/88; 58%) and grasses (30/88; 34.1%). There was no difference in sensitization to aeroallergens between the two groups. Immunological testing was done in 4 patients in the chronic group and all the results were normal.

Presenting symptoms and clinical manifestations

The most common principal complaints in the acute and chronic groups was cough (54.4% and 45.1%, respectively) followed by nasal discharge (28.2% and 37.3%). There was no significant difference in the frequency of these symptoms between the groups (Table 2). The presenting symptoms in both groups are summarized in Table 3. The most common symptoms were rhinorrhea (94.8%), cough (90.9%), postnasal drip (85.7%), nasal congestion (82.5%) and snoring (64.9%). However 30% of children could not be evaluated for postnasal drip, abnormal taste and abnormal sense of smell because their ages were lower than 5 years. There were no significant differences in symptoms

between the two groups, except that periorbital pain and sleep apnea that were found more frequently in the CRS group. The presenting signs of acute and chronic rhinosinusitis are shown in Table 4. For anterior rhinoscopy, the three most common signs were middle meatus obstruction, turbinate swelling and erythematous nasal mucosa. Middle meatus obstruction was dominantly found in the acute rhinosinusitis group (92% vs. 85%, $P = 0.04$). The appearance of nasal discharge was mostly mucopurulent or mucoid discharge. Cervical lymphadenopathy was infrequent but more commonly found in the chronic rhinosinusitis group (18% vs. 36%, $P = 0.03$).

With regard to cough, productive cough was reported in 116/154 patients (75.3%) while 24/154 patients had a dry cough (15.6%). Cough most commonly occurred at night (109/154 patients (70.8%)), while morning and day-time cough were reported by 55/154 (35.7%) and 54/154 (35.1%) patients, respectively.

Paranasal sinus radiography

Radiographic findings in the paranasal sinuses are summarized in Table 5. Abnormal appearances were found in 67 (64.07%) and 30 (58.82%) cases in the ARS and CRS groups, respectively. All patients in both groups with abnormal finding had maxillary sinus involvement. Bilateral involvement of the sinuses was found more than unilateral involvement

Table 2. Chief complaints in patients with acute and chronic rhinosinusitis group.

	Acute (n= 103)	Chronic (n=51)	P value
Cough	56 (54.4%)	23 (45.1 %)	0.31
Nasal discharge	29 (28.2%)	19 (37.3%)	0.27
Congestion	9 (8.7%)	3 (5.9%)	0.75
Snoring	3 (2.9%)	4 (7.8%)	0.24

in both groups. The most common abnormal finding was opacification of the affected sinus. We found no air-fluid level finding in our study.

Adenoidal hypertrophy was found in 30 (29.1%) and 24 (47.1%) cases in the ARS and CRS, respectively, with a significantly higher frequency in the CRS group ($p = 0.03$)

Medication used and outcome of treatment

Antibacterial medications were prescribed in all patients. More than half of them had received antibiotic within 3 months before enrollment to the study (103 patients; 66.9%). The two most commonly prescribed antibacterial medications were amoxicillin-clavulanic acid (84/154 patients = 54.55%) and cefditoren pivoxil (52/154 patients = 33.77%). No difference in the duration of antibacterial treatment was found between these two medications (P value = 0.915). Th mean duration of antibacterial treatment was 14.6 ± 3.82 days (\pm SD) in the ARS group and 22.35 ± 5.04 days (\pm SD) in the CRS group. Nine patients were admitted for intravenous antibiotics because of high fever. Of these, 7 were diagnosed as acute rhinosinusitis. The prescribed adjunctive medications were non-sedating antihistamines (149/154; 96.75%), normal saline irrigation (134/154; 87.01%) and intranasal corticosteroids (116/154; 75.32%). There was overall improvement after 14.6 days and 22.4 days (mean) of antibiotic treatment in the ARS and CRS groups, respectively. None of the patient had undergone surgery.

Discussion

Rhinosinusitis is one of the most common diseases in the pediatric population but it remains inadequately studied. The diagnosis of rhinosinusitis is quite difficult because the presenting symptoms are variable and of varying severity. There is no specific history for rhinosinusitis. At present, there is no consensus on the definition of chronic rhinosinusitis. Therefore, in this study we defined

Table 3. Presenting symptoms in acute and chronic rhinosinusitis group.

Symptoms	Acute	Chronic	P value*
Rhinorrhea	97 (94.17%)	49 (96.08%)	0.62
Cough	95 (92.23%)	45 (88.24%)	0.42
Posterior nasal dripping	90 (87.38%)	42 (82.35%)	0.40
Congestion	86 (83.5%)	41 (80.39%)	0.63
Snoring	64 (62.14%)	36 (70.59%)	0.30
Night awakening	47 (45.63%)	26 (50.98%)	0.53
Sore throat	40 (41.67%)	18 (38.30%)	0.70
Wheezing	39 (37.86%)	21 (41.18%)	0.69
Halitosis	39 (37.86%)	22 (43.14%)	0.53
Malaise	24 (23.53%)	19 (38%)	0.06
Fever	23 (22.33%)	8 (15.69%)	0.33
Ear pain	17 (17.53%)	12 (26.09%)	0.23
Epistaxis	15 (14.56%)	8 (15.69%)	0.85
Periorbital pain	10 (9.71%)	13 (25.49%)	0.001
Sleep apnea	8 (7.77%)	11 (21.57%)	0.01
Tooth pain	8 (7.77%)	8 (15.69%)	0.13
Facial pain	4 (4.6%)	4 (10.81%)	0.20
Abnormal smelling	4 (5%)	1 (3.03%)	0.64
Abnormal tasting	3 (3.75%)	1 (2.94%)	0.83

*P value estimates determined using Chi-Square test.

chronic rhinosinusitis as persistence of upper respiratory symptoms for longer than 8 weeks⁸, because we wanted to manage chronic rhinosinusitis early, including immunologic investigations and choice of antibacterial or adjunctive medications. Our findings showed that the common main complaints were cough and nasal discharge. The common presenting symptoms, such as post-nasal drip, nasal congestion, cough and rhinorrhea reported in this study are consistent with the results of other studies in western countries^{5,13} and also Thailand.¹⁴ These presenting symptoms are also found in allergic rhinitis and the common cold and this can lead the physician to the misdiagnosis the condition. Our findings indicate that most of the common symptoms in the ARS and CRS groups were similar. However, periorbital pain, sleep apnea symptoms and cervical lymphadenopathy were found more commonly in the CRS group and this difference is statistically significant.

The most common physical findings in this study were middle meatus obstruction, turbinate swelling and erythematous nasal mucosa. In our study, the results of paranasal sinus radiography were abnormal in about 60% of cases in both the

Table 4. Presenting signs in acute and chronic rhinosinusitis group.

Findings	Acute	Chronic	P value*
Middle meatus obstruction	97 (94.17%)	43 (84.31%)	0.04
Turbinate swelling	89 (86.41%)	44 (86.27%)	0.98
Color of nasal mucosa			
Red	76 (73.79%)	40 (78.43%)	0.55
Pale	18 (17.48%)	9 (17.65%)	
Normal	9 (8.74%)	2 (3.92%)	
Color of nasal discharge			
Mucopurulent	50 (48.54%)	22 (43.14%)	0.84
Mucoid	35 (33.98%)	19 (37.25%)	
Serous	2 (1.94%)	2 (3.92%)	
No discharge	16 (15.53%)	8 (15.69%)	
Tonsillar enlargement	46 (44.66%)	24 (47.06%)	0.78
Tonsillar injection	16 (15.53%)	3 (5.88%)	0.09
Posterior granular pharynx	33 (32.04%)	20 (39.22%)	0.38
Pharyngeal injection	28 (27.18%)	7 (13.73%)	0.06
Posterior nasal dripping	19 (18.45%)	6 (11.76%)	0.29
Halitosis	13 (12.62%)	10 (19.61%)	0.25
Cervical lymphadenopathy	12 (11.65%)	13 (25.49%)	0.03
Wheezing	5 (4.85%)	2 (3.92%)	0.79
Abnormal tympanic membrane	3 (2.91%)	3 (5.88%)	0.37
Facial tenderness	2 (1.94%)	4 (7.84%)	0.08
Facial swelling	2 (1.94%)	1 (1.96%)	0.69

*P value estimates determined using Chi-Square test.

ARS and CRS groups, which similar to the findings of the previous study by Low et al.¹⁵ In our study, we used sinus x-rays to confirm the diagnosis. However, if positive sinus radiography is used for confirmation of disease, the correct diagnosis is made approximately only 40% to 50% of cases.¹⁶ The diagnosis of rhinosinusitis remains largely clinical alone. Together with the clinical symptoms and signs, paranasal sinus radiography might be useful for diagnosis in patients with persistent symptoms despite adequate treatment.¹⁷ The frequency of adenoid hypertrophy in patients with acute rhinosinusitis was similar to that in a previous study by Poachanukoon et al.¹⁸ Adenoid hypertrophy was found significantly more often in the CRS group. However, the frequency of adenoid hypertrophy was lower in both groups, as

Table 5. Radiographic findings of pediatric patients with acute and chronic rhinosinusitis.

X-ray findings	Acute RS (n=103)	Chronic RS (n=51)	P value*
Overall findings			
Normal	37	21	0.60
Abnormal	66	30	
Frequency of sinuses involved			
Maxillary	48	21	1.00
maxillary+ other sinuses	19	9	
Abnormal findings by sinuses			
Maxillary			
mucoperiosteal thickening	28	10	0.05
Opacification	39	20	
Ethmoid			
mucoperiosteal thickening	1	0	1.00
Opacification	17	8	
Sphenoid			
mucoperiosteal thickening	1	0	1.00
Opacification	1	1	
Adenoid			
Hypertrophy	30	24	0.03
Normal	73	27	

*Fisher's exact test.

compared with the results in the study by Tantimongkolsuk et al.¹⁴

The very high rate of personal atopic diseases reflected bias of patient recruitment, since the majority of cases were recruited from an allergy clinic. Allergic rhinitis was significantly more frequent in the CRS group. This finding was similar to those of previous studies.^{14,19} Asthma was found in 32.47% of our patients, which is also similar to the results of the previous study by Tantimongkolsuk et al.¹⁴ (31%), but higher than in that of Nguyen et al.²⁰ (25.3%). For aeroallergen sensitization of patients in our study, the three most common allergens were house dust mite, cockroach and grass which is similar to the results of a previous study of allergen sensitivity in Thai children.²¹ We found no difference in allergen sensitization between the acute and chronic rhinosinusitis groups. Environmental exposure, such as current common cold in the family, tobacco smoke, or pet fur, were found in one third of patients

with no difference between the ARS and CRS groups.

It may be that drug-resistant organisms, such as *S. pneumoniae*, *H. influenza*, were the causative organisms in this group of patients. Because most of the patients had already received first line treatment, the treatment consisted of second line treatment with amoxicillin-clavulanic acid or cefditoren pivoxil. This treatment, which would cover such organisms, was successful in all patients. We found no difference between these two medications in term of duration of treatment.

This study had some limitations. The sample size is small, patients were recruited from a single hospital and most of patients were attending an allergy clinic. This may limit the generalizability of the findings. Sinus aspiration was not used in the diagnosis of rhinosinusitis because the procedure is invasive and not recommended for establishing routine diagnoses in children.

In conclusion, the most common rhinosinusitis symptoms in this study were rhinorrhea, cough, post-nasal drip and nasal congestion, and most symptoms and signs in acute and chronic rhinosinusitis were similar. Only a few symptoms suggested the diagnosis of chronic rhinosinusitis, namely periorbital pain and sleep apnea. Adenoid hypertrophy was found more frequently in the CRS group. Patients with chronic rhinosinusitis were more likely to have underlying allergic rhinitis. Medical treatment was successful in all patients, and none of the patients required sinus surgery.

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