An Association Between Acute Bronchitis and Asthma

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The relationship between the common acute bronchitis syndrome and atopic disease was examined using a retrospective, case-control method. The charts of 116 acute bronchitis patients and of a control group of 60 patients with irritable colon syndrome were reviewed for evidence of previous and subsequent atopic disease or asthma. Bronchitis patients were more likely to have a previous history of asthma, a personal history or diagnosis of atopic disease, and more previous and subsequent visits for acute bronchitis. The main finding of the study was a tenfold increase in the subsequent visit rate for asthma in the acute bronchitis group. Thirty percent of patients with acute bronchitis made return visits for unresolved cough despite an 83 percent rate of antibiotic use. These findings challenge the common belief that the symptoms of acute bronchitis are solely infectious in origin and suggest the involvement of occult bronchospasm.

Acute bronchitis is a commonly made diagnosis for patients without chronic lung disease who suffer cough, sputum production, and associated infection of the upper respiratory tract. Several surveys have shown acute bronchitis to be one of the most frequently made diagnosis in family practices.[1-5]

The duration of the syndrome is considerable, with one half of the patients coughing three weeks and one fourth continuing to cough after one month.[6] Acute bronchitis is often treated with antibiotics, although studies have not shown striking benefits favoring antibiotic use.[6-8] The prolonged cough and the relative inefficacy of antibiotic treatment in this syndrome suggest that more is involved than simply bacterial infection.

Some previous research provides indirect evidence that bronchospasm might play a role in acute bronchitis. Uncomplicated viral upper respiratory tract infections, particularly those caused by rhinovirus, influenza virus, and respiratory syncytial virus, may precipitate airway hyperreactivity in normal subjects.[9-12] Several studies have documented the association of various viruses with the syndrome of acute bronchitis.[13-16] A recent study has demonstrated a link between a subgroup of acute bronchitis patients and asthma; nearly two thirds of patients with "recurrent acute bronchitis" evaluated by allergists were given a diagnosis of asthma.[17]

That patients with acute bronchitis may cough because of bronchospasm seems plausible. Indeed, the clinical syndrome of acute bronchitis resembles the syndrome experienced by known asthmatics with upper respiratory tract infection.

As a first step in investigating the relationship of bronchospasm with acute bronchitis, the frequency of previous or subsequent bronchospastic and atopic disease was assessed in patients with acute bronchitis. The charts of patients with the diagnosis of acute bronchitis were audited and compared with a control group for indicators of asthma and other atopic disease.

METHODS

This case-control, chart audit study was conducted at the Family Medical Care Center of the University of Missouri–Columbia. The study group was selected from a computer listing of all patients given the diagnosis of acute bronchitis (ICHPPC 466) between June 30, 1978, and June 30, 1980. The control group was chosen from a computer listing of all patients given the diagnosis of irritable colon syndrome (ICHPPC 564)

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TABLE 1. COMPARABILITY OF GROUPS

	Acute Bronchitis (n = 116)	Irritable Colon Syndrome (n = 60)
Mean age, years	32	32
Sex (female)	70%	82%
Mean follow-up	44 months	42 months
Smoking status		
Smoker	39%	33%
Nonsmoker	28%	15%
Not documented	33%	53%

during the same period. Patients older than 65 years and younger than 16 years were excluded, as were those whose chart audit indicated chronic obstructive pulmonary disease or who had no sputum production associated with the syndrome diagnosed as acute bronchitis. Patients who had no subsequent chart entry whatsoever after the index visit were also excluded. The earliest visit for either acute bronchitis or irritable colon syndrome during the specified period was designated as the index visit, with all information considered previous or subsequent to the index visit.

Patients with irritable colon syndrome were selected as the control group. Previous research on acute bronchitis in the same setting demonstrated that bronchitis patients tended to be young and female. It was presumed that the demographic features of the two groups would be similar, and there is no known association between irritable colon syndrome and atopic disease.

Charts from both groups were audited for sex, age at index visit, smoking status, previous history of asthma, previous and subsequent visits for asthma, family or personal history of atopic disease (hay fever, eczema, and allergic rhinitis), visits for atopic events, and previous and subsequent visits for other episodes of acute bronchitis. Audited charts included notes from other specialists at the medical center; patient-completed database forms as well as all records of visits were reviewed. In the bronchitis group, charts were also audited for physical findings on chest examination, return visits for unresolved symptoms after the index acute bronchitis episode, and for treatments given.

The two groups were analyzed to determine comparability and to search for differences suggesting a predisposition to atopic or bronchospastic disease in the group with acute bronchitis. Chi-square tests were used for comparing proportions and *t* tests for means.

RESULTS

The charts of 60 control and 116 acute bronchitis patients provided information for analysis. The two groups were virtually identical with respect to age and duration of follow-up after index visit, but differed somewhat with respect to sex distribution (Table 1). Comparability of smoking status is impossible to assess because one third of the bronchitis and one half of the control group charts contained no documentation of smoking status (Table 1).

TABLE 2. RESULTS OF CHART AUDIT

	Acute Bronchitis	Irritable Colon Syndrome	P Value
Atopic disease	68%	54%	.06
Personal history	46%	28%	.03
Family history	30%	28%	NS
Previous diagnosis	21%	10%	.05
Subsequent diagnosis	19%	15%	NS
Bronchitis			
Previous visits, mean	1.12	.61	.01
Subsequent visits, mean	1.25	.72	.03
Asthma			
Previous visits	2.7%	1.8%	NS
Previous history	11%	1.7%	.03
Subsequent diagnosis	16%	1.7%	.01

NS: Not significant

In comparing the rates of asthma, family and personal history of atopic diseases, and other atopic manifestations, trends all favor greater frequencies in the study group. Significant differences were found for both atopic disease and asthma categories. Study patients were also more likely to receive a previous or subsequent diagnosis of acute bronchitis (Table 2).

The main finding of the study was a nearly tenfold increase in subsequent asthma visits in the bronchitis group (Table 2). Eleven percent of bronchitis patients had a previous history of asthma and 16 percent a subsequent visit for asthma. Only 1.7 percent of the control group had either a previous history or subsequent visit for asthma.

Within the bronchitis group, the data were stratified by several variables to determine whether any of these would predict a subsequent visit for asthma. Patients with wheezes were more likely to be given a subsequent diagnosis of asthma than those without wheezes (39 percent vs 10 percent, $P = .002$). Those with a previous diagnosis of asthma were also more likely to receive a subsequent diagnosis of asthma than those without (44 percent vs 5 percent, $P < .001$). However, even when patients with wheezes and those with a past history of asthma were excluded, there was still a significantly higher rate of subsequent asthma in the bronchitis group (8.7 percent vs 1.7 percent, $P = .04$).

Thirty percent of patients with acute bronchitis made a return visit for unresolved symptoms, and 83 percent were prescribed antibiotics. Nine percent

were given bronchodilators and 14 percent antitussives. None of these treatments was associated with a reduced rate of return visits, although the study design allows no conclusions about efficacy.

DISCUSSION

The study was designed to investigate the association of atopic and bronchospastic disease with acute bronchitis. The similarity between the syndromes of acute bronchitis and upper respiratory tract infection-induced asthma, the association of acute bronchitis with viral respiratory infection, and the demonstration of airway hyperactivity in normal subjects with uncomplicated "colds" had suggested this association. Consequently, a case-control study seemed a plausible avenue for investigation.

The differences between the bronchitis group and the control group with regard to sex were not large and probably do not explain the differences found.

A retrospective case-control study using chart audits has some significant limitations. Bias may have occurred in a systematic fashion. For example, it seems likely that the patients with acute bronchitis would be more intensively questioned for symptoms of asthma and atopic disease. Classification errors may also have occurred, because few of the cases of asthma were actually diagnosed with pulmonary function tests, and diagnostic criteria for acute bronchitis are not uniform.

None of these limitations detracts from the main finding, however—a tenfold increased rate of subsequent asthma diagnosis in the bronchitis group.

There was a higher rate of recurrent episodes of acute bronchitis in the study group, suggesting either a susceptibility or increased visit rate for respiratory infection. The high rate of return visits for unresolved symptoms also suggests that current treatment methods did not meet the expectations of patients.

One explanation for the findings of this study is that providers simply diagnosed acute bronchitis when asthma would have been the correct diagnosis.

Another hypothesis is that patients with acute bronchitis, particularly those with prolonged cough, have an intermediate susceptibility to bronchospasm. Perhaps the clinical syndrome known as acute bronchitis involves an airway-damaging infection that sensitizes bronchioles in susceptible individuals; this theory is consistent with previous speculation concerning viral infection and airway hyperreactivity in asthmatics. Viral infection may cause occult bronchospasm, but true clinical asthma may not be manifest. Perhaps airway reactivity should be considered a disease spectrum that ranges from cough associated with viral infection to the more familiar triad of cough, dyspnea, and wheezing. In this light, it is worth noting that wheezing is often not appreciable in asthmatic patients until respiratory obstruction is moderately severe.[18]

Acute bronchitis has generally been considered an infectious disease with edema of the mucous membranes, destruction of respiratory epithelium, and diminished mucociliary function. These changes are thought to be responsible for the lingering cough, chest discomfort, and sputum production. Although this study provides no conclusive evidence about the role of bronchospasm in acute bronchitis, it does lend credence to the idea that this condition is more than a simple infection of the upper and mid-respiratory tract. Bronchospasm may well be an important component of this commonly seen and temporarily debilitating syndrome. Further research concerning the role of bronchospasm and the potential for the use of bronchodilator therapy is needed.

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