Association of bronchiectasis and gastroesophageal reflux

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Abstract

This study represents the experience of a tertiary care center in Saudi Arabia on association of non-cystic fibrosis bronchiectasis and gastroesophageal reflux (GER). A retrospective review of all patients with GER and Non-Cystic Fibrosis (Non-CF) Bronchiectasis was done in a pulmonary clinic for the period 1993-2005.

A total of 49 patients were found to have both conditions. Twenty six (53%) were males, 23 (47%) were females. 48 (98%) are alive and 1(2%) died. The southwestern regions contributed to 29(60%) of the cases. There is a period of 5± 3.2 years between the start of symptoms and the diagnosis of bronchiectasis. More than 2/3 of the patients had cough, tachypnea, wheezing, sputum production and failure to thrive. 30(61%) had associated disease: Pulmonary diseases in 22(45%), Immunodefficiency in 5(18%), CNS in 9 (18%), and cardiac in 3 (6%). Left lower lobes (LLL) was commonly involved in 38(76%). Asthma was found in 41(84%) of the patients. Twenty five (51%) of 49 patients found to have sinusitis. Hemophilus influenza (H-flue) was cultured in 16(33%), Streptococcus pneumoniae in 3 (6%), pseudomonas aeruginosa in 7(14%). Twenty two of 49 patients (92%), who were able to do PFT, had abnormal changes. Disease progression developed in 32 (65%) of the patients. GER was directly related to early development of symptoms. The diagnosis of bronchiectasis was delayed with the presence of CNS anomalies ($p < 0.05$).

GER is commonly associated with Non-CF bronchiectasis. Early recognition and institution of treatment will prevent progression of the disease.

Introduction

Bronchiectasis was called an orphan disease since its incidence decreased markedly and became an uncommon clinical entity among adults and children in developed countries [1]. It is defined as a permanent dilatation of the bronchi [2], which typically involves the second to 6th order of segmental bronchi [2]. It was first described by Laënnec in 1819 based on examination of postmortem specimens [3,4]. Ruberman and colleagues (1957) evaluated 69 patients with persistent abnormalities on chest radiographs by bronchoscopy [5)] Out of 1711 young adults (18 to 25 years of age) treated for pneumonia at a U.S. army hospital, 29 (1.7 %) found to have Bronchiectatic changes (5). Field noted a dramatic decrease in admission rates, for bronchiectasis at 5 British hospitals from an average of 48 per 10,000 in 1952 to 10 per 10,000 total pediatric admissions in 1960 [6]. She speculated that improved treatment of lower respiratory tract infections by the increased availability of broadspectrum antibiotics reduced the incidence during that period [6]. Other contributing factors include the prevention of measles and pertussis through immunization and the marked decrease in primary pulmonary tuberculosis in the pediatric population. The incidence of childhood bronchiectasis is gradually declining [2,7].

Aspiration is the inhalation of liquid or solid materials into the lower respiratory tract, usually from the oral or nasal cavities, oropharynx, esophagus, or stomach. Bartlett [13] reviewed various markers placed in the stomach the night before surgery have been documented as being in lungs during surgery the next day in 7-16% of patients [14,15]. Nasogastric and oropharyngeal tubes, including endoscopes and tracheostomies, increase the rate of aspiration. Normal people tend to clear such aspirations without difficulty or sequelae. An acute cough reflex is most important, but also valuable are intact mucociliary activity and alveolar macrophage response. The pathological effects of aspiration are dependent upon the character, volume, and frequency of the aspirated components. Food, gastric acid, lighter hydrocarbons, and heavier oils will be separately considered. Squamous cells in the lungs of adults is an indicator of oral, oropharyngeal, or esophageal aspiration. Lowgrade chronic aspiration of gastric contents may escape easy detection. These aspirations may lead to interstitial fibrosis, and perhaps account for the 20% [16] to 54% [17] incidence of associated and unexplained pulmonary fibrosis in patients with esophageal abnormalities. Most often these esophageal problems were hiatal hernia and/or simple reflux [17].

Aspiration is the most common cause of lung abscess. Excluding cases of Kartagener's syndrome, the occurrence of sinusitis and bronchiectasis together is greater than expected. Even by 1929, Quinn and Meyer (100 noted a 58% incidence of chronic sinusitis in cases of bronchiectasis. Aspiration of infection from the sinuses may play a role. Pulmonologists today are aware of the high incidence of sinusitis in their failure rare cases of bronchiectasis. Haemophilus influenzae, a common pathogen of the upper respiratory tract, is also found with some regularity in lung cultures from patients with bronchiectasis. Anaerobic bacteria, reflecting those types seen in the mouth, may also be cultured from these sites. Treatment with penicillin or a broadspectrum antibiotic for some 4 to 6 weeks may be required for complete eradication of these organisms [18].

In this report, we present the experience of a tertiary care center in Saudi Arabia on the association of GER and childhood bronchiectasis.

Materials and Methods

A retrospective review of charts for all children aged 1-15 years, who were confirmed to have "GER based on barium swallow studies and or Technetium Nuclear scan (Milk scan) in association with Non-CF bronchiectasis based on chest x-ray and or Computerized Tomography scan of the chest (CT) during the period Jan. 1993- Aug. 2005 at King Faisal specialist hospital and research center (KFSH&RC) in Riyadh region" were studied. Demographic, radiological patterns, associated diseases, and pulmonary function test data (PFT) were collected.

Statistical analysis

SPSS program for Windows (release 11.0.0) was used for data analysis. Chi-Square (χ^2) was used to compare categorical variables. Results were presented at a level of significance of $p = <0.05$

Definitions

Progression of disease is a qualitative measurement, defined as a radiological deterioration with more lobes involved in addition to clinical deterioration with increased sputum production, cough and or fever.

PFT severity is a quantitative measurement of airflow in PFT:

Mild lung changes are defined as forced expiratory volume in one second (FEV1) as 65-75% of predicted values.

Moderate lung changes: As FEV1 = 55-65% of predicted values.

Severe lung changes: As FEV1 < 55% of predicted values.

Results

A total of 151 cases were diagnosed as Non-CF bronchiectasis based on chest x-ray in 151(100%) of the patients and or CT chest on 145 (96%) of the patients during the period Jan 1993- August 2005. Fourty three of 69 patients

62%) who had barium swallow studies, were found to be positive forGER. Thirteen of 27 patients (48%) who had nuclear medicine milk scan studies were positive for GER. A total of 49 patients (32%) inour sample were found to have GER (by barium swallow and or milk scan) in association with Non-CF bronchiectasis. Twenty six (53%) were males, 23 (47%) were females. 48 (98%) are alive and 1 (2%) died. Fourty five (92%) from Saudi Arabia and 4 (8%) were from other countries. Fourty four patients (90%) were full term. Seven (14%) from the Eastern region, 5 (10%) from the central region, 15 (31%) from the western region, 8 (16%) from the Northern region, and 14 (29%) were from southern region. Thirty two (65%) of the families were consanguinous. Mean age of presentation was 2.3 ± 2.2 years. Age at referral to our center was 6.3 ± 4 years. Age of bronchiectasis diagnosis was 7.3 ± 4.1 years. There is a period of (5± 3.2) years between the start of symptoms to the diagnosis of bronchiectasis. Period of follow up was 5.5 ± 3.9 years. Two third of the patients presented with cough, Tachypnea, wheezing, sputum production and failure to thrive. Clubbing was found in 16 (33%) of the patients. Cyanosis and oxygen requirement was observed in 11 (23%) of the patients. Hemoptysis was only reported in 4 (8%) of the cases. Thirty (61%) had associated diseases (Table 1). Pulmonary diseases in 22 (45%), Immunodefficiency in 5 (18%), Central nervous system (CNS) in 9 (18%), cardiac in 3 (6%), skeletal anomalies in 2 (4%) and asthma in 41 (84%) of the patients (Table 1). Radiological changes that were reported: Consolidation of one or 2 lobes in 44 (91%) of the patients, hyperinflation in 39 (80%), interstitial pattern in 17 (35%), atelectasis in 43 (88%), Peribronchial wall thickening in 37 (76%) and lymph node enlargement of the Para tracheal region in 10 (20%) of the patients. Left lower lobes (LLL) was commonly involved in 38 (76%), right middle lobe (RML) in 31 (69%), and right lower lobe (RLL) in 28(57%), lingula in 26(53%), right upper lobe (RUL) in 15(31%), and left upper lobe (LUL) in 13 (27%) of the patients.Bilateral lobar involvement in 35 (71%). Twenty five (51%) of 49 patients "who had sinus radiological investigations" found to have sinusitis. Thirteen of 49 patients with GER (23%) required Nissen fundo- plication. Suctions of nasopharynx were done in 34 (70%) of the patients. Twenty five patients had positive culture for bacteria. Hemophilus influenza (H-flue) was cultured in 16 (33%), Streptococcus pneumoniae in 3 (6%), pseudomonas aeruginosa in 7 (14%), Branhamella Cattarrhales in 2 (4%), and Staphylococcus aureus (Staph.) in 7 (14%) of the patients. Twenty four (49%) of the patients were able to do pulmonary function test (PFT). Twentytwo (92%) of them had abnormal PFT changes. 5 (22%) had obstructive lung changes, 4 (18%) had restrictive lung changes, and 12 (48%) had combined obstructive and restrictive lung changes. Nine (37%) had mild PFT changes, 9 (39%) moderate lung changes and 6 (25%) had severe lung changes. Disease progression developed in 32 (65%) of the patients. Unilateral Lobectomy was done in 4 (8%) of the patients whereas bilateral lobectomies in 2 (4%) of them. Recurrent otitis media was reported in 4 (8%) of the patients. Development ofGER was directly related to early development of symptoms < 5 years of age, late bronchiectasis diagnosis (5-10 years of age) and with presence ofCNS anomalies ($p < 0.05$) (Table 2). Hyper inflation and persistent atelectasis of Bronchiectatic lobes in chest x-ray are early signs of GER development ($p < 0.05$) (Table 2). GER was not related to disease progression ($p < 0.003$) (Table 2).

Table 1: Gastroesophageal reflux and Bronchiectasis/ disease association (Total 31 patients,63% Patients)

Disease association	Number	Disease association	Number
Pulmonary:			
Kartagener	11		
FBA	6		
Immotile cilia syndrome	1		
Lipid pneumonia	1	**Immunodefficiency:**	
Interstitial pneumonia	1	Hypogammaglobulinemia	1
ABPA	1	Common variable-Hypogammaglobulinemia	2
T.B	1		
RML syndrome	3		
TEF repair	2		
Cystic lung disease	2		
Lung collapse			
Cardiac Diseases:		**Central nervous system disease:**	
Dextrocardia	1	Cerebral palsy/ seizure disorder	2
Pulmonary hypertension	1	Apnea	1
Mitral valve prolapse	1	Craniosynostosis	1

		Cutis laxa/ developmental delay	1
		Down syndrome/ Seizure	1
		Other disease associations:	
Skeletal:		Antithrombin III defficiency	1
Scoliosis	1	Liver cirrhosis	1
		Bullous skin lesion/ septicemia	1
			1

FBA - Foreign body aspiration
ABPA - Allergic Bronchopulmonary Aspergillosis
TB - Tuberculosis
RML - Right middle lobe
TEF - Tracheoesophageal fistula

Table 2: Correlations of GER/ Bronchiectasis (Total 151 patients)

Factors		GER			P value
		Yes (%)	No (%)	Total (%)	
Age when symptoms started:	0-5 years	45 (36%)	80 (64%)	125 (100%)	
	5.1-10 years	1 (8%)	12 (92%)	13 (100%)	0.03
	Total (%)	46 (33%)	92 (67%)	138 (100%)	
Age at bronchiectasis diagnosis	0-5 years	16 (35%)	30 (65%)	46 (100%)	
	5.1-10 years	20 (44%)	26 (56%)	46 (100%)	0.05
	10-15	5 (17%)	25 (83%)	30 (100%)	
	Total (%)	41 (34%)	81 (66%)	122 (100%)	
Chest X-ray changes:					
Hyperinflation	Yes	39 (38%)	63 (62%)	102 (100%)	0.04
	No	10 (21%)	37 (79%)	47 (100%)	
	Total (%)	49 (33%)	100 (67%)	149 (100%)	
Atelectasis of Bronchiectatic lobes:	Yes	43 (37%)	73(63%)	116 (100%)	0.03
	No	6 (18%)	28 (82%)	34 (100%)	
	Total (%)	49 (33%)	101 (67%)	150 (100%)	
CNS anomalies	Yes	9(53%)	8(47%)	17 (100%)	
	No	40 (30%)	93 (70%)	133 (100%)	0.05
	Total (%)	49 (33%)	101 (67%)	150 (100%)	
Disease progression	Yes	32 (44%)	40 (56%)	72 (100%)	
	No	17 (22%)	61 (78%)	78 (100%)	0.003
	Total (%)	49 (33%)	101 (67%)	150 (100%)	

GER- Gastroesophgeal reflux
CNS- Central nervous system anomalies

(For larger image of table, click here)

Discussion

Published reports from some developing countries suggest that childhood bronchiectasis may not be disappearing, and that it represents a more common problem than in developed countries [2,19]. Karakoc from Turkey described 23 children with bronchiectasis and found that factors other than infections have contributed to the development of

bronchiectasis, such as Immunodefficiency, primary ciliary dyskinesia and asthma [2]. A report by Dawson from United Arab Emirates from Abu Dhabi region described 32 children with bronchiectasis from a population of 300,000 [20]. He found that congenital anomalies of the respiratory system, prematurity, Immunodefficiency were some of the factors that contributed to the cause of the disease in addition to viral or bacteria infections [20].

In our report, bronchiectasis was found to be 1 in 4 cases that presented with recurrent chest infection in our center, which makes it a common problem in this part of the world. Bacterial infection with the common respiratory organisms such as: Staph aureus, Hflue, Pneumococcus, and pseudomonas were found in 51% of the patients. Recurrent aspiration pneumonia due to CNS anomalies or seizure is described for the first time in the literature and might be related to recurrent aspiration of secretions due to swallowing incoordination and or GER. Association between bronchiectasis and GER has not been described before except in the post operative period [3]. Our report agrees with other report of early start of symptoms before 5 years of age in 83% of our study [2] with a delay of diagnosis of bronchiectasis by an average of 5-10 years. Sixty five percent of our patients had radiological and clinical progression in spite of medical treatment, which may suggest the adoption of surgical intervention in patients with progressive disease. Sinusitis was reported in 23% of our patients and may suggest a longer period of antibiotic treatment for 4-6 weeks [3]. Gastroesophageal reflux and recurrent aspiration is found in 32% of our patients and may have contributed to the development of bronchiectasis or complicated its progression. A case control study need to be done to identify the actual risk factors of developing such disease in our country and efforts should be made to early diagnosis, awareness of contributing factors and early treatment or referral before development of progression.

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