Volume 1 No. 3, September 2005

Three cases of asthma

Siu-Ngan Chow 周笑顏
Department of Paediatrics and Adolescent Medicine, Alice Ho Miu Ling Nethersole Hospital, Hong Kong

Introduction

Asthma is a common disorder affecting 10-15% of children in Hong Kong. Management is rather straight forward in most cases although problems are encountered in a minority of cases. Three problematic cases of childhood asthma were presented. In case 1, different clinical phenotypes were reviewed. In case 2, the importance of looking for other allergic diseases especially allergic rhinitis was highlighted. In case 3, the issue of compliance problem was brought up. Monitoring of asthma was also discussed. Though seemingly a disease so common and easily handled, cases requiring special attention do occur. The paediatrician is reminded to be alert to these for a better treatment outcome.

Case reports

Case 1

A 17-year-old boy had asthma since 8-year-old. He was admitted to the hospital at 11-year-old with mild asthmatic attack. Beclomethasone inhaler (100 mcg bd) and salbutamol puff were given upon discharge. The boy was admitted the next month for moderate asthmatic attack. He was put on the same medication after discharge. However, he required frequent salbutamol to relieve his symptoms. The treatment regimen of the boy was tabulated (Table 1). Serial lung function tests were performed (Figure 1), which showed minimal improvement in the flow-volume curve after bronchodilator was given.

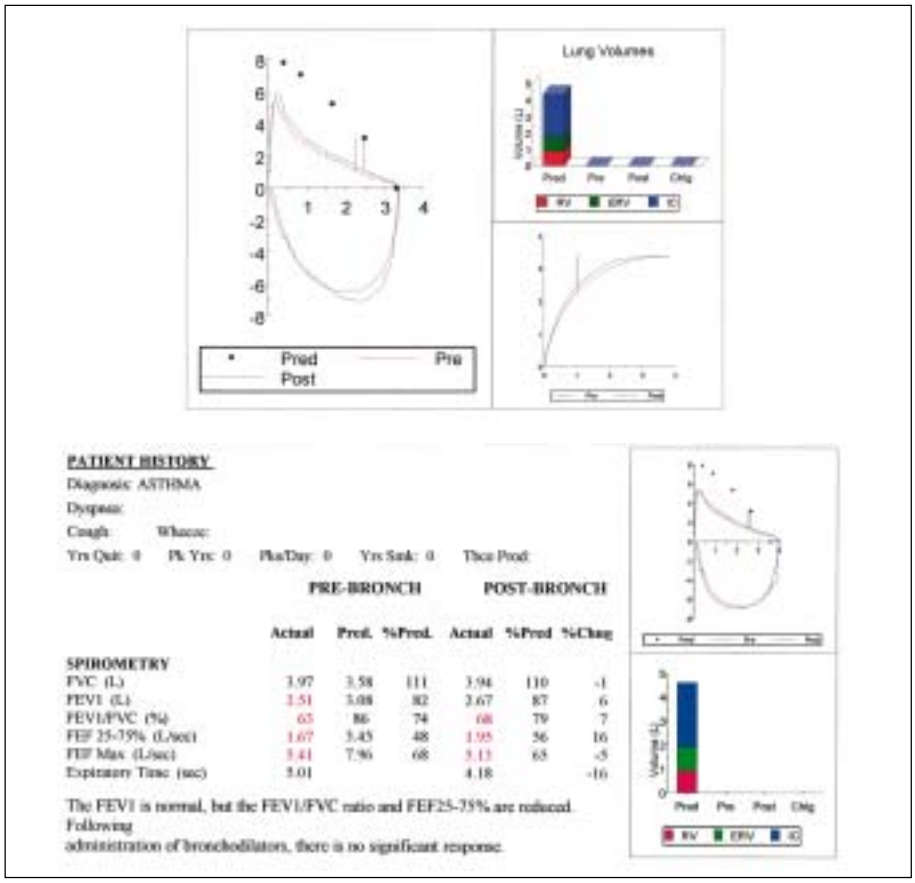


Figure 1. Serial lung function tests of case 1.

Email: chow1998@hotmail.com

Table 1. Treatment regimen of case 1

4-1999:	Becodisk 100 mcg bd
8-2000:	Becodisk stepped up to 200 mcg bd
8-2001:	Changed to Becotide, dosage decreased to 50 mcg bd
11-2001:	Becotide increased to 100 mcg bd
1-2002:	Changed to Pulmicort turbuhaler 200 mcg bd (1st lung function test performed)
9-2002:	Changed to Flixotide 125 mcg bd in view of suboptimal lung function test
12-2002:	Flixotide increased to 250 mcg bd
1-2003:	Montelukast added
7-2003:	Montelukast taken off because of poor compliance (2nd lung function test performed)

Case 2

A 14-year-old girl was admitted at the age of 9-year with moderate asthmatic attack. She was discharged with budesonide turbuhaler 100 mcg bd. The medication was stopped by the patient 2 years later. On follow-up 3 months later, budesonide was started again for increasing coughing and breathing difficulty. All along, the girl was taking her medication as prescribed. Because of persistence of "symptoms", further escalation of treatment was decided. Treatment regimen was tabulated as below (Table 2). Serial lung function tests were performed (Figure 2), which were all normal. On further questioning, the girl noted that her nostrils were completely blocked. On examination, the inferior turbinates were very large, blocking both nostrils. Medication for allergic rhinitis was started and asthma medications adjusted (Table 2).

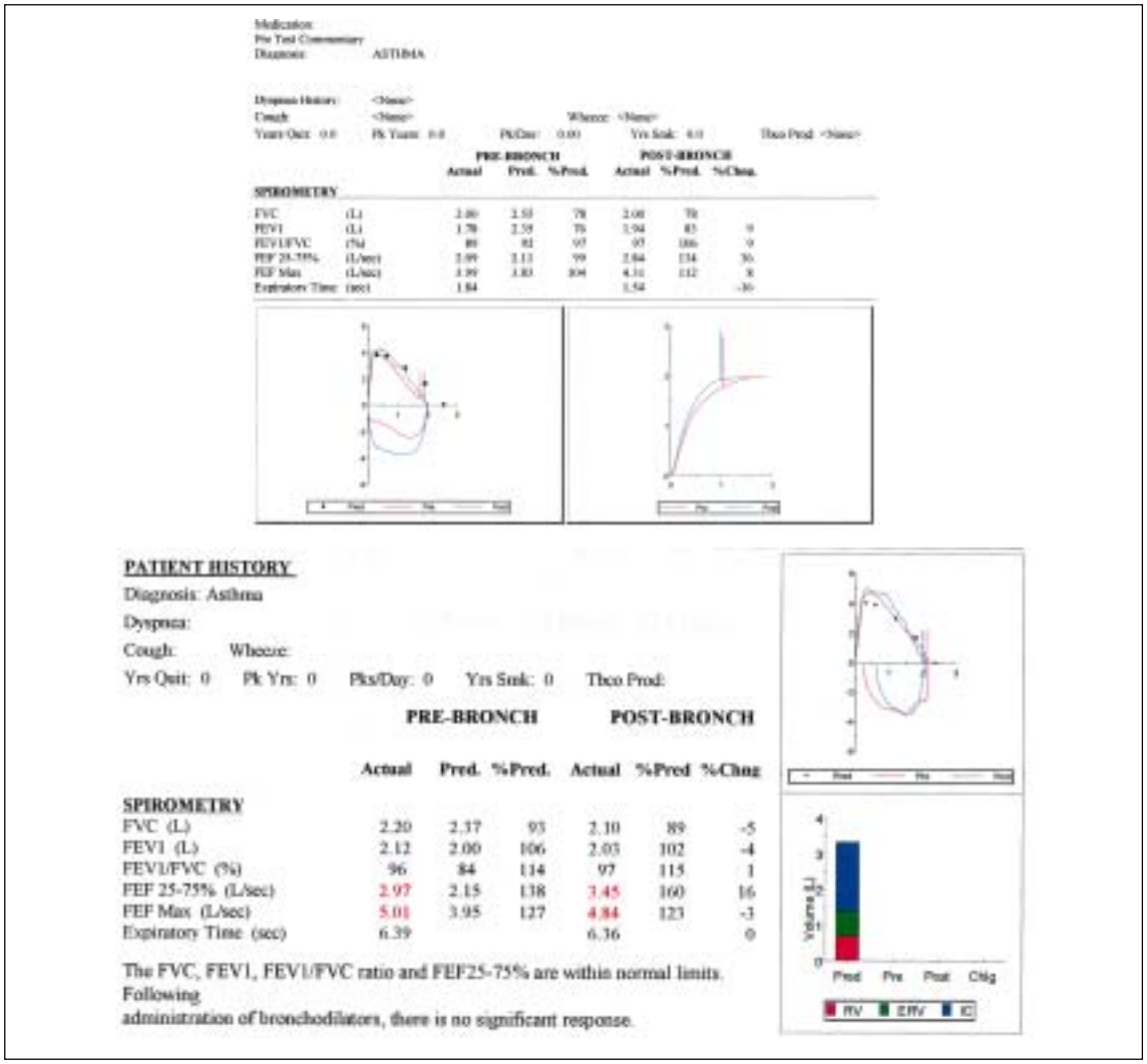


Figure 2. Serial pulmonary function tests for case 2.

Case 3
A 12-year-old girl was admitted in 1999 for mild asthma. The girl was admitted three times in 2001 and once in 2004. The treatment regimen was tabulated as below (Table 3). Inhaled corticosteroid was increased stepwise in view of the poor lung function test, which showed gradual deterioration of the lung function (Figure 3). She also suffered from moderate eczema and allergic conjunctivitis. She had depression that was being seen by psychiatrist and was put on tri-cyclic antidepressant. During one of the follow-up consultation, the girl admitted that she had not been taking the medication all along as prescribed.

Discussions

Case 1: Clinical phenotypes of asthma

Asthma is a phenotypically heterogeneous disorder. It results from complex interactions between environmental and genetic factors. The expression of which also depends on age and gender. A precise definition of different phenotypes is important for better understanding of the pathophysiological mechanisms and to ascertain the specific genes associated with these phenotypes.

Accordingly, asthma can be classified into childhood asthma, asthma persisting from childhood to adulthood, adult-onset asthma and severe asthma.

Three sub-types of severe asthma have been identified, namely, near fatal asthma, steroid-resistant asthma and asthma with fixed airway obstruction.[1]

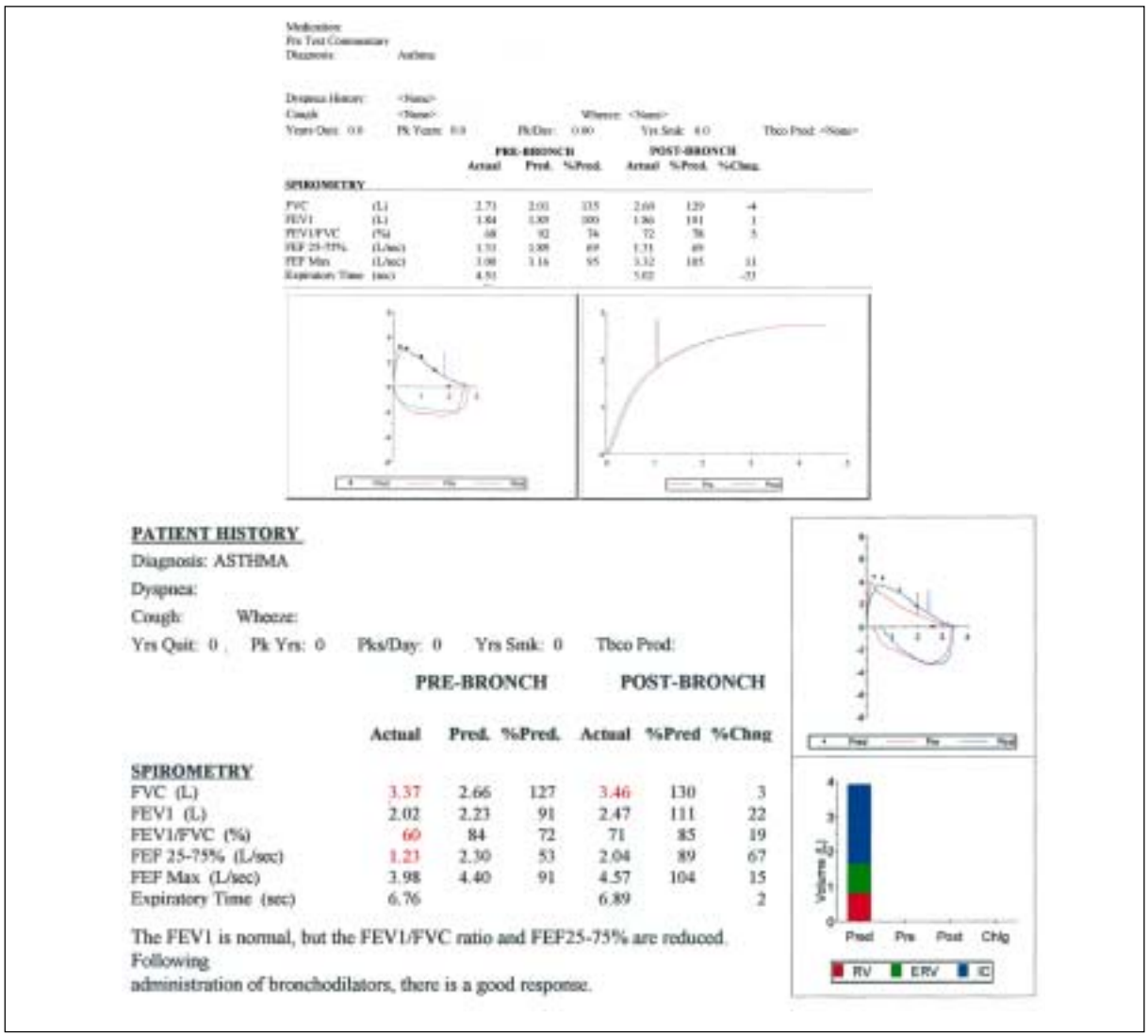
In case 1, the boy is likely to be suffering from fixed airway obstruction. Fixed airway obstruction, or irreversible airway obstruction, is obstruction not responding to a bronchodilator, or preferably, to a bronchodilator and a short course (1-2 weeks) of systemic steroids.[3] The prevalence of which in the adult asthmatic patients was estimated to be 35-50%.[1] Risk factors included male, adult onset, eosinophilia and absence of atopy.[1] It is believed to be the final common pathway of chronic inflammation and remodeling. The process involves damaged epithelium producing TGF-beta, fibroblast proliferation with increased activated myofibroblasts below the basement membrane, smooth muscle hypertrophy/ hyperplasia and deposition of extracellular matrix.[2] This results in increased thickness of the airway wall. Up to this stage, controversies still exist as to the cause of this

Table 2. Treatment regimen of case 2

4-1999:	Pulmicort turbuhaler 100 mcg started
1-2002:	Self stopped medication
4-2002:	Pulmicort turbuhaler 100 mcg bd restarted for increased coughing
10-2003:	Oxis 9 mcg bd added after admission together with Pulmicort turbuhaler 100 mcg bd
11-2003:	Symbicort turbuhaler (160/4.5) given. Oxis and Pulmicort taken off.
All along complained “can’t breath at night”. Put on Volmax 8 mg nocte since 12-2003.	
1-2004:	Changed to Oxis (9 mcg bd) and Pulmicort turbuhaler (100 mcg bd) again, because girl claimed symptoms better controlled with Oxis and Pulmicort rather than Symbicort turbuhaler
9-2004:	“BLOCKED and can’t breath”: - Symbicort (160/4.5), planned to step down further - Flixonase + Clarityne + NS for douching - Off regular Volmax

Table 3. Treatment regimen of case 3

Pulmicort
- Increased to 400 mcg bd
- Decreased to 200 mcg bd 4 months later (see Lung Function Test)
- Increased to 400 mcg bd 2 months later, because of frequent mild attacks
Changed to Flixotide 200 mcg bd 2 months later



PATIENT HISTORY

Diagnosis: ASTHMA

Dyspnea:

Cough: Wheeze:

Yrs Quit: 0 Pk Yrs: 0 Pks/Day: 0 Yrs Smk: 0 Tbco Prod:

SPIROMETRY		PRE-BRONCH			POST-BRONCH		
		Actual	Pred.	%Pred.	Actual	%Pred	%Chng
FVC	(L)	3.37	2.66	127	3.46	130	3
FEV1	(L)	2.02	2.23	91	2.47	111	22
FEV1/FVC	(%)	60	84	72	71	85	19
FEF 25-75%	(L/sec)	1.23	2.30	53	2.04	89	67
FEF Max	(L/sec)	3.98	4.40	91	4.57	104	15
Expiratory Time	(sec)	6.76			6.89		2

The FEV1 is normal, but the FEV1/FVC ratio and FEF25-75% are reduced. Following administration of bronchodilators, there is a good response.

Figure 3. Serial pulmonary function test of case 3.

asthma subtype. It is still under debate whether this clinical subtype represents under-treatment of asthma, or it is the extreme spectrum of the disease or it is just another subgroup with totally different pathogenesis. It is generally believed that early adequate anti-inflammatory treatment may prevent the development of fixed airway obstruction.[3] However, how early and what is adequate has not yet been well studied.

In case 1, the boy showed little improvement in his flow-volume curve after bronchodilator was given. Preferably a short course of systemic steroid should be tried. If the spirometry finding is the same with no improvement after bronchodilator, the diagnosis of fixed airway obstruction is established.

Case 2: Allergic rhinitis

Allergic rhinitis was estimated to affect 10-20% of the population.[4] When both parents are atopic, the chance of developing allergic rhinitis is about 50%. It is an important coexisting allergy with asthma and it is very often the aggravating factor of asthma. Eighty percent of asthma patients had allergic rhinitis, and 80% of whom develop symptoms before the age of 20. People suffering from asthma are 3 times more likely than the general population to have allergic rhinitis.[6] Paediatricians should be alert to this as children may not be able to describe their symptoms precisely, as illustrated in case 2.

Symptoms and complications of allergic rhinitis are listed in Table 4. The main stage of treatment is

intranasal steroid, which can relieve all symptoms (Table 5).

Case 3: Monitoring of asthma and compliance

Monitoring of asthma is important to guide treatment outcome. Nowadays, monitoring of asthmatic patients depends largely on clinical symptoms supplemented with testing the degree of airway obstruction. Patients are asked about the number of attacks since last visit, any attacks during exercise, any night-time symptoms, ways to get well during attacks and frequency of using bronchodilating therapy.[5] Besides clinical monitoring, pulmonary function tests (PFT's) and diurnal variation of peak flow rate (PFR) are common tests to guide the treatment of asthma.

For PFR, the commonly used variable is Peak Expiratory Flow variance (PEFvar). This is the highest PEF minus the lowest PEF over the lowest PEF in percentage. Normal variation is within 20%.[6]

PFT, mainly the flow-volume curve, measures the degree of airway narrowing. It is an indirect way to measure airway inflammation. It requires the co-operation of the patient. The test is not sensitive. A normal test does not necessarily exclude asthma. Airway hyperresponsiveness is diagnosed when an improvement in FEV1/FVC of more than 12% after bronchodilator. Provocation tests including exercise or metacholine can be used to document the degree of airway hyperresponsiveness.

Exhaled nitric oxide provides a direct way to measure the degree of airway inflammation. However, clinical correlation is still not yet well defined.

Like all chronic illnesses, adherence to medication or compliance is an important issue to ensure the prescribed medication getting into the body. In the literature, compliance has been defined as taking >70% of prescribed medication. As illustrated in case 3, the technique of using drug delivering device is also very important before escalating or changing the treatment regimen.

Table 4. Symptoms of allergic rhinitis

Typically have
Chronic cough / Post nasal drip, especially at night
Hyper-nasal speech
Itchy nose
Sneezing
Rhinorrhoea
Mouth breathing
Dry / Irritant throat

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Table 5. Intranasal steroid for treating allergic rhinitis in HA hospitals

Drug	Benconase (BDP)	Nasonex (Mometasone furoate)	Filxonase (FP)	Rhinocort (BUD)
		2-11 1 dose daily	4-11 1 dose daily-bd (Max: 2 sprays each nostril)	
	>6 2 sprays bd	>11 2-4 dose daily-bd	>11 2 doses daily-bd (Max: 4 sprays each nostril)	>6 256 mcg daily, then 32 mcg