Editorial

Advances in the Management of Bronchial Asthma

The prevalence of asthma and recurrent wheezing in children is increasing, having doubled in most communities over the past twenty five years. The reasons for this increase are not clear, although it is postulated that a decrease in serious respiratory infections and changes in the home environment may be important. It is argued that infections in early childhood would normally stimulate the T-lymphocytes to a TH_1 response to produce antibodies that would protect against further infections with the same organisms. However, a reduction in such infections may predispose to the T-lymphocytes producing a TH_2 response and allergic antibodies which would induce sensitization to normally harmless agents in the home environment rather than tolerance to these agents.

Diagnosis

Approximately 30% of infants will wheeze during the first year of life. Two thirds of these will have reduced airway caliber which results in wheeze with a viral illness but the wheezing will resolve over the early years of life so that the individual becomes asymptomatic. It is not yet clear whether this group is still predisposed to other forms of chronic obstructive airway disease in late adult life. The other third are usually atopic and will continue to wheeze and manifest as childhood asthma. The remainder of those predisposed to develop asthma will start wheezing after the first year or two of life.

Recurrent wheezing in this age group in developing countries is more complex. There is more likely to be associated bacterial infection probably related to damage to the airways and altered host immunity due to greater viral load and more frequent viral infections, bacterial colonization, poor nutrition and poor social circumstances.

Some infants with asthma will present with recurrent cough and be diagnosed on chest radiograph as having recurrent pneumonia. In many of these, the radiological changes are due to atelectasis as a result of mucus plugs and not lower respiratory infections. This group is better treated with inhaled corticosteroid than antibiotics. Cough variant asthma is certainly an entity but without associated wheeze is probably not common in childhood. Persistent cough alone is more likely to be due to prolonged sensitization of cough receptors after viral infections. There may be a diagnostic dilemma with these children and a therapeutic trial with asthma treatment may be justified.

Deaths from asthma in childhood are extremely rare. However, deaths in adolescents remains significant and an important problem. They are more likely to occur in those with labile asthma as well as in those with poor compliance and associated psycho-social problems. Any child with severe disease is at risk of death and should be treated aggressively. Unfortunately, there are some children with mild episodic asthma who are treated inappropriately with high dose inhaled corticosteroids while there are others with severe troublesome asthma who are grossly under-treated.

Treatment Principles

There is no cure for asthma; steroids in any form have never cured asthma. They do reduce the inflammatory process and decrease bronchial responsiveness and improve symptoms but these recur as soon as the steroids are stopped. These are important medications for those with moderate disease and will help control the inflammatory process and reduce morbidity. They may not be necessary in those with mild episodic asthma as these can be readily controlled with intermittent bronchodilators and often cease to wheeze in later childhood or early adolescence.

Treatment in infancy and early childhood is more difficult than at other ages as the patients are less responsive to beta-2 agonists and there are fewer objective measurements to assess response to treatment. Beta-2 agonists can be shown to have an affect from birth. They are particularly effective in babies with chronic lung disease of prematurity and can be shown to block mediator challenges with histamine and methacholine in infants with asthma. However, the clinical response to beta-2 agonists in those with wheezing is much less marked than in older children. It has also been difficult to objectively document responses to anti-inflammatory agents in young children although they can reduce sensitivity to histamine in this age group.

The aims of management should be to minimize symptoms, to prevent morbidity, to optimize quality of life and to minimize side-effects from drugs.

Assessment of Severity

The first step in the treatment of asthma is to assess severity. Acute asthma may be divided into mild, moderate and severe. Mild asthma is associated with an audible wheeze without any distress, cyanosis or impaired activity. Lung function is usually >80% predicted. These episodes can usually be treated with beta-agonist by aerosol alone.

A moderate episode is associated with an audible wheeze as well as the use of accessory muscles, an increased respiratory rate, and distress and walking or talking. These children need larger doses of inhaled beta-agonist and may need a short course of oral corticosteroids.

Severe acute episodes are associated with cyanosis, severe distress, lower rib recession, pulsus paradoxus and lung function below 50% predicted. These children need oxygen, high dose inhaled beta-agonist, oral or intravenous corticosteroids and usually admission to hospital.

The long term severity of asthma is defined as infrequent episodic, frequent episodic or persistent. Infrequent episodic asthma, which constitutes 75% of the childhood population, is recognized as that with episodes occurring less frequently than every four to six weeks with no interval symptoms, normal lung function and normal quality of life. This group can usually be treated with intermittent beta-agonists.

Frequent episodic asthma constitutes about 20% of the childhood asthma population and is associated with attacks of asthma less than every four to six weeks and symptoms at least every one to two weeks. Lung function is near normal. This group does need preventive agents such as sodium cromoglycate, nedocromil sodium or inhaled corticosteroids.

Persistent asthma affects 5% of the asthmatic population and is associated with frequent acute episodes, wheezing most

days and reduced lung function. This group needs preventive inhaled corticosteroids and intermittent or regular beta-2-agonists. Asthma is usually assessed by careful clinical assessment. Questions that should be asked are: *(i)* how often do you wake at night with wheeze or cough and use your medication?; *(ii)* how often do you wheeze and cough and have to use your medication as soon as you wake in the morning?; *(iii)* how often does wheeze, tightness or cough interfere with your sport or normal physical activity?; *(iv)* how often do you have to use additional doses of bronchodilator because you are wheezing or tight in the chest?; *(v)* how long does a puffer last? A metered dose inhaler (MDI) should last at least one month if not being used excessively; *(vi)* how many day care, kindergarten or school days have been lost during the last six months due to asthma? Answers to these questions will provide important information on the current control of asthma. Unless the answers to all questions are negative then the treatment needs to be modified.

Peak Flow Meters

Peak flow meters can be helpful in those with poor perception of asthma or in those whose symptoms are difficult to control. In some they are required for two to three weeks to assess severity and then to monitor control. A very small group may need to use peak flow meters permanently to better document early deterioration and the need for early introduction of oral corticosteroids. However, for most children a clinical assessment is adequate and in many cases better than regular peak flow monitoring.

Broncho-Alveolar Lavage

Broncho-alveolar lavage is now being used for the assessment of the inflammatory process in asthma. Induced sputum expectoration with hypertonic saline may provide useful information. The clinical role is not yet defined. It is hoped that there will be indirect measures of inflammation which in the future will allow us to monitor anti-inflammatory medications.

Action Plan

Every patient must be given a handwritten action plan to help them understand clearly the drug regimes to be used, when they should be used, and when they should be stopped.

Environmental Control

Environmental control will help in the overall management of asthma. However, simple measures such as plastic covers to the mattress and pillow, airing bed linen, avoiding foods that may induce wheezing, and avoiding contact with pets that may trigger asthma can be helpful. More aggressive interventions are unlikely to provide any benefit. Exercise should not be avoided. The ability to cope with exercise is a good means to monitor control of asthma and it should be controlled so that any activity can be undertaken. It may be necessary to have warm-up sprints of 30 seconds every 2 minutes for 10 minutes and to take prophylactic medication to allow involvement in competitive sports.

Immunotherapy

Immunotherapy is not recommended for most children. It is occasionally used in adolescents where a single allergen can be identified to be important in the child's disease. It is more likely to have a role in seasonal rhino-conjunctivitis with mild asthma. It should not be administered when asthma is poorly controlled as it may aggravate the condition. It should be used where facilities for resuscitation are available.

Beta Agonists

Beta-2-agonists remain the most effective treatment for wheezing and should be used as first line treatment in the minimum dose that will provide adequate relief of symptoms. Beta-2-agonists should always be used by the aerosol route. Those children under 4 years of age will be able to use a face mask and a small volume spacer or a nebulizer. From 4 to 6 years, children can use a large volume spacer and mouthpiece. Many will be able to use a dry powder inhaler, but this requires an inspiratory flow rate of approximately 30 L/min through the device to de-aggregate particles and obtain reasonable deposition. Not all children in this age group, particularly during an acute attack of asthma; will be able to use them effectively. Nebulizer therapy can be used in those unable to use these devices. From 7 years of age, most children can use a metered dose inhaler effectively. However, technique needs to be checked at each visit and, in some cases; better deposition may be obtained with the use of a large volume spacer. Some may find co-ordination easier with a dry powder inhaler. A nebulizer can be used for those with severe airway obstruction.

In most cases, an MDI will be as effective as a nebulizer if adequate numbers of puffs are given. It may be necessary to give six to ten puffs, one or two at a time, to achieve the same effect as a nebulization. It is important to wash the spacer and allow it to dry without wiping to reduce electrostatic forces which may reduce available aerosol.

Nebulizers with air compressors or oxygen are very effective means of delivering beta-2-agonists in acute attacks of asthma. The extra benefit is usually related to the higher dose given. The new Venturi type nebulizer should be used wherever possible. The volume fill in a nebulizer should probably be 4 ml. Thus standard ampoules should be diluted with 2 ml of normal saline. This prevents the progressive increase in osmolality which occurs during nebulization and provides more consistent particle size.

Preventive Agents

Preventive agents are introduced in any child with recurrent or persisting symptoms. Sodium cromoglycate or nedocromil sodium would generally be introduced for those with mild recurrent symptoms. Any infant who fails to respond to these agents or who has severe persisting asthma will probably require inhaled corticosteroids. Although generally free of side-effects, even regular doses of inhaled corticosteroids have been shown to have some effect on bone metabolism and growth. The clinical significance of these observations is uncertain. Below 400 ug/24 hours, the side-effects of corticosteroids are minimal, above 800 jig/24 hours side effects may probably become clinically significant and extra benefit is not usually great. Therefore, the maximum benefit: risk ratio is achieved with lower doses of corticosteroids.

Other Agents

Those unresponsive to low dose inhaled corticosteroids and beta-2-agonists may require the addition of drugs such as long acting beta-2-agonists, slow release theophylline, anti-cholinergic agents or high dose inhaled or oral corticosteroids. Antihistamines, antibiotics, mucolytic agents and cough suppressants do not have a major role in the management of childhood asthma. Similarly, alternative measures such as chiropractic and acupuncture have not been shown to alter the natural history of childhood asthma.

Specialist referrals should be considered for any child where the diagnosis is uncertain, where there are life-threatening severe attacks, where there is no response to a standard therapeutic regime or where there are side-effects from the medications being used.

A second opinion will help ensure that the correct diagnosis has been made and that the child is receiving optimal therapy using the best possible techniques.

Poor compliance may be related to poor understanding but in teenagers it may be complicated by concerns regarding body image, anxiety about drug dependence, attitudes of parents, peers and teachers. These issues need to be addressed and can only be approached if the physician has adequate knowledge regarding the use of devices and the appropriate therapeutic regimes required to maintain good asthma control with minimum side effects.

Louis I. Landau,
Professor of Pediatrics,
University of Western Australia,
Respiratory Physician,
Princes Margaret Hospital for Children,
GPO Box D184, Perth,
Western Australia 6001, Australia.

NOTES AND NEWS

DR. VIDYASAGAR ENDOWMENT FUND RESEARCH/TRAVEL FELLOWSHIP GRANT

Applications are invited from NNF members for Research and/or Travel Fellowship grants of the Dr. Vidyasagar Endowment Fund for the year 1996-97. These should be sent by 31.07.1996 to The Secretary, NNF, Department of Pediatrics, All India Institute of Medical Sciences, New Delhi 110 029. For other details see Jan-March, 1996 issue of Bulletin- NNF.