ABC of Asthma

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DRUG TREATMENT IN ACUTE ASTHMA

β Stimulants

Adrenaline has been used in acute asthma for 80 years. The specific β_2 stimulants such as salbutamol, terbutaline, and fenoterol have replaced the earlier non-selective preparations, and within this group there are no great differences in practice.

In acute asthma metered dose inhalers often lose their effectiveness. This is largely because of difficulties in the technique of inhalation, and an alternative method of administration is necessary—usually by nebuliser or intravenously. Since there is no difference in the effectiveness of nebulised or intravenously administered drugs nebulisation is preferable. Many general practitioners find it useful to have nebulisers available for this purpose. Theoretically β stimulants are best given using oxygen to drive the nebuliser, as bronchodilator treatment for asthma may occasionally be associated with a worsening of hypoxia. Domiciliary oxygen sets do not provide a sufficient flow to run standard nebulisers efficiently, and therefore nebulisers at home are usually driven by air. It is advisable, however, to have an oxygen cylinder available to treat the hypoxia of acute asthma. There is no real advantage in nebulisation with a machine capable of producing intermittent positive airway pressure. A simple nebuliser is sufficient; even a high dose administered by a device such as a nebuliser (which does not require deep inspirations or coordination) will do.

For adults the initial dose should be 5 mg salbutamol or its equivalent. This should be halved if the patient has ischaemic heart disease. It is essential to continue with the intensive therapy after the first response. Many of the problems in acute asthma arise because the doctor or patient becomes complacent after the initial improvement with inhaled bronchodilators.

Methylxanthines

A loading injection of aminophylline must be given slowly over 15 minutes. When the patient is taking oral theophylline the dose should be reduced by at least 50%.

Aminophylline is an effective bronchodilator in acute asthma but it is probably less effective than β stimulants and there are many more problems in its use. Therefore, it is best not used until β stimulants and steroids have failed to produce an adequate response. Toxic effects are common and occur with drug concentrations in or just above the therapeutic range. Concentrations are difficult to predict from the dose given because of individual differences in the rate of metabolism and interaction with drugs such as nicotine, cimetidine, and erythromycin.

The position is further complicated when patients are already taking oral theophyllines. The usual starting dose for intravenous aminophylline is 5.6 mg/kg body weight given over 15 minutes. If the patient has taken oral theophylline or aminophylline in the previous 24 hours and a blood value is not available the initial dose should be halved. A continuous infusion is then given at a rate of 0.5 mg/kg/h, though this dose should be reduced if there is kidney or liver disease. If intravenous therapy is necessary for over 24 hours then blood concentrations will need to be determined (see sixth article).

Corticosteroids

Corticosteroids are effective in preventing the development of acute severe asthma. Oral prednisolone should be given when control of asthma seems to be deteriorating in spite of adequate bronchodilator treatment. Twenty to 40 mg of prednisolone should be given in a single oral dose each day for seven to 14 days according to the speed of the response. The dose may then be tailed off slowly or stopped abruptly. If this opportunity is missed and acute asthma does develop corticosteroids are still indicated. Doubt has been expressed about their effectiveness in acute asthma, but there is an overwhelming clinical impression of their usefulness. No noticeable response occurs for four to six hours so it is important to begin steroids early and to use intensive bronchodilator treatment while waiting for them to take effect.

In acute severe asthma intravenous hydrocortisone should be used in an initial dose of 4 mg/kg body weight, followed by 3-4 mg/kg/6 h. After the first 24 hours if there has been a substantial improvement oral prednisolone should be substituted for hydrocortisone. Prednisolone should start at a dose of 40-60 mg/day and after the first dose hydrocortisone should be continued for six to 12 hours (50 mg prednisolone is equivalent to 200 mg hydrocortisone). If the patient is first seen at home and then transferred to hospital the first dose of hydrocortisone should be given together with initial bronchodilator treatment before he leaves home.

The reduction in the dose of corticosteroids after an acute attack of asthma requiring hospital admission is governed by the patient's response. But it is important not to decrease the dose too quickly; and when intensive initial treatment has been required prednisolone should be maintained at 30 mg/day for at least one week. There are few side effects of such short courses of corticosteroids.

Anticholinergic agents

Ipratropium bromide has replaced atropine as the anticholinergic agent of choice in asthma as it has greater bronchial selectivity. Nebulised ipratropium appears to be as effective as a nebulised β stimulant in acute asthma. The dose of nebulised ipratropium is 500 μ g or 1 mg, which should be diluted with saline rather than water. There are no problems with increased viscosity of secretions at this dose. Ipratropium has a slower onset of action than salbutamol, and adverse reactions have occasionally been reported. Therefore β stimulants remain first line treatment, but nebulised ipratropium should be added if the response is not adequate. Alternate nebulisations of the two drugs can then be used at 60 to 120 minute intervals.

Antibiotics

Only in a few cases are acute exacerbations of asthma precipitated by bacterial infections. When respiratory infections are implicated they are usually caused by viruses. There is no evidence of benefit from the routine use of antibiotics, and these should be reserved for patients in whom there is presumptive evidence of infection such as fever, neutrophilia in blood or sputum, and radiological changes. In these circumstances, even though these features may occur in acute asthma without infection, an antibiotic such as amoxycillin or erythromycin should be included in the initial treatment.

Oxygen

Acute severe asthma is always associated with hypoxia, although cyanosis develops late and is a grave sign. It is very unusual to provoke carbon dioxide retention with oxygen treatment in asthma, and oxygen should therefore be given freely during transfer to hospital, where blood gas measurements can be done. In older subjects with an exacerbation of chronic airflow obstruction initial treatment should be with 24% oxygen. Nebulisers should also be driven by oxygen rather than compressed air whenever possible, except in those with chronic airflow obstruction.

Fluid and electrolytes

Patients with acute asthma tend to be depleted of fluid because they are often too breathless to drink and because fluid loss from the respiratory tract is increased. Dehydration increases the viscosity of mucus, increasing the likelihood of plugging in the airways. Intravenous fluid replacement is therefore often necessary in management. Three litres in the first 24 hours should be given if little oral fluid is being taken.

Hyperventilation, sympathomimetic drugs, and corticosteroids all tend to lower the serum potassium concentration. This is the most common electrolyte disturbance in acute asthma, and the serum potassium concentration should be monitored and supplements given as necessary.

Controlled ventilation

Occasionally mechanical ventilation is necessary for a short time while treatment takes effect. Usually it is necessary because the patient becomes exhausted, and experience and careful observation are necessary to judge the right time to begin this treatment. High inflation pressures and prolonged expiratory times may make ventilation difficult in asthmatic patients, but most experienced units have good results provided the decision to ventilate the patient is made electively and is not precipitated by a respiratory arrest. When mechanically ventilated patients fail to improve on adequate treatment bronchial lavage should be considered to reopen airways by removing plugs of mucus.

Other factors

Most patients with acute severe asthma improve with these measures. Occasionally physiotherapy may be useful to help patients cough up thick sputum plugs, but mucolytic agents to change the nature of the secretions do not help.

An episode of severe asthma is frightening and the dangerous use of sedatives such as morphine was common before effective treatment became available. Unfortunately this practice still continues with occasional fatal consequences. Treatment of agitation should be aimed at reversing the asthma precipitating it, not at producing respiratory depression.

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Appropriate Technology

Anaesthetics

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It is a sad fact that many doctors in countries where access to Western technology is limited regard the "rag and bottle" type of anaesthesia as all that is possible unless complicated machines are available. It is another sad fact that many trained anaesthetists also believe this and that such machines are essential to undertake major surgery. In this article I attempt to show that there is an alternative, and that anaesthetic running costs may be kept to a minimum while the scope and flexibility of Boyle's, Heidbrink, or other similar machines are retained. The approach advocated is practical and reasonable and is not offered as a second best. (Costs are indicated in current sterling prices, although most will be higher in Third World countries because of customs dues and dealers' profits.)

Local techniques are the mainstay of anaesthetic practice in many small hospitals and, indeed, should be, but for this very reason doctors tend to have more experience in their use than in general anaesthetic techniques. Several good teaching texts are available, and a selection is listed at the end of this article. Of the local anaesthetic blocks that are of most practical use, spinal blocks undoubtedly head the list. Epidurals will be possible for those who are keen on developing their use. Either

technique is appropriate for most analgesic requirements in the abdomen and legs. Among the nerve blocks, brachial block by the supraclavicular or axillary approach is useful, as is Bier's block (intravenous perfusion of the limb). Field blocks of the abdominal wall are not easy to perform, but an inject and cut technique is safe and simple, especially for repair of a hernia.

Inhalational anaesthesia

Inhalational anaesthesia will be the standard method of maintaining anaesthesia for the foreseeable future. The impression gained is that this needs complicated equipment, but this is not necessarily so. Much of the apparent complexity is due to dependence on supplies of nitrous oxide and oxygen, which are stored under high pressures in cylinders. In many Third World countries distribution of these gases is likely to produce transport problems, and (even if they are available) the supply may be uncertain and the equipment, as well as the nitrous oxide, is expensive (tables I and II). It is possible, however, to give perfectly adequate and controlled anaesthesia without nitrous oxide, using relatively simple apparatus. It is desirable to have oxygen, but if this is used alone a simple flow meter with a regulator is all that is needed, and provided that the gas is used economically large stocks are not required—indeed, air alone is sufficient for most patients, and the oxygen may be kept for those who really need it.

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