

Status Asthmaticus: Treatment after steps A, B, C

For the purposes of this segment I will be discussing the intensive care management of the asthmatic in severe distress. We will discuss the child who has had 3 or 4 nebs in the ER, is in the ICU and is still in severe distress. Your worry is respiratory failure and you are trying to prevent intubation.

In a child such as this it is important to be aggressive. If you are realistically trying to prevent the intubation, it is of paramount importance that you maintain an aggressive approach and optimize medical management. This probably means you stay at the bedside ready to intervene with intubation if necessary and to "facilitate" the prompt institution of therapy. The endpoint in this effort is for improvement, the so called "breaking" of the attack or the decision to intubate.

The article included in this segment is excellent and there is little that can be added to the discussion of the individual therapies addressed. I will try to give an outline to the sequence used for initiation of various therapies. I would suggest referring to the article for details about dosage and methods of use.

Toolbag

I often view my management of a certain condition in terms of what are my available tools to do the job. For the asthmatic the tools include:

1. Oxygen
2. Steroids
3. Continuous Nebulization
4. Atropine or Ipratropium
5. IV Terbutaline
6. NaHCO₃
7. Aminophylline
8. Magnesium Sulfate
9. Sedation
10. Mechanical Ventilation

It is important when using any of these tools to develop a rationale for their use and a method if using them and measuring the effects on the patient.

Oxygen/Sedation

All patients with severe airway obstruction are relatively hypoxemic and have a significant amount of V/Q mismatch. O₂ saturations should be maintained above 92% to prevent further bronchoconstriction from hypoxemia

Steroids

All patients in status asthmaticus should be on high dose steroids. They should get a bolus of 1-2mg/kg initially and then continue on 0.5-1mg/kg every 6 hours.

Bicarbonate

Metabolic Acidosis is caused by a lactic acidosis from respiratory muscles. Acidosis produces myocardial depression, ineffective rapid ventilation, and reduces effectiveness of β_2 agonists. When base deficit is greater than -5 it may be of value to correct up to half the deficit slowly. Be aware that bicarb may lower CSF pH in the short run causing greater dyspnea.

Albuterol

Continuous nebulization with albuterol is the first line of treatment for the severe asthmatic. The dosage varies in the literature, 0.1-0.3 mg/kg/hr is a reasonable dose to start with. The dose may be increased and it is not unusual to have dosage to 15mg/hr. The goal is to titrate to effect or to prevent an unacceptable heart rate or arrhythmia while still relieving bronchospasm.

IV terbutaline

If there is not a sufficient response to nebulization, IV terbutaline may be of value. The method is to bolus with 10µg/kg over 20 minutes and then start a drip. at 0.1µg/kg/min. If this has not improved the situation, then rebolus and increase the drip to 0.2µg/kg/min. You may continue this until the patient has improved or a maximal dose of 4.0µg/kg/min has been reached. Frequently though the patient will become unacceptably tachycardic before reaching a dose that high.

Anticholinergic agents

Since these agents work differently than agonists, it may be of value to use them in this situation. Ipratropium bromide can be used every 3 to 6 hours.

Magnesium Sulfate

If the patient is continuing to deteriorate in spite of aggressive management, the use of this agent may be beneficial. Few studies have been done on this agent in status asthmaticus. Refer to the article for dosage information.

Aminophylline

If the patient is not responding to agonist therapy it is reasonable to start an aminophylline drip. Standard dosage is a bolus of 5mg/kg followed by an infusion of 0.5-0.9mg/kg/hr to maintain a level in the therapeutic range of 10-20. If this agent is used in conjunction with iv terbutaline, the terbutaline should be decreased in half to prevent serious side effects.

Sedation

Most patients in this situation are very anxious. Anxiety can exacerbate respiratory distress. Sedation of a child in status asthmaticus should not be taken lightly, and close monitoring should be in place before embarking on this venture. Droperidol and ketamine are the agents which have bronchodilation, in addition to sedative effect, and may be of value, particularly in the intubated patient. In the non-intubated child, Versed (midazolam) at low doses (<0.1mg/kg) may be of some value.

Mechanical Ventilation

Despite all efforts, some children will need to be intubated. A caution! Intubating an asthmatic is a very dangerous undertaking. First, pre-oxygenate with 100% oxygen. There is an enormous amount of hyperinflation in the lungs of asthmatics which can impede venous return. Intubation and subsequent relaxation of musculature and autonomic drive can result in cardiovascular collapse. A fluid bolus is usually prudent before intubation.

When ventilating an asthmatic, make sure you listen to the lungs after initiating ventilation. There has to be adequate time for exhalation. Most asthmatics need slow rates providing a sufficient I:E ratio. Often we use rates in the low teens with a little higher than normal tidal volume. This is a place where permissive hypercapnia must be considered.

If ventilation is not adequate after intubating, the use of inhalational anesthetics such as halothane or isoflurane, which are bronchodilators, may be necessary. ECMO is an option if all else fails.

Asthmatics can develop pneumothoraces and pneumomediastinum from the amount of pressure needed to ventilate. Be on guard.