Epics in intensive care: acute asthma

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To boldly go where no man has gone before.
Captain James T Kirk

When I want to understand what is happening today or try to decide what will happen tomorrow, I look back.
Oliver Wendell Holmes

When acute asthma progressively worsens, clinical signs alone will tell that death, due to respiratory failure, is imminent or probable. The lung pathology was elucidated by 19221 and was deemed largely reversible. The technology for supporting gas exchange by means of artificial ventilation was available from the early 1950s. Blease's 'Pulmoflator' became available in 1950 and the Radcliffe ventilator described below became available in 1953. The first machine to incorporate electronic circuitry, the Bennett MA1, was not introduced until 1967. We briefly review the first successful use of intermittent positive pressure ventilation (IPPV) some forty years ago at two UK hospitals.

The Hammersmith Hospital

From 1955 artificial ventilation was used to treat the respiratory failure which can punctuate the course of chronic bronchitis and emphysema2. IPPV and tracheostomy were enthusiastically applied to these patients at the Hammersmith Hospital by Hugh-Jones and colleagues. The paper published in 19583 reported the first successful treatment of status asthmaticus in the UK and highlighted the considerable difficulty of removing bronchial secretions in these patients: 'in her case the main problem was removing through the tracheostomy the almost rubbery exudate which filled the bronchii'. At first, the patient's lungs were ventilated by a Radcliffe ventilator (Fig 1). The airway pressure generated by this machine was limited but was sufficient to restore pulmonary gas exchange; in other cases it would have failed. After three days a patient-triggered ventilator was substituted – the Pneumotron (British Oxygen Company).

Salisbury General Infirmary

During the first six months of 1959, three adults died from severe acute asthma in the hospital. Extensive mucous plugging of the bronchi was found at autopsy. The failure of current therapy dismayed Dr B W Broom, medical registrar4. In August of that year a 40-year-old woman was admitted and the asthma worsened progressively. A desperate situation called for heroic measures. Endotracheal intubation and anaesthesia delivered via Boyle's apparatus, together with a muscle relaxant, allowed manual IPPV and suction (Fig 2). Slow inflation at a high pressure was required and gas exchange had to be judged clinically since no measurements were available. Twice during the next 24 hours ventilation fell drastically and on each occasion 10 ml of saline containing trypsin was injected into the trachea. Thick mucus was subsequently aspirated and chest expansion increased. After a total of 21½ hours of IPPV, the patient had improved sufficiently to allow weaning and extubation. Both patient and doctor could then sleep. Later in the same year a second asthmatic was successfully treated using similar methods.

Discussion

The staffing and facilities at the two hospitals could not have been more different. Hammersmith had a prestigious unit for respiratory medicine; at Salisbury General a mechanical ventilator was not available for use by the solitary registrar. However, at both hospitals bold and rapid
decisions were made to use similar techniques which saved the lives of the three patients. The intensive therapy is summarised in Table 1. Routine treatments using bronchodilators and hydrocortisone were continued, intragastric suction is routine and sometimes a pneumothorax needs to be drained. Over the next decade IPPV was used to treat more patients so that by the late 1960s several series were published.

Criteria for admission to an intensive care unit were formulated together with a pre-planned programme for artificial ventilation. By 1990 near perfect results were possible; of 100 consecutive patients treated at the Princess Alexandra Hospital, Brisbane, no patient died from asthma alone. However, patients continue to die from acute asthma either at home or during transit to hospital. In the UK the annual number of deaths is approximately 1,500. Renewed efforts were made to reduce the avoidable slaughter by two means. The first was to extend the open door policy pioneered by Dr D A Williams in Cardiff in the 1950s. Patients were instructed to report worsening asthma at any time of the day or night. A fresh study of the natural history of severe asthma showed that there was usually time to alter the treatment and thus avoid the life-threatening stage and the need for artificial ventilation.

To conclude, intensive therapy improved the outcome of life-threatening asthma and benefited many more patients by better care outside hospital. This indirect benefit was admirably summarised by the Danish pioneer Ibsen: ‘Intensive care units are of great value not only to patients who are admitted for treatment, but even more so to the many patients who due to the experience gained are saved from complications later. When the patient is saved by intensive therapy it has very often been said; why was he allowed to be so ill? It would have been easier to prevent this than cure it.’

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References

1. Earle BV. Fatal bronchial asthma – a series of 15 cases with review of the literature. Thorax 1953;8:195–200.
2. Finnegan P, Jones ES. Treatment of respiratory failure due to chronic lung disease by intermittent positive pressure ventilation. Br J Anaesth 1969;41:856–67.
3. Hugh-Jones P, Oligopnoea. Proc Roy Soc Med 1958;51:104–8.
4. Broom B. Intermittent positive pressure respiration and therapeutic bronchial lavage in intractable status asthmaticus. Lancet 1960;1899–901.
5. Riding WD, Ambiavagar M. Resuscitation of the moribund asthmatic. Postgrad Med J 1967;43:234–43.
6. Gordon JU, Jones ES. Effective clinical policies in a district general hospital. Health Care Anal 1998;6:295–304.
7. Jones ES. Respiratory therapy – artificial ventilation. In: Jones ES, McWilliam D, Coakley JR. The really useful book on intensive care. Carnforth: Martin Lister, 1998:253–91.
8. Henderson A, Wright M. Status asthmaticus: experience of 100 consecutive admissions to an intensive care unit. Clin Intensive Care 1992;3:148–52.
9. Personal communication. Office of National Statistics, 1999.
10. Davis B, Gitt PM, Jones ES. A service for the adult asthmatic. Thorax 1980;35:111–13.
11. Ibsen B. Intensive therapy: background and therapy. Int Anesthesiol Clin 1966;4:277–94.

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Table 1. Intensive therapy of acute asthma.

| Aim                                   | Methods                                      |
|---------------------------------------|----------------------------------------------|
| Restore and maintain gas exchange     | Intermittent positive pressure ventilation controlled by muscle relaxants |
| Remove some of the mucus plugs        | Endotracheal suction                        |
| Relieve mechanical stresses on the circulation | Bronchial lavage                            |
| Relieve exhaustion                    | Intermittent positive pressure ventilation    |
|                                       | Sedation                                     |