Hazards of air travel for the obese: Miss Pickwick and the Boeing 747

ABSTRACT—A morbidly obese woman took a touring holiday which included two long flights and a stay at altitude. At the end of the second week of her holiday she was admitted to hospital in respiratory and cardiac failure. When she was better she travelled home by a combination of air ambulance and scheduled flights with a medical escort. This extreme case illustrates some of the physiological and physical challenges of air travel to the obese passenger, which may precipitate respiratory and cardiac decompensation in susceptible individuals. When advising these patients, consultation with the airline medical department is recommended, and preflight testing by altitude simulation may be helpful. If medical transport is required, there may be particular problems in lifting and accommodating these patients on board normal air ambulance aircraft.

A 33 year old morbidly obese woman flew from London to Los Angeles on the first leg of a touring holiday. Several hours into the flight she became dyspnoeic and was given oxygen by the crew; she had already been moved to a first-class seat because the seatback on her economy seat kept collapsing.

On arrival in Los Angeles, she continued her holiday as planned but became progressively fatigued. She spent a few days in the region of the Grand Canyon (altitudes of 5–9,000ft (1,520–2,740m)), which included a short local flight, and later flew for five hours (without oxygen) to Florida, where she was eventually admitted to hospital 16 days after arriving in the USA.

On admission, a diagnosis was made of acute ventilatory failure and cor pulmonale secondary to the Pickwickian syndrome, and arterial blood gas values confirmed arterial hypoxaemia with CO_2 retention: Po_2 5.72 kPa, Pco_2 9.44 kPa, pH 7.34. (Other findings included a normal lung ventilation-perfusion scan and a hypochromic microcytic anaemia (Hb 10.8g/dL) without polycythaemia.) She weighed 211 kg, equivalent to 345% of the ideal body weight (61kg±10%) for her height (170cm) and build; the body mass index (BMI) was 73. Apart from the effects of flying, no obvious cause for the cardiac and respiratory decompensation was found. She gave no history of respiratory problems and claimed to have flown previously without incident.

Treatment was started with 28% oxygen by Venturi mask, frusemide, acetazolamide, medroxyprogesterone, antibiotics, intravenous fluids, and low-dose heparin.

Attempts to titrate inspired oxygen concentration and the use of mask CPAP were accompanied by further rises in Pco_2. The patient was transferred to a specialist respiratory centre where bimodal CPAP (BIPAP) was started with humidified oxygen 28%, initially by face mask, then by nasal pillows. Over the next 72 hours arterial blood gas values improved; oxygen therapy continued by nasal cannulae at 3 l/min during the day and by BIPAP at night; protriptyline was added to the medications. The patient became more alert and energetic, peripheral oedema resolved, and a formal diet was started.

After 25 days in hospital the patient was discharged on continuous oxygen at 3 l/min by nasal cannulae, with arterial blood gas values of Po_2 11.17 Kpa, Pco_2 8.51 Kpa, pH 7.36. She was able to care for herself, able to walk more than 100m without assistance, climb a few steps, and had been taken out of the hospital on several occasions to visit friends.

The patient was escorted to the UK by a doctor and nurse with medical facilities available for resuscitation and advanced life-support. A dedicated air ambulance aircraft was used to transfer the patient from the local airport to New York, allowing observation of the response to depressurisation and assessment of any other problems. In New York she was admitted to hospital overnight for observation and rest, before continuing to London by scheduled services (Fig 1). Because of her girth (170cm) a wide wheelchair had to be used for ground transfers, and she was just able to fit into the toilet on board the Boeing 747. Oxygen at 4 l/min was given throughout both flights, using nasal cannulae. The medical team kept a regular check on her condition by pulse oximetry and observation of vital signs. Prior to departure blood oxygen saturation was 98%, and during flight remained at 96% at a cabin altitude equivalent to 6,000ft (81kPa).

On arrival in the UK, the patient was admitted to hospital, and after two weeks discharged home on domiciliary oxygen.

Discussion

The obese patient who travels by air faces a number of physiological and physical challenges which, among

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Fig 1. *Patient seated in the first-class cabin aboard a Boeing 747*

other effects, may exacerbate alveolar hypoventilation and, in extreme cases such as this, precipitate respiratory and cardiovascular decompensation.

Most passenger aircraft fly with cabin pressures equivalent to an altitude of 5–8,000ft (1,524–2,438m) [1]. Not only is the ambient Po_2 reduced by 17–26%, but expansion of gas in the bowel may also produce abdominal discomfort and further restrict ventilation in the obese passenger by splinting the diaphragm. These detrimental effects on respiration may be compounded by fatigue or increased metabolic demands resulting from anxiety or excitement.

Although these patients may be given oxygen in flight, passenger medical oxygen systems are usually variable-performance devices, and CO_2 retention may be increased both directly, by rebreathing, and indirectly, by depressing the hypoxic respiratory drive [2] (as occurred in this patient when oxygen therapy was started in hospital). In these circumstances nasal cannulae may be more appropriate as they eliminate rebreathing and can maintain oxygenation as effectively as a mask system [3,4].

Because people vary in their response to the effects of flight and oxygen therapy, it has been suggested that passengers with chronic respiratory disease should have a trial run, either in an altitude chamber or by inspiring oxygen at the cabin Po_2 at sea level [5]. On the basis of blood gas measurements during the trial, in-flight oxygen therapy can be planned. Other measures might include oral progesterone therapy [6].

Airline passengers, particularly the obese, are at increased risk of deep vein thrombosis and pulmonary embolus resulting from prolonged periods of inactivity in a cramped seat, and a tendency towards dehydration [7]. Although the true incidence is unknown, pulmonary embolus may be a factor in a significant proportion of deaths associated with passenger flying [8]. Particularly in susceptible individuals, prophylactic measures should be considered, including an adequate non-alcoholic fluid intake, a regularly repeated simple exercise programme, elastic stockings, and low-dose heparin or aspirin.

The flight is usually only one part of a longer journey which includes travel to and from the airport, and the physical as well as psychological demands of transit through the terminal may be particularly stressful to overweight passengers.

Airport terminal facilities vary widely and baggage carts, moving walkways, lifts, porters, and wheelchair or electric buggy transport are not always available. Passengers may have to wait for long periods in queues and carry baggage or heavy hand baggage for considerable distances, perhaps in a hot and/or humid environment. Wide wheelchairs are rarely available, even if specially requested. There may be a lift-on facility or an airbridge to allow wheelchair access to the aircraft door, but passengers are still often expected to walk up a flight of steps. It is probably no coincidence that more medical problems present at the airport than during flight [9].

In advising very obese patients on air travel, each case will require individual assessment based on the degree of obesity, the presence of systemic disease, and an understanding of the effects of flight. Physicians should contact the airline medical department which, if notified in advance, can offer advice and assistance in reducing the stresses of air travel. It may also be necessary to obtain medical clearance from the airline, and the provision of some special facilities, such as oxygen, may depend on this.

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