

Acute ventilatory failure secondary to a sigmoid volvulus

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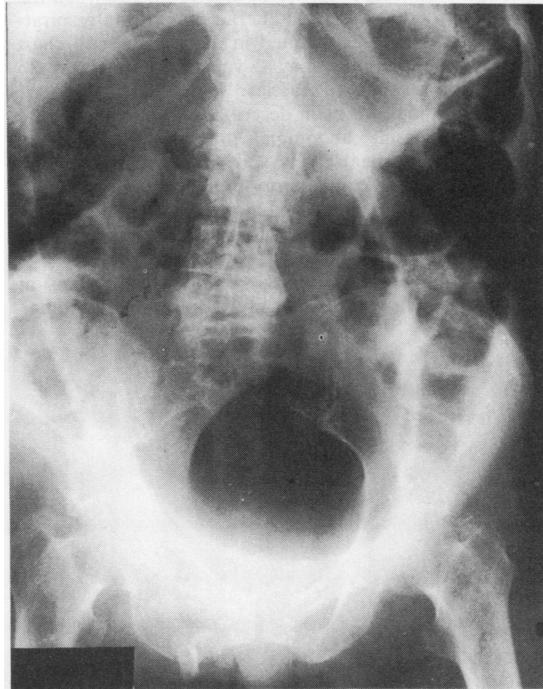
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In view of the recent increase in interest in respiratory muscle dysfunction as one of the causes of respiratory failure, we would like to report a case of acute respiratory failure secondary to a sigmoid volvulus in which extreme abdominal distension appeared to impede the action of the respiratory muscles.

Case report

An 84 year old woman was found comatose in the early morning and was admitted to hospital. Before this episode she had been reasonably well but had taken one Moduretic (amiloride 5 mg and hydrochlorothiazide 50 mg) tablet in the morning for mild cardiac failure. There was no history of chronic airflow obstruction, trauma, psychiatric illness, cigarette smoking, or alcohol abuse.

On examination she was comatose, unresponsive to painful stimuli, atonic, and areflexic. The pupils were equal and constricted and they reacted slightly to light. The oculocephalic and corneal reflexes were absent. There were no signs of trauma, liver disease, or meningitis. She was afebrile and appeared to be slightly centrally cyanosed. The pulse was irregular at 90-100 beats/min, and the blood pressure was 140/90 mm Hg. There were no signs of heart failure. Breathing was shallow but regular at 15 breaths/min. The findings at chest auscultation were unremarkable. The abdomen was immobile, distended, and tympanitic. Bowel sounds were absent. The rectum was empty. Plasma sodium, phosphate, potassium, bicarbonate, calcium, protein, and glucose concentrations; creatine phosphokinase activity; and a full blood count were normal. Plasma and urinary drug screening tests gave negative results. An electrocardiogram showed atrial fibrillation. The results of arterial blood gas measurement, done twice while the patient was breathing room air, were: pH 7.11, arterial oxygen tension (P_{aO_2}) 4.25 kPa, (32 mm Hg), arterial carbon dioxide tension (P_{aCO_2}) 10.45 kPa (78 mm Hg), and bicarbonate (HCO_3^-) 24.1 mmol/l. A supine abdominal radiograph showed a striking bilateral elevation of the diaphragm and massive volvulus of the sigmoid colon (fig). She was given naloxone 1.2 mg followed by 50 g of glucose by intravenous injection without any change in the coma or



Abdominal supine radiograph showing the gaseous abdominal distension resulting from a volvulus of the sigmoid colon.

the acidosis after 35 minutes. A 2 cm diameter rubber tube was then passed into the rectosigmoid and, within a few minutes, the patient's level of consciousness improved and after 30 minutes she was fully orientated. Arterial blood gas pressures (breathing air) were then: pH 7.31, P_{aO_2} 8.07 kPa (61 mm Hg) P_{aCO_2} 5.73 kPa (43 mm Hg). She later underwent sigmoid colectomy and made a good recovery.

Discussion

The initial arterial blood gas measurements were indicative of acute alveolar hypoventilation. The rapid reversal of coma with return to normal of P_{aO_2} and P_{aCO_2} after the

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decompression of the sigmoid volvulus, without other effective treatment, suggests that abdominal distension was the sole cause of this episode of acute ventilatory failure.

During inspiration chest wall and abdomen must be displaced by a volume similar to tidal volume.¹ The force creating such displacement is generated by inspiratory muscles, mainly the diaphragm.^{2,3} In the present case the abdominal overdistension probably reduced abdominal and rib cage "compliance."³ To sustain a normal tidal volume greater inspiratory force is required. If a "critical" inspiratory force is reached, respiratory muscle fatigue can ensue⁴ and ventilation then fails. Acidosis⁵ and hypoxaemia⁴ are two factors known to favour inspiratory muscle fatigue. The recovery time observed in our patient is compatible with the disappearance of muscle fatigue when the load is abolished.^{6,7} Diminished efficiency of the respiratory muscles has been described in association with chest wall distortion and this may have contributed here to fatigue of the respiratory muscles.⁸

A canine model has been described which explores the effect of increasing abdominal pressure produced by inflating the peritoneal cavity with air. Richardson *et al*⁹ showed that the peak inspiratory pressure given by a volume cycled ventilator increased markedly when a constant tidal volume was inflated, suggesting reduced compliance of the respiratory system.

This case demonstrates that gross abdominal distension can lead to severe ventilatory failure presenting as coma.

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