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## CASE REPORT

# Prone positioning for ARDS following blunt chest trauma in late pregnancy

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### ABSTRACT

After a road traffic accident a pregnant patient at 34 weeks of gestation developed ARDS following blunt chest trauma, for which she required mechanical ventilation. Twenty-four hours after the accident, ongoing severe hypoxaemia with atelectasis mainly in the dorsal parts of the lung led to the decision to manage the patient in the prone position. Prone positioning over 8 h resulted in a persistent improvement of oxygenation, which allowed extubation the following day. At term, however, our patient was admitted with dyspnoea, chest pain, haemodynamic instability and fetal bradycardia, for which she required emergency caesarean section followed by thoracotomy for haemothorax, from which she eventually made a full recovery. We have demonstrated that prone positioning can be used safely and effectively in a pregnant patient. It might be superior to other therapeutic options for improvement of oxygenation in pregnant patients. Careful positioning avoiding any external abdominal pressure and continuous fetal monitoring are mandatory.

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**Keywords:** ARDS; Prone position; Pregnancy complications; Mechanical ventilation; Blunt chest trauma; Hypoxaemia

### Introduction

The prevalence of acute respiratory distress syndrome (ARDS) in pregnancy has been estimated at 16–70 per 100 000, with high rates of fetal death and perinatal asphyxia.<sup>1</sup> Severe disorders of gas exchange during pregnancy are typically related to infection, preeclampsia, tocolytic-induced pulmonary oedema and aspiration of gastric contents.<sup>2,3</sup> The treatment of pregnant patients in intensive care units requires consideration of the physiological and anatomical changes of pregnancy, fetal susceptibility to decreases in placental blood flow and their integration with intensive care practice. Essentially, the intensivist is faced with the management of both mother and fetus although the health of the mother takes priority.

We report the case of a pregnant patient at 34<sup>+1</sup> weeks of gestation with ARDS secondary to blunt chest trauma sustained at a road traffic accident. Placing the patient in the prone position markedly improved gas exchange, allowing extubation on the fourth day after the

accident. To our knowledge, this is the first reported case of prone positioning in late pregnancy.

### Case report

A 25-year-old gravida 3, para 1 woman at 34<sup>+1</sup> weeks of gestation was involved in a road traffic accident in which she suffered a head-on collision as the driver of a car travelling at 60 km/h. The seatbelt was fastened and the airbag was triggered. She suffered blunt chest trauma with fractures of the left 9th to 11th ribs and severe bilateral lung contusions, as well as a fracture of the shaft of left femur. Pregnancy had been uneventful until that point and she had no significant past medical history. Her height was 168 cm and her weight at the time of the accident was 70 kg with a pre-pregnancy weight of 59 kg (body mass index 21 kg/m<sup>2</sup>).

She was initially admitted to a district general hospital where she was assessed and taken to theatre for repair of the femur fracture. On admission she was awake and alert, her blood pressure was stable and she had a mild tachycardia of 104 beats/min. Her saturation was 100% with oxygen supplementation via a facemask. Cardiotocography (CTG) and fetal ultrasound were unremarkable.

Accepted February 2009

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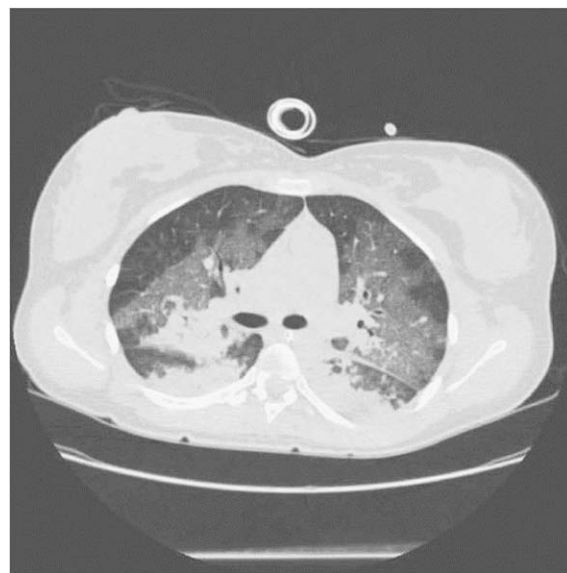
After antacid premedication, rapid sequence induction was performed with thiopental 500 mg and suxamethonium 100 mg. There was no evidence of aspiration and correct positioning of the tube was checked by auscultation repeatedly. General anaesthesia was maintained with isoflurane in oxygen-enriched air and fentanyl in 100- $\mu$ g increments as well as repeat doses of cis-atracurium 5-10 mg. The patient was ventilated with tidal volumes of 5-6 mL/kg predicted body weight and with a positive end-expiratory pressure (PEEP) of 3 cm H<sub>2</sub>O. She received 1500 mL of crystalloid and 500 mL of colloid in addition to the 1000 mL of crystalloids that had been given in the emergency room. During the course of the operation oxygenation deteriorated dramatically, with a resulting PaO<sub>2</sub>/FiO<sub>2</sub> ratio of 60 mmHg. The patient remained intubated and was taken to the intensive care unit. At this stage she was referred to our academic ARDS referral centre to which she was transferred two hours later.

On admission she was being ventilated with a FiO<sub>2</sub> of 1.0, producing a PaO<sub>2</sub> of 9.0 kPa (67.4 mmHg) and a PaCO<sub>2</sub> of 6.1 kPa (45.7 mmHg). She was haemodynamically stable without inotropic or vasopressor support and had a good urine output. Analgesia and sedation with fentanyl and midazolam were continued. No further muscle relaxants were given. For thromboprophylaxis, the patient received unfractionated heparin as a continuous i.v. infusion. Ranitidine was given regularly. We continued fluid replacement with crystalloids and invasive blood pressure measurement in addition to standard monitoring. CTG monitoring was performed continuously. Steroids were not given for fetal lung maturation as the patient was already 35 weeks pregnant.

A computed tomography (CT) scan of the head, thorax, abdomen and skeletal system was performed on admission, which showed bilateral lung infiltrations combined with dorsal atelectasis (Fig. 1). Transoesophageal echocardiography excluded injuries to the heart and great vessels and right ventricular failure. There were no signs of fetal distress, premature contractions or uteroplacental abnormalities on either CTG or repeated fetal ultrasound.

For ventilation, standard treatment of ARDS was provided, including pressure-controlled ventilation with low tidal volume of 5-6 mL/kg predicted body weight and an extrinsic positive-end-expiratory pressure of 15 cm H<sub>2</sub>O. On the first day after the accident oxygenation remained poor (PaO<sub>2</sub>/FiO<sub>2</sub> 19.3 kPa or 145 mmHg) and the patient still met ARDS criteria. In view of the distribution of atelectasis mainly in the dorsal parts of the lung in combination with the severely impaired oxygenation, we decided to place the patient prone.

Following standard care in our unit, rolls were placed under both chest and pelvis to minimise pressure on the abdomen. The arms were flexed at the elbow with the shoulders in neutral position. During 8 h of prone posi-



**Fig. 1** Computed tomography of the thorax on admission: bilateral lung infiltrations with dorsal atelectasis.

tioning oxygenation improved rapidly to a PaO<sub>2</sub>/FiO<sub>2</sub> ratio of 46.8 kPa (351 mmHg). Despite low tidal volumes the PaCO<sub>2</sub> remained within normal range. The improvement in oxygenation persisted when the patient was turned supine, allowing stepwise reduction of PEEP and FiO<sub>2</sub>. On day 3 after the accident the patient was successfully extubated. A left-sided pneumothorax, which appeared on day 2, required insertion of a chest drain which was removed on day 6.

On day 7 the patient returned to the district general hospital. She recovered well and was discharged home 18 days after the accident at 36<sup>+5</sup> weeks of gestation with outpatient obstetric follow-up.

The remaining course of the pregnancy was uneventful up to the due date. At 40 weeks of gestation the patient was readmitted to hospital with dyspnoea and left-sided thoracic pain. Emergency caesarean section was performed under general anaesthesia because of increasing haemodynamic instability with resulting fetal bradycardia. After antacid prophylaxis, standard monitoring was established and the patient was placed supine with left lateral tilt. She was given thiopental 400 mg and suxamethonium 80 mg and an uneventful rapid sequence induction was performed. For maintenance of anaesthesia, she was given isoflurane and rocuronium 30 mg and, at the delivery of a live male infant, fentanyl 100  $\mu$ g. After the caesarean section a large haemothorax was identified on CT scan. A chest drain was inserted, yielding 1.5 L of blood followed by another 500 mL over the next 1.5 h. Four units of red cell concentrate were transfused.

The baby had Apgar scores of 5, 8 and 9 at 1, 5 and 10 min respectively and an umbilical vein pH of 6.79. He

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