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## Prone positioning does not affect survival in patients with ARDS

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## Keywords

Acute respiratory distress syndrome, prone position, respiratory failure

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## Context

The exact mechanism by which oxygenation is improved in patients ventilated in a prone position (compared to those ventilated in supine position) is not known but may be due to reductions in ventilation/perfusion (VQ) mismatching and chest wall compliance. Improvement in oxygenation is noted in about 60% of patients; significant numbers sustain improvement after being returned to a supine position. Careful positioning usually requires three to five people. Complications are rare, although hemodynamic instability (1.1% per prone cycle), accidental extubation (0.4%), central line dislodgement (0.4%), pressure ulcers (15%) (see Additional information [1]) have all been reported.

## Significant findings

Neither intention to treat nor per-protocol analysis revealed significant differences in the primary outcomes. The prone group had a larger improvement in ratios of partial pressure of arterial oxygen to the fraction of inspired oxygen ( $\text{PaO}_2/\text{FiO}_2$ ) at day 10 (63 versus 45 [ $P = 0.02$ ]) and slightly higher tidal volumes (10.7 versus 10.7 [ $P = 0.03$ ]). The prone group had a higher incidence of new pressure sores - 2.7% versus 1.9% ( $P = 0.004$ ). There were no significant differences in endotracheal tube or venous access displacement. However, prone positioning resulted in increased requirements for sedation (55%) and neuromuscular blockade (27.7%), and more episodes of transient airway obstruction (39%) and hypotension (12%). In a post-hoc analysis, a subgroup of patients with the lowest  $\text{PaO}_2/\text{FiO}_2$  ratio (<88) in the prone group had a lower 10-day mortality, but this did not persist to discharge from the ICU.

## Comments

The majority of patients with acute respiratory distress syndrome (ARDS) die not from hypoxemia but from multiple-organ failure (see Additional information [2]). Thus, improvement in surrogate outcomes (such as PaO<sub>2</sub>/FiO<sub>2</sub> ratio) with prone positioning may be misleading. Minimizing tidal volumes to prevent ventilator associated lung injury at the price of accepting lower physiologic values of PaO<sub>2</sub> and pH has led to improved survival (see Additional information [3]). The patients in this study were ventilated with larger tidal volumes than currently recommended. Although generally safe (in a research setting), routine use of prone positioning cannot be recommended as yet because appropriate timing and duration of prone positioning remain unknown.

## Methods

A total of 304 patients from 28 ICUs met the criteria (see Additional information [4]) for ARDS or acute lung injury. They were assigned randomly to either the prone ( $n = 152$ ) or supine group ( $n = 152$ ). Patients in the prone group were kept prone for at least six hours per day for 10 days. Physicians used standardized ventilator settings (see Additional information [5]). Primary endpoints were mortality at 10 days, ICU discharge and six months after randomization; secondary endpoints were oxygenation and organ dysfunction at 10 days.

## Additional information

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*Am J Crit Care* 1999, **8**:397-405.

2. **Montgomery AB, Stager MA, Carrico CJ, Hudson LD. Causes of mortality in patients with the adult respiratory distress syndrome.**

*Am Rev Respir Dis* 1985, **132**:485-489.

3. **The Acute Respiratory Distress Syndrome Network: Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome.**

*New Engl J Med* 2000, **342**:1301-1308.

4. **Bernard GR, Artigas A, Brigham KL, Carlet J, Falke K, Hudson L, Lamy M, Legall JR, Morris A, Spragg R: The American-European consensus on ARDS: definitions mechanisms, relevant outcomes, and clinical trial coordinations.**

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5. Slutsky AS: **Consensus conference on mechanical ventilation - January 28-30, 1993 at Northbrook, Illinois, USA.**

*Intensive Care Med* 1994, **20**:378.

Also, see the Editorial in the same issue of *N Engl J Med*:

**Slutsky AS: The Acute Respiratory Distress Syndrome, Mechanical Ventilation, and the Prone Position.**

*New Engl J Med* 2001, **345**:610.

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