Effect of prone positioning in patients with acute respiratory distress syndrome: a meta-analysis

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CRD summary
This meta-analysis assessed effectiveness of prone position versus supine position in patients with acute respiratory disease syndrome and concluded that prone position improved oxygenation and reduced mortality in the subgroup with severe illness. The authors’ conclusions appear reliable, based on a small number of trials. Absence of detail on patient characteristics limited judgement about generalisability of the evidence.

Authors’ objectives
To evaluate the effectiveness of prone position compared to supine position in patients with acute respiratory disease syndrome (ARDS).

Searching
PubMed, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL) and Cochrane Database of Systematic Reviews were searched in November 2006 with no language restrictions. Search terms were reported. Reference lists of retrieved papers were reviewed. Authors of relevant articles were contacted for further studies. There was no apparent attempt to retrieve unpublished trials.

Study selection
Randomised controlled trials (RCTs) that assessed the effectiveness of prone position compared to supine position in mechanically-ventilated adult patients in the intensive care unit were eligible for inclusion. Studies needed to report at least one of the outcomes: mortality; improvement in oxygenation; number of days of mechanical ventilation; and incidence of mechanical-associated pneumonia. The prone position had to be used for a minimum of six hours. Mortality outcomes of interest were those that occurred in the intensive care unit at 28 days and 90 days. Oxygenation was assessed as absolute change in PaO$_2$/FIO$_2$ ratio from baseline to early (12 hours to day two), intermediate (day four) and late (days seven to 10) periods.

Most trials compared sessions of variable times of at least six hours of prone positioning with supine positioning.

Two reviewers independently applied the inclusion criteria and selected studies.

Assessment of study quality
Trial quality was assessed with the Jadad scale of randomisation, allocation concealment, blinding and loss to follow-up. Use of allocation concealment was reported separately in the results as adequate, unclear, inadequate or not used.

Two reviewers independently assessed study quality and resolved discrepancies by discussion.

Data extraction
Dichotomous outcomes were extracted to enable calculation of odds ratios (OR) and 95% confidence intervals (CIs). Continuous outcomes were extracted to enable calculation of weighted mean differences (WMD) and 95% CIs. Authors were contacted for missing data.

It appeared that more than one reviewer extracted data.

Methods of synthesis
Odds ratios and WMD, both with 95% CIs, were each combined separately in a meta-analysis using a random-effects model.
Heterogeneity between trials was assessed by the $I^2$ statistic.

**Results of the review**

Five RCTs ($n=1,316$ patients) were included in the meta-analysis. Sample size ranged from 39 to 780 patients. Four studies reported methods of randomisation. Allocation concealment was adequate in all five trials. No treatment was blinded due to the nature of the intervention. Only two studies recorded losses to follow-up; the overall number was six (0.46%).

There was no statistically significant difference in intensive care unit mortality with prone position compared with supine position (three studies, $n=466$ patients). There was no significant difference in 28- to 30-day mortality (three studies, $n=1,231$ patients) or in 90-day mortality (four studies, $n=1,271$ patients).

For the subgroup of patients with higher illness severity, prone position demonstrated a significant reduction in mortality compared with supine position (OR 0.29, 95% CI 0.12 to 0.70; two studies, $n=113$ patients). Prone position led to a significantly higher and persistent improvement in oxygenation in early (WMD 51.5, 95% CI 6.95 to 96.05; four studies, $n=866$ patients), intermediate (WMD 43.87, 95% CI 13.86 to 73.88; three studies, $n=754$ patients) and late (WMD 24.89, 95% CI 15.3 to 34.48; four studies, $n=833$ patients) periods.

There were no significant differences in the number of days on mechanical ventilation (two studies, $n=831$ patients) or the incidence of ventilator-associated pneumonia (three studies, $n=967$ patients).

**Authors’ conclusions**

Prone position improved oxygenation in adult patients with respiratory distress syndrome and it may have reduced mortality in patients with higher illness severity.

**CRD commentary**

This review addressed a well-defined question in terms of participants, interventions, outcomes and study design. The search included appropriate electronic databases. It appeared that no attempts were made to retrieve unpublished studies, which meant that relevant data may have been missed and publication bias was a possibility. Two reviewers independently selected studies and assessed study quality with appropriate criteria. It appeared that attempts were made to minimise bias and error in the data extraction process. Potential sources of heterogeneity were explored and reported. Aspects of quality assessment were reported, but full use of the Jadad scoring system was not applied.

The authors’ conclusions appear reliable, based on a small number of trials. Absence of detail on patient characteristics limited judgement about the generalisability of the review findings.

**Implications of the review for practice and research**

**Practice:** The authors stated that because their review did not identify major adverse events, prone position should be considered early in the management of patients with ARDS and high severity of illness.

**Research:** The authors stated that well-designed prospective trials were needed to investigate further the effect of prone position.

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Not stated.

**Bibliographic details**

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.