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Critical Care Medicine

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Prone positioning in patients with moderate and severe acute respiratory distress syndrome: A randomized controlled trial. JAMA 2009; 302:1977–84

Acute respiratory distress syndrome (ARDS) may be associated with severe hypoxemia and high mortality. Prone positioning has demonstrated some efficacy as a rescue maneuver for severe hypoxemia and is recommended in patients with ARDS. This prospective, multicenter, unblinded, randomized controlled trial (the Prone-Supine II Study) of patients (N = 342) with ARDS receiving mechanical ventilation assessed the possible outcome benefits of prone positioning in patients with moderate and severe hypoxemia. Patients were randomized to undergo supine (n = 174) or prone (20 h/day; n = 168) positioning during ventilation, and the 28-day all-cause mortality was recorded.

Overall, similar mortality rates were observed in the prone and supine groups (28 days: 31.0 *vs.* 32.8%; *P* = 0.72 and 6 months: 47.0 *vs.* 52.3%; *P* = 0.33). In the subsets of patients with moderate or severe hypoxemia, similar mortality rates were observed (28 days: *P* = 0.62 and 0.31; 6 months: *P* = 0.85 and 0.19). Furthermore, a significantly greater proportion of patients in the prone group experienced at least one complication (*e.g.*, need for increased sedation, muscle paralysis, hemodynamic instability, and device displacement).

Interpretation

This well-designed study clearly indicates that routine prone position in mechanically ventilated patients with moderate to severe ARDS offers no benefits in terms of mortality and complication rates. This does not mean that prone position should necessarily be abandoned in all intensive care unit (ICU) patients with ARDS. However, when deciding to place ICU patients in the prone position to transiently improve oxygenation, the risk–benefit balance should be carefully weighed.

Comparison of routine and on-demand prescription of chest radiographs in mechanically ventilated adults: A multicenter, cluster-randomized, two-period crossover study. Lancet 2009; 374:1687–93

Although the American College of Radiology recommends daily chest radiographs for mechanically ventilated patients in

the ICU, there is a lack of consensus among physicians on whether or not this is necessary. In comparison with an on-demand strategy, in which chest radiographs are performed only if warranted by the patient's clinical status, routine daily radiographs increase a patient's radiation exposure and hospital costs.

To compare the benefit:risk of routine *versus* on-demand chest radiographs, a cluster randomized, open-label crossover study was conducted in 21 ICUs at 18 hospitals. Each center enrolled 20 consecutive patients per ICU, and patients were monitored until discharge from the unit or for up to 30 days of mechanical ventilation, whichever was first. The primary outcome measure was the mean number of chest radiographs per patient-day of mechanical ventilation.

Patients who received radiographs with the on-demand strategy (n = 425; 3,148 radiographs) received 32% less (3,148 *vs.* 4,607) radiographs compared with the routine group (n = 424; *P* < 0.0001). The number of chest radiographs that led or contributed to diagnostic procedures or therapeutic interventions was not significantly different between the two groups. Days of mechanical ventilation, length of stay in the ICU, and mortality were similar between the two groups.

Interpretation

This study clearly supports that the use of an on-demand *versus* routine strategy for chest radiograph in mechanically ventilated ICU patients is safe and cost effective. It should therefore be encouraged, provided that standardized, careful review of radiographs is performed.

Extracorporeal membrane oxygenation for 2009 influenza A (H1N1) acute respiratory distress syndrome. JAMA 2009; 302:1888–95

The 2009 novel swine-origin influenza A (H1N1) is associated with a large number of ICU admissions, especially during the southern hemisphere winter. A high proportion of ICU patients developed ARDS, and a small part of them were refractory to conventional treatment requiring extracorporeal membrane oxygenation (ECMO).

This prospective observational study of patients (N = 201) with ARDS associated with influenza A (H1N1) was conducted in 15 ICUs in Australia and New Zealand. Patients were treated either conventionally (n = 133) or by ECMO (n = 68). Compared with patients who underwent conventional treatment, patients who received ECMO were younger (36 *vs.* 44 yr, *P* = 0.02), had fewer comorbidities (*P* = 0.02), and required more vasopressors (57 *vs.* 34%, *P* = 0.02). Before commencement of ECMO, ARDS was severe: PaO₂/FiO₂ ratio at 55 with protective ventilation protocols, 67% of the patients had recruitment

maneuvers, 20% were prone positioned, 5% had high-frequency oscillation ventilation, 32% received nitric oxide, and 22% received prostacyclin. The initial mode of ECMO was venovenous in 93% of the patients. The median duration of ECMO support was 10 days, and the median circuit blood flow at 24 h was 4.9 l/min. Hemorrhagic and infectious complications occurred in 54 and 62% of the patients, respectively, during ECMO therapy. Compared with patients who underwent conventional treatment, patients who received ECMO had a longer duration of mechanical ventilation (18 *vs.* 8 days, $P = 0.001$), a longer ICU length of stay (22 *vs.* 12 days, $P = 0.001$), and a higher mortality rate (23 *vs.* 9%, $P = 0.01$). Hemorrhagic complications were associated with 74% of deaths in the ECMO group.

Interpretation

Despite the limitations of this study (*e.g.*, randomization, ECMO use timing, and transfer organization), overall mortality was low in the conventional group and the ECMO group. It may be hypothesized that a fast use of ECMO in ARDS before the onset of other organ failures is associated with a better outcome. However, this remains to be validated.

Suggested by: Hervé Dupont, M.D., Ph.D.

Perioperative Medicine

J. Lance Lichtor, M.D., and Joseph F. Antognini, M.D., Editors

Risks of complications by attending physicians after performing nighttime procedures. JAMA 2009; 302:1565–72

Despite increased public interest in the association between resident physician fatigue and medical errors, there are few studies assessing the relationships between experienced physicians' work hours, sleep, and patient safety.

A matched retrospective cohort study of procedures performed by attending physicians (86 surgeons and 134 obstetricians/gynecologists) who had been in the hospital performing another procedure involving for at least part of the preceding night (12:00 AM–6:00 AM, postnighttime procedures) was conducted to determine whether sleep opportunities are associated with risk of complications the following day. Matched control procedures included as many as five procedures of the same type performed by the same physician on days without preceding overnight procedures.

A total of 919 surgical and 957 obstetrical postnighttime procedures were matched with 3,552 and 3,945 control procedures, respectively. There were no differences in overall procedures with complications (5.4 *vs.* 4.9%) or preventable complications (4.6 *vs.* 4.7%) between postnighttime and control procedures, respectively. Differences were not observed in the types of complications between the two groups. Complications occurred more frequently (6.2 *vs.* 3.4%) in postnighttime procedures with sleep opportunities of 6 h or less compared with

more than 6 h. Postnighttime procedures completed after working more than 12 h had nonsignificantly higher complication rates compared with 12 h or less (6.5 *vs.* 4.3%).

Interpretation

Complication rates from elective procedures performed by attending surgeons who worked during the previous night and then got less than 6 h of sleep were higher (6.2%) than if sleep exceeded 6 h (3.4%). More work is needed to determine whether the same work rules that apply for residents or most attending anesthesiologists should also apply to attending surgeons.

Collected world and single center experience with endovascular treatment of ruptured abdominal aortic aneurysms. Ann Surg 2009; 250:818–24

The feasibility and effectiveness of endovascular aneurysm repair (EVAR) of ruptured abdominal aortic aneurysms (RAAAs) remain controversial because of a lack of consistent reports and prospective data.

This study used questionnaires to collect information about experiences with EVAR for RAAAs from 49 centers worldwide. Updated questionnaires were also obtained from 13 centers that were committed to providing EVAR treatment for all anatomically suitable RAAAs. Single study center data from one of the authors' institutions were also included.

Overall, 30-day mortality after EVAR in 1,037 patients was 21.2%. Centers performing EVAR for RAAAs whenever possible did so in 49.1% (28–79%) of patients, had a 30-day mortality of 19.7% (range, 0–32%) for EVAR patients ($n = 680$) and 36.3% (8–53%) for open repair patients ($n = 763$; $P < 0.0001$). Supraceliac aortic balloon control was obtained in 19.1%, and abdominal compartment syndrome was treated by decompression in 12.2% of EVAR patients, respectively.

Interpretation

Patients with RAAAs have a high mortality rate. EVAR was associated with lower mortality than open repair, suggesting that the former treatment might be better for patients with favorable anatomy.

Effect of high perioperative oxygen fraction on surgical site infection and pulmonary complications after abdominal surgery: The PROXI randomized clinical trial. JAMA 2009; 302: 1543–50

After abdominal surgery, surgical site infection is a common and serious postoperative complication. Optimization of perioperative oxygenation may provide a benefit *via* improved tissue oxygenation tension and resultant tissue healing. However, the data for use of high inspiratory oxygen concentrations during and immediately after surgery remain controversial.