Continuous positive airway pressure reduces respiratory complications following abdominal surgery

Synopsis


Objective: To review the evidence as to whether continuous positive airway pressure (CPAP) reduces postoperative pulmonary complications compared with standard care in patients undergoing major abdominal surgery. Data sources: OVID version of MEDLINE, EMBASE, CINAHL, and Cochrane Central Register of Controlled Trials, searched to November 2005. This search was supplemented by mail and phone follow up of authors to retrieve mortality data. Study selection: Randomised controlled trials involving adults who underwent elective major abdominal surgery other than abdominal aortic aneurism repair in which CPAP plus standard care (physiotherapy and oxygen therapy) was compared to standard care only. Outcome measures were postoperative pulmonary complications (PPCs), pneumonia, atelectasis, endotracheal intubation, and mortality. Data extraction: Two reviewers extracted data and discrepancies were resolved by consensus. Methodological quality was assessed using a scoring system between 0 and 11 where randomisation, concealment, blinding, patient selection, comparability of groups at baseline, treatment protocol, analysis of confounders, outcome definition, extent of follow-up, and intention-to-treat analyses were scored as 0 if not performed or 1 if performed in the study. Data synthesis: Of 735 studies initially identified by the search, 9 studies with a total of 654 patients met the selection criteria and were included in the review. The mean quality score was 6.2. Based on the quantitative pooling of the available data from these trials, there was a statistically significant reduction in PPCs in favour of CPAP, with a risk reduction of 0.34 (95% CI 0.15 to 0.48). This corresponds to a number needed to treat for one patient to benefit (NNT) of 14 (95% CI 10 to 32). There were also significant reductions in atelectasis: risk reduction 0.25 (95% CI 0.03 to 0.42), NNT of 7 (95% CI 4 to 64) and pneumonia: risk reduction 0.67 (95% CI 0.25 to 0.86), NNT of 18 (95% CI 14 to 49) using CPAP. Only two studies measured intubation and the pooled results showed a significant reduction in the need for intubation with CPAP: risk reduction 0.85 (95% CI 0.34 to 0.97). Too few data were available to calculate meaningful estimates for mortality. There was large variability in the application of both CPAP and standard care within these studies, although they represented an international perspective. Conclusion: The use of CPAP in the early management of patients after abdominal surgery reduces the incidence of PPCs, including atelectasis, pneumonia, and need for re-intubation.

Commentary

This review provides evidence for physiotherapists and other health care practitioners to make decisions concerning the use of postoperative CPAP to reduce PPCs in patients undergoing major abdominal surgery. The included studies are all randomised controlled trials examining adult patients and the outcomes that are assessed are clinically relevant.

The review provides evidence that the addition of postoperative CPAP to a regimen of physiotherapy and oxygen therapy in patients undergoing major abdominal surgery reduces their risk of PPCs, pneumonia, atelectasis, and endotracheal re-intubation. From both a clinical and socioeconomic point of view, this benefit is of significance. The number of patients that need to be treated to prevent one PPC is, however, high at an average of 14. Therefore, a challenge for physiotherapists is to stratify patients before surgery to direct CPAP treatment toward patients who may benefit most from this intervention. Furthermore, in patients who undergo upper abdominal surgery, preoperative physiotherapy may be more effective in reducing PPCs in patients at high risk for developing complications compared with patients at low risk (Dronkers et al 2008, Olsén et al 1997, Chumillas et al 1998).

Although the search strategy is comprehensive and the meta-analysis is sound, several issues warrant further discussion. The first is that data regarding duration of mechanical ventilation have not been described. Postoperative pulmonary dysfunction, including pneumonia, is commonly associated with a longer duration of mechanical ventilation, difficulty weaning the patient, and prolonged hospitalisation (Hunter 2006). Additionally, there is no international consensus about the definition of PPCs. Only the Centers for Disease Control and Prevention used explicit criteria for the definition of pneumonia (Dal Nogare 1994). The use of physician documentation of atelectasis and abnormal breath sounds is subjective and may be confounding the incidence of PPCs. Furthermore, as discussed by the authors, there is no common CPAP treatment regimen used in the studies described.

This well-conducted systematic review supports the use of CPAP in this patient population, particularly in the management of postoperative hypoxemia.

Erik Hulzebos

University Medical Center, Utrecht, The Netherlands

References