

# Editorial

## Prophylactic use of noninvasive positive pressure ventilation after video-assisted thoracoscopic surgery (VATS)

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Postoperative respiratory dysfunction occurs after 5-10% of major thoracic and abdominal surgery procedures (1). Prophylactic noninvasive positive pressure ventilation (NPPV) has been proposed as a way to mitigate postoperative respiratory dysfunction, thereby preventing reintubation, and the complications that come with it. Noninvasive ventilation and continuous positive airway pressure (CPAP) masks have undergone rapid advances since the 1980's (2,3), with extensive use of the mask for exacerbation of chronic obstructive pulmonary disease (COPD). Indeed, one of the more common indications for NPPV has been for hypercarbic COPD exacerbation with respiratory failure. It is important to make a distinction between noninvasive ventilation and CPAP. While noninvasive CPAP allows for constant positive airway pressure during inspiration and expiration, during NPPV the patient's spontaneous inspiratory effort triggers the ventilator to provide a variable flow of gas that increases until airway pressure reaches a selected level (4). This results in a pressure supported breath, and authors comment that compared to CPAP, NPPV allows for respiratory system muscle unloading, alveolar recruitment, oxygenation, CO<sub>2</sub> washout, and dyspnea relief (4).

Other authors have investigated whether NPPV indications can be extended to the post operative period to prevent post-extubation respiratory problems. The trial mentioned in the paper is that of Kindgen-Milles et al-who showed that prophylactic use of CPAP after extubation for 12-24 hours after thoracoabdominal aortic aneurysm surgery successfully reduced pulmonary complications, resulted in improved oxygenation, and resulted in shorter hospital stay than in the controls (5). In this study, the authors have recommended the use of continuous nasal CPAP against postoperative atelectasis because it is well tolerated and is a simple method for improving pulmonary function (5). A randomized controlled study from Turkey found that noninvasive ventilation associated with recruitment maneuvers prevented postoperative atelectasis and hypoxemia after cardiac surgery-but that the benefit had no effect on duration of mechanical ventilation, intensive care unit stay, and length of hospitalization (6). Zarbock et al found that using nasal CPAP prophylactically after cardiac surgery improved arterial oxygenation, reduced pneumonia rate, reintubation rate, and readmission to the ICU (7). Finally, in thoracic surgery patients undergoing lung resectional surgery, Perrin et al have shown that prophylactic use of NPPV in a preoperative and postoperative manner significantly reduced pulmonary dysfunction and reduced hospital stay after lung resection (8) Interestingly, Pasquina et al have found that prophylactic use of NPPV (9) compared to nasal CPAP resulted in a greater improvement of

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atelectasis, but this did not translate into measurable clinical benefit after cardiac surgery.

Another group has investigated the use of NPPV as rescue, rather than prophylactic strategy to prevent impending respiratory failure. Squadrone et al (10) looked at patients who had undergone upper abdominal surgery of at least 90 minutes exhibiting difficulty with oxygenation (P/F ratio < 300 mm Hg). Patients were randomized to receive either oxygen via air-entrainment mask at FiO<sub>2</sub> of 0.5 or CPAP at 7.5 cm H<sub>2</sub>O. The authors found that the CPAP group had a markedly lower intubation rate, and lower rates of pneumonia and sepsis. Another study looked at NPPV as a rescue strategy in post operative respiratory failure after lung resection, and found NPPV to reduce reintubation rate, and even reduce in hospital mortality (11).

With all of these redeeming studies supporting NPPV in the post operative period, due caution against the use of NPPV as a rescue therapy in any patient who is profoundly acidotic, hemodynamically unstable, unconscious, or otherwise unable to protect their airway should be exercised.

In their article, Liao et al looked at the prophylactic use of NPPV strategy in post-thoracic surgery patients (12). The authors are to be commended on randomizing patients into both a control group and a NPPV group. The study found that there was no significant difference of total post operative pulmonary complications between the two groups, and that no significant adverse effects of NPPV therapy were observed, with NPPV reducing inadequate lung expansion rate, and volume of residual cavity calculated by CT scan. The authors use NPPV for what seemed like a short duration of time in the treatment arm postoperatively (13.5 ± 4.9 hours, ranging from 6.5 to 23 hours over a 3 day time period). Importantly, the impact on lung function, lung re-expansion, and volume of residual cavity after operation was assessed via CT scan or pulmonary function study one week later-or presumably at least 4 days after the conclusion of NPPV therapy. One questions the clinical significance of this time interval-as many complications of thoracic surgery including atelectasis, wheezing, and aspiration would also be common in the acute post operative period. One questions as to whether the 13.5 hours of total NPPV therapy in the 3 days after operation was a sufficient amount of time in which to see a difference between the 2 treatment arms. In the Perrin study quoted earlier, hospital stay was significantly reduced in the treatment arm-however, NPPV was initiated in these patients one whole week prior to operation and continued over a similar three day course in the postoperative period. Furthermore, respiratory parameters were checked in the acute postoperative period-specifically on postoperative days 1, 2, and 3 (8).

Although the baseline lung function parameters between the two groups seem similar, the indications for operation within the study vary widely. Indications for elective thoracic surgery

were relatively heterogeneous and included malignant tumor, COPD with bulla, benign lung tumor, organized pneumonia, bronchiectasis, esophageal carcinoma, and pericardial cyst. It is unclear what the extent of surgery was for each of the patients-time in the operating room-and whether or not lung resection was needed. It is reasonable to expect, for example, that post operative complications would vary depending on the type of surgery endured by the patient.

It is revealed in the discussion section of the paper that every patient of the 50 in the study were subjected to video-assisted thoracoscopic surgery (VATS), and not open thoracic operations, and the authors concede this may be one of the reasons why the current study failed to show a significant difference in the incidence of post operative pulmonary complications in the NPPV treatment arm. In the Perrin study, for example, the included patients all underwent posterolateral thoracotomy (8).

From review of the papers detailed above, and the results of the current study, it seems that NPPV, whether delivered by face mask, or by nasal mask does prophylactically improve pulmonary mechanics in the post operative period. Whether this can definitely translate to a clinically significant benefit in post operative thoracic surgery patients remains to be seen. The current study does not show, at least for now any long term benefit or benefit in morbidity from NPPV for patients who are status post VATS.

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