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EDITORIAL

N. S. Hill

Noninvasive ventilation routine therapy for community-acquired pneumonia? Not so fast!

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N. S. Hill (✉)
Pulmonary Division APC 479A,
Rhode Island Hospital, 593 Eddy Street,
Providence, RI 02903, USA
E-mail: nicolas_hill@brown.edu
Phone: +1-401-4443560and+1-401-4446205
Fax: +1-401-4445914

Noninvasive positive pressure ventilation (NPPV) – the use of mask ventilation to avoid airway invasion in patients with respiratory failure – has seen rapidly expanding use in intensive care units throughout the world. Solid evidence is accumulating to support these applications. For several years, NPPV administered using pressure support ventilation (PSV) has been widely accepted as the ventilatory modality of first choice in selected patients with COPD exacerbation [1]. However, the role of NPPV for most non-COPD causes of respiratory failure remains controversial.

In particular, patients with acute hypoxemic respiratory failure, i.e., those with respiratory distress and hypoxemia related to acute pulmonary edema, the acute respiratory distress syndrome (ARDS), pneumonia or trauma [2], have generated debate regarding the appropriateness of using NPPV. Wysocki et al. [3] observed a number of years ago that patients with non-COPD causes of acute respiratory failure did poorly with NPPV unless they had hypercapnia as well. More recently, however, a randomized controlled trial by Antonelli et al. [4] reported rapid improvement in oxygenation, reduced need for intubation, fewer infectious complications, shortened lengths of ICU stay, and lower mortality among non-hypercapnic patients with acute hypoxemic respiratory failure. A problem with these studies is that the diagnostic category of "hypoxemic respiratory failure" is too broad to apply to individual patients. Consequently, more recent studies have focused on some of the individual diagnoses within the larger category.

With regard to acute pulmonary edema, for example, a number of randomized, controlled trials support the use of CPAP (10–12.5 cmH_2O) as the noninvasive technique of first choice to improve oxygenation and avoid intubation [5, 6, 7]. Although some studies have reported success with the use of NPPV (i.e., pressure support via mask) in these patients [8, 9], others have raised concerns about use in conjunction with acute myocardial ischema or infarctions [10]. Although the final answer regarding the use of CPAP versus NPPV for acute pulmonary edema remains unclear, this experience emphasizes the importance of performing randomized, controlled trials to establish that our well-intentioned therapies are not adding to morbidity rather than reducing it.

Acute pneumonia is another etiology of acute respiratory failure within the larger rubric that has garnered considerable individual attention. Earlier reports identified pneumonia as a risk factor for NPPV failure and cautioned about its use in such patients [11]. However, more recent studies have reported NPPV success in patients with acute pneumonia, particularly in immunocompromised patients with respiratory failure [12, 13]. These patients appear to fare better with NPPV compared to conventional therapy including intubation, presumably because of the lower rate of intubation-related complications including ventilator-associated pneumonia and sepsis [14].

Attention has also focused on patients with severe community-acquired pneumonia. In a randomized controlled trial on such patients, Confalonieri et al. [15] recently reported that NPPV lowered intubation rate, length of ICU stay, and 2-month mortality. However, these beneficial actions were confined to the subgroup of patients with underlying COPD. In this issue of *Inten-*

sive Care Medicine, Jolliet et al. [16] provide another perspective on the use of NPPV for severe community-acquired pneumonia. Their study differs from that of Confalonieri in that it is a prospective observational study that excluded patients with underlying COPD. Jolliet et al. [16] enrolled 24 consecutive patients with severe community-acquired pneumonia defined by American Thoracic Society Criteria [17], nine of whom were immunocompromised by the human immunodeficiency virus or chemotherapy. Patients were treated with sequential "trials" of face mask pressure support ventilation that lasted from minutes to hours as tolerated at average inspiratory and expiratory pressures of 17 cmH_2O and 4 cmH_2O, respectively.

The investigators found that oxygenation improved and respiratory rate fell in 22 of the 24 patients during the initial trial, but 66 % of patients needed intubation after an average of 1.3 days, mainly because of deteriorating gas exchange and unremitting respiratory distress. The Project Research in Nursing (PRN) index, an instrument used to estimate the amount of nursing care required by patients in acute care settings, was higher during the 24 h following intubation than following initiation of NPPV, and the percentage of time devoted to respiratory therapy interventions was the same. The authors concluded that "a trial of [NPPV] is warranted" in patients with severe community-acquired pneumonia, because outcomes of patients who succeeded with NPPV were better than those who required intubation and NPPV does not appear to add to nursing workload. Further, the need for intubation was apparent "very early" so that the authors were not concerned about inordinate delays.

The authors are to be commended for adding to evidence on use of NPPV in a category of respiratory failure that has not yet been adequately studied and for carefully acknowledging the weaknesses inherent in their study design. However, in view of these weaknesses, it is difficult to justify the conclusion that a trial of NPPV is warranted in these patients. Lacking a control group, the authors cannot know how their patients would have fared had they been managed without NPPV. It is not surprising that the patients who required intubation had worse outcomes; every NPPV study published to date has made the same observation. However, the need for intubation was undoubtedly a marker for greater illness, and it cannot be concluded that a randomized control group would necessarily have required more intubations and had worse outcomes than patients randomized to receive NPPV.

In fact, the intubation rate of 66 % is remarkably high and can hardly be construed as a finding that supports the contention that a trial of NPPV is routinely warranted. The authors comment on the disparity between the high intubation rate in their study and lower rates in other studies, including that by Confalonieri et al. [15], but they are unable to fully explain it. The average PaO_2/FIO_2 ratio was lower in the Jolliet study (104) than in the Confalonieri study (175), and this may explain the difference. In addition, the exclusion of COPD patients from the Jolliet study undoubtedly predisposed to a higher intubation rate. On the other hand, the patients with pneumonia and underlying COPD are not the ones in question. Evidence supports the use of NPPV in patients with COPD whether or not they have pneumonia; it is pneumonia patients without COPD, such as those in the Jolliet study, for whom more supportive evidence is needed. Unfortunately, lacking randomized controls, it can only be concluded from the Jolliet study that the need for intubation was extraordinarily high, even among patients who responded favorably initially, and it is unclear that other outcomes were improved by NPPV.

The favorable acute response to NPPV observed by Jolliet et al. [16] is encouraging but does not make it any more likely that long-term outcomes were improved by NPPV. In their recent study of noninvasive continuous positive airway pressure (CPAP) to treat acute hypoxemic respiratory failure, Delclaux et al. [18] also found significant early improvements in oxygenation and respiratory rate in their treatment group. However, eventual intubation and mortality rates were not reduced by CPAP compared to randomized controls treated with oxygen therapy alone despite these early improvements.

Jolliet et al. [16] argue that a trial of NPPV is warranted in patients with severe community-acquired pneumonia partly because failure is apparent "very early", i.e., after an average of 1.3 days. Of course, "very early" is a relative term. It is notable that Wood et al. [19] found a stronger trend for a higher mortality rate in the NPPV group than in controls in their randomized controlled trial of NPPV in the emergency setting. The 25-hour delay before NPPV patients who failed were intubated was thought to be inordinate and a possible contributor to excess morbidity. Likewise, a 1.3-day delay could be viewed as excessive rather than "very early" and a possible contributor to morbidity, particularly if clinicians wait until emergency intubation is necessary.

It is remarkable that the Jolliet study found no increase in nursing time consumption attributable to the application of NPPV, considering that these authors were the first to report excessive consumption of nursing time during the application of NPPV [20]. They attribute their earlier finding to inexperience and the use of nasal rather than oronasal masks. Alternatively, it is possible that the PRN index is not sufficiently sensitive. The authors allow that the PRN index probably underestimates the time spent administering respiratory care. Short of using a method for recording or sampling actual time spent, it is possible that the PRN index is not suffi-

cient to detect differences in time spent administering respiratory care, particularly during initiation when other studies have detected more time expenditure attributable to NPPV [21, 22].

Perhaps the greatest value of the Jolliet study is to highlight the need for more randomized studies. Presently, there is no convincing evidence to support the routine use of NPPV in non-COPD, non-immunocompromised patients with severe community-acquired pneumonia. The Confalonieri study found no benefit of NPPV compared to conventional therapy in this subgroup of patients, and the high intubation rate in the Jolliet study raises concerns that morbidity may not be reduced or could even be increased by use of NPPV. Pending properly designed trials, it is difficult to conclude on the basis of current evidence that a trial of NPPV is "routinely" warranted, at least in most of these patients. However, a cautious trial could be undertaken in patients who have a higher likelihood of succeeding, i.e., those who are younger and less hypoxemic than the average patient in the Jolliet study. Patients undergoing a trial should be observed closely and intubated without delay if their gas exchange defect or respiratory distress worsens within a few hours of initiation.

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