



EDITORIAL

Noninvasive ventilation: When, how and where?☆

Ventilación no invasiva: ¿cuándo, cómo y dónde?

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Acute respiratory failure (ARF) of any origin is commonly seen in the Intensive Care Unit (ICU). When clinical improvement of ARF is not achieved with the usual medical treatment, tracheal intubation and invasive mechanical ventilation (MV) prove necessary—a situation which in turn implies a significant increase in morbidity–mortality.^{1,2}

In the late 1990s, the need to avoid the complications of intubation and MV led to the first studies of noninvasive MV (NIMV). These pioneering studies yielded encouraging results in a very concrete type of critically ill patient, i.e., individuals with exacerbated chronic obstructive pulmonary disease (COPD),³ but also opened the way to application of the technique to other types of patients with ARF. At present, and as a result of improved knowledge of the technique, the gradual accumulation of experience, and technological improvements in the devices used, NIMV has become a common technique in the ICU.

The use of NIMV has increased in Spain in recent years,⁴ and although its utilization in this country is comparatively greater than in other parts of the world,⁵ the technique is probably still underused. NIMV is commonly employed in patients with exacerbated COPD or in individuals with acute lung edema. Nevertheless, its use is still exceptional in application to other disorders such as acute respiratory distress syndrome (ARDS) or asthma, for example.

At present there is little doubt that correct indication and usage of NIMV in the ICU can avoid tracheal intubation and

MV, improve oxygenation and respiratory mechanics, reduce complications, shorten hospital stay, and reduce patient mortality.⁶ However, does this justify the use of NIMV in all critical patients and in all circumstances? The answer is clearly no.

Initially, most studies of NIMV in the ICU were carried out in patients with COPD exacerbation or acute cardiogenic lung edema. Posteriorly, the published information has been abundant and categorical in affirming the benefits of NIMV in patients of this kind, and it is clear that when ARF is secondary to such disorders, NIMV should always be viewed as a first line treatment option.^{7–9}

NIMV has also been shown to improve the prognosis in immune depressed patients and in individuals with hematological diseases who develop ARF.^{10,11} These patients, when admitted to the ICU and requiring intubation with MV, have a high incidence of ventilator-associated pneumonia (VAP), and important morbidity–mortality.

In contrast, the evidence of the benefits of NIMV in application to other causes of hypoxemic ARF is less clear. In the specific case of ARF secondary to community-acquired pneumonia or ARDS, the success rate of NIMV is lower and highly variable, depending on the type of patient, the experience of the healthcare professionals using the technique, and the devices employed. Belenguer-Muncharaz et al.¹² have published a study of the technique in patients with pneumonia due to H1N1 viral infection that clearly illustrates this variability in the application of NIMV. Despite the studies that describe benefits with NIMV in patients with hypoxemic ARF, the use of the technique in these cases is still controversial and subject to important debate, and no indications for its utilization have yet been established in the international consensus-based guides.¹³ This lack of

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recommendation is due to the poor results described in some studies in relation to NIMV failure. In these studies, the success of the technique in patients with hypoxemic ARF was associated to globally improved results. However, failure of the technique and the ultimate need for intubation and MV in those patients in which NIMV failed gave rise to a significant increase in mortality.^{14,15}

In this issue of *Medicina Intensiva*, Delgado et al.¹⁶ describe results that contrast with those mentioned above. According to these authors, the failure of NIMV in patients with hypoxemic ARF does not imply a worsened prognosis or increased mortality. In another article also published in *Medicina Intensiva*, Fernández-Vivas et al.¹⁷ obtained similar results. However, caution is required in interpreting these findings, since both studies were not originally designed to evaluate this aspect of NIMV. Specifically, the first of these two studies was a sub-analysis based on a previous prospective trial, while the second publication was a retrospective, multicenter descriptive study.

Having seen such discrepancy among the different studies referred to NIMV and the lack of clear recommendations for using the technique on the part of the different medical societies, we must ask ourselves the following question: In which cases of hypoxemic ARF should we initially apply NIMV without this decision having a negative impact upon the patient course?

In order to obtain the maximum benefit from the technique and improve the prognosis of patients of this kind, it is essential to know when, how and where to apply NIMV. Furthermore, it is important to know and quickly identify failure of the technique, followed by rapid intubation and MV in such situations.

Taking into account the literature to date, we consider that a reasonable and cautious recommendation designed to maximize the options for success with NIMV in patients with hypoxemic ARF is to ensure careful selection of those individuals amenable to application of the technique. Specifically, we should select hemodynamically stable patients with fewer than two failing organ systems, and who maintain a sufficient level of consciousness. NIMV should be started early, by personnel experienced in the use of the technique, and in Units in which adequate patient monitorization can be guaranteed. Special attention must focus on the clinical course of elderly patients, with higher severity scores, labored breathing, and with a diagnosis of pneumonia or ARDS as the cause of hypoxemic ARF. Consideration is also required of the appearance of signs suggestive of NIMV failure, such as a lack of clinical improvement and deficient oxygenation in the first hours following the start of NIMV. Such intensive monitoring in the ICU will ensure the early detection of NIMV failure and allow us to perform rapid intubation with protective MV is necessary.

Other aspects of NIMV that must be considered are the use of the technique in difficult weaning scenarios or in facilitating early extubation in hypoxemic ARF.¹⁸ Although these additional aspects fall outside the scope of this editorial and will not be addressed here, they constitute potentials future lines of research on NIMV in critical patients.

In conclusion, and as a summary, based on the existing literature we can offer the following questions and answers:

When should noninvasive mechanical ventilation be used?

- In cases of ARF in immune depressed patients or with hematological malignancies who are hemodynamically stable and maintain a sufficient level of consciousness.
- In cases of ARF secondary to decompensated COPD or acute cardiogenic lung edema, thoracic trauma or atelectasis in patients who are hemodynamically stable and maintain a sufficient level of consciousness.
- In cases of hypoxemic ARF secondary to community-acquired pneumonia and/or ARDS in patients who are hemodynamically stable and maintain a sufficient level of consciousness.
- In the prevention of ARF after extubation in those patients at a high risk of developing ARF following extubation due to antecedents of COPD or previous heart failure.

How and where should noninvasive mechanical ventilation be used?

- NIMV should be started early, by personnel experienced in the use of the technique, and in Units in which adequate patient monitorization can be guaranteed.
- In cases of hypoxemic ARF, special attention should focus on the clinical course of elderly patients, with higher severity scores, labored breathing, with a diagnosis of pneumonia or ARDS as the cause of hypoxemic ARF, and with a lack of clinical improvement and oxygenation after the start of NIMV.

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