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POINT OF VIEW

Respiratory support therapy after extubation: Who and how?[☆]

Soporte respiratorio tras la extubación: ¿a quién y cómo?

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Who?

Customarily, since there has never been enough scientific evidence to be able to come up with one general recommendation of use of any type of respiratory support after extubation,[1] traditionally, patients of this clinical setting have received conventional oxygen-therapy (COT) only.

On the other hand, extubated patients who have recovered from the process that triggered the need for invasive respiratory support are categorized into two (2) different groups based on their risk of developing respiratory failure after extubation, or extubation failure, depending on whether they have, at least, one of the factors associated with such risk. Although no definitive model has validated these factors, several different models have been used so far, mainly epidemiological,[2] since they have the strongest level of evidence of all, and due to their applicability and clinical utility, are clearly superior to the physiological varia-

bles obtained during the process of tolerance assessment to respiratory support withdrawal.

The publication of several clinical trials recently allowed increasing the evidence needed to generate strong recommendations (although the degree of evidence is moderate) with respect to the preventive use of non-invasive mechanical ventilation (NIMV) in patients with high risk of respiratory failure after extubation[3]; however, its application, at clinical level, and in real life, is still scarce, probably due to several reasons such as the significant delay with which this evidence was generated; the disparity of such evidence with one recommendation conditioned by a low-quality evidence[4] that, in turn, may be conditioned by the lack of a standard in the prediction of extubation failure and at a more practical level; the difficulties applying the NIMV when it comes to the availability of machines for this preventive indication; and the problems of tolerance it generates in a variety of patients who do not have respiratory discomfort when they initiate the therapy. This may even explain the significant increase in the incidence of respiratory failure after extubation in patients with NIMV compared to those who received respiratory support with high flow oxygen therapy (HFOT) in a recent clinical trial.[5]

The development of HFOT as an alternative to avoid the difficulties of NIMV has triggered a recent scientific

advancement that, eventually, has led to generating several therapeutic indications.

While we wait until a definitive model for the prediction of respiratory failure after extubation has been developed, the aforementioned actual classification into two (2) groups still stands. On the one hand, low-risk patients who benefit from using HFOT compared to COT,[6] with positive results in preliminary meta-analyses with heterogeneous populations.[7] The problem in this group of patients is that, although they represent a small percentage of the total (depending on the case-mix and up to a maximum of 40%, approximately), we could not find any subgroups that clearly would, or would not, benefit from preventive HFOT. Also, cost-effectiveness in this group was not studied.[8]

When it comes to the group of high-risk patients, and taking into consideration that more evidences recommend the preventive use of NIMV, the results[7] confirm the non-inferiority of HFOT compared to the NIMV at overall population level. However, in this group we did find one subgroup of patients where non-inferiority was questionable, meaning that we would need to re-think the categorization of risk of reintubation failure into three (3) groups, and divide the high-risk group into two (2) new groups—one intermediate-risk group (patients with a maximum of 3 factors), and one high-risk group (patients with a maximum of 4 or more factors). With this new categorization, in intermediate-risk patients, the non-inferiority of HFOT would be guaranteed, while in high-risk patients it would not, meaning that the prior recommendation of preventive NIMV would need to be kept.[8] Today, an alternate model is in the pipeline to be able to determine the risk of failure based on the presence of specific factors, and not on the total number of factors. However, we should remember that the original study excluded patients with hypercarnic COPD during the withdrawal test - considered patients at high risk of failure.

How?

On the practical aspects for the optimization of the use of HFOT as a preventive treatment for the management of respiratory failure after extubation, today this is still a field under development. The most significant points are:

Time of application: although the two (2) randomized trials used HFOT for a fixed period of 24 h,[4,7] other studies found better results with prolonged uses (48 h) as the main difference between the application protocols. Although this hypothesis has not been confirmed yet, several mechanisms that may explain the benefits are dependent upon the time of application, with benefit increases after 24 h of continuous application, such as convenience for the patients, and pulse-oximetry improvement. Today, the traditional main problem of the HFOT applicability for prolonged periods of time has been worked out since there are devices available that do not require medicinal oxygen and can be perfectly used in conventional hospital wards.

Applicable optimal flow: although we are lacking specific studies in extubated patients, the main message here is that, within the flow range of clinical application (between 30 and 60 bpm) during the acute phase of respiratory failure, there are more benefits with higher flows

for most clinical parameters,[9] without compromising any safety parameters. This includes parameters such as inspiratory effort; end-expiratory lung volume; oxygenation; and dynamic compliance, although the CO_2 removal and work of breathing are parameters where the maximum benefit is obtained with low-range flows. Until these patients are studied more specifically, it seems reasonable to prescribe the oxygen flows based on the clinical tolerance reported by the patient.[10]

Prediction of early failure: once again, this has been conducted in patients in the acute phase of hypoxemic respiratory failure.[11] Today, the ROX index is in its validation stages for patients treated with HFOT with respiratory failure secondary to community pneumonia (ClinicalTrials.gov Identifier: NCT02845128). The generalization of these results to be able to predict the HFOT failure in extubated patients seems excessive, which is why the actual recommendation should prioritize the criterion of safety, same as it happens with patients on NIMV. Until one predictor is validated in extubated patients, both on HFOT and NIMV, the safety parameters from the clinical trials conducted should be observed here, including the use of bedside pre-established re-intubation criteria (adjusted to local protocols), and the use of HFOT and NIMV for fixed periods of time between 24 and 48 h (also adjustable to the local conditions of each unit).[4,7]

Conflict of interests

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