

Does pH Simply Play a Ventilatory Role when it Comes to the Success in the Noninvasive Ventilation?

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In the well-known study of Confalioneri, *et al.* pH was one of the most important factors in the success of the noninvasive ventilation (NIV) [1]. Even if the $p\text{CO}_2$ is the gasometrical value that directly measures the ventilation, in the multivariate analysis it disappears favouring pH. Therefore, the pH is believed to be the prognostic ventilatory factor in the noninvasive ventilation. Confalioneri, *et al.* objectified that a $\text{pH} < 7.25$ portrayed an odd ratio ready for the failure of the NIV of 1.97 at the beginning and 21.02 two hours afterwards. This finding has resulted in the fact that nowadays $\text{pH} < 7.25$ is being used as an indicator of the severe ventilatory problem in hypercapnic patients undergoing NIV.

Previous studies such as the ones of Pacilli, *et al.*, Roberts, *et al.* [2,3]; reviews such as the ones provided by Bourke, *et al.*, Hess, *et al.* and Nava, *et al.* [4-6] and The British Thoracic Society guideline [7] include $\text{pH} < 7.25$ as a factor of failure for the NIV. Nonetheless, the studies put forward by Lemyze, *et al.*, Kida, *et al.*, Merlani, *et al.* and Moretti, *et al.* [8-10] did not manage to objectify the fact that the low levels of pH could present a higher probability of failure of the NIV.

From where does this discrepancy stem from? In order to answer this question, we should first get acquainted with the main factors that alter the pH. On the one hand, we find the $p\text{CO}_2$ and therefore, it is related with the already known ventilation. On the other hand, we find bicarbonate, which is related to the renal function. This balance is maintained thanks to Henderson-Hasselbalch's equation. In conclusion, pH is related not only with ventilation but also with the renal function.

On the studies previously mentioned, just Pacilli, *et al.*'s [2] study analyze the renal failure even if this is not done in depth. In fact, it is frequently found that in the studies bicarbonate is not present. Thus, the analysis of the effect of pH in the prognosis of the NIV is biased given that it does not count on the renal function.

Our research group carried out a study whose objective was to establish the relationship between the Acute Kidney Injury (AKI) and the survival within 90 days in patients that have undergone NIV in the emergency department. 174 patients were analysed with diagnosis of acute pulmonary edema (APE) and exacerbation of chronic obstructive pulmonary disease (ECOPD). The global intra-hospital mortality was of a 14.3% and a prevalence linked to AKI of a 17.2%. The mortality was of a 32% in patients with an alteration of their renal function in comparison to a 11.1% in those patients with a normal function (RR 2.554; IC 95%: 1.32 - 4.92. $p < 0.001$). This linkage between mortality and AKI was not only present in APE but also in ECOPD. With regards to pH lower values were objectified in patients with AKI. Nevertheless, the pH was not maintained as an independent predictor of mortality in the Cox regression analysis.

Therefore, to answer the question previously posed, pH only plays a role when it comes to ventilation as a factor of success in NIV. However, these data lead us to a number of questions. For instance, is pH a factor of prognosis independent for the success/failure of the NIV? Or is it a distractive factor in patients with AKI? If it is an independent factor, what is the role that ventilation plays? And what about the renal function?

These questions are still looking for their answers. However, what we could conclude with is by saying that AKI is the “long forgotten” factor of prognosis in the NIV.

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