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Title: Acidotic hypercapnia: Beyond type 1 and type 2 respiratory failure

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Body: Introduction: The indications of non-invasive ventilation (NIV) have widened in the recent years, which is now used in treating hypercapnia with acidosis in a variety of patients. However, in many of the patients treated with NIV, the acidosis may have preceded the hypercapnia. The current case series from our 11-bedded ward based NIV unit describes such acidotic hypercapnia: hypercapnic respiratory failure following metabolic acidosis. Methods: Time series of Arterial Blood Gas (ABG) findings in 4 patients with acidotic hypercapnia with a background of COPD confirmed with spirometry. Results: The ABGs for cases 1 and 2 showed a rising CO₂ following the onset of a metabolic acidosis; a mixed metabolic and respiratory acidosis in patients 3 & 4 - with the acidosis preceding hypercapnia (Case 3) or being out of proportion to CO₂ rise (Case 4). All four patients improved with initiation of NIV combined with active fluid/electrolyte management. A sample ABG time series (Case 3) showing initial eucapnia with acidosis leading to hypercapnia is shown:

Acidosis preceding hypercapnia on ABG Time series

Time:	Day 1: FIO ₂ =0.28	Day 2: FIO ₂ =0.24	Day 2: 1 hour post NIV	Day 2: 4 hours post NIV
pH	7.336	7.143	7.367	7.462
pO ₂	11.2	8.76	6.55	7.91
pCO ₂	5.56	11.8	7.51	5.7
Bicarbonate	21.6	N/A	29.4	29.8
Base Excess	-3.2	-4.0	+3.0	+6.2

The classic Acidotic Hypercapnia picture

Discussion: Acidotic hypercapnia could be a further subtype of respiratory failure (akin to previously described Type 4 or shock-muscle hypoperfusion related respiratory failure) for which larger confirmatory studies and prospective trials to establish the efficacy and timing of NIV are required.