

Paradigm Shift in Understanding and Interpretation of Arterial Blood Gas Reports

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ABSTRACT

The various approaches for Arterial Blood Gas interpretation are the Physiological Approach, Base Excess Approach and Physicochemical Approach by FencI-Stewart. The physiological approach which is based on bicarbonate carbon dioxide buffer system is very simple and easier. Standard base excess as a parameter for metabolic acid base disorder is well validated for accuracy and clinical correlation. According to Stewart's theory, the respiratory acid base disorders are due to alterations in $p\text{CO}_2$ which is similar to the traditional approach, but the metabolic disorders are due to primary alterations in strong ion difference (SID) and plasma concentration of weak non-volatile acids namely albumin and phosphate [ATOT].

The calculated hydrogen ion concentration equivalent of standard bicarbonate is called the 'non-respiratory' hydrogen ion concentration. The bicarbonate concentration is a variable parameter because it varies with the changes in $p\text{CO}_2$ values. The actual bicarbonate and the standard bicarbonate concentrations are approximately equal under normal ventilation. But in hypoventilation and hyperventilation the two values differ and deviate from each other. The novel ratios derived using actual bicarbonate, standard bicarbonate and carbonic acid (derived from $p\text{CO}_2$) values render some clues in discriminating various acid base disturbances which can be applied for the construction of a graphical tool for ABG interpretation.

The non-respiratory hydrogen ion concentration is inversely proportional to the Strong ion difference and directly proportional to the total concentration of dissociated weak acids (A^- or A^- tot) and the anion gap. Delta Gap is directly proportional to the main strong ion difference. The concept of non-respiratory hydrogen ion concentration forms a connecting link between the various acid base approaches required for better understanding of the ABG interpretation.

Keywords: Various ABG approaches, Paradigm shift, ABG interpretation

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