Strong Ion Difference assessment: point-of-care or central laboratory?

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Argomento: Altro

Introduction: The Strong Ion Difference (SID) is essential for the assessment of acid-base equilibrium, thus requiring an accurate measurement of plasma electrolytes. Currently there is no gold standard for electrolyte measurements and SID computation. Differences in electrolyte values obtained with point-of-care (PoC) and central laboratory (Lab) analyzers have been reported [1,2]. In previous studies [3,4] we have shown that changes in PCO_2 induce electrolyte shifts from red blood cells to plasma (and vice versa), yielding variations in SID. Aim of the present *in-vitro* study was to induce SID changes through acute changes in PCO_2 and compare values of electrolytes and SID obtained with PoC and Lab techniques.

Methods: Blood samples from 10 healthy volunteers were tonometered (Equilibrator, RNA Medical) with three gas mixtures at fractions of CO_2 (FCO_2) of 2, 12, and 20%. Electrolytes were measured quasi-simultaneously with a PoC analyzer (ABL800 FLEX, Radiometer) and a routine Lab method (COBAS 8000 ISE, Roche). For both techniques a simplified SID was computed as sodium+potassium–chloride.

Reults: Bland-Altman analysis of SID calculated with PoC and Lab showed a proportional bias (slope=0.64, r^2=0.55, $p<0.001$), indicating a variable agreement between methods according to the average SID value (Fig.1). SID values measured with PoC and Lab at different FCO_2 differed significantly ($p<0.001$, Fig.2). A similar discrepancy was observed for chloride ($p<0.001$, Fig.2), while sodium ($p=0.439$) and potassium ($p=0.086$) were similar.

Conclusions: SID measured with PoC and Lab differed significantly, mainly due to a variable discrepancy in chloride. Our findings suggest that our PoC analyzer is superior to the Lab, in measuring electrolytes and thus compute SID.

References:

- 1) Morimatsu H et al. Anesthesiology 98:1077-1084,2003
- 2) Jain A et al. International Journal of Emergency Medicine 2:117-120,2009
- 3) Langer T et al. Critical Care 22(suppl 1):82,2018
- 4) Langer T et al. Journal of Critical Care 30:2-6,2015

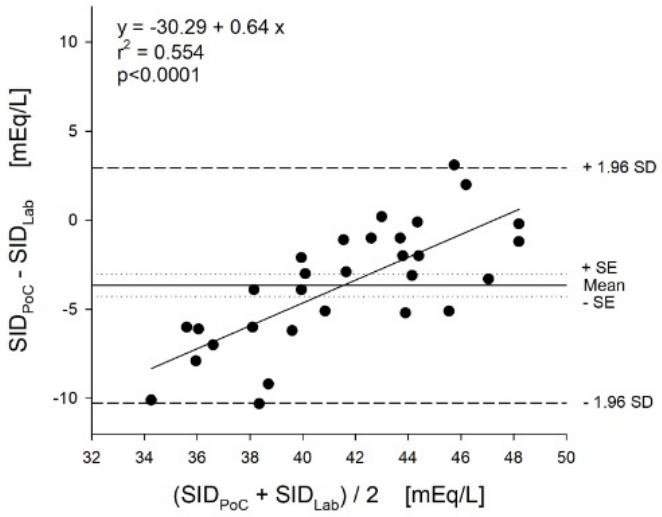

Figure 1. Bland-Altman analysis of simplified Strong Ion Difference (SID) calculated with point-of-care (PoC) and central laboratory (Lab) techniques. X-axis represents the mean of the two measurements, while Y-axis represents their difference. Bias is represented as the horizontal solid line (-3.66 mEq/L); standard errors of the bias are represented as horizontal dotted lines; limits of agreement (±1.96 SD) are represented as horizontal dashed lines (-10.26 and 2.94 mEq/L).

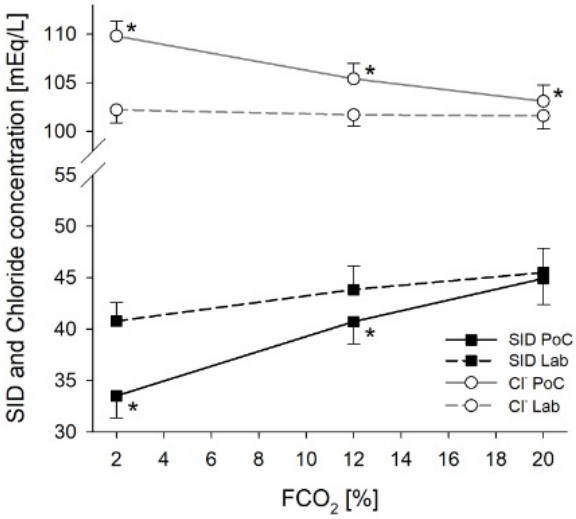

Figure 2. Variations in simplified SID and chloride concentration at incremental fractions of CO_2 (FCO_2) in gas mixture used for tonometry. Point-of-care (PoC) and central laboratory (Lab) data were compared via Two Way Repeated Measures ANOVA. *=p<0.05 as compared to Lab.