

SODIUM MEASUREMENT IN SEVERELY BURNED, CRITICALLY ILL PATIENTS: POINT-OF-CARE OR CENTRAL LABORATORY?

INTRODUCTION

Sodium abnormalities are very frequent in severely burned, critically ill patients.

Currently, two methods are applied routinely to measure sodium in the intensive care unit (ICU).

- ✓ The direct method (dNa), employing an ion-selective electrode (ISE) on whole, non-diluted blood. This technique is typical of blood gas analyzers.
- ✓ The second, is an indirect method (iNa) on pre-diluted plasma. This method is typical of machines used in central laboratories.

Indirect methods assume the solid component of plasma (proteins and lipids) to be normal, i.e. 7% of plasma.

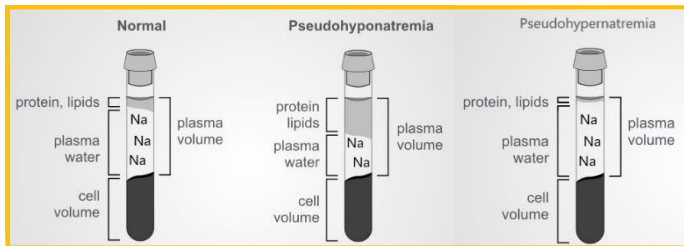


Figure 1: Whole blood composition with different solid component concentrations.

The risk related to the indirect method is the incorrect sodium measurement and the definition of pseudodysnatremias.

AIM

The aim is compare dNa and iNa in severely burned patients and evaluate any correlation with plasma albumin concentrations.

METHODS

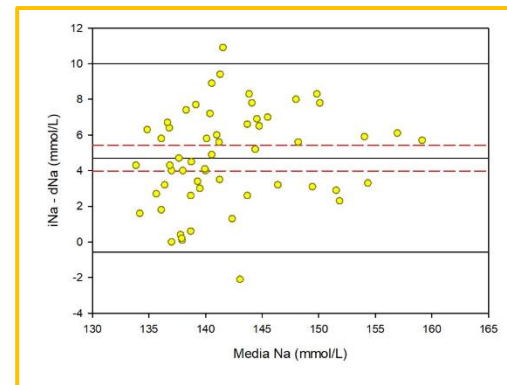
Severely burned patients admitted to Niguarda hospital's ICU between January 2019 and February 2020 were enrolled.

Simultaneous sodium couples (iNa and dNa) and protein and albumin concentrations were retrospectively collected. Bland-Altman analysis was used to evaluate the agreement between dNa and iNa.

RESULTS

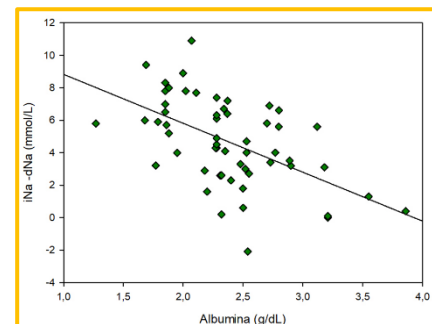
Twenty-four burned patients were included and fifty-seven couples of samples were analyzed.

Overall, **iNa values were significantly higher than dNa.**



Graphic 1: Bland-Altman analysis revealed a bias of 4,71 mmol/L (-0,58; 9,99 C.I. 95%) with limits of agreement of 2 (±2) mmol/L.

The analysis shows that there is not an increase of Δ Na correlated with an increase of sodium value.



Graphic 2: Correlation between Δ Na and plasmatic albumin

When analyzing the correlation between albumin and the difference between iNa and dNa, a negative linear correlation was found ($iNa-dNa = -3 (Alb) + 12$, $R^2 = 0.3$, $p < .001$).

CONCLUSIONS

Results of indirect sodium measurement can be misleading when protein concentrations are outside the normal range.

As this is frequently the case in burn patients and in critically ill patients in general, **dNa should be preferred in this context.**