

Acid-Base Equilibrium during Continuous Venovenous Renal Replacement Therapy

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INTRODUCTION

About 10% of patients admitted to the Intensive Care Unit receive continuous renal replacement therapy (CRRT), exposing them to large exchanges of volume and electrolytes. The aim of the present study was to describe the kinetics of the achievement of acid-base equilibrium during Continuous Venovenous Hemofiltration (CVVH) using the Stewart's approach.

METHODS

Oligo-anuric, ICU patients with clinical indication for CRRT (PrismaMax, Baxter) were enrolled. CVVH modality was employed, with a blood flow rate set at 150 ml/min. Regional anticoagulation was performed with diluted citrate (Prismocitrate 18/0; Gambro, SID = 54 mEq/L) at 1500 ml/h. Phoxilium (Baxter Healthcare Spa, SID = 32 mEq/L) or Multibic 2K (Fresenius Medical Care, Germany, SID = 35 mEq/L) were administered post-dilution at 1500 mL/h as replacement solutions. Blood gas analysis and electrolytes were measured (RAPIDPoint 500 Blood Gas System, Siemens Healthcare Diagnostics) at the beginning of CVVH treatment (T₀) and after 24, 48, and 72 hours. The following acid-base parameters were registered: pH, Base Excess (BE), apparent Strong Ion Difference (SIDa), effective Strong Ion Difference (SIDe), and Strong Ion Gap (SIG), a proxy of unmeasured anions.

RESULTS

Twenty-seven patients aged 62±14 years were enrolled. While SIDa remained stable over time (from 42 ± 5 to 42 ± 3 mEq/L; p=0.9), a significant increase in SIDe (from 30 ± 6 to 36 ± 3 mEq/L; p <0.001) was observed (Figure 1). As a result, SIG decreased significantly (from 12 ± 5 to 5 ± 4 mEq/L; p < 0.001). These changes were reflected by an elevation in BE and pH (p <0.001). Acid-base and electrolyte changes are described in Table 1.

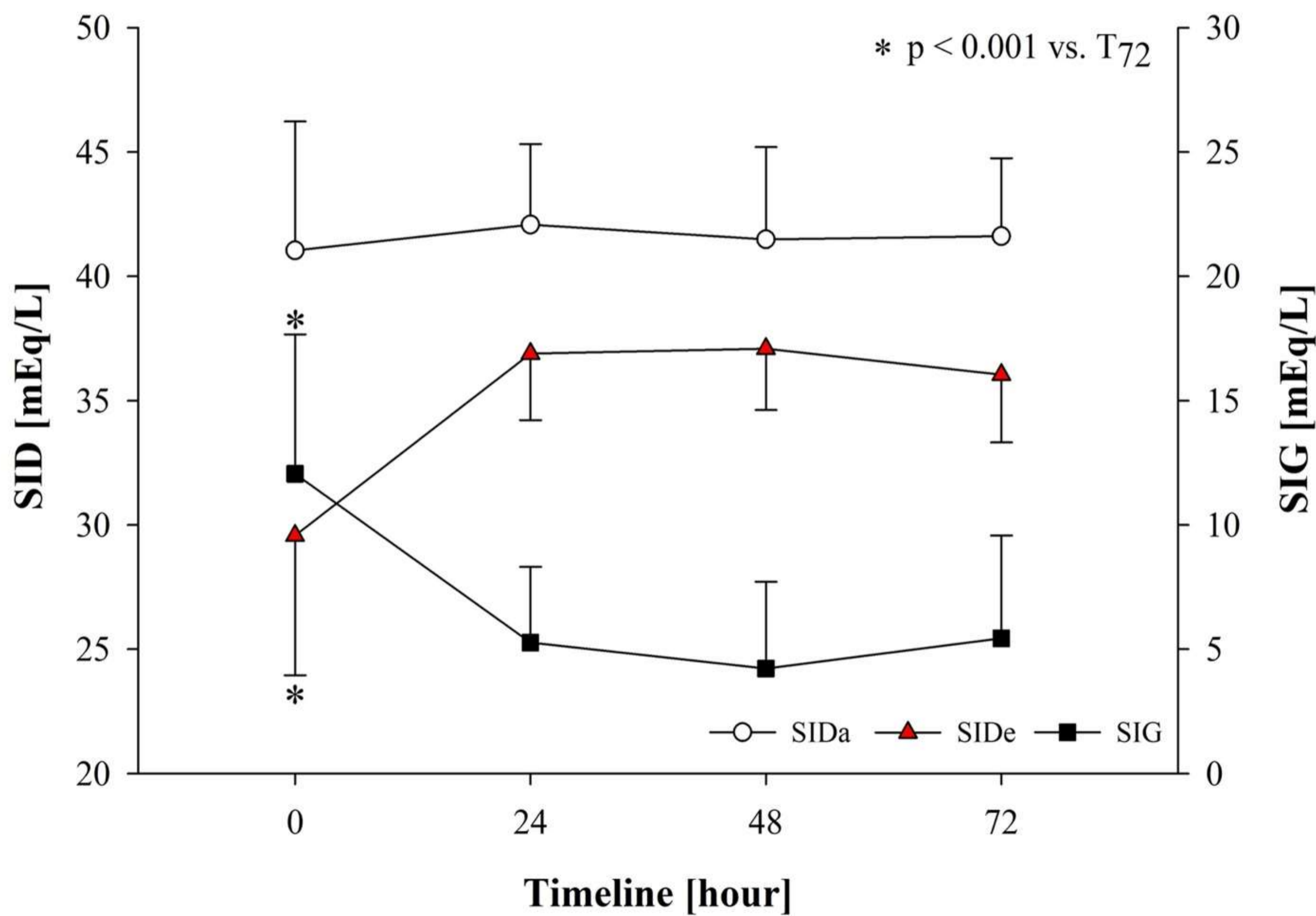


Figure 1: Main acid-base parameters change in the first 72 hours in patients undergoing CVVH.

Variable	Start	24 hours	48 hours	72 hours	p-value
pH	7.30 ± 0.12	7.38 ± 0.06	7.39 ± 0.06	7.40 ± 0.06	< 0.001
BE (mmol/L)	-3.3 ± 6.2	2.6 ± 2.9	3.5 ± 2.2	3.6 ± 2.3	< 0.001
[Na ⁺] (mEq/L)	142 ± 7	136 ± 3	135 ± 3	135 ± 3	< 0.001
[Cl ⁻] (mEq/L)	104 ± 6	98 ± 2	98 ± 2	98 ± 2	< 0.001

Table 1: Acid-base equilibrium at CVVH start (baseline) and after 24, 48 and 72 hours of treatment. Acronyms: BE is Base Excess, [Na⁺] is Sodium Concentration, [Cl⁻] is Chloride Concentration.

CONCLUSIONS

Our CVVH system corrected the underlying acid-base disorder through a reduction in unmeasured anions.

REFERENCES

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