

Effectiveness of Intermittent Infusion Hemodiafiltration (I-HDF) Using Ultrapure Dialysis Fluid

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INTRODUCTION AND AIMS

In a typical hemodialysis (HD) treatment, excessive water removal often induces hypotension and muscle spasm. Intermittent infusion hemodiafiltration (I-HDF) using backfiltration of an ultrapure dialysis fluid by an automated dialysis machine, GC-110N (JMS Co. Ltd., Tokyo, Japan), has been developed to improve the peripheral circulation and to enhance water and solute transport from extravascular to intravascular of the patient by repeated intermittent infusion.

Under a typical I-HDF treatment, some 200-300 mL of ultrapure dialysis fluid was infused into the blood component through the dialysis membrane at a rate of 100 mL/min, every 30 min. I-HDF, namely, means a modified HDF system with replacement fluid of only 1.4 to 2.1 L (= 200-300 mL x 7 times)/session. In this study, a multi-center clinical trial was carried out to evaluate the clinical effectiveness of the I-HDF therapy in comparison with standard HD (CHD).

METHODS

Twenty chronic renal disease patients participated in a multi-center clinical trial to evaluate the clinical effectiveness of I-HDF compared with conventional HD (CHD).

The values of removal rate (RR), solute clearance (CL) and cleared space (CS) for urea, creatinine, uric acid, inorganic phosphate, β_2 -microglobulin (β_2 -MG) and α_1 -microglobulin (α_1 -MG) were compared between the I-HDF and CHD therapies.

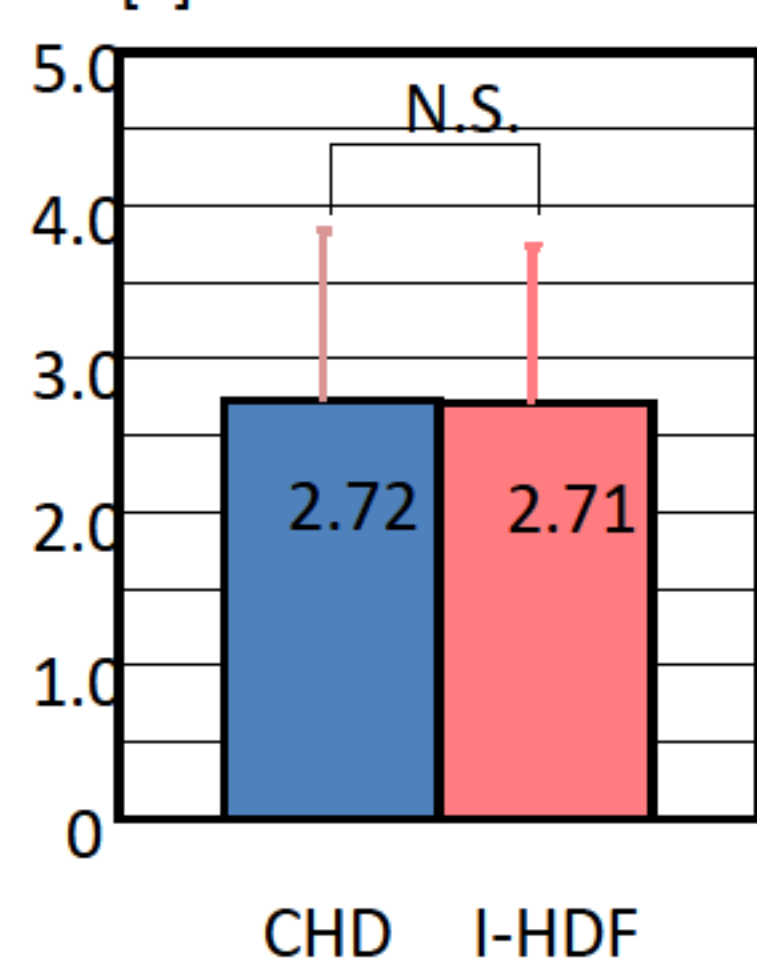
Removal rate (RR): $RR = 1 - C_{post}/C_{pre}$

Solute clearance (CL): $CL = (1 - C_{BO}/C_{BI}) \times Q_B$

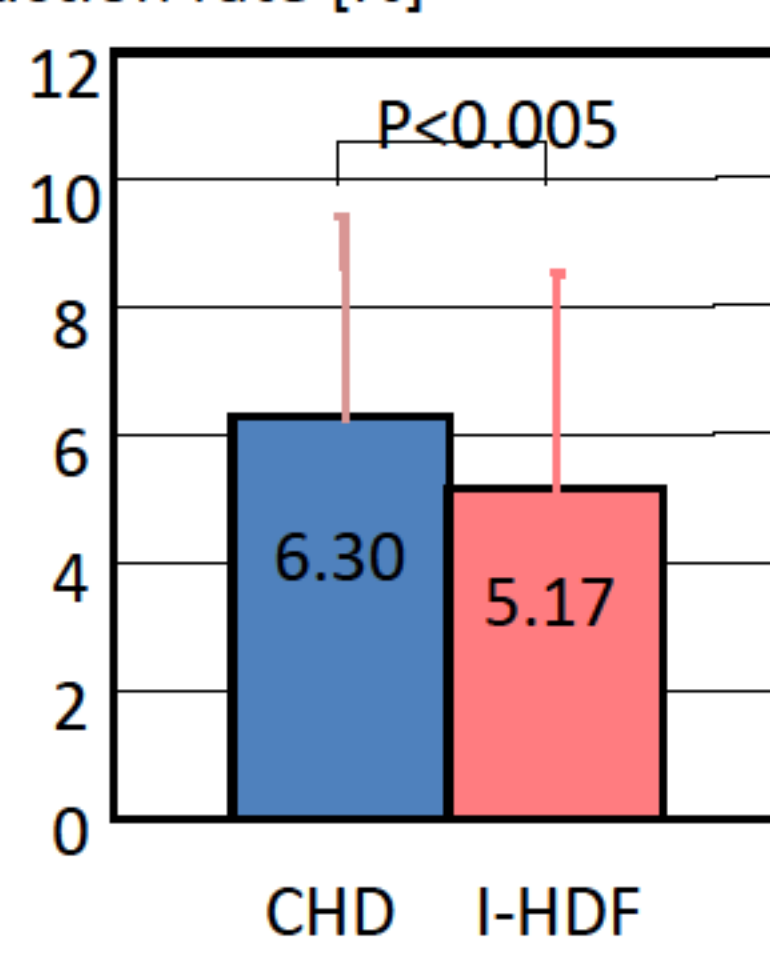
Cleared space (CS), $CS = (\text{Total removal amount of the solute})/C_{pre}$

RESULTS AND DISCUSSIONS

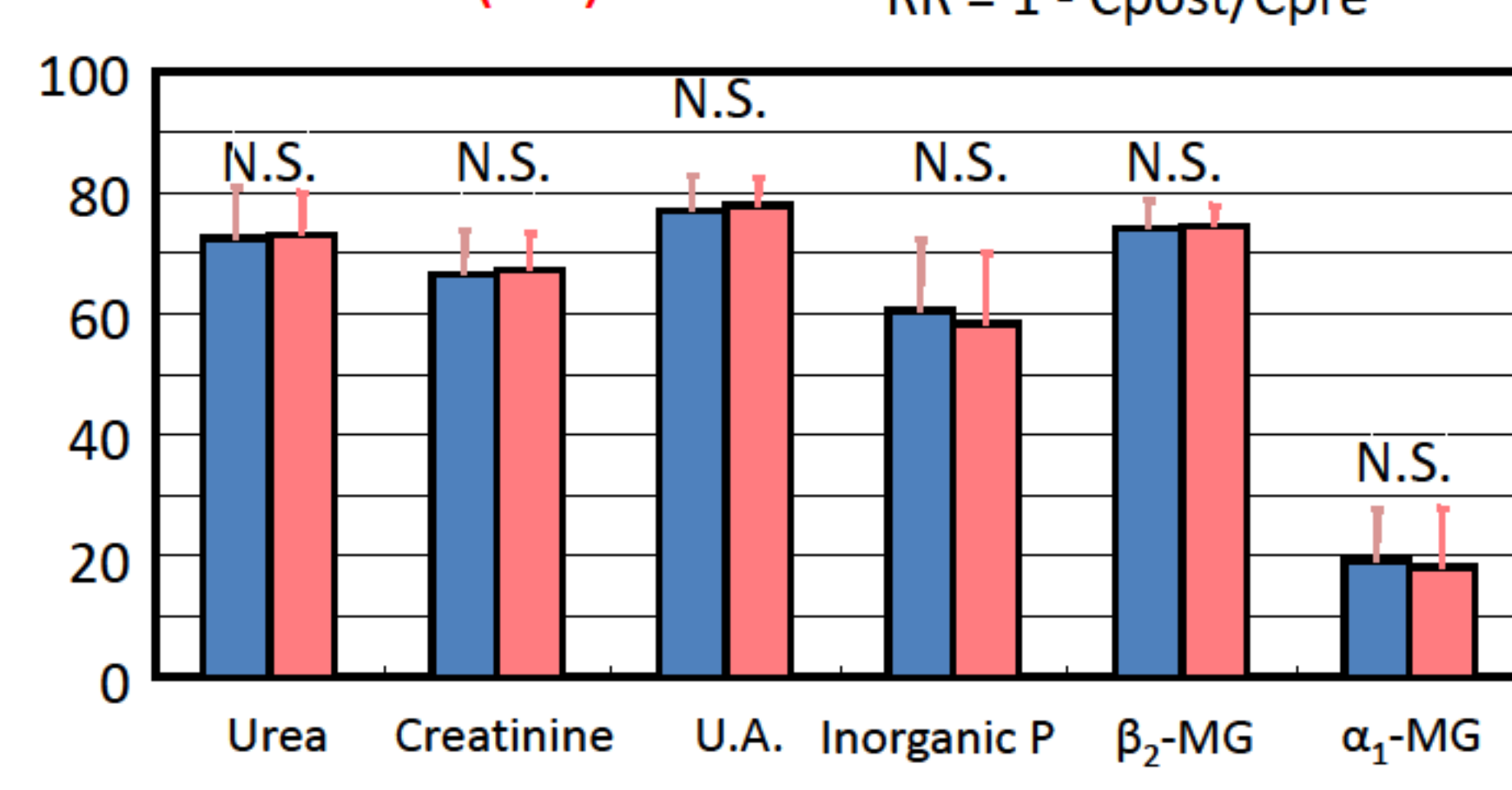
Total amount of water removal [L]



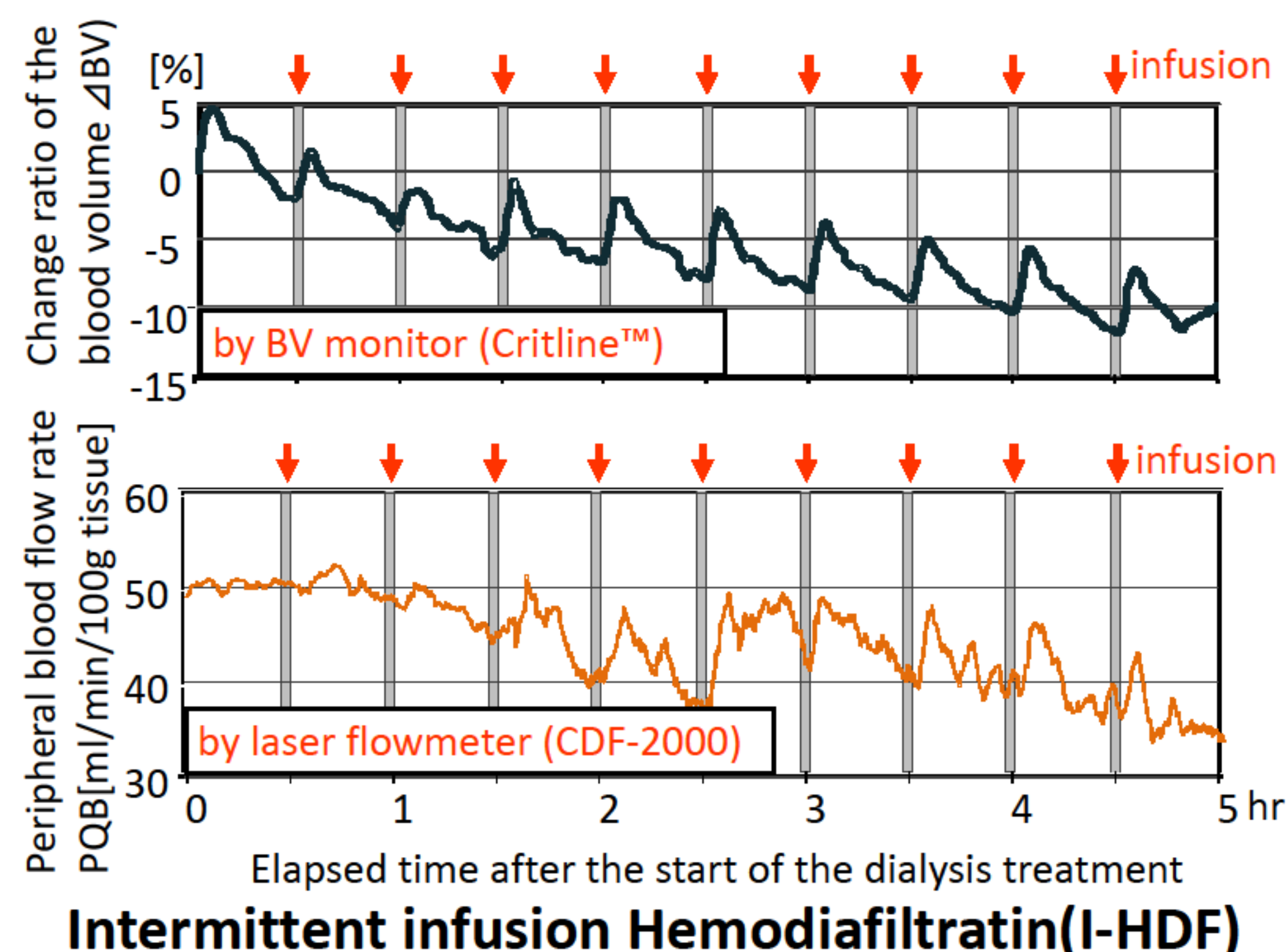
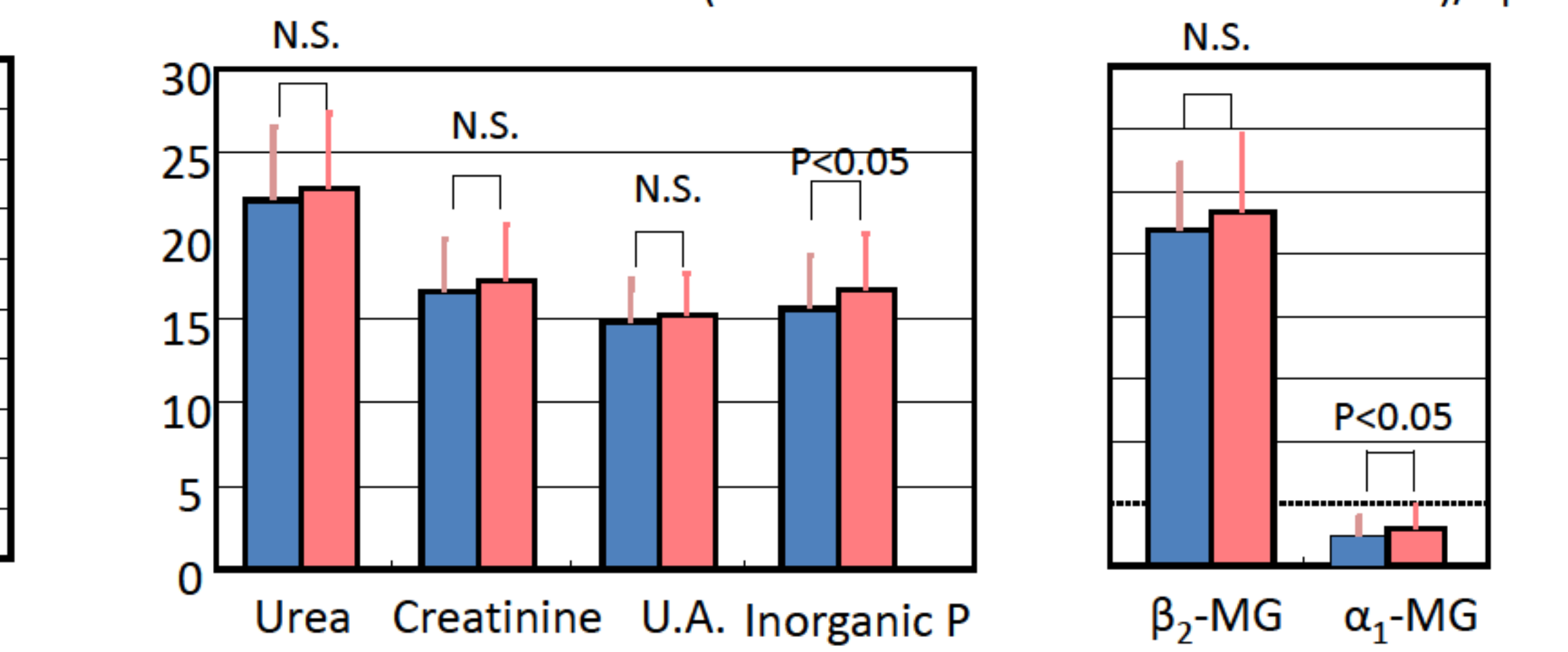
Time averaged BV reduction rate [%]



Removal Rate (RR)



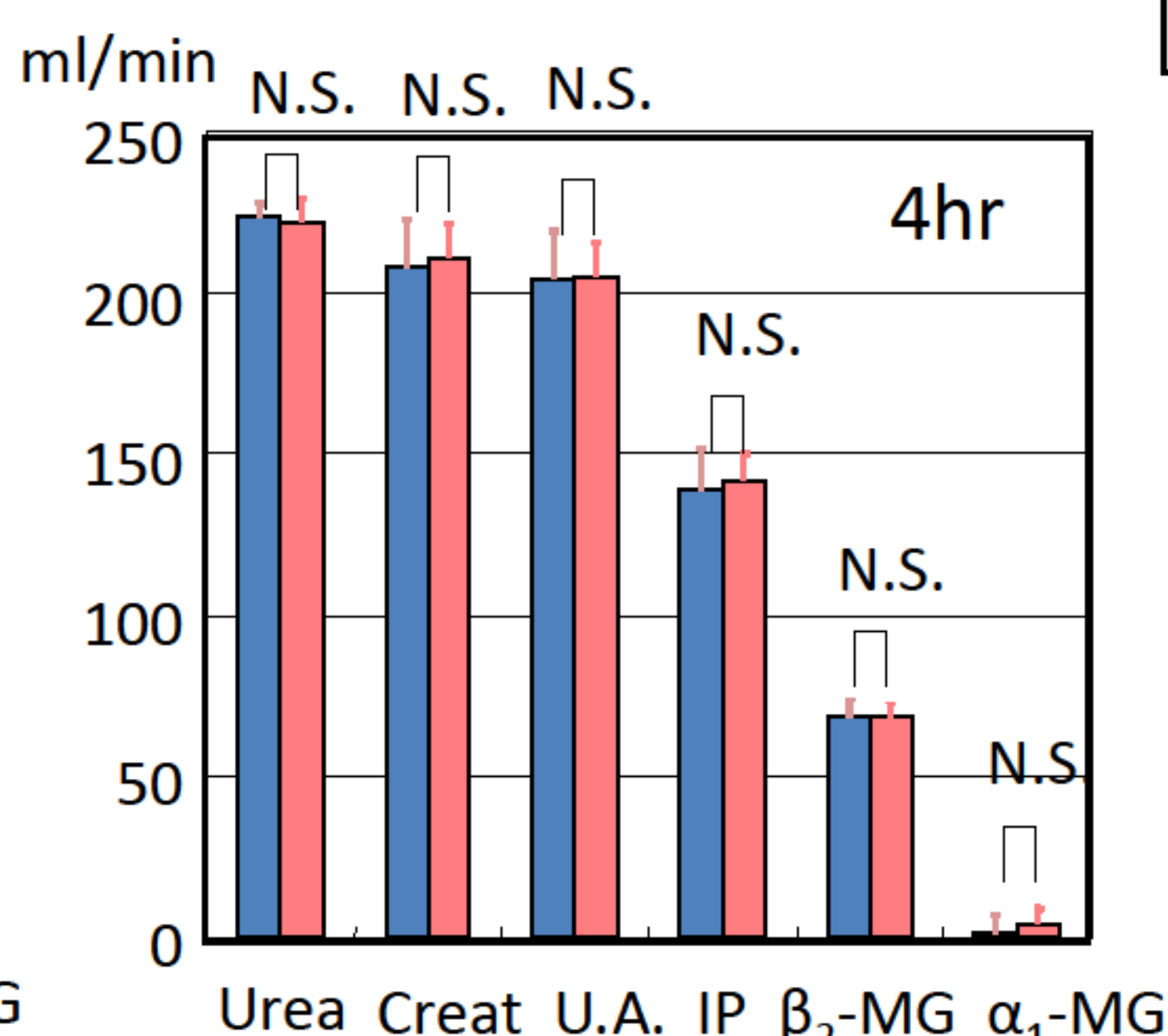
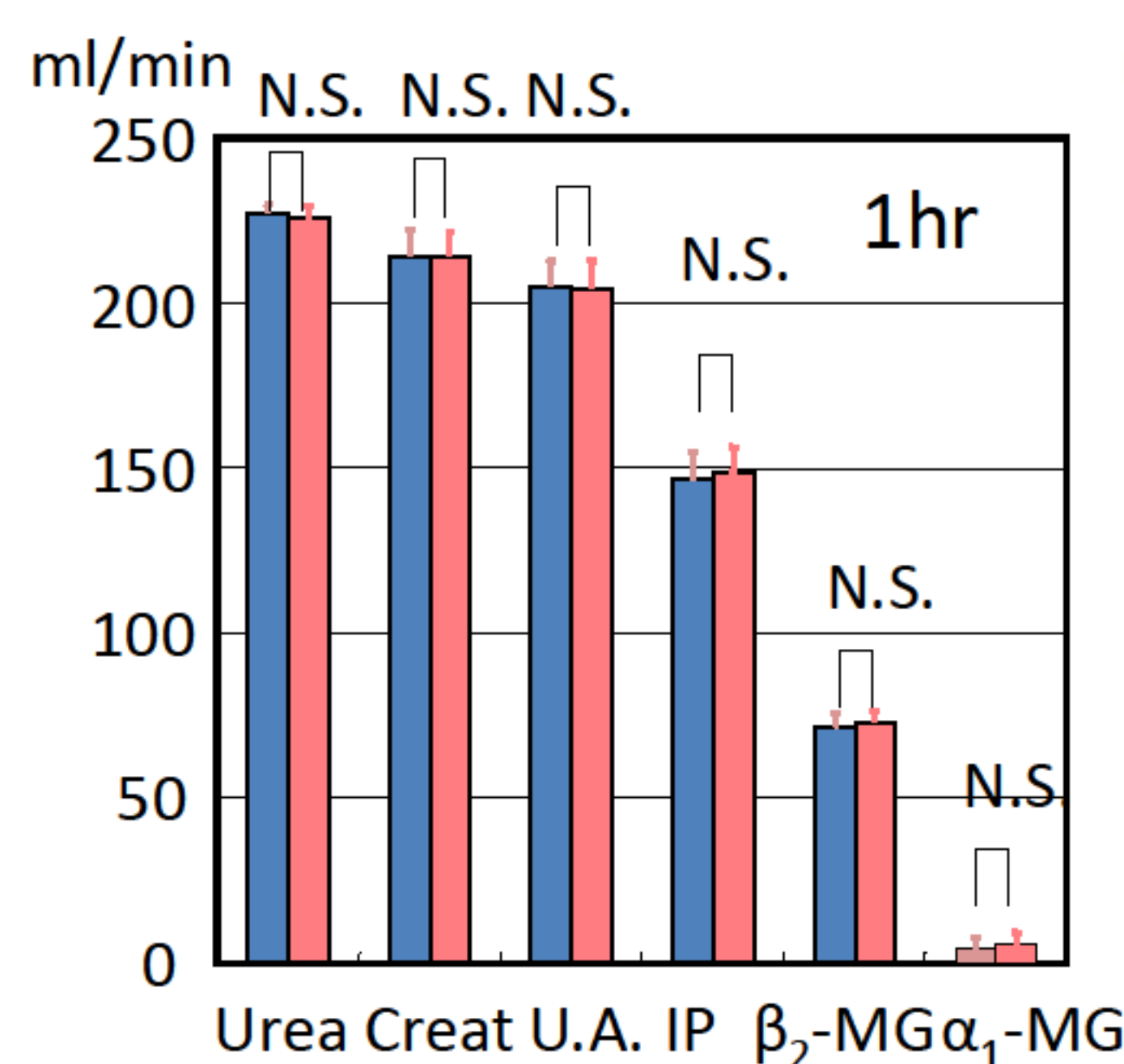
Cleared Space (CS)



Clearance (CL)

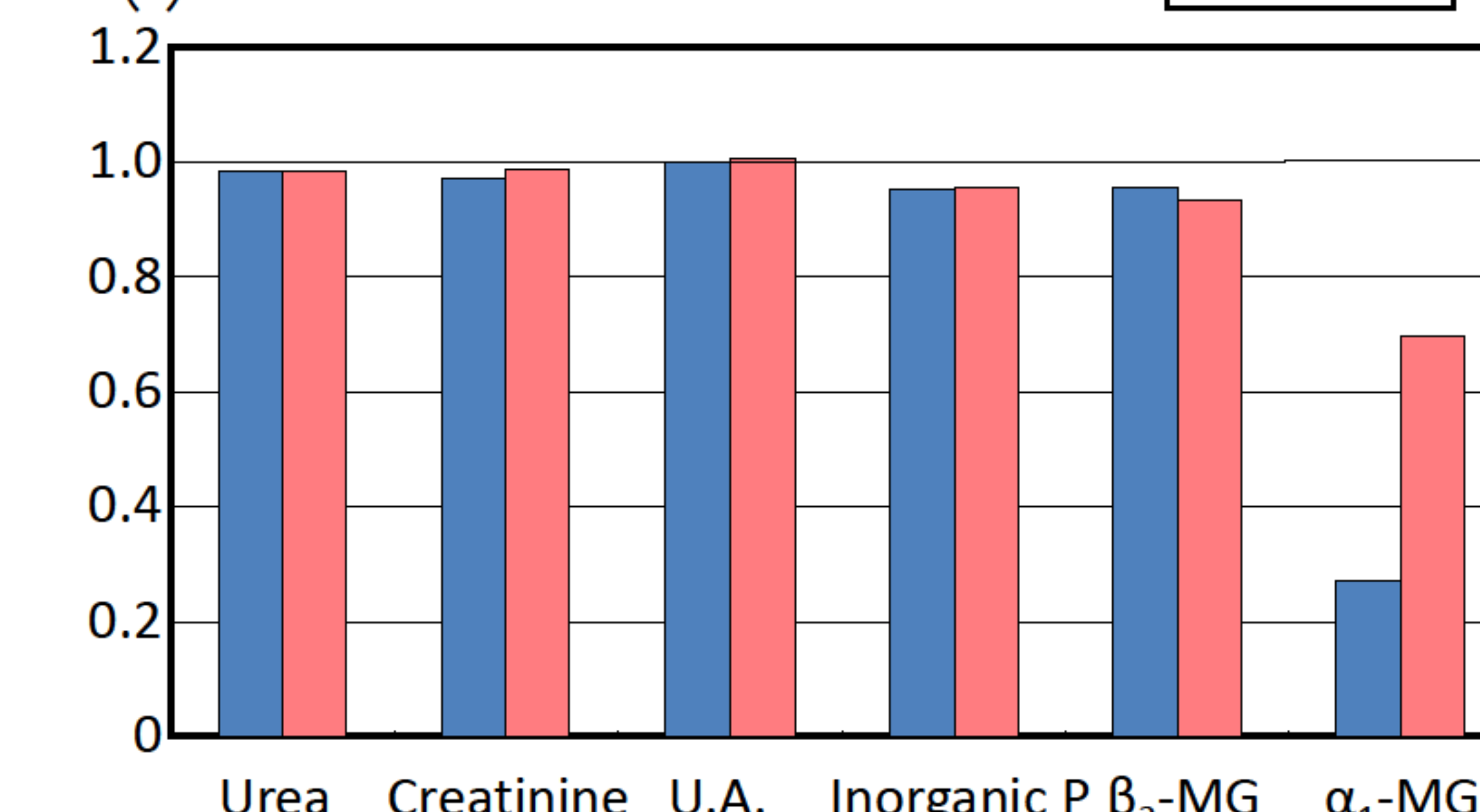
$CL = (1 - C_{BO}/C_{BI}) \times Q_B$

$Q_B = 250 \text{ ml/min}$
UF coefficient = 10 ml/min/m^2



CL ratio

$CL \text{ ratio} = \frac{CL \text{ at } 4hr}{CL \text{ at } 1hr}$



Increasing peripheral blood flow rate in the patient's toe was detected by a laser flowmeter for each infusion in many patients. A significantly lower value for time-averaged BV reduction was obtained with I-HDF compared with CHD in spite of there being no difference in the total amount of water removal. The amount of normalized solute removal, cleared space (CS), for inorganic phosphate and α_1 -MG during a treatment were higher with I-HDF than CHD. Moderate α_1 -MG K reduction was found in I-HDF due to the prevention of membrane fouling by intermittent backfiltration of the dialysis fluid.

CONCLUSIONS

Intermittent Infusion HDF using an automated dialysis machine was effective for improvement of the peripheral circulation of dialysis patients.

Disclosures: The authors have no financial conflicts of interest to declare.



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