

Proenkephalin Predicts Renal Dysfunction, Organ Failures, Renal Replacement Therapy, and Mortality in Sepsis

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Introduction

Kidney failure occurs frequently in sepsis and is associated with high mortality. Proenkephalin (PENK) is an emerging plasma biomarker for renal function, and has been investigated so far mainly in Europe and North America (1, 2). We evaluated whether PENK level could predict severity of renal dysfunction, RRT requirement, organ failure, and 30-day mortality in a Korean cohort of septic patients.

Methods

In a total of 215 septic patients (table 1), PENK level was measured using the sphingotest® penKid® assay (Sphingotec GmbH, Hennigsdorf, Germany). The PENK levels were analyzed in terms of sequential (sepsis-related) organ failure assessment (SOFA) renal subscore, the Chronic Kidney Disease Epidemiology Collaboration estimated glomerular filtration rate (CKD-EPI eGFR) categories, requirement of renal replacement therapy (RRT), sepsis severity, vasopressor use, and 30-day mortality. The number of organ failures, SOFA subscores, requiring RRT, and 30-day mortality were compared according to the PENK quartiles.

Variable	All patients (N = 215)
Patients enrollment	
ICU*	92 (42.8)
Emergency room	123 (57.2)
Age (years)	71 (58 – 79)
Males	127 (59.1)
Comorbidities	
Cardiovascular	116 (54.0)
Cerebrovascular	115 (45.1)
Renal and genitourinary	60 (27.9)
Gastrointestinal	20 (7.8)
Respiratory	20 (7.8)
Hemato-oncologic	8 (3.1)
Others	7 (3.3)
Type of infections	
Respiratory	98 (41.7)
Urinary	63 (26.8)
Gastrointestinal	56 (23.8)
Soft tissue	10 (4.3)
Others	7 (3.0)
SOFA score	7 (4 – 10)
Cardiovascular	3 (0 – 4)
Central nervous system	0 (0 – 2)
Coagulation	1 (0 – 2)
Liver	0 (0 – 1)
Renal	1 (0 – 2)
Respiratory	3 (1 – 4)
Laboratory parameters	
WBC (× 10 ⁹ /L)	12.8 (6.8 – 16.9)
CRP (mg/dL)	16.2 (10.2 – 25.4)
Lactate (mmol/L)	3.56 (2.00 – 6.04)
Creatinine (mg/dL)	1.58 (0.95 – 2.82)
Procalcitonin (ng/mL)	17.7 (6.5 – 44.4)

Table 1: Patients characteristics

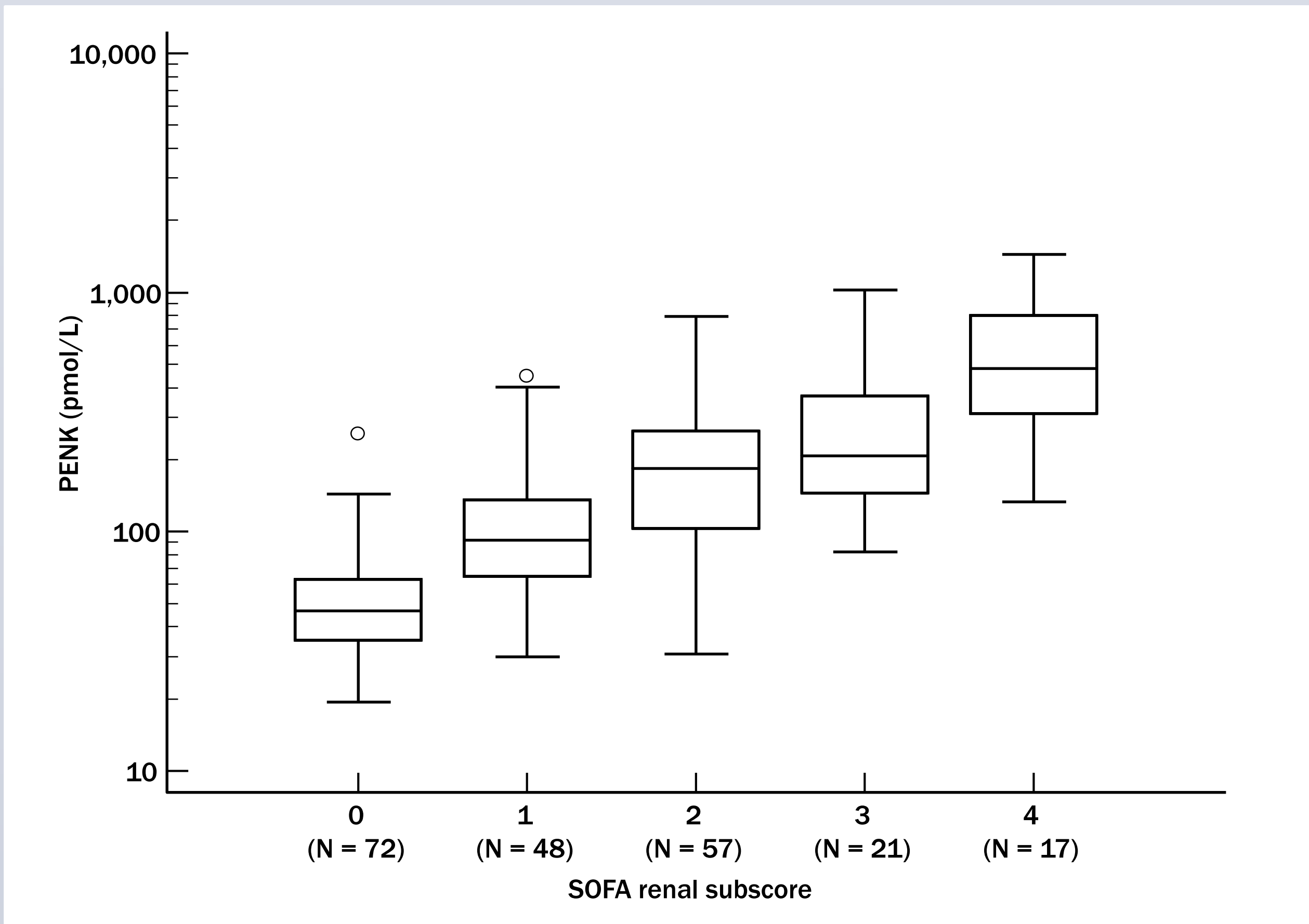


Figure 1: PENK concentrations according to the renal SOFA score.

Results

The PENK levels were significantly associated with SOFA renal subscore (Fig. 1) and CKD-EPI eGFR categories (all P < 0.0001). The PENK levels were significantly higher in patients who required RRT than in those who did not require RRT (P < 0.0001) (Fig. 2).

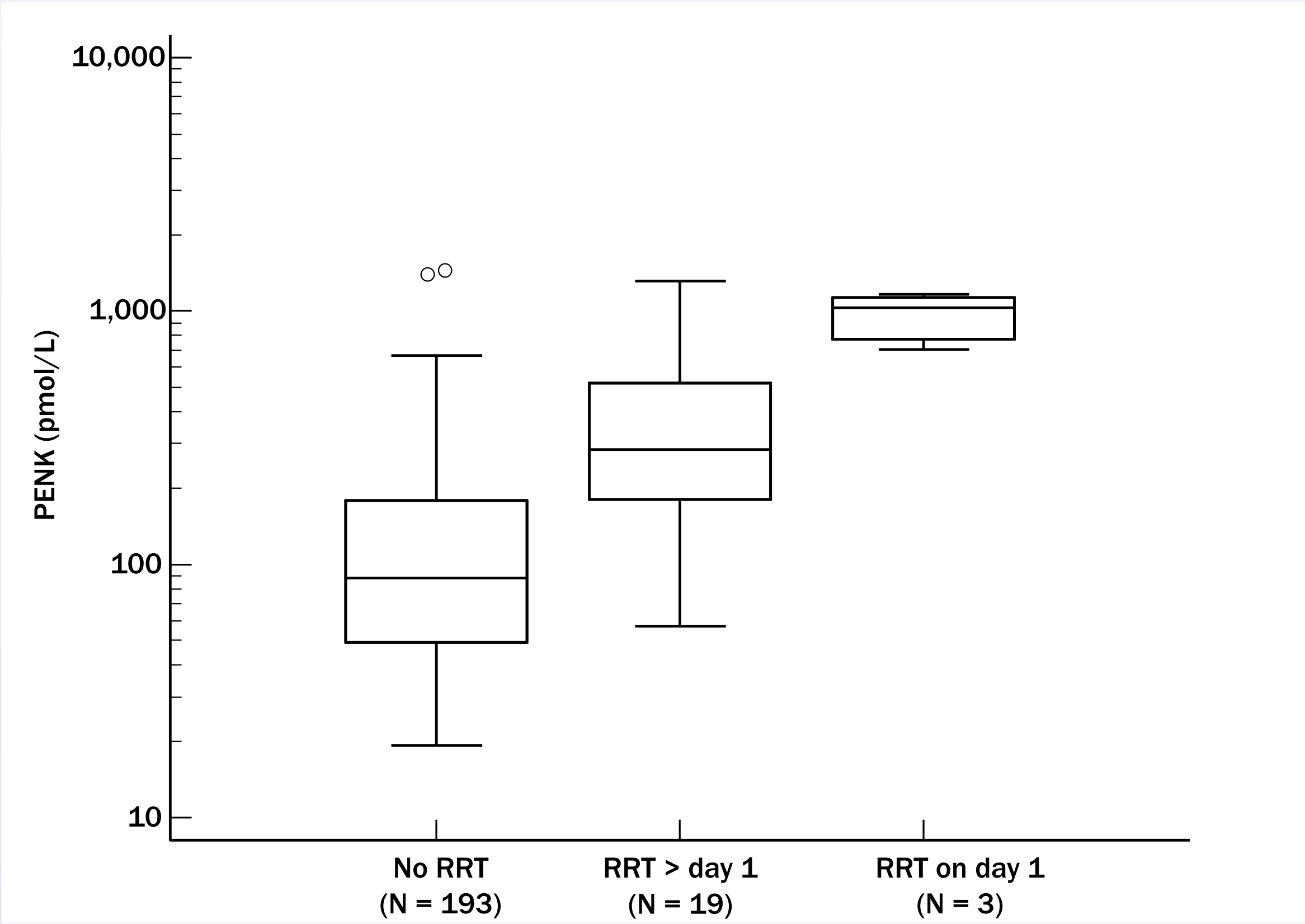


Figure 2: PENK concentrations according to the requirement of RRT.

The PENK levels were significantly higher in patients with septic shock, vasopressor use, and non-survivors than in patients with solitary sepsis, no vasopressor use, and survivors, respectively (all P < 0.01). The PENK quartiles were associated with the number of organ failures as well as SOFA renal, cardiovascular, respiratory, and central nervous system subscores (all P < 0.05). High PENK level was also associated with high 30-day mortality (P < 0.0001) (Fig. 3).

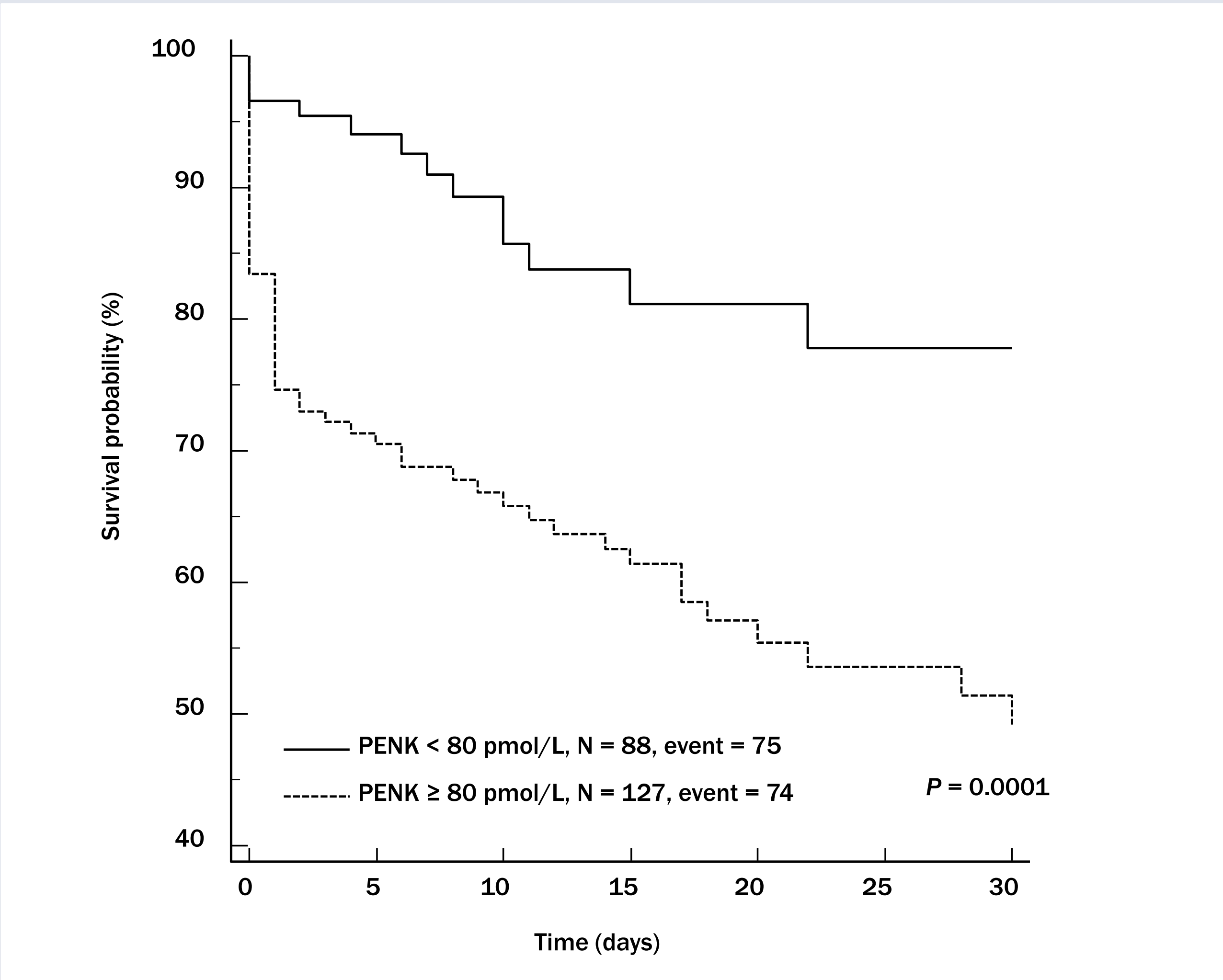


Figure 3: 30-day mortality rate by PENK below/above 80 pmol/L.

Conclusions

PENK is a useful and objective marker to predict renal dysfunction, severity, organ failure, and 30-day mortality in septic patients. Data gained in our Korean patient cohort are comparable to those reported for non-Asian populations.

References

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