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Assessment of the usefulness of Presepsin (soluble CD14 subtype; sCD14-ST) in septic patients

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Background

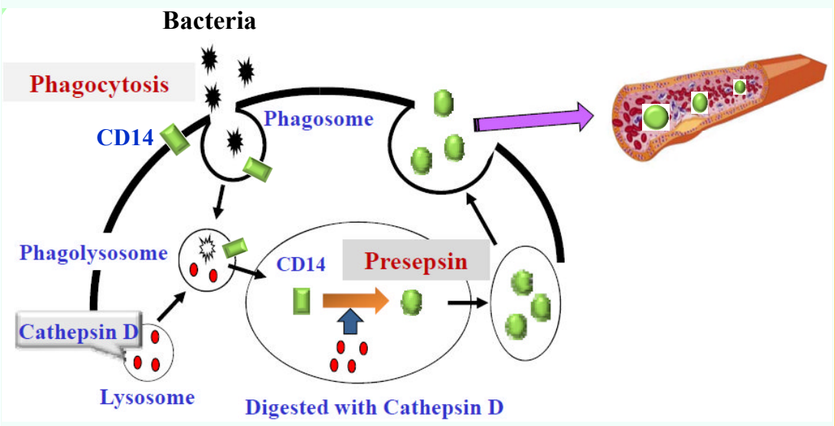
Sepsis is a life-threatening condition that is characterized by a whole body inflammatory state.

Many studies indicated an early diagnosis and adequate treatment of sepsis improved a prognosis and increased a survival rate in severe sepsis or septic shock patients. However, it is often difficult to diagnoses sepsis in an early stage.

As an auxiliary tool of the early diagnosis of sepsis, PCT (Procalcitonin) is more specific to a bacterial infectious disease than to biomarkers, such as endotoxin, IL-6, and C-reactive protein (CRP), and is made the differential diagnosis of a bacterial infectious disease, and a severity-of-illness judging with the useful marker.

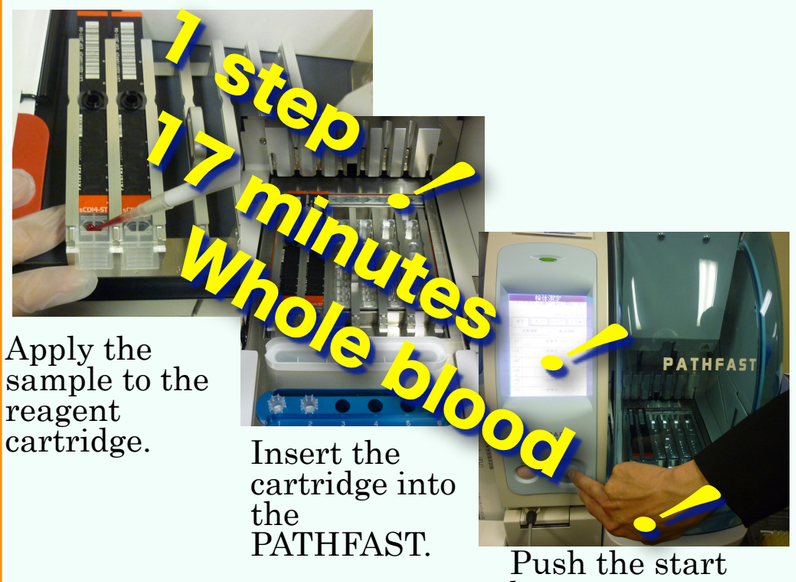
The soluble CD14 subtype (sCD-14-ST) as Presepsin, has emerged as a new biomarker of sepsis diagnosis. It has been reported that inspection with whole blood is possible. Presepsin which produced in Phagocytosis (Fig. 1) can be measured an actual measurement quickly and simply (Fig. 2).

Fig. 1: Putative Mechanism of Presepsin release into blood.
When bacteria are taken into a granular leukocyte, one of the soluble CD14-ST produced after CD14 is taken in simultaneously, and the enzyme dissolution carried out in Phagolysosome is emitted into blood as sCD14-ST (soluble CD14 subtype). Presepsin is the 14kD's sCD14-ST .



(Naitoh, et al. The new sepsis marker, sCD14-ST (PRESEPSIN), SEPSIS 2010: P19)

Fig. 2: PATHFAST; Chemiluminescence Immunoassay Analysis System.
Presepsin can be measured out of whole blood to see results in 17 minutes.



Apply the sample to the reagent cartridge.

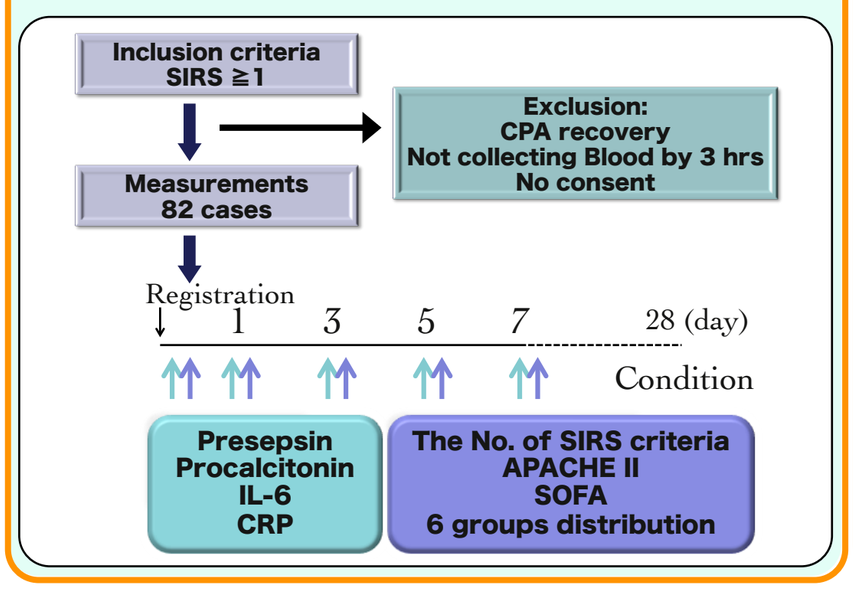
Insert the cartridge into the PATHFAST.

Push the start button.

PATHFAST Immunoanalyser; MITSUBISHI CHEMICAL MEDIENCE CORPORATION, Tokyo, JAPAN

Method

Fig. 3: Study Design
Patients who had one or more systemic inflammatory response syndrome (SIRS) criteria were included in this study. The observation method measured with each biomarker at an admission time and every other day for a week. Each candidate's condition was judged and distributed into the six groups;non-infection, SIRS, infection, sepsis, severe sepsis, and septic shock according to the ACCP/ SCCM Conference committee.



Result

Eighty two patients were included this study, eighteen were SIRS and forty two were Sepsis at the time of registration (Tab. 1, Fig.4).

In the receiver operating characteristics (ROC) analysis, the area under the curve (AUC) to distinguish sepsis was the highest for Presepsin (0.92) followed by IL-6 (0.89), PCT (0.88), and CRP (0.83) (Fig. 5). And the Presepsin values were significantly higher in the patients with the more severe septic condition (eg. sepsis, severe sepsis, septic shock). In addition, a significant correlation was found between the sepsis related organ failure assessment (SOFA) scores and the Presepsin values (r2=0.258; P<0.01) (Fig. 6). In Sepsis patients at the admission time retained SIRS Group at day 7, Presepsin concentration did not decrease, but PCT concentration had decreased. Declining SIRS at day 7, both biomarkers got decreased (Fig. 7).

Tab. 1: Characteristics of 82 patients at the admission time.

Variable (n = 82)	Value
Age, yrs (IQR)	72 (62.2-78.75)
Sex, (%)	
Male	44 (53.66)
Female	38 (46.34)
Baseline value & scores (IQR)	
WBC	11.8 (7.6-17.0)
APACHE II score	18 (13-23.75)
SOFA score	6 (4-10)

IQR, interquartile range.

Fig. 4: Distribution of patients' severity at the admission time.

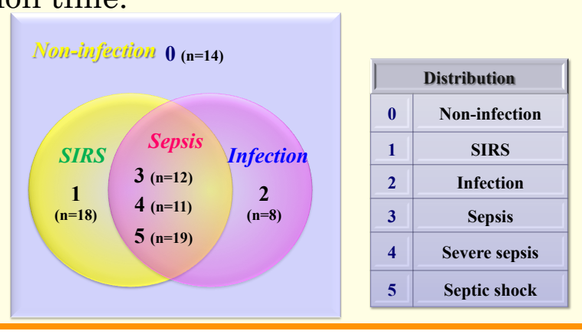


Fig. 5:
Receiver Operating Characteristic (ROC) diagram of Presepsin, PCT, IL-6, and CRP for the differential diagnosis of sepsis or SIRS (non-infection) at the admission time. [n=60 (SIRS: 18, Sepsis: 42)]

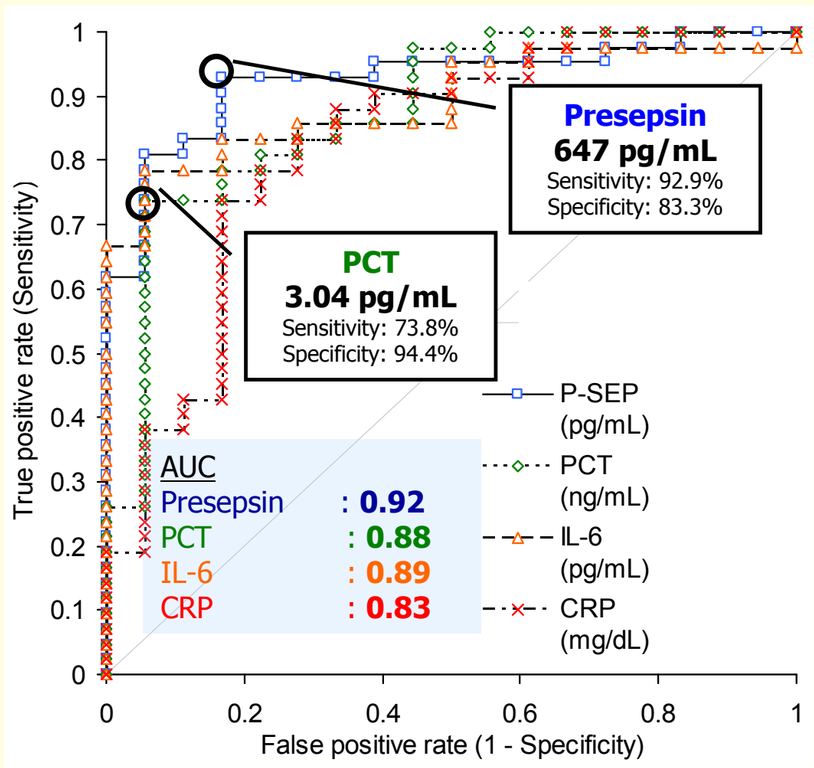


Fig. 6: Correlation Diagrams; Presepsin with APACHE II and SOFA scores.
Presepsin value showed high with the statistical predominance difference as SOFA score became higher. The significant correlation was found between the SOFA scores and Presepsin values.

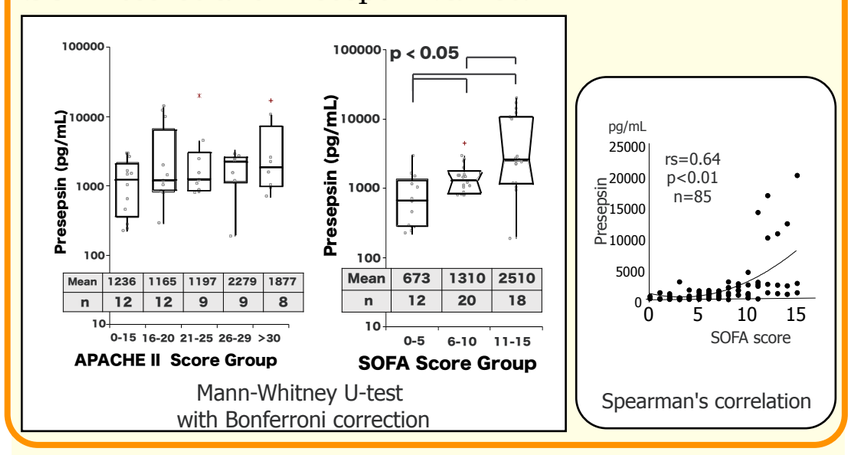
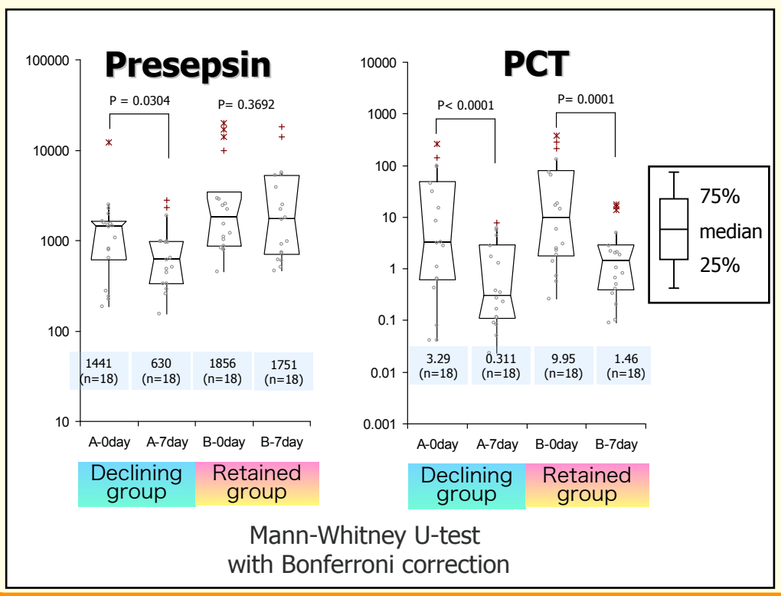


Fig. 7:
Declining SIRS Group vs. Retained SIRS Group at day 7.
Both groups were satisfied the sepsis criteria at the admission time.



Discussion

- Not be clarified how to induce Presepsin.
- Presepsin value might effected by other stress or invasion?
- Presepsin value was increased as Chronic kidney disease.

Conclusion

Presepsin is the most valuable predictor of sepsis compared with PCT, IL-6, and CRP. Moreover, the result suggests that Presepsin values can serve as a parameter that closely reflects the sepsis severity. Therefore we strongly suggest that Presepsin will be not only a very useful new biomarker of sepsis diagnosis, but also useful for monitoring the severity of disease.