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Clinical, Biochemical and Physical Parameters Associated with Severe Acute Kidney Injury in Patients with Hantaan Virus Infections : Results from a Single-Center Prospective Cohort Study

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Objectives : Hantaan virus is the most common species of hantavirus in South Korea clinically presenting hemorrhagic fever with renal syndrome (HFRS). Acute kidney injury (AKI) is frequently involved in the disease course (~90%) and often result in fatal morbidity and mortality. This is the first prospective cohort study to evaluate the clinical, physical, biochemical factors associated with the risk of developing severe acute kidney injury stratified according to KDIGO AKI stage.

Methods : From October 2015 to February 2017, a total of 25 active-duty soldiers were admitted to Armed Forces Capital Hospital with suspected HFRS. Among them, 3 patients were excluded from data analysis due to following reasons; 1 case was confirmed as Malaria infection, 1 case showed negative PCR result, 1 case was transferred to other hospital and lost to follow up. On initial visit, baseline demographics and clinical information including Hantavax vaccination history and recent outdoor activity were collected. Initial symptoms-shortness of breath, abdominal pain, and flank pain-were evaluated according to Visual Analog Scale. After obtaining informed consent, laboratory investigation and anthropometric measurement using Inbody-S10 were performed daily until patient's discharge. Before analysis, the subjects were stratified into 3 AKI risk groups according to 2012 KDIGO AKI stage; stage I (n=2), stage II (n=10), stage III (n=10).

Results : A total of 22 HFRS male soldiers were included in the analysis. Age was 21.6 ± 1.9 years old and average hospitalization day and ICU stay were 14.5 ± 5.5 days and 5.1 ± 2.5 days, respectively. Compared to AKI stage I and II, the patients with AKI stage III showed longer duration of hospitalization (18.7

± 4.7 vs. 11.0 ± 3.1 days, p < 0.001), severe thrombocytopenia (34.6 ± 25.5 vs. 72.4 ± 50.1 (*103/μL), p = 0.04) and leukocytosis (20.0 ± 6.21 vs. 12.9 ± 4.74 (*103/μL), p = 0.009), and greater amount of proteinuria (8.77 ± 6.5 vs. 3.86 ± 3.0 g/g, p = 0.046). Neither subjective symptoms nor radiologic finding of pulmonary edema/effusion were related to the severity of renal outcome. On the other hands, patients with AKI stage III showed positive trend of phase angle from oliguric to diuretic phase, while patients with AKI stage I~II showed declining trend (0.02 ± 0.57 vs. −0.7 ± 0.59, p<0.015).

Conclusions : In conclusion, a positive trend of phase angle together with severe thrombocytopenia, severe leukocytosis, and greater amount of proteinuria are related to the severity of renal outcome in the patients with HFRS. This study suggests that the serial evaluation of clinical, biochemical, and physical parameters are essential to predict renal outcome in HFRS.

Keywords : Acute kidney injury; Hemorrhagic fever with renal syndrome; Hantaan virus