HEMODYNAMIC CHANGE OF CEREBRAL BLOOD FLOW USING CAROTID DOPPLER ULTRASONOGRAPHY IN PATIENTS WITH HEMODIALYSIS

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Introduction and Aims: During hemodialysis, hemodynamic alteration can be occurred by changes of flow via arteriovenous fistula (AVF). Also it can affect cerebral blood flow (CBF). However, there has been few study to evaluate hemodynamic change of CBF during hemodialysis. We evaluated whether hemodynamic alteration during hemodialysis can be detected by carotid duplex ultrasonography (CDU). And we also assessed the correlation of change in CBF with clinical symptom and hemodialysis-related factors, such as AVF flow volume and age of AVF.

Methods: We prospectively enrolled patients who receive hemodialysis via AVF on upper extremity. Before and during hemodialysis, blood pressure (BP) and presence of dizziness were monitored. We performed CDU twice, just before and 1 hour after start of dialysis. With CDU, we checked peak systolic velocity (PSV) and flow volume in bilateral common carotid artery (CCA) and vertebral artery (VA). We calculated total volume of CBF by sum of flow volumes of 4 sonated neck vessels. The differences (Δ) of these hemodynamic variables before and during dialysis were measured and compared according to the side to the AVF. We also evaluated the correlation of various factors, such as patient age, BP, cerebral flow, and AVF flow volume.

Results: Eighty-one patients (mean age ± SD, 61.1±10.7) were enrolled. During dialysis, PSVs and flow volumes of bilateral CCA and VA of AVF side were significantly decreased, and total cerebral blood flow was also significantly decreased (1221.9±344.9 vs. 1085.8±319.2, p=0.000). According to the side to AVF, ΔCCA and ΔVA flow volume were higher in AVF side (AVF vs. non-AVF side; ΔCCA, -94.3±109.7 vs. -52.6±119.1, p=0.007; ΔVA flow volume, -11.9±23.1 vs. -1.3±23.1, p=0.002). There was no correlation between BP and hemodynamic variables even though BP was significantly decreased during dialysis. Access flow volume via AVF during hemodialysis were negatively correlated with Δ total-CBF (r=-0.223, p=0.046). Age were positively correlated with Δ total-CBF (r=0.388, p=0.000). Clinical symptom was not related with the changes of hemodynamic variables.

Conclusions: In the present study, we found hemodynamic alteration in cerebral blood flow during hemodialysis were significant, independent to systemic BP change, and related to the side to the AVF. Even though those alterations did not correlate with the clinical symptom significantly, the study results can be helpful for understanding the hemodynamic change during hemodialysis.