The association between protein-bound uremic toxins levels, peripheral artery disease and vascular access failure in hemodialysis patients

透析病患血中親蛋白尿毒素對週邊動脈疾病與血管通路阻塞之影響

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Background: P-cresyl sulfate (PCS) and indoxyl sulfate (IS) have been reported to predict poor clinical outcomes in hemodialysis (HD) patients. However, little is known about the effect of the two toxins on peripheral arterial disease (PAD) and vascular access dysfunction. Our goal was to investigate the association between the two toxins and PAD and vascular access failure (VAF) in patients on hemodialysis.

Materials and Methods: 100 stable HD patients were enrolled from a single medical center. These patients were screened for PAD by machine and recorded as ABI (ankle brachial index) and brachial-ankle PWV (pulse wave velocity). Serum levels of PCS, IS and biochemical data were also collected concurrently. In addition, we also recorded the first event of VAF and frequency of PTA and thrombectomy during 3-year follow-up.

Results: Total and free PCS were correlated to right and left ABI and PWV ($p<0.01$), and total IS was associated with right and left ABI ($p<0.01$) by Pearson's analysis. Repeated measuring by mixed model analysis revealed that serum albumin ($p=0.003$), cholesterol ($p=0.01$) and total PCS ($p=0.031$) had significant correlation with ABI after adjusting other confounding factors. As for brachial-ankle PWV, serum triglyceride ($p=0.002$), total IS ($p=0.04$) and total PCS ($p=0.050$) reached significance finally. In addition, multivariate Cox regression analysis revealed dialysis length and total PCS were related to AV shunt failure event (Hazard Ratio: 1.14, $p=0.01$, and Hazard Ratio: 1.04, $p=0.04$, respectively). Both of total and free PCS and IS were also positively linked to numbers of PTA and thrombectomy. Further, the Kaplan–Meier analysis showed only total PCS was significantly associated with vascular access failure event (log-rank $P=0.02$).

Conclusions: Our results shows that the serum PCS and IS levels were associated with PAD and total PCS could be a valuable determinant of access viability other than traditional or nontraditional risk factors in HD patients.