KSN 2021
FULLY VIRTUAL MEETING
September 02 (Thu) - 05 (Sun)

Oral Communication Abstract
Presentation No. OC9-06 (Abstract Submission No. 2259)

Oral Communications 9 Sep. 4 (Sat), 17:00-19:00

A virtual diagnosis of diabetic nephropathy using metabolomics in place of kidney biopsy

Da Woon Kim[1], Hyo Jin Kim[1], Sang Soo Kim[1], Eun Young Seong[1], Sang Heon Song[1], Suhkmann Kim[2], Sujin Lee[2]
[1]Department of Internal Medicine-Nephrology, Pusan National University Hospital, Korea, Republic of
[2]Department of Department of Chemistry and Chemistry Institute for Functional Materials, Institute for Plastic Info, Pusan National University, Korea, Republic of

Objectives: In diabetes, kidneys are affected by a variety of causes and it is important to distinguish damage from other causes than diabetes, such as glomerulonephritisHowever, there is still no established tool to diagnose diabetic nephropathy (DN) other than kidney biopsy. This study aims to define a urine metabolome that can virtually diagnose DN instead of kidney biopsy.

Methods: Patients with type 2 diabetes who underwent kidney biopsy from 2010 to 2020 at Pusan national university hospital were retrospectively reviewed. The most combined glomerulonephritis was IgA nephropathy (IgAN) and membranous glomerulonephritis (MN). Thus, we selected patients with pure DN, pure non diabetic kidney disease (NDKD) (IgAN, MN) and matched patients with age and sex variables each other for urine metabolomics analysis. The control group was donors for living kidney transplantation. Experimental groups were four and each group consisted of 11 patients. Metabolomics was performed using ^{1}H-nuclear magnetic resonance. To compare DN with NDKD, orthogonal projection to latent structure discriminant analysis (OPLS-DA) was performed.

Results: OPLS-DA showed that a set of 9 urine metabolites (trigonelline, tyrosine, glutamine, acetoacetate, xanthine, N-phenylacetylglycine, alanine, trimethylamine N-oxide, and pseudouridine) with variable importance in projection scores ≥1.0 effectively classified type 2 diabetic patients into DN and NDKD group. The composite predictability for DN of 9 metabolites in receiver operating characteristics (ROC) curves showed area under the curves (AUC) of 0.766 (P = 0.025). Trigonelline, reported to reduce diabetic nephropathy and insulin resistance in type 2 diabetic rats, showed highest average importance among abovementioned urine metabolites and its median concentrations were lower in DN than in NDKD group (0.173 (0.141-0.209) mmol/L vs. 0.309 (0.208-0.369) mmol/L, P = 0.009).

Conclusions: Nine urine metabolites may useful to predict biopsy-confirmed diabetic nephropathy and guide the indication of kidney biopsy to accurately diagnose glomerulonephritis in type 2 diabetics with kidney damage.

Fig1.ROC curve of diabetic nephropathy

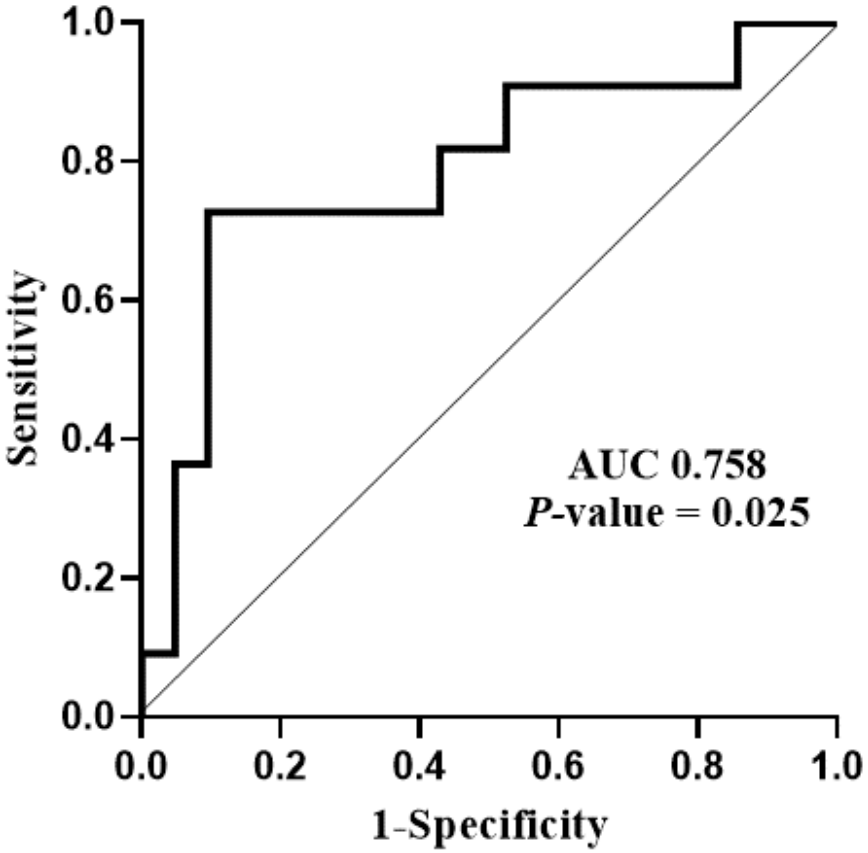

Fig 1. The ROC curve using variables (trigonelline, tyrosine, glutamine, acetoacetate, xanthine, N-phenylacetylglycine, alanine, trimethylamine N-oxide, and pseudouridine). The AUC for predicting diabetic nephropathy was 0.758 ($P = 0.025$). Positive predictive value was 82.15% and negative predictive value was 58.97%.