

Infrared spectroscopic imaging: An emerging route for chemical and structural analysis of renal tissues in diabetic patients

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Infrared (IR) spectroscopic imaging is an emerging route to measure biochemical changes in tissues in a label-free and non-destructive fashion. The identification of renal failure in kidneys associated with diabetes has been based on the examination of visible and electron microscopy images to examine tissue histology. IR spectroscopic imaging can allow for biochemical insight into the changes occurring that are associated with the diabetic process. Kidney biopsies were acquired consisting of 8 normal biopsies and 8 with diabetic nephropathy. Formalin-fixed paraffin-embedded tissues were sectioned and stained using Periodic Acid Schiff with an adjacent tissue section also acquired for IR imaging. High resolution IR images were acquired of identified kidney glomeruli and kidney tubules. Kidney glomeruli were categorized as normal, early Kimmelstiel-Wilson (KW) nodules, late KW nodules and obsolete. Structures from kidney glomerular and tubular structures were identified and spectroscopic data extracted for comparison. High resolution IR imaging allowed for the visualization and chemical characterization of tubular and glomerular structures in kidney tissues. IR spectroscopic images demonstrated chemical changes between normal and diabetic tissue structures, in particular, increased levels of glycosylation in late KW and obsolete mesangium. IR spectroscopic imaging can allow for novel insight into the chemical changes occurring in kidney tissue structures that correlate with disease state. Future work will focus on tracking of complications in renal transplant patients, such as chronic rejection and recurrent diabetic nephropathy

Biography

Michael Walsh is an Assistant Professor in the Department of Pathology at the University of Illinois at Chicago where he focuses on the development of chemical imaging approaches for clinical translation