

Novel biomarkers of obstructive uropathy

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Over the past decade, substantial progress has been achieved in the discovery and validation of novel biomarkers along with refinements in the use of serum creatinine as a marker of kidney function. The effects of ureteral obstruction on renal function are a result of many elements that change different factors involved in the regulation of glomerular function. Beside the acute effects on glomerular filtration rate and tubular function, a chronic obstruction causes tubular and interstitial injury because of activation of several pathways. The progression of tubulointerstitial injury results in chronic damage characterized by inflammatory cell infiltration, tubular atrophy and interstitial fibrosis.

Obstructive uropathy, which can be congenital or acquired, is a growing disease, where renal damage persists even after relief of obstruction. Congenital obstructive uropathy constitutes one of the major causes of renal insufficiency in infants and children. Ureteropelvic junction obstruction (UPJO) accounts for 35% of all congenital hydronephrosis cases, diagnosed in 0.5% of all newborns. The challenge in managing childhood hydronephrosis is to distinguish obstruction from non-obstructive cases and thereby identify patients requiring surgical intervention. So biomarkers of renal injury may be of particular value in predicting the need for surgical intervention or in measuring the severity of obstruction and renal injury. In this setting, tubular biomarkers as neutrophil gelatinase-associated lipocalin (NGAL) and kidney injury molecule-1 (KIM-1) have been proven useful early biomarkers of progressive renal damage. In addition, we have also identified that the urine-excreted kidney cytokines epidermal growth factor (EGF) and monocyte chemoattractant protein-1 (MCP-1) as potential biomarkers of obstruction in children with hydronephrosis.

In addition to serum/urine biomarkers, imaging biomarkers have achieved great interest over the years. A variety of MRI methods have been developed and applied to many renal diseases, including obstructive uropathy. These advanced MRI techniques show great potential, enabling non-invasive assessment of renal structure, function and injury in patients. State-of-the-art approaches for characterization of pathological (functional and structural) changes in renal disease include blood flow, tissue oxygenation, renal tissue injury and fibrosis, renal metabolism as well as sodium concentration.

These biomarkers may guide future therapy, facilitate research efforts to reduce

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the severity of obstructive uropathy and allow prognostication that is more accurate for patients with obstructive uropathy.