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Understanding the Importance of Urinary Biomarkers in Early Detection of Acute Kidney Injury

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INTRODUCTION

Acute kidney injury in pediatric patients is clinically characterized by a rapid loss of glomerular filtration rate, resulting in an inability to clear the end products of nitrogen metabolism, resulting in fluid volume and electrolyte and acid base homeostasis cannot be maintained. Pediatric AKI is a heterogeneous disease with variable clinical manifestations and unpredictable outcomes. In developed countries, the incidence of his AKI in hospitalized children is increasing, dramatically transforming from isolated acute renal disease to multiple organ failure. Excessive prevalence of AKI in pediatric patients is primarily related to the severity of the underlying disease. Extensive research efforts over the past decade have been directed to the discovery and validation of numerous novel AKI biomarkers. Most of these protein-binding biomarkers are indicators of structural renal damage, rather than diminished renal function. An ideal AKI biomarker should be accurate, reliable, easily measurable by standard assays, non-invasive, reproducible and sensitive, and specific with defined cut-off values. Importantly, new biomarkers for AKI should provide additional information not available from clinical evaluations or standard laboratory tests. Urine is an ideal bodily fluid for the assessment of AKI biomarkers because it can be obtained non-invasively and repeatedly from spontaneously voided urine samples or indwelling urinary catheters.

DESCRIPTION

Differences in etiology, treatment and other factors of childhood AKI, pre-existing comorbidities, concurrent multi-organ failure, and patient age and height characteristics may hinder extrapolation of biomarker data collected in adults. Research in the field of AKI can be challenging due to ethical considerations and low prevalence of the disease, resulting in small sample sizes. However, the group of children with AKI may be more suitable for biomarker development compared to her adult AKI patients. Pre-existing chronic kidney disease or hypertension, atherosclerosis or diabetes, all of which impair renal function. Moreover, pediatric patients with congenital heart disease undergoing cardiac surgery have a high prevalence of definite renal impairment and can be screened prospectively for the development of AKI. L-FABP in urine is a small, highly conserved cytoplasmic protein that plays an important role in cellular lipid metabolism. A protein originally identified in hepatocytes, it is highly expressed in renal proximal tubules and mediates the transport of long-chain fatty acids to mitochondria. Preclinical studies have shown that urinary levels of L-FABP histologically correlate with the degree of renal injury.

CONCLUSION

Despite differences in the age of cardiac patients, the severity of paediatric AKI, the optimal timing of urine collection, and the definition of biomarker cut-off concentrations, published data, although sparse, indicate that urinary L-FABP levels are sensitive and an early predictive biomarker for paediatric AKI after cardiac surgery. Because the number of AKI patients who require dialysis or die is very small, the prognostic potential of this new biomarker is still unknown. Promising urinary biomarkers for early detection of AKI and prediction of worse events also have major hurdles to overcome towards clinical application. The diagnostic and prognostic properties of new biomarkers are commonly compared with serum creatinine-based measurements of AKI as the existing gold standard. Undeniably, the serum creatinine-based diagnosis of his AKI is inherently imperfect, which may contribute to the apparent limitations of new biomarkers, making other means of assessing the accuracy of new tests necessary.

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