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Cystatin C: a potentially useful marker for identifying individuals with spina bifida and early renal insufficiency

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Background

Individuals with spina bifida (SB) are at risk for deterioration of their upper urinary tracts due to neurogenic bladder and subsequent progressive chronic renal insufficiency (CRI). Serum creatinine (SCr) is the most widely used marker to assess renal function and to estimate glomerular filtration rate (GFR), although it has significant limitations. SCr is dependent on age, height, gender and muscle mass and has been shown to be an unreliable marker of renal function in SB. Cystatin C (CyC) is a cysteine proteinase inhibitor of low molecular weight, produced at a constant rate by all nucleated cells, freely filtered at the glomerulus, and not secreted or reabsorbed at the renal tubule. CyC is independent of age, height, and gender and is believed to be independent of muscle mass. Over the past several years, serum CyC has been shown to be a better marker of renal function and GFR than SCr (using the Schwartz formula) in children. One study by Pham-Huy in 2003 showed that CyC was much better correlated with GFR than SCr in children with SB.

Materials and methods

We made arrangements with the Johns Hopkins Hospital Department of Laboratory Medicine to make Cystatin C available as a clinical laboratory test and began recommending yearly Cystatin C and serum electrolytes as part of routine care for patients in the SB Center at Kennedy Krieger Institute in July 2006.

Results

To date, CyC has been measured in 34 patients, mean age of 18.2 years, and range 1 to 47. None of these patients were previously diagnosed with CRI. For 33 of the patients with SB, the CyC measurements were within the previously established normal range for children and adults of 0.5 – 1.0 mg/L. These 33 SB patients had a mean CyC of 0.75 mg/L, range 0.56 to 0.94, and standard deviation of 0.10, fitting a very typical normal distribution. The 47 year old had an elevated CyC of 1.91 mg/dL, suggesting CR. Review of her history showed several episodes of acute renal failure in the past as well as chronic metabolic acidosis and other clinical evidence of CRI, although her measured serum creatinine was normal at 1.0 mg/dL. Of the 33 patients, 19 (58%) had SCr measured below normal while CyC was always within the normal range. One patient had CyC measured twice, 6 months apart, and values were consistent 0.81 initially and then 0.85.

Conclusion

Cystatin C shows promise as a simple blood test that can be used to screen individuals with SB for early development of chronic renal insufficiency and for estimating GFR.