Medical Xpress

New lab test predicts risk of kidney injury after surgery

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A simple laboratory test may provide a new way for doctors to identify patients at risk of developing potentially severe acute kidney injury (AKI) after surgery—up to three days before the problem would otherwise be detected, reports a pilot study in the May 2008 issue of the *Clinical Journal of the American Society of Nephrology*.

The test, which measures a biomarker called "neutrophil gelatinase-associated lipocalin" (NGAL), may permit earlier treatment, giving a chance to prevent or improve outcomes of postoperative AKI. "Urine NGAL represents a powerful early predictive marker of AKI, preceding the increase in serum creatinine—the current gold standard—by several hours to days," comments Dr. Prasad Devarajan of Cincinnati Children's Hospital Medical Center, one of the study authors.

The researchers measured NGAL in urine samples from 196 children undergoing cardiopulmonary bypass (CPB) during surgery to repair congenital heart defects. Cardiopulmonary bypass is a major risk factor for AKI, a serious complication that can cause death or permanent loss of kidney function.

Fifty-one percent of the children in the study developed AKI. This diagnosis was based on increased levels of the breakdown product creatinine, which did not occur until two or three days after CPB.

In contrast, urine NGAL levels began to increase within a few hours in children who developed AKI. For this group, NGAL increased 15 times

higher than normal within two hours after CPB, and 25 times higher by four hours.

Increases in urine NGAL were highly accurate in predicting risk of AKI. The NGAL level at two hours identified 90 percent of children who later developed AKI. Urine NGAL also predicted the severity of AKI—children with higher NGAL levels were at higher risk of death, were more likely to require dialysis, and had a longer time to recovery of kidney function.

An important part of the study was the incorporation of urine NGAL measurement into a standard system for monitoring patients during surgery. Previous studies had linked NGAL levels to AKI risk, but the NGAL test used was not practical for routine clinical use. The standardized laboratory platform for measuring NGAL levels in this study (ARCHITECT® assay, Abbott, under development) requires only a few drops of urine and provides results in 35 minutes.

The new test could be a major advance in identifying patients at risk of developing AKI after surgery or trauma, and in other situations commonly seen in critically ill patients. "An early elevation in urine NGAL would trigger an immediate shift in clinical management, making caregivers aware of the high potential for development of clinical AKI," says Dr. Devarajan. With close monitoring—including treatments to ensure good blood flow to the kidneys and avoidance of potentially toxic drugs—it might be possible to prevent AKI from developing.

"The availability of an early biomarker like NGAL might also enable the timely initiation of interventions such as atrial natriuretic peptide and insulin-like growth factor," adds Dr. Devarajan. Previous studies have yielded mixed results as to whether these treatments can improve kidney function in patients with AKI—Dr. Devarajan speculates that they might be more effective if started at the onset of AKI. The early information

provided by NGAL might also promote testing of other promising treatments for AKI. NGAL measurements may also provide predictive kidney safety biomarker in future drug development processes.

Confirmatory research is needed, including studies of adults and patients with certain characteristics putting them at high risk of AKI, such as pre-existing kidney dysfunction, diabetes, and potentially toxic drugs.

Source: American Society of Nephrology