Nano-measurement of troponin levels proves an accurate predictor of deterioration in heart failure

December 14 2010

Today, heart failure is by far the single biggest reason for acute hospital admission. Around 30 million people in Europe have heart failure and its incidence is still increasing: more cases are being identified, more people are living to an old age, and more are surviving a heart attack but with damage to the heart muscle. Yet traditional risk-factor prediction models have only limited accuracy in this population to identify those at highest risk for worsening outcomes.

So far, those risk prediction models have relied on measurements of a biomarker known as pro-B-type natriuretic peptide (BNP) for prognostic information, but studies have provided inconsistent and often inaccurate results. Measurements of troponin have been previously used in some types of cardiovascular disease, but the standard assays were not sufficiently sensitive to detect relevant changes in most heart failure patients. Now, the introduction of highly sensitive troponin assays has improved accuracy and allowed the detection of even small concentration changes.

This latest study assessed the prognostic value of the new high-sensitive assay with nanotechnology (ie, within the nanogram per litre range) in patients admitted to hospital with heart failure. The investigation, part of the Veteran Affairs Effects of Therapy study, was performed at the San Diego Veteran Affairs Medical Center in California, USA, in which 144 patients with acute heart failure were followed from admission to 90

days post-discharge.

Troponin I and BNP levels were checked on admission, discharge, and up to four consecutive days during hospitalisation. Thirty-eight of the 144 patients reached the study's primary endpoint of mortality or heart failure-related readmission and 22 patients had died by 90 days.

Using the new high sensitive assay, troponin measurements could be quantified in more than 99% of serum samples taken from all patients in the study. Analysis showed that levels in the higher quartile ranges (even at these small nanogram levels) were significantly associated with increased risk of mortality and readmission; patients with increasing levels during treatment also had higher mortality rates than those with stable or decreasing levels. The associations with troponin were statistically significant, while those with BNP were not.

The investigators drew three conclusions from the study:

- Troponin levels are measurable in virtually all heart failure patients with the use of a high sensitive assay
- Even small elevations in troponin during hospitalisation for heart failure are associated with increased 90-day mortality and readmission
- Serial increases in troponin concentrations during hospitalisation are associated with higher mortality than stable or decreasing levels.

Commenting on the study, co-investigator Dr Yang Xue from the Division of Cardiology, University of California at San Diego, acknowledged that heart failure is a complex disease and that no single

biomarker is likely to be fully predictive. However, because troponin is a marker for myocardial damage (a significant cause of heart failure), its accurate measurement in combination with other biomarkers will help provide a more comprehensive evaluation - and certainly more accurate than BNP alone.

Said Dr Xue: "The fact that 99% of our samples had measurable levels highlights the feasibility of measuring troponin in virtually all heart failure patients. This was simply not possible with earlier assays. But it did allow us to detect a trend of increasing troponin levels during the 90-day study period which was significantly associated with an increased risk of mortality which was not evident in patients with stable or decreasing levels. These findings may help identify a previously unidentified subgroup of high-risk patients who need closer monitoring in hospital and post-discharge."

Provided by European Society of Cardiology