

Elevated levels of cardiac biomarkers following CABG surgery associated with increased risk of death

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Patients who underwent coronary artery bypass graft surgery and had elevated levels of the cardiac enzymes creatine kinase or troponin in the 24 hours following surgery had an associated intermediate and long-term increased risk of death, according to a study in the February 9 issue of *JAMA*.

"About 400,000 [coronary artery bypass](#) grafting (CABG) procedures are performed annually in the United States, giving public health significance to factors that affect the outcome of these procedures," the authors write. Increases in creatine kinase (CK-MB) or troponin levels following CABG is common, and are an indicator of myocardial necrosis (death of [heart muscle cells](#)). Small amounts of necrosis are often regarded as insignificant. However, several small studies have suggested that cardiac enzyme elevation in the 24 hours following CABG surgery is associated with worse prognosis, but a definitive study has not been available, according to background information in the article.

Michael J. Domanski, M.D., of the Mount Sinai Cardiovascular Institute, New York, and colleagues examined the relationship between post-CABG elevation of enzyme markers of myocardial damage and early, intermediate-, and long-term mortality. The researchers analyzed data from randomized clinical trials or registries in which patients underwent CABG surgery and postprocedure [biomarker](#) (CK-MB, troponin, or both) and mortality data were collected. For this analysis, the researchers

identified 7 studies, which included a total of 18,908 patients. Follow-up varied from 3 months to 5 years.

For each patient, the CK-MB ratio was calculated as the ratio between the peak CK-MB and the upper limit of normal for the participating laboratory of each study. The researchers found that higher ratios were associated with greater risk of death. The 30-day mortality rates by categories of CK-MB ratio were 0.63 percent for 0 to less than 1, 0.86 percent for 1 to less than 2, 0.95 percent for 2 to less than 5, 2.09 percent for 5 to less than 10, 2.78 percent for 10 to less than 20, and 7.06 percent for 20 to 40 or greater. "The model suggests that a CK-MB ratio value of 4 to 5 results in an expected 30-day mortality that is more than double that for a CK-MB ratio of 1. Available troponin data yielded a similar relationship," the authors write.

The researchers also found that of the variables in the model, including CK-MB ratio, age, history of kidney dysfunction, and prior heart attack, the CK-MB ratio was the strongest predictor of death and remained significant even after adjusting for baseline risk factors. This result was strongest at 30 days, but the adjusted association persisted from 30 days to 1 year and a trend was present from 1 year to 5 years. The findings were similar when the troponin ratio, rather than CK-MB ratio, was examined.

"Although enzyme elevations are common following CABG surgery, our data make clear that the long-term prognosis is worse for patients who experience even a small elevation of CK-MB than those who do not experience such an increase," the researchers write.

"These findings may inform the design of future clinical trials with respect to using cardiac markers as an outcome measure following CABG surgery. Although these findings require confirmation in large prospective studies, they suggest that there are clinical implications in

terms of long-term prognosis for cardiac enzyme elevations following CABG [surgery](#), particularly among those with very high levels."

More information: *JAMA*. 2011;305[6]:585-591.

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