

# B-type natriuretic peptide in anesthesia practice to predict adverse cardiovascular outcomes

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BNP (B-type natriuretic peptide) was originally termed *brain* natriuretic peptide because it was first identified in porcine brain in 1988 [1]. Subsequently, it was detected in ventricular cardiomyocytes, and the ventricular myocardium was later recognized as the major source of circulating BNP [2].

The clinical diagnosis of congestive heart failure can be challenging, particularly in patients presenting with acute shortness of breath in the emergency room. Today, the clinical application of BNP testing is frequently used as a screening test in the urgent care setting to identify patients who may have heart failure and require further definitive investigation such as echocardiography. Additionally, in the intensive care unit, postoperative serial monitoring of BNP has also been demonstrated to be useful in the management of heart failure after major surgeries such as liver transplantation [3].

In this regard, a number of observational studies have recently examined the hypothesis that preoperative BNP elevations identify patients at risk of adverse events after major noncardiac surgery. Ryding et al. [4], in a meta-analysis including 4,856 patients, evaluated the prognostic value of BNP in noncardiac surgery. They demonstrated that preoperative BNP elevations were associated with an increased risk of short-term major adverse cardiac events (MACE, OR 19.77; 95% confidence interval [CI] 13.18–29.65;  $P < 0.0001$ ), all-cause mortality (OR 9.28; 95% CI 3.51–24.56;  $P < 0.0001$ ) and cardiac death (OR 23.88; 95% CI 9.43–60.43;  $P < 0.00001$ ). Given the association between BNP and the severity of heart failure, it is not surprising that this peptide is strongly predictive of the incidence of mortality and MACE.

What causes BNP elevation in patients without congestive heart failure? A number of factors other than ventricular function, including advanced patient age, female gender, decreased body mass index, decreased renal function, left ventricular hypertrophy, history of myocardial infarction and ongoing cardiac ischemia, pulmonary embolism, chronic right ventricular failure and cardiac arrhythmias have been shown to influence circulating BNP levels. Five independent predictors of elevated BNP levels ( $> 100$  pg/ml) in the absence of acute heart failure were also identified: low hemoglobin values, low body mass index, a medical history of atrial fibrillation, radiographic cardiomegaly and advanced age of the patient [5]. However in that study, renal function did not emerge as an independent predictor of BNP, possibly because of collinearity with patient age.

In this month of the Korean Journal of Anesthesiology, Jo et al. [6] aimed to assess whether preoperative NT-proBNP levels could be used as predictors of early postoperative outcomes on the basis of renal function in patients undergoing off pump coronary artery bypass surgery (OPCAB) and they found that preoperative NT-proBNP levels seem to be predictive of early postoperative complications in patients undergoing OPCAB with an estimated glomerular filtration rate  $< 90$  ml/min/1.73 m<sup>2</sup>. However, despite their promising results, several issues remain. Their finding is contrary to a previous report where the discriminative value of NT-pro-BNP was most pronounced in patients with a GFR  $> \text{or} = 90$  ml/min/1.73 m<sup>2</sup> undergoing noncardiac vascular surgery and there was no prognostic value in patients with a GFR  $< 30$  ml/min/1.73 m<sup>2</sup>.

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[7]. Although the study populations are different in these two investigations, further study will be needed to clarify these issues using multivariable linear or logistic analysis to identify the association between NT-proBNP levels and postoperative complications after controlling for other parameters.

In summary, since cardiac stress determines prognosis in cardiac and noncardiac disorders, the use of BNP may be helpful in many perioperative clinical situations, such as risk stratification and MACE prediction. Thus, these reasons might persuade anesthesiologists to measure BNP levels perioperatively.

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