—**Short Communications**—

# Biochemical Assessment of Cardiac Function in Patients Undergoing Surgery for Gastric Cancer

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An increasing number of patients with cardiovascular disease have undergone surgery for gastric cancer. The detection of patients with heart dysfunction is crucial to reduce in morbidity and mortality after surgery. Preoperative assessment of cardiac risk for patients undergoing noncardiac surgery involves the identification of risk factors present in a patient's medical history during physical examinations. Functional classification of patient's cardiac risk status using the New York Heart Association's/(NYHA) guidelines provides useful information not only for physician but also for surgeon. The NYHA functional classification is as follows: class I: no symptoms with ordinary physical activity, class II: symptoms with ordinary activity and slight activity limitations, class III: symptoms with less than ordinary activity and marked activity limitations, IV: symptoms with any physical activity or even at rest. Risk classification by anesthesiologists and consulting cardiologists are also important in identifying surgical patients who are at risk for cardiac complications.

Recently, elevated circulating concentrations of two peptides, atrial natriuretic peptide (ANP; secreted mainly by the atria) and brain natriuretic peptide (BNP; mainly produced by the ventricles), have been reported in patients with symptomatic left-ventricular systolic dysfunction[1,2]. Moreover, the plasma concentration of these peptides are also elevated in patients with asymptomatic left-ventricular dysfunction[3].

This study was designed to examine the concentrations of ANP and BNP and to assess their usefulness as indicators of cardiac function in patients with gastric cancer. Their use in the screening of surgical patients was also evaluated.

## Materials and Methods

Plasma concentrations of ANP and BNP were measured in 183 patients undergoing surgery for gastric cancer. Of the 183 patients, the clinical stage of gastric cancer was stage I in 116 patients, stage II in 16 patients, stage III in 27 patients, and stage IV in 24 patients. The patients were classified according to the NYHA functional classification by a consulting cardiologist. Sixty patients were identified as class I, 12 patients as class II, 6 patients as class III, and 2 patients as class IV. Two patients who complained of dyspnea due to severe anemia were excluded from this study. There were 15 patients with heart failure, 36 patients with ischemic heart disease and 29 patients with hypertension. One hundred and three patients did not have any form of cardiovascular disease. Differences between means were analyzed with Kruskal-Wallis and Student's t-test, and those at $p < 0.0125$ were considered to be significant.

Correspondence to Akira Tokunaga, MD, Department of Surgery(I), Nippon Medical School, 1-1-5 Sendagi, Bunkyo-ku, Tokyo 113-8603, Japan
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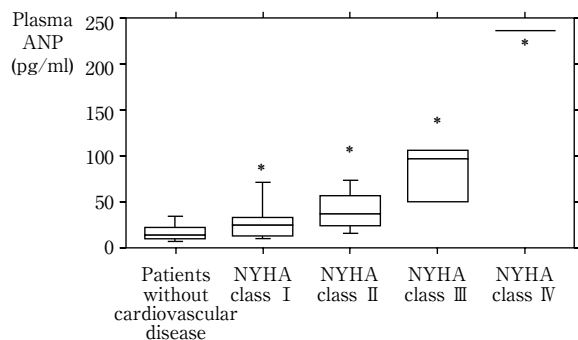Journal Website (http://www.nms.ac.jp/jnms/)

Fig. 1  Levels of Plasma Atrial Natriuretic Peptide
(ANP) in gastric cancer patients according to
the patients' New York Heart Association
(NYHA) Functional Classification
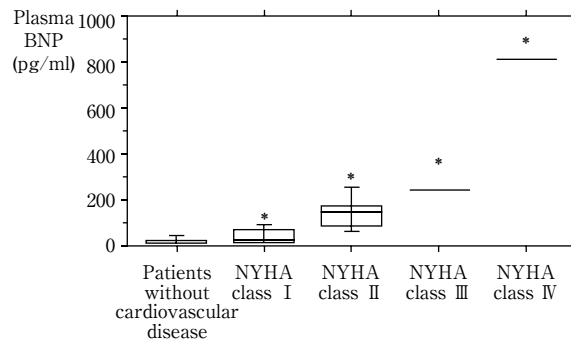*p<0.001 (Kruskal-Wallis test)



Fig. 2  Levels of Plasma Brain Natriuretic Peptide
(BNP) in gastric cancer patients according to
the patients' New York Heart Association
(NYHA) Functional Classification
*p<0.001 (Kruskal-Wallis test)

## Results

The plasma concentrations of ANP ranged from
10.2 pg/ml to 27.4 pg/ml in the patients without car-
diovascular disease. The concentration of ANP in the
patients with NYHA classifications of I, II, III and IV
were significantly higher than those of the patients
without cardiovascular disease (**Fig. 1**). The ANP in-
creased according to the degree of the NYHA classifi-
cation. The highest level of ANP was 240 pg/ml in a
patient with of class IV NYHA classification.

The plasma concentration of BNP ranged from 5.9
pg/ml to 18.5 pg/ml in the patients without cardiovas-
cular disease. The concentration of BNP in the pa-
tients with NYHA classification of I, II, III and IV
were significantly higher than those of the patients
without cardiovascular disease (**Fig. 2**). The highest
level of BNP was 800 pg/ml in a patient with a class
IV NYHA Classification.

## Discussion

The NYHA functional classification is based on the
symptoms of patients with cardiovascular diseases.
The present study shows that the plasma concentra-
tions of ANP and BNP are significantly higher in pa-
tients with a NYHA classification than in those of pa-
tients without cardiovascular disease. The levels of
ANP and BNP are related to the NYHA class. BNP is
probably more sensitive than ANP for identifying

heart dysfunction.

Examination of ANP and BNP levels would help not
only the operating surgeons, but also the anesthesiolo-
gist and consulting cardiologist to recognize the risk
of an adverse cardiac outcome in surgical patients.
The examination of plasma ANP and BNP together
with the combined cooperation of the operating sur-
geon, anesthesiologist and consulting cardiologist
should be effective in reducing postoperative morbi-
dity and mortality in patients undergoing surgery.

## References

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