

**A Comparative Study of BNP and NT-proBNP in Patients Presenting to the Emergency Department with Chest Pain.**

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**Objective:** Brain Natriuretic Peptide (BNP) and the N-terminal BNP fragment (NT-proBNP) are effective plasma biomarkers for heart failure since they are released from the myocardium in a stoichiometric ratio in response to stretch. However, there is a pressing need to evaluate these two peptides and their relationship with one another in various diseases.

**Methods:** Patients presenting with chest pain, with the suspicion of Acute Coronary Syndrome (ACS), were admitted to the ED at the Johns Hopkins Hospital and approached for informed consent. Blood was drawn upon presentation and serum and plasma samples were frozen for future analysis. BNP was measured in EDTA plasma by the Triage assay (Biosite), and NT-proBNP was measured in serum on the Roche Elecsys Modular Analytics E170 platform (Roche Diagnostics). Data analysis was conducted using MedCalc (version 7.2). All analyzed data were log-transformed to assume a normal distribution.

**Results:** The patient population was as follows: age ( $57 \pm 14$  years; range: 30-97,  $n=420$ ), male (48.1%); Race: 49% Caucasian, 51% African-American, diabetes (22.9%), hypercholesterolemia (27.6%), coronary artery disease (CAD, 17.9%), hypertension (48.6%), previous stroke (6.7%), previous myocardial infarction (M.I., 22.3%) and, on presentation, 68.6% had dyspnea. The mean NT-proBNP concentration was greater than the mean BNP concentration for the entire population ( $2738 \pm 9256$  pg/mL vs  $138 \pm 355$  pg/mL,  $p < 0.0001$ ). By Deming regression, the log-transformed equation of the line is:  $NT\text{-}proBNP = 0.75 + 1.22(BNP)$  and BNP and NT-proBNP concentrations correlate well as a whole population ( $r=0.89$ ). The correlation between measured BNP and NT-proBNP was examined for patient sub-groups with and without the following: diabetes, hypercholesterolemia, a previous stroke, hypertension, CAD, a previous M.I., and dyspnea; no statistical difference was found when comparing these correlations. BNP and NT-proBNP concentrations correlated with age (log-transformed:  $0.39 [0.26-0.49]$ ,  $p < 0.0001$  for BNP vs  $0.43 [0.35-0.51]$ ,  $p < 0.0001$  for NT-proBNP). No difference was observed in BNP or NT-proBNP correlations between race  $0.90 [0.87-0.92]$  for Caucasians vs  $0.90 [0.85-0.93]$ ,  $p=0.77$ , or gender; females:  $0.89 [0.87-0.92]$  vs males:  $0.90 [0.87-0.92]$ ,  $p=0.75$ , respectively). The mean BNP and NT-proBNP concentration was significantly greater in hypertensive patients ( $192 \pm 441$  pg/mL vs  $86 \pm 240$  pg/mL,  $p < 0.001$  for BNP;  $4092 \pm 11880$  vs  $1441 \pm 5507$ ,  $p < 0.001$  for NT-proBNP). A regression model was constructed to assess the effect of the above variables on the BNP or NT-proBNP concentration. From the model, a significant interaction ( $p=0.034$ ) was found between race and dyspnea as predictors of NT-proBNP concentration; NT-proBNP was higher in Caucasians in the absence of dyspnea. BNP and NT-proBNP were comparable in predicting those patients that had an M.I. (AUC=  $0.57 [0.52-0.62]$  vs  $0.60 [0.55-0.65]$ , respectively;  $p=0.26$ ).

**Conclusions:** Measured BNP and NT-proBNP in patients admitted to the ED with suspected acute coronary syndrome correlate well in general. Measured NT-proBNP was higher in Caucasians than African Americans regardless of the presence of dyspnea; a greater reduction in this value was seen when dyspnea was absent. Gender, age, diabetes, and certain vascular pathologies do not appear to affect the correlation between measured BNP and NT-proBNP. This information is valuable in the Emergency Room setting to aid decision making for certain patient populations.