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Review Article

Brain Natriuretic Peptide (BNP) In Congestive Heart Failure - A Review

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ABSTRACT

The burden of disease with congestive heart failure is high. Natriuretic peptide hormones, a family of vasoactive peptides with many favourable physiological properties, have emerged as important contenders for development of diagnostic tools and therapeutic agents in cardiovascular disease. Elevated plasma brain natriuretic peptide (BNP) concentrations correlate with increased cardiac filling pressures. Therefore, increased BNP has been proposed as a marker for asymptomatic ventricular dysfunction, as an aid in the diagnosis of cardiac dyspnoea, as an endpoint to assess the efficacy of heart failure therapy, and as a prognostic marker in heart failure. This article is an attempt to give a short overview on the utility of BNP blood levels for the diagnosis and treatment of heart failure.

Keywords: B-Type Natriuretic peptide; Left ventricular ejection fraction

INTRODUCTION

Brain natriuretic peptide (BNP), now known as B- type natriuretic peptide or ventricular natriuretic peptide, is a 32-amino acid polypeptide secreted by the ventricles of the heart in response to excessive stretching of heart muscle cells (cardiomyocytes). The release of BNP is modulated by calcium ions. BNP is named as such because it was originally identified in extracts of porcine brain, although in humans it is produced mainly in the cardiac ventricles. [1] BNP levels are simple and objective measures of cardiac function. These measurements can be used to diagnose heart failure, including diastolic dysfunction, and using them has been shown to save money in the emergency department setting. The high predictive value of BNP tests is particularly helpful for ruling out heart failure. Treatment with angiotensin-converting enzyme inhibitors, angiotensin-II receptor blockers, spironolactone and diuretics reduces BNP levels, suggesting that BNP testing may have a role in monitoring patients with heart failure.[2] However, patients with treated chronic stable heart failure may have levels in the normal range. Increases in BNP levels may be caused by intrinsic cardiac dysfunction or may be secondary to other causes such as pulmonary or renal diseases. BNP tests are correlated with other measures of cardiac status such as New York Heart Association classification. BNP level is a strong predictor of death and cardiovascular events in patients previously diagnosed with heart failure or cardiac dysfunction. [3] BNP levels

increase markedly in left ventricular dysfunction and the level in heart failure correlates with symptom severity. BNP can therefore be an important clinical marker for the diagnosis of heart failure. [4]

Heart Failure: Assay of BNP is a potential aid in the diagnosis of heart failure. BNP testing allows a rapid assessment for defining those patients warranting an echocardiogram and also has a potential to enable rapid changes in therapy for those already receiving treatment for heart failure. BNP testing is effective in screening for left ventricular systolic dysfunction and reduces the number of patients requiring an echocardiogram. [5,6]

Figure 1: BNP Tester

Preparation: To test the BNP level, a small amount of blood is taken and is placed in a machine that detects the level of BNP in blood. The test takes about 15 minutes. The BNP level helps to determine the presence of heart failure, rather than another condition that may cause similar symptoms. In addition BNP help the physician make decisions about hospitalizations, aggressive treatments and future prognosis.

BNP Tester Results

- BNP levels below 100 pg/ml indicate no heart failure
- BNP levels of 100-300 pg/ml suggest heart failure is present
- BNP levels above 300 pg/ml indicate mild heart failure
- BNP levels above 600 pg/ml indicate moderate heart failure
- BNP levels above 900 pg/ml indicate severe heart failure [7,8]

BNP levels are simple and objective measures of cardiac function. This prediction of the clinical course is a crucial part of the decision-making process about the adequate treatment strategy for patients with advanced congestive heart failure. Although laborious, multivariable indexes have been established for risk stratification, simple plasma BNP measurements may be useful as prognostic indicators. [9]

Physiological properties of the natriuretic peptides: ANP, BNP, and Uro bind to the natriuretic peptide - A receptor (NPR-A), which via 3',5'-cyclic guanosine monophosphate (cGMP) mediates natriuresis, Vasodilatation, rennin-inhibition, anti- mitogenesis and growth-inhibiting actions via the guanylyl cyclase-linked natriuretic peptide-B receptor (NPR-B). All four peptides are cleared by the natriuretic peptide-C receptor (NPR-C) and degraded by the ectoenzyme neutral endopeptidase 24.11 (NEP), both of which are widely expressed in the kidney, lung, and vascular wall.

Natriuretic peptide receptor organization and signal transduction mechanisms for ANP, BNP, and CNP with co-localization of NEp and angiotensin-converting enzyme at cell surface. RA, natriuretic peptide receptor A; RB natriuretic peptide receptor B; RC, natriuretic peptide receptor C; GC, guanylyl cyclase; GTP, guanosine triphosphate; PDE, Phosphodiesterase; PK, protein kinase; BK, Bradykinin. [10]

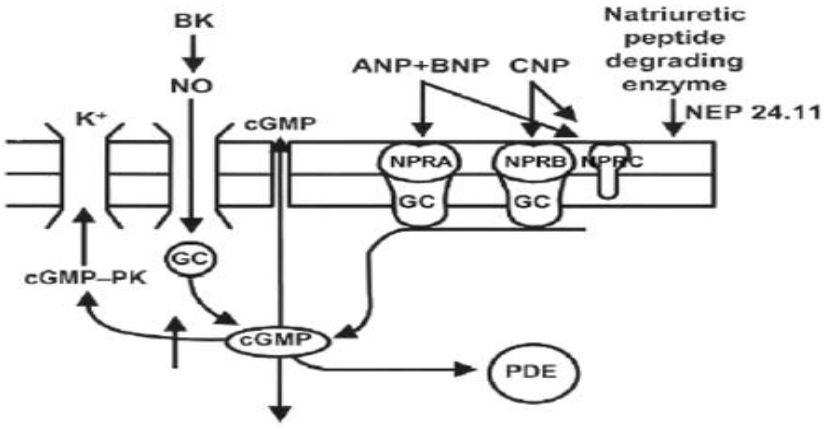

Figure 2: Signal transduction mechanisms of natriuretic peptides

CONCLUSIONS

The natriuretic peptides are family of peptides with great potential both as therapeutic agents and as biomarkers. Measurement of plasma BNP concentrations might provide a useful and cost-effective screening tool that helps reduce the need and frequency for more expensive cardiac tests. Measurement of circulating endogenous BNP has proven to be sensitive and specific test for heart failure.

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