The Significance of a “B bump” on M-mode Echocardiography and Its relationship to Systolic or Diastolic Heart Failure and Natriuretic Peptide Levels
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Background and Hypothesis
Elevated Left Ventricular End Diastolic Pressure (LVEDP) is a common marker in the development of Congestive Heart Failure (CHF). CHF is a common clinical syndrome arising with either reduced or preserved ejection fraction. Elevated LVEDP may signal a failing left ventricle or uncompensated heart failure. When LVEDP rises, patients may begin to experience the most common symptoms of CHF, including paroxysmal nocturnal dyspnea, shortness of breath, and orthopnea. The presence of a “B bump,” on M-mode Echocardiography has been shown to correlate with elevated LVEDP.2 Elevated LVEDP results from a noncompliant ventricle receiving blood from the left atrium during atrial systole. The resulting elevation in left atrial pressure causes a delay in mitral valve closure recognized as the “B bump.” This “B bump” arises because the left ventricle requires more time to overcome the left atrial pressure.3 Brain natriuretic peptide (BNP) has become a widely-used test in CHF. BNP rises with CHF presence and falls as the CHF stabilizes. BNP is released due to elevated intracardiac pressure in order to signal the body to reduce vascular volume. Several studies have shown that as BNP increases patient prognosis worsens proportionately.1 If the “B bump” is present in patients due to elevated LVEDP then a proportional elevation in BNP level should be seen. This study is designed to see if there is a correlation between a patient’s “B bump” and elevated BNP levels.

Methods
130 patients from the University of South Alabama Medical Center were identified as having B bumps using the Syrogo Dynamics software. Controls consisted of 70 patients with systolic dysfunction (Ejection Fraction (EF) <50%) and 50 patients with normal systolic function (EF>50%). The Control Patients did not present with a “B bump.” Using Electronic Medical Records from the Sorian System patient BNP levels were obtained from their test closest to the Echocardiogram with “B bump” presentation. Patient demographics, reported systolic/diastolic function, BMI, and PMH were obtained to observe possible confounding factors. The patients’ BNP data were then compared using a T test to observe if there were any significant difference between groups.

Results
Patients who presented with a “B bump” demonstrated a mean BNP level of 1,356 pg/ml compared to patient groups’ mean of 980 pg/ml (p=.046). Both means are within the positive diagnostic range for a BNP test. “B bump” patients with reduced EF had a mean BNP of 1,699 pg/ml compared to reduced EF control patients with an mean BNP of 1,125 pg/ml (p=0.12). The significant elevation in BNP levels puts patients with B bump at greater risk of mortality. It was found in a previous study of heart failure that every 100 pg/ml increase in BNP level raises a patient’s risk of all-cause mortality by 3%.1 The difference in BNP between “B bump” patients with preserved EF having a mean BNP of 722 pg/ml compared to control patients with normal EF’s average BNP of 665 pg/ml was not significant (p=0.85).

Secondary Factor Results
There are many factors that can affect BNP levels such as Renal Disease, Cardiac Disease, Obesity, Age, Gender, and more. For example, obesity has been shown to reduce BNP levels in patients by promoting BNP clearance, while female patients have been shown to possess elevated BNP levels.3 These values were compared between the patients with “B bump” versus control patients in order check for potential confounding factors. There was no significant difference between the groups rate of Renal Disease (p=0.30), Cardiac Disease (p=58), Obesity (p=83), Age (p=64), or gender (p=64). This implies that the difference seen in BNP levels between the “B bump” and control groups is a result of the presence of a “B bump.” There was no significant difference between the “B bump” patients and control in length of hospital stay (p=0.078) as a clinical outcome.

Summary
• In General, and in Patients with reduced EF the presence of a “B bump” is related to a greater elevation in BNP level.
• Elevated BNP levels have been shown to increase risk of patient mortality
• No other significant difference between the two groups existed in factors that are known to affect BNP levels.
• There is a need to further study the “B bump” as a signal of specific Heart Failure or to see if it can be used in patients with non-diagnostic BNP levels as well as investigating left ventricular diameter data

References