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Case Report

NT-pro BNP - Important Screening Tool for Perioperative Risk Assessment

Itee Chowdhury[1]*, Soumi Pathak[2] and Sangeeta Bhagat[3]

[1]Senior Consultant, Rajiv Gandhi Cancer Institute and Research Centre, DA, DNB Anaesthesia, Delhi, Presently Max Institute of Cancer Care SHBG, India

[2]Consultant Anaesthesia, Rajiv Gandhi Cancer Institute and Research Centre, MD Anaesthesia, Delhi, India

[3]Attending Consultant, Rajiv Gandhi Cancer Institute and Research Centre, DA, DNB Anaesthesia, Delhi, India

***Corresponding Author:** Itee Chowdhury, Senior Consultant, Rajiv Gandhi Cancer Institute and Research Centre, DA, DNB Anaesthesia, Delhi, Presently Max Institute of Cancer Care SHBG, India.

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Abstract

Background: NT pro BNP is a prognostic marker for patients with heart failure (HF) and chronic kidney disease (CKD). The implication of excessively high (≥4000 pg/ml) NT pro BNP levels is still a highly debatable topic. However, such values cannot be ignored and must be taken note of as an impending heart failure if already not so in a preanaesthetic check up and treated aggressively. We present here a case report to highlight this issue.

Case: A 76 years old female, known case of CAD, nephrotic syndrome and CKD, diagnosed carcinoma breast, was posted for Breast conserving surgery and oncoplasty. On examination she did not have any signs and symptoms of heart failure (HF). Left ventricular ejection fraction was 30% and she had critically low GFR (15ml/min/1.73m2). Her preanaesthetic work up included NT pro BNP levels which was 4310 pg/ml. She was aggressively treated with frusemide, B blocker and vasodilators. Maintaining a balance between her preload and after load was the key to the successful intraoperative management of this patient.

Conclusion: High NT pro BNP in patients with no signs and symptoms of HF must not be ignored as it may be the only indicator of the impending heart failure.

Keywords: Heart Failure; Renal Insufficiency; Chronic; Breast Neoplasms

Abbreviations

SVV: Stroke Volume Variation; SV: Stroke Volume; CO: Cardiac Output; MBP: Mean Blood Pressure; SVR: Systemic Vascular Resistance; GFR: Glomerular Filtration Rate; HF: Heart Failure; USG: Ultrasound; NT PRO BNP: N Terminal Brain Natriuretic Peptide

Introduction

Brain natriuretic peptide (BNP), is a 32–amino acid neurohormone produced and released by the ventricles in response to pressure and volume overload.[1-4] Several studies have shown it to be a prognostic marker for patients with heart failure (HF) and chronic kidney disease (CKD). In patients with concurrent cardiac and chronic kidney disease, the levels of NT Pro BNP are markedly high ≥4000 pg/ml due to excessive production in the myocardium and decreased excretion due to the low GFR (Glomerular filteration rate). These patients have a complex pathophysiology in which the worsening cardiac condition results in decrease in the renal function and the decreased renal function in turn causes water retention and volume overload, thereby leading to cardiac overload. At present no studies are available which clearly states the implication of excessively high NT pro BNP levels. However, such values should not be ignored and must be treated aggressively to prevent heart failure during perioperative period.

Case

A 76 years old female, who is known case of CAD with single coronary stent was referred to our hospital for BCS (breast conserving surgery) with OPS (oncoplasty). She had nephrotic syndrome and was diagnosed with membranous glomerulonephritis 8 years ago. She gave history of repeated episodes of breathlessness and pleural effusion in the last 8 years. Last episode of breathlessness was 3 years prior and her serum creatinine level was 5.2-5.4mg % since 2014. She was on tablets Metoprolol, Nicardia (Nifedipin) and frusemide 20 mg on every alternate day. On examination the patient was pale with mild pedal edema. Her JVP was not raised and her pulse and blood pressure were within normal limits. Room air

saturation was 97% and chest auscultation was normal without any basal crepitations. Blood investigations revealed Haemoglobin of 10 g, serum creatinine 3.8 mg/dl and urea of 102mg. ECG showed T inversion in AVL and V2-V6. Echocardiography revealed an ejection fraction of 30% with hypokinetic anterior, lateral and apical segments. LAD territory showed severe hypokinesia and there was grade 2 diastolic. dysfunctions. USG Kidney demonstrated raised cortical echogenicity. NT Pro BNP was requested in preanaesthetic work up which was 4310 pg/ml Cardiologist was consulted and apart from tab Metolar, strovas, frusemide20 mg twice a day, Isolazin (Isosorbid dinitrate and Hydralazine combination) twice a day orally was started. Serial NT Pro BNP was sent over next few days and it was only after a week that the NT pro BNP value had decreased to 900pg/l. and patient was taken up for breast conservative surgery.

On the day of surgery, the patient was shifted to the operation theater after tablet Rantac and Granisep premedication. All standard monitors were applied and left radial artery was cannulated for invasive blood pressure monitoring and SVV, CO monitoring using EV1000 clinical platform (Edward life science) monitor. Intraoperative period SVV guided fluid was administered and a boluses of 50 ml was given at a time to maintain SVV between 5-10.

General anesthesia was induced with small aliquots of Injection Fentanyl (1µg/kg), etomidate 4-6 mg and injection cisatracurium 0.15 mg/kg. Anesthesia was maintained with oxygen, nitrous oxide and desflurane. BIS was kept at 50-60. Ultrasound guided Pectoral nerve- 2 and and Serratus Anterior plane block (SAP) was given with 20 ml of 0.25% of bupivacaine. Dopamine infusion was started at the rate of 3µ/kg/min to maintain urine output. The patient was catheterized and fentanyl bolus was given at blood pressure rise of 20% above the baseline. The total fluid administered was 340 ml over a period of 3 hours and her urine output during this period was 175ml. The patient remained hemodynamically stable throughout the surgery and reversal done after train of four monitor showed adequate recovery and trachea extubated, at the completion of surgery. The patient was conscious oriented and pain free and was shifted to PACU for monitoring. Her NT Pro BNP was 900 Pg/ml after 24 hours and she was discharged after 3 days.

Table showing the EV1000 readings every 30 mins.

SVV	10	5	8	4	4
SV	80	81	93	80	80
CO	4.4	4.6	5.5	5.7	5.6
MBP	70	65	70	68	65

Table 1

Discussion

In the older adult population, with morbid risk factors including diabetes and hypertension, the incidence of HF is considerably high. The serum assays of brain natriuretic peptide (BNP), which is a 32–amino acid neurohormone produced and released by the ventricles in response to pressure and volume overload, has aided in the diagnosis of HF in patients presenting with dyspnea [1-4]. Elevations in BNP is associated with significant risk for major post operative complication and death [5-7]. While BNP level generally rises in exacerbation of heart failure and decreases in compensation, it has a marked variability that makes interpretation difficult. Sometimes BNP levels are different in patients with clinically similar presentations, and sometimes they are unusually high in patients with very mild HF. The underlying mechanism for this significant heterogeneity in BNP values is unclear. Left atrial volume and index are independent predictors of BNP levels. In addition, NT pro-BNP levels also have diagnostic and prognostic role in patients with Chronic kidney disease (CKD) [8].

In patients with concurrent cardiac and chronic kidney conditions, the synthesis of BNP within myocardial cells is increased and its clearance in the kidney is decreased due to the impaired renal function. Thus, the concentration of serum NT-PROBNP may be elevated much more in comparison to patients of heart failure with normal kidney function.

Our patient had low ejection fraction of 30% due to coronary artery disease and also had critically low GFR due to membranous glomerulonephritis. She also had low albumin levels because of her nephrotic syndrome. All these factors were together responsible for recurrent episodes of breathlessness and pleural effusions in the past. When she reported to this hospital she did not have any symptoms of heart failure or volume overload. But in view of her previous history of repeated episodes of breathlessness NT Pro BNP biomarker was requested at preanaesthesia work up and levels were markedly high (4000 pg/ml). This was probably because of the presence of chronically dilated, hypokinetic myocardium which resulted in increased production of BNP and decreased excretion due to critically low GFR.

Cardiac consultation was done and patient was treated in the lines of prevention of cardiac decompensation and elective surgery was postponed till the NT-pro BNP levels came down to values acceptable which took a weeks time. Thus possibility of perioperative heart failure in her case was very high had she not been treated aggressively in the lines of prevention of heart failure, and this was undertaken only after a request to do NT–Pro BNP levels in her preanaesthetic work up which came extremely high, although she was

clinically asymptomatic at that point of time.

Aggressive treatment with frusemide and Isolazin (combination of isosorbide dinitrate and hydralazine) helped in reducing the excessive water content of the body and the after load. Thus reduced the NT pro BNP levels probability of cardiac decompensation. Usg guided Pecs 2 blocks provided a pain free postoperative period thereby reducing the postoperative stress and associated increase in oxygen demand.

Dopamine infusion during surgery helped in maintaining urine output. Dopamine has a dose dependent effects on dopaminergic beta1-and alpha –adrenergic receptors and increases renal blood flow and provides diuretic and natriuretic effects our patient had a good urine output. Advanced cardiac monitoring helped to maintain stable haemodynamics, we can observe that intraoperatively her fluid transfusion based on SVV was only 350 ml and adequate urine output.

Conclusion

Natriuretic Peptide Tests (BNP,NT-proBNP) is an important screening tool available which may be included in an anaesthesiologists armamentarium whenever indicated.

Level of B-type natriuretic peptide (BNP) is associated with left ventricular end-diastolic pressure, left ventricular wall stress, fibrosis and systolic dysfunction.

Also high BNP levels (>4000 pg/mL) do not always reflect heart. It may be due to the presence of concomitant renal dysfunction but aggressive preoperative treatment with frusemide and vasodilators will help in preventing cardiac failure and the use of regional blocks and advanced cardiac monitoring intraoperatively are the cornerstone in the management of these patients under general anaesthesia.

Authors Contribution

- Dr Chowdhury - To conception and design or acquisition of data or analysis and interpretation of data. Drafting the article or revising it critically for important intellectual content.
- Dr Pathak -To conception and design or acquisition of data or analysis and interpretation of data. Drafting the article or revising it critically for important intellectual content.
- Dr Bha gat - in writing the manuscript.
- All authors read and approved the final manuscript.

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