

# N-terminal-pro-brain natriuretic peptide, a surrogate biomarker of combined clinical and hemodynamic outcomes following percutaneous transvenous mitral commissurotomy



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**Aim:** To examine the relationship between plasma levels of N-terminal-proB type natriuretic peptide (NT-proBNP) and various echocardiographic and hemodynamic parameters in patients with mitral stenosis undergoing percutaneous transvenous mitral commissurotomy (PTMC).

**Materials and methods:** The study population consisted of 100 patients with rheumatic mitral stenosis who underwent PTMC. NT-proBNP levels in these patients were measured before PTMC and 48 hours after PTMC. These levels were then correlated with various echocardiographic and hemodynamic parameters measured before and after PTMC.

**Results:** Eighty-one percent of the study population were women, and the most common presenting symptom was dyspnea which was present in 94% of the patients. Dyspnea New York Heart Association class correlated significantly with baseline NT-proBNP levels ( $r = 0.63$ ;  $p < 0.01$ ). The plasma NT-proBNP levels in these patients increased as echocardiogram signs of left atrial enlargement and right ventricular hypertrophy developed ( $r = 0.59$ ,  $p < 0.01$ ). Patients in atrial fibrillation had significantly higher NT-proBNP levels than patients in sinus rhythm. Baseline NT-proBNP levels correlated significantly with left atrial volume ( $r = 0.38$ ;  $p < 0.01$ ), left atrial volume index ( $r = 0.45$ ;  $p < 0.01$ ), systolic pulmonary artery pressures ( $r = 0.42$ ;  $p < 0.01$ ), and mean pulmonary artery pressures ( $r = 0.41$ ;  $p < 0.01$ ). All patients who underwent successful PTMC showed a significant decrease in NT-proBNP (decreased from a mean 763.8 pg/mL to 348.6 pg/mL) along with a significant improvement in all echocardiographic and hemodynamic parameters ( $p < 0.01$ ). The percent change in NT-proBNP correlated significantly with the percent improvement noted with left atrial volume ( $r = 0.39$ ;  $p < 0.01$ ), left atrial volume index ( $r = 0.41$ ;  $p < 0.01$ ), systolic ( $r = 0.32$ ,  $p < 0.01$ ), and mean pulmonary artery pressures ( $r = 0.31$ ,  $p < 0.01$ ).

**Conclusions:** The decrease in NT-proBNP levels following PTMC reflects an improvement in clinical and hemodynamic status; hence, it is reasonable to suggest that NT-proBNP is helpful in evaluating the response to PTMC.

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## Introduction

Rheumatic heart disease (RHD) is a permanent sequelae of rheumatic fever (RF). The prevalence of RF and RHD has decreased in developed countries, but they still remain a major health hazard in developing countries. The incidence of RF is equal in both genders, but rheumatic mitral stenosis (MS) is two times more common in women [1].

Rheumatic fever affects all the valves microscopically, but clinically significant disease is observed mostly in the mitral valve [1]. Mitral stenosis being a mechanical obstruction to the forward flow of blood, the only definitive therapy is a mechanical relief in this obstruction. Three procedures are effective in providing such therapy, which are percutaneous transvenous mitral commissurotomy (PTMC), surgical mitral commissurotomy, and mitral valve replacement. A successful PTMC results in improvement in mitral valve area (MVA), thereby causing a decrease in left atrial (LA) pressures, decrease in pulmonary artery (PA) pressures, and increase in left ventricular end diastolic pressure.

Brain natriuretic peptide (BNP), a cardiac neurohormone secreted predominantly by ventricles and to some extent by atria, has a regulatory and modulatory role in the cardiovascular system by its diuretic, natriuretic, and vasodilator actions. N-terminal-pro B type natriuretic peptide (NT-proBNP) is part of prepro-BNP, which is secreted in a proportion equivalent to BNP. It is more stable than BNP due to its long half-life, therefore higher levels of NT-proBNP are observed. The diagnostic and prognostic role of NT-proBNP in left ventricular dysfunction of various etiologies has been extensively studied [2–4]. It has also been shown in studies that plasma NT-proBNP levels increase in diseases like primary pulmonary hypertension, cor-pulmonale, and pulmonary embolism which affect the pulmonary bed and right heart [5,6].

The prognostic role of various NPs in valvular heart diseases has been extensively studied [7–9]. It was noted that various NPs were elevated in patients of MS, and few of them correlated with the severity of MS [7]. Following a successful PTMC, a decrease in various NPs is expected and few studies have evaluated this change [10,11]. Although NT-pro-atrial-NPs are increased

### Abbreviations

NT-proBNP	N-terminal-pro B type natriuretic peptide
PTMC	Percutaneous transvenous mitral commissurotomy
RHD	Rheumatic heart disease
RF	Rheumatic fever
MS	Mitral stenosis
MVA	Mitral valve area
LA	left atrium
PA	Pulmonary artery
BNP	Brain natriuretic peptide
NPs	natriuretic peptides
LAVI	Left atrial volume index
LVEDP	left atrial end diastolic pressure
AF	Atrial fibrillation
NYHA	New York Heart Association

in patients of MS along with BNP and NT-proBNP, due to the ease of laboratory tests and reproducibility usually only BNP or NT-proBNP is used. Plasma NT-proBNP levels are affected in MS and they correlate with the severity of MS [12–17]. Only a few studies have evaluated the change in NT-proBNP levels in patients of severe MS following PTMC [18–23].

The reversible nature of the pulmonary hypertension in MS may be an explanation for the decrease in NT-proBNP levels after PTMC. The decrease in pressures in the LA and right side of the heart following PTMC cause a decrease in wall stress which contributes to the decreased NT-proBNP levels. This present study is designed to examine the relationship between plasma levels of NT-proBNP and various echocardiographic and hemodynamic parameters in patients with MS undergoing PTMC.

## Materials and methods

The study population consisted of 100 patients with rheumatic severe MS who underwent PTMC at department of Cardiology, Sri Venkateswara Institute of Medical Sciences, Tirupati, India between June 2012 and November 2013. The protocol was approved by the Institutional Ethics Committee and all patients gave a written informed consent. All patients with severe MS [2-dimensional (2D) MVA = 1.5 cm<sup>2</sup>] who were candidates for PTMC, as per ACC/AHA/ESC guidelines, were included in this study [24,25]. Inclusion criteria were patients with symptomatic severe MS with favorable valve morphology,

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