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Original Research Article

Functional (ischemic) mitral regurgitation in acute phase of myocardial infarction: Associated clinical factors and in-hospital outcomes

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ABSTRACT

Background and objective: Mitral regurgitation (MR) after myocardial infarction (MI) carries adverse prognosis. The objective of this study was to assess the impact of functional MR on adverse in-hospital outcomes in acute MI.

Materials and methods: A total of 569 patients with first ever acute MI were divided into three groups: no MR, mild MR (regurgitant orifice area <0.2 cm^2) and moderate-severe MR group (regurgitant orifice area more or equal >0.2 cm^2). Clinical profile and in-hospital outcomes were compared among the groups.

Results: Patients with increasing grade of MR were elder ($P < 0.001$), more likely to be female ($P = 0.003$), have atrial fibrillation ($P < 0.001$), higher peak C-reactive protein values ($P = 0.001$), multivessel coronary artery disease ($P < 0.001$), and less likely to have dyslipidemia ($P = 0.029$). Ejection fraction, age, atrial fibrillation and left ventricular end diastolic diameter index were independent predictors of moderate and severe MR ($P < 0.001$). In hospital cardiac death and decompensated heart failure was more prevalent in moderate-severe MR group.

Conclusions: Moderate and severe MR in acute MI is related to age, atrial fibrillation, increased left ventricular diastolic dimensions and decreased ejection fraction. Moderate and severe, but not mild MR is an important clinical contributor to in-hospital cardiac death.

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1. Introduction

Ischemic mitral regurgitation (MR) after myocardial infarction (MI) is a recognized adverse prognostic factor known to account for increased risk of adverse patient outcomes: it is an independent predictor of increased mortality, risk of heart failure and death at long-term follow-up [1,2]. Although MR after MI is a frequently reported echocardiographic finding, significant (moderate and severe) MR is less prevalent [3]. Recently even mild MR was recognized as an important risk factor contributing to increased risk of heart failure and death after MI during a long-term follow up [2,4].

A great proportion of lethal post MI complications occur in acute phase of myocardial infarction or during the hospitalization period, and the role of ischemic MR in this setting is being explored [1,5,6].

Reported incidence of significant (moderate and severe) MR after MI ranges between 6% and 12% [3,7,8]. Recognition of ischemic MR and pitfalls of its estimation by angiographic studies and semi-quantitative color flow Doppler echocardiographic imaging rises a need to reassess the prevalence of ischemic MR by established quantitative doplerographic measures according to recent international guidelines for valve function assessment [9].

The aims of this study are to assess the incidence of mitral regurgitation in patients with myocardial infarction, to determine associated clinical factors, and the impact of MR on in-hospital cardiac death.

2. Materials and methods

Retrospective analysis of electronic health records database was performed to identify patients, who presented and were treated for suspected acute myocardial infarction at Hospital of Lithuanian University of Health Sciences (HLUHS) Kaunas clinics in the year 2012: 869 such cases were identified. Only patients with confirmed diagnosis of MI who met the diagnostic criteria of European Society of Cardiology third definition of myocardial infarction [10] and had undergone in-hospital departmental echocardiographic examinations were further considered for inclusion in the study (812 cases). The echocardiographic reports were reviewed for adequate data and quality assessment. The following exclusion criteria were applied: reported suboptimal image quality for valve function assessment, structural hemodynamically significant aortic valve disease, structural mitral valve abnormalities, left sided heart valve replacement/repair, mechanical complications of myocardial infarction, known dilated, hypertrophic or storage cardiomyopathies, and previously known mitral regurgitation. Application of aforementioned exclusion criteria resulted in final study population comprising 731 patients with confirmed MI (with or without ST segment elevation on ECG) and adequate departmental echocardiographic assessment of cardiac structures and valve function.

The following clinical data were obtained from medical records: vital parameters (arterial blood pressure and heart rate upon admission), medical history (arterial hypertension, history of prior MI, dyslipidemia, diabetes mellitus, ischemic stroke, and atrial fibrillation), biochemical markers (peak troponin I, peak C-reactive protein (CRP) values, serum creatinine, lipid profile). Dyslipidemia was defined as elevated total (>5.2 mmol/L) or low-density lipoprotein (LDL) level (>2.59 mmol/L), or low levels of high-density lipoprotein (HDL) cholesterol (<1.55 mmol/L). Echocardiographic findings (index of left ventricular end diastolic diameter (LV EDDi), LV ejection fraction (EF), myocardial mass index (MMI), grade of mitral regurgitation), ECG criteria (ST segment elevation, Q wave formation, localization of MI, conduction and rhythm disturbances), coronary angiography findings, percutaneous coronary intervention results, and clinical course (heart failure class according to Killip, in-hospital treatment duration and outcomes) have also been recorded.

At HLUHS Kaunas Clinics mitral regurgitation is routinely quantified according to the recommendations provided by European Society of Echocardiography, and reported as none (grade 0), mild (grade I, regurgitant orifice area (ROA) $< 0.2\ cm^2$), moderate (grade II, ROA 0.2–0.3 cm^2), or severe (grade III–IV, ROA $\geq 0.3\ cm^2$ or $\geq 0.4\ cm^2$ respectively) [7]. Based on reported mitral regurgitation degree all patients were divided into three groups: no mitral regurgitation group (no identifiable or measurable MR), mild mitral regurgitation (M-MR) group (grade I) and moderate-severe mitral regurgitation (M/S-MR) group (grade II–IV).

Statistical analysis was performed with SPSS 21.0 statistics package. The data were expressed as mean ± standard deviation or median for continuous variables, and number (%) for categorical variables. Clinical and other characteristics were compared among the groups of mitral regurgitation with chi-square test for categorical variables and ANOVA test for linear variables. Intragroup comparisons for categorical variables were performed with Z test, while quantitative variables within the groups were compared by Tukey and Dunnett's T_3 tests if dispersions were equal or not, respectively. In addition, logarithm function and Tukey test were used to compare means of triglycerides within the groups of mitral regurgitation, where the distribution of triglycerides was not following the normal distribution. Multivariate logistic regression analysis was performed to assess the impact of selected risk factors to development of significant MR after adjusting for possible confounding factors. Univariate regression analysis was performed to explore predictors of in-hospital cardiac death.

3. Results

The final study population comprised 731 patients: 511 (69.9%) men and 220 (30.1%) women. The mean age of the patients was 65.37 ± 11.99 years (range 23–94 years). A total of 569 (77.8%) patients were treated for the first ever MI; 162 (22.2%), for repeated MI. In-hospital cardiac death occurred in 24 (3.3%) patients: 16 (2.8%) deaths were reported in the incidental first MI group, and 8 (4.9%) deaths in repeated MI group.

3.1. *Incidence and prevalence of MR*

In the general MI population (n = 731), varying degrees of MR were reported in 629 (86%) patients, and no detectable or measurable MR was found in 102 (14%) patients. Prevalence