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5 YEAR RESULTS OF EJECTION FRACTION IN PATIENTS WITH ACUTE CORONARY SYNDROME AFTER MULTIVESSEL PERCUTANEOUS TRANSLUMINAL ANGIOPLASTY

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SUMMARY

Aim. The aim of this randomized clinic trial was to study 5-year follow up of morbidity and mortality in patients with acute coronary syndrome after conducted multivessel percutaneous transluminal coronary angioplasty (PTCA).

Material and methods. The trial was carried out in two groups with EF <35% and >35% for assessment of acute coronary syndrome impact to myocardial revascularization. 742 patients were included to the trial. All patients were undergone coronary angiography admitted during 6 hours after MI and followed through PTCA. 5 year follow-up of morbidity was investigated on these patients considering an initial EF.

Results. 129 patients had got EF indices lower than 35%. Only 122 patients (94%) among these ones completed the 5 year follow up. 613 patients had got EF with initial indices higher than 35%. Average age of patients with EF <35% was 55,4 year (SD 12-15) and in patients with EF >35% - 55,8 year (SD 10-17).

110 patients (90,2%) with EF <35% and 501 patients (86,6%) with EF >35% were men. 12 (9,8%) women were in the group with EF<35% and 76 (13,2%) in the group with EF >35%. Only 577 (93,8%) of them completed the follow up. The estimation of morbidity and mortality were done in divided groups by EF for both sex. Also there were investigated and compared the causes of death in both groups.

Conclusion. EF was determined as an important factor influenced morbidity and mortality in patients after PTCA.

Keywords: *Ischemic heart disease, myocardial infarction, percutaneous, transluminal angioplasty, ejection fraction.*

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INTRODUCTION

Although coronary heart disease (CHD) is the main cause of morbidity and mortality in most European countries and around the world [1] there is a gradual decrease in the incidence and mortality in acute myocardial infarction (MI) [2]. This may be partly due to a decrease in the known risk factors for cardiovascular diseases [3], as well as a decrease in the incidence of ST-elevated myocardial infarction (STEMI) [4], which has a higher risk of short-term mortality in patients compared to non-ST-elevated myocardial infarction (NSTEMI). On the other hand, a national observation conducted in 2007 in France showed that patients with NSTEMI and STEMI have comparable nosocomial and long-term prognoses [5].

The introduction of evidence-based therapies, including the timely use of revascularization procedures, such as percutaneous coronary interventions (PCI) in STEMI could also help to reduce mortality [6].

After the introduction of balloon angioplasty in 1977, there was a gradual, significant improvement in patient survival, which was promoted by coronary non-metal stents introduced in 1994 and drug-eluting stents in 2004, as well as increased control over stent thrombosis using dual antiplatelet therapy [7, 8]. These methods dramatically reduced the incidence of complications, although they still occur [9]. The efficacy of PCI in patients with ST-elevated MI and non-ST-elevated MI was demonstrated in randomized trials [10, 11].

As known, unstable angina and MI are widespread heart pathologies. However, low EF is a significant factor affecting coronary heart disease incidence and mortality [12, 13].

Taking into this into account, a study of the long-term results after PTCA and study of the effect of the EF preservation in patients with this pathology is of great scientific and practical importance.

MATERIAL AND METHODS

The trial was conducted in 2008-2014 at the Central Clinical Hospital. A group of patients after PTCA due to MR was examined prospectively. During the trial, patients were mainly selected by the Syntax coefficient below 22. Patients with Syntax coefficient between 22–23 were selected for PTCA according to the overall decision of the cardiology team taking into account the wishes of the patient. A written consent was provided by the patients.

The patients admitted within 6 hours after myocardial infarction underwent coronary angiography. Patients with MI underwent PTCA + stenting. The trial included patients with unstable angina and MI. The 5-year survival rate of these patients was studied taking into account the initial EF values.

The patients who had previously undergone PTCA, as well as those who need extracoronary cardiac or vascular intervention, patients admitted after 3 hours from the pain onset, patients who have had dialysis and have neurological disorders were excluded from the trial.

Second- and third-generation drug-eluting stents (Medtronic, Boston and Biomatrix) were used [14].

Current standard methods were chosen for the procedure according to the recommendations of the European Society of Cardiology (ESC). Patients for the trial were selected among those with a history of MI and unstable angina. The primary purpose of this procedure was complete cardiac revascularization.

The femoral or radial route was chosen for implantation in the vascular bed for PTCA. Patients were observed in the hospital for 24-72 hours after the procedure. The patients were re-examined after seven days. Before the procedure, all the patients received 300 mg of acetylsalicylic acid and 600 mg of clopidogrel. Treatment with clopidogrel lasted for at least 12 months.

Statistical analysis of the data was carried out depending on the treatment prescribed. The results of the study for 5 years were identified as events for binary analyses. For statistical data processing, the Kaplan-Meier estimation system with log-rank test P was used to calculate cumulative events. Risk ratios and 95% confidence interval were calculated using the partial Cox likelihood test. A high sensitivity analysis was performed to identify the effect in patients based on 5-year results. We calculated the binary variables such as the absolute number (%) and continuous variables, as the mean (SD). A statistical analysis was reproduced using the SPSS statistical system and a statistical comparison of binary variables was performed using the $\chi2$ test or Fisher's exact test.

RESULTS AND DISCUSSION

To assess the effect of an acute coronary syndrome on the state of MR, a trial was conducted in two groups with EF below 35% and above 35%.

For randomized cohort trials, 742 patients were selected. 129 patients had EF below 35%. After 5 years, follow-up was completed in 122 (94%) of these patients. 613 patients had EF higher than 35%. After 5 years, 577 (93.8%) of these patients completed the follow-up.

Patient characteristics were summarized as follows: in a randomized controlled trial, the mean age of the patients with EF below 35% was 55.4 (SD 12-15) and with EF above 35% – 55.8 (SD 10-17).

110 patients (90.2%) with EF below 35% and 501 (86.8%) with EF above 35% were male patients. 12 (9.8%) women were in the group with EF below 35%, and 76 (13.2%) in the group with EF above 35%.

42 patients (34.4%) below 35% and 141 patients (24.4%) in the group with EF above 35% received treatment for the previously established diagnosis of type 2 diabetes mellitus. The Syntax ratio was 26.8 in the group with EF below 35% and 25.5 in the group above 35%. The patients in the trial received the antiplatelet drug clopidogrel for a year and stopped taking it after the expiration date. All the patients received acetylsalicylic acid for 5 years. After 5 years, no differences were found in the use of this drug.

To assess the effect of EF on myocardial revascularization, groups with EF below 35% and above 36% were studied. The patients who survived with EF below and above 35% during the 5 years after MR are shown in Figure 1.

Apparently, during the period after MR, 87.3% of the surviving patients were observed in the group with EF below 35% (12.7% mortality), and 94.6% of the surviving patients – in the group with EF above 36% (5.4% mortality). A significant difference was found (p = 0.00067) when comparing the number of surviving patients and mortality in both groups. EF below 35% increases mortality after MR by 2.5 times (Fig. 2). Thus, the EF degree can be considered a fairly serious factor affecting longevity MR.

The Kaplan-Meier survival analysis dynamically shows the significance of this difference from the first weeks.

In the follow-up period after MR, the survival rate of male patients in the group with EF below 35% was 88.1% (mortality – 11.9%), and in the group with EF above 36% it was 94.9% (mortality – 5.1%). Significant differences were found when comparing survival and mortality in both groups (p = 0.000297). This confirms the increase in the mortality in males with low EF after MR. Thus, it is safe to say that the EF level can be considered an important factor affecting the longevity of male patients after MR.

In the follow-up period after MR, the survival rate of female patients in the group with EF below 35% was 78.9% (mortality – 21.1%), and in the group with EF above 36% – 92.9% (mortality – 7.1%). When comparing survival and mortality rates in both groups, significant differences were determined (p = 0.036). EF values below 35% in females triple the number of deaths after MR (Fig. 3).

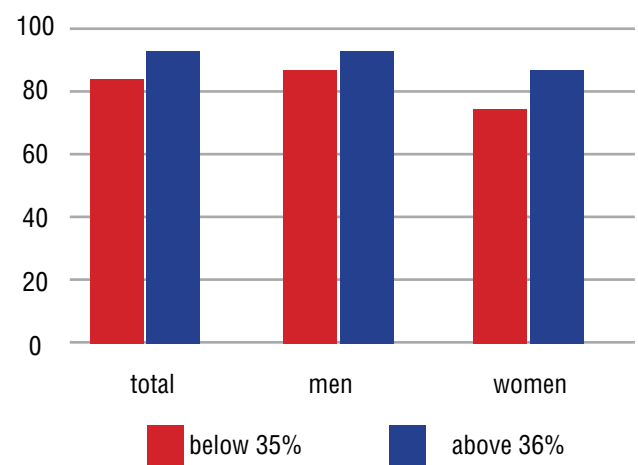Thus, the EF level in women can also be assessed as an important factor influencing longevity.

Figure 1. The number of patients surviving after MR in patients with EF below 35% and above 36% (percentages).
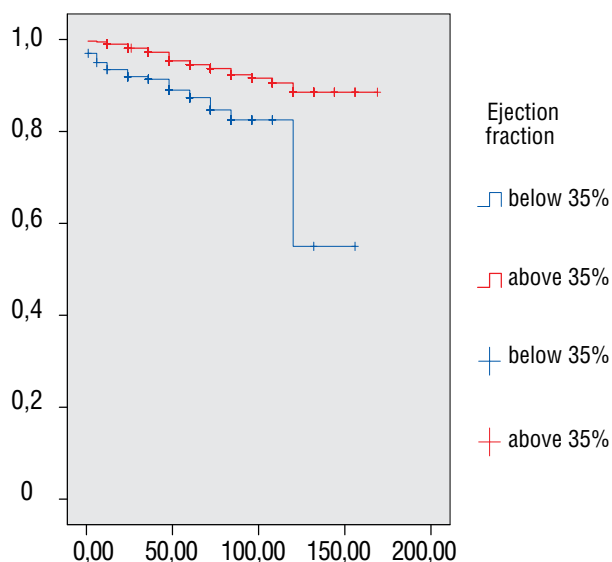
Figure 2. Survival analysis according to Kaplan-Meier in patients with EF below 35% and above 36% after MR. The x-line is the follow-up period (weeks), the y-line is the relative number of surviving patients.
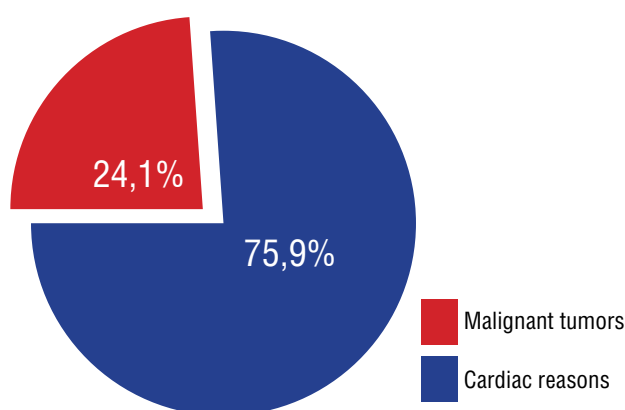

Figure 3. Mortality rate after MR in patients with EF below 35% and above 36%

Figure 4. Causes of death in patients with EF below 35% after MR.
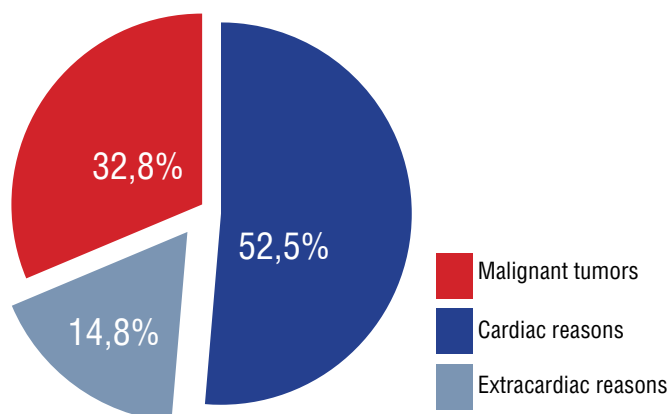
Figure 5. Causes of death in patients with EF above 36% after MR

Investigating the causes of death after MR, it became known that in patients with EF below 35%, it occurred due to cardiac reasons in 75.9% of cases, and due to malignant tumors – in 24.1% (Fig. 4).

In patients with EF above 36%, death occurred due to cardiac reasons in 52.5% of cases, due to extracardiac reasons – in 14.8% of cases, due to malignant tumors – in 32.8% of cases (Fig. 5).

Thus, an analysis of the causes of death after MR showed that cardiac reasons prevailed among the causes of death in patients with EF below 35%. Cardiac reasons and other reasons of death were of equal importance in patients with EF above 36%.

CONCLUSION

The EF level significantly affected longevity after MR for 5 years. When comparing the number of surviving patients and mortality with EF below and above 35%, a statistically significant difference was found. These data were identical in patients of both sexes. However, there was a tripling in deaths after MR in women with EF below 35%. Also a low level of EF was the cause of death to a greater extent compared with the normal level of this indicator.

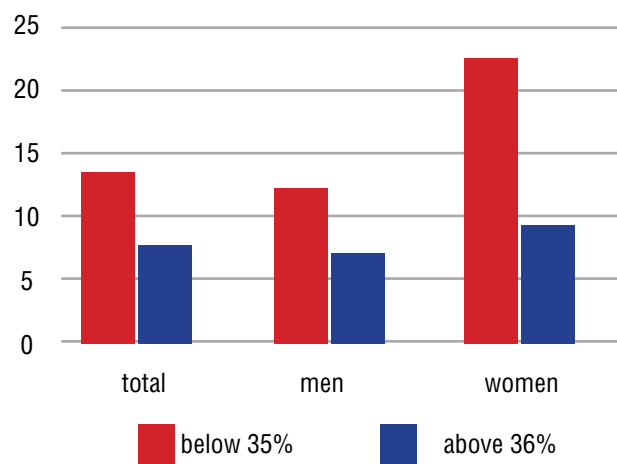The author declares no conflict of interest on the presented article.

BIBLIOGRAPHY

1. *Cowburn G, Bhatnagar P, Løgstrup S. Cardiovascular disease prevention in Europe- the unfinished agenda. EuroHeart work package 5: National plans, policies and measures impacting in cardiovascular health promotion and cardiovascular disease prevention. European Heart Network; 2009.*

2. *Rosamond WD, Chambless LE, Heiss G, Mosley TH, Coresh J, Whitsel E, et al. Twenty-two-year trends in incidence of myocardial infarction, coronary heart disease mortality, and case fatality in 4 US communities, 1987–2008. Circulation. 2012; 125: 1848-1857. doi: 10.1161/CIRCULATIONAHA.111.047480*

3. *Journath G, Hammar N, Elofsson S, Linnersjö A, Vikström M, Walldius G, et al. Time Trends in Incidence and Mortality of Acute Myocardial Infarction, and All-Cause Mortality following a Cardiovascular Prevention Program in Sweden. PLoS One. 2015, 10 (11): e0140201 doi: 10.1371/journal.pone.0140201*

4. *5. Yeh RW, Sidney S, Chandra M, Sorel M, Selby JV, Go AS. Population trends in the incidence and outcomes of acute myocardial infarction. N Engl J Med. 2010; 362 (23): 2155-2165. doi: 10.1056/NEJMoa0908610*

5. *Montalescot G1, Dallongeville J, Van Belle E, Rouanet S, Baulac C, Degrandsart A, et al.; OPERA Investigators. STEMI*

and NSTEMI: are they so different? 1-year outcomes in acute myocardial infarction as defined by the ESC/ACC definition (the OPERA registry). Eur Heart J., 2007; 28 (12): 1409-1417. doi: 10.1093/eurheartj/ehm031

6. Wijeysundera HC, Machado M, Farahati F, Wang X, Witteman W, van der Velde G, et al. Association of temporal trends in risk factors and treatment uptake with coronary heart disease mortality, 1994–2005. JAMA, 2010; 303 (18): 1841-1847. doi: 10.1001/jama.2010.580

7. Morice MC, Serruys PW, Sousa JE, et al. RAVEL Study Group A randomized comparison of a sirolimus-eluting stent with a standard stent for coronary revascularization. N Engl J Med. 2002; 346 (23): 1773-1780.

8. Price MJ, Angiolillo DJ. Platelet inhibitor agents. In: Topol EJ, Teirstein PS, editors. Textbook of Interventional Cardiology. 7th. Philadelphia, PA: Elsevier; 2016: 151-204.

9. Eng MH, Moses JW, Teirstein PS. Complications of percutaneous coronary intervention. In: Topol EJ, Teirstein PS, editors. Textbook of Interventional Cardiology. 7th. Philadelphia, PA: Elsevier; 2016: 464-481.

10. Keeley EC, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. Lancet. 2003; 361(9351): 13-20.

11. Bavry AA, Kumbhani DJ, Rassi AN, Bhatt DL, Askari AT. Benefit of early invasive therapy in acute coronary syndromes: a meta-analysis of contemporary randomized clinical trials. J Am Coll Cardiol. 2006;48(7):1319-1325.

12. Noa P Yee, Andrea M Siu, James Davis, and John Kao. Recovery of Left Ventricular Function after Percutaneous Coronary Intervention Compared to Coronary Artery Bypass Grafting in Patients with Multi-Vessel Coronary Disease and Left Ventricular Dysfunction. Hawaii J Med Public Health. 2016 Sep; 75(9): 273-277.

13. Gabriel C.Brooks, Byron K.Lee, MASa RajniRao, FengLin, Steven L.Zweibel, Alfred E.Buxton, Mark J.Pletcher, EricVittinghoff, Jeffrey E.Olgin. Predicting Persistent Left Ventricular Dysfunction Following Myocardial Infarction: The PREDICTS Study. Journal of the American College of Cardiology. Volume 67, Issue 10, 15 March 2016: 1186-1196.

14. Yan TD, Padang R, Poh C, et al. Drug-eluting stents versus coronary artery bypass grafting for the treatment of coronary artery disease: a meta-analysis of randomized and nonrandomized studies. J Thorac Cardiovasc Surg 2011; 141: 1134–44.