

PROBLEMS AND PROSPECTS OF OPTIMAL MANAGEMENT OF ARTERIAL HYPERTENSION IN PATIENTS WITH ACUTE CORONARY SYNDROME AND MYOCARDIAL INFARCTION

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SUMMARY. Arterial hypertension (AH) is one of the main risk factors for acute coronary syndrome (ACS) and myocardial infarction (MI). From a clinical perspective, blood pressure (BP) should be closely monitored in patients with acute coronary syndrome for many reasons, primarily to prevent further target organ damage and complications. However, there is currently no single point of view regarding the target BP levels in certain categories of patients in different phases of recovery treatment of myocardial infarction.

Hypertension in the anamnesis of patients with myocardial infarction is most associated with a worse prognosis. In contrast, some studies have suggested that increased systolic blood pressure in the acute phase of MI has a compensatory and protective effect and is associated with lower 1-year mortality from coronary occlusion. Therefore, the search for optimal programs for the management of arterial hypertension in patients with acute coronary syndrome and myocardial infarction is currently an urgent and promising task.

KEY WORDS: arterial hypertension; acute coronary syndrome; myocardial infarction; target blood pressure levels.

Introduction. Cardiovascular disease (CVD) is the leading cause of death worldwide, accounting for approximately 30 % of all mortality [1,2]. Arterial hypertension is probably the most important risk factor for the development of cardiovascular diseases [3]. The prevalence of AH is 30–40 % among patients with ST-elevation myocardial infarction (STEMI) and increases to 70 % in patients with MI without non-ST-elevation (NSTEMI). There is a strong epidemiological link between the interaction of ACS and hypertension [4].

The prevalence of hypertension in the world is very high, it affects about 40 % of the population. However, more than 40 % of these patients remain untreated worldwide, two-thirds of them are uncontrolled, and only about 34 % have blood pressure under control. However, these percentages are much lower in developing countries and their regions. A history of hypertension is a common finding in patients with acute coronary syndrome. Its recurrent association with female sex, diabetes, older age, smoking, and vascular comorbidities presents a risk profile quite distinct from its normotensive ischemic counterpart. AH is associated with higher rates of mortality and pathological events both early and long-term in the course of acute myocardial infarction, especially when complicated by left ventricular dysfunction and/or congestive heart failure. In contrast to adverse outcomes associated with preexisting hypertension, higher systolic pressure at chest pain onset is associated with lower mortality within 1 year after coronary occlusion [5].

Each subsequent increase in systolic blood pressure (SBP) by 20 mm Hg (or 10 mm Hg for diastolic blood pressure (DBP) doubles the risk of death from a fatal coronary event or heart attack. This associa-

tion between elevated blood pressure and cardiovascular risk is continuous, constant, and independent of other factors [6].

The aim of the work is to show the use of anti-hypertensive drugs to lower blood pressure a significant advantage in reducing the risk of cardiovascular diseases. Data from placebo-controlled studies and meta-analyses show that with adequate blood pressure control, the frequency of coronary heart disease can be reduced by as much as 20 % [7].

Material and Methods. The 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology and the European Society of Hypertension states that the target level for patients aged 18 to 65 years is <130/80 mm Hg and <140/80 mm Hg – in elderly patients. However, antihypertensive treatment in hypertensive patients after acute coronary syndrome that prevents recurrent ischemia is often uncertain. Excessive falls in diastolic pressure may compromise coronary perfusion and predispose to new acute coronary events. The exact causal mechanisms underlying this phenomenon require further evaluation. However, an increase in BP recorded after hemodynamic stabilization due to an acute ischemic event has a conflicting relationship with recurrent coronary events during long-term follow-up [8].

Patients who have suffered acute coronary syndrome and have a history of long-term arterial hypertension have structural changes in the myocardium, which, in turn, deepens systemic hemodynamic disturbances, contributes to the development and deepening of vascular pathology and death. The obtained results coincide with the data of other researchers regarding the mutually aggravating influence of vari-

ous forms of coronary heart disease, including myocardial infarction. Peripheral artery disease is an independent predictor of a worse functional state in patients with MI due to deepening structural and functional changes of the heart, deterioration of central and peripheral hemodynamic parameters due to structural changes of the heart and peripheral vessels, metabolic and functional disorders in internal organs, which were accompanied by more frequent development of myocardial infarction complications. These patients require careful monitoring of arterial hypertension and indicators of intracardiac hemodynamics [9].

The dynamics of systolic and diastolic blood pressure indicators in the acute period of the development of myocardial infarction can be a simple and reliable marker not only of changes that occur in the hemodynamic system disturbed by the pathological process, but also a predictor of the development of complications.

Low levels of systolic and diastolic blood pressure in the acute period of MI development indicate the depletion of hemodynamic resources to compensate for a significant fall in the systolic function of the heart muscle and can be considered as limiting markers for early activation of patients [10].

Both high blood pressure and low blood pressure may be associated with a poor prognosis in patients with acute myocardial infarction, the so-called J-curve phenomenon. Studies examining the relationship between blood pressure levels and the risk and prognosis of a patient with acute myocardial infarction have generally confirmed the importance of maintaining SBP and DBP within target levels over a long period of follow-up [11, 18].

In contrast to adverse outcomes associated with preexisting hypertension, higher systolic pressure at chest pain onset is associated with lower 1-year mortality from coronary occlusion, whereas elevated blood pressure recorded after hemodynamic stabilization from an acute ischemic event has inconsistent associations with recurrent coronary events in the long-term follow-up period. The presence of hypertension in the acute period in patients with MI prevents ischemic relapses. Excessive drops in diastolic pressure can compromise coronary perfusion and lead to new acute coronary events [12, 19].

A retrospective analysis of 11,483 STEMI patients treated with thrombolysis found that a history of hypertension was associated with higher mortality [13]. Data from 15,414 patients enrolled in six randomized trials of Thrombolysis in Myocardial Infarction (TMI) showed that a history of hypertension was associated with a 54 % higher risk of combined cardiovascular death.

The presence of hypertension may be associated with softer endpoints such as disease severity and infarct size. Lingman et al. examined the relative risk profile of hypertension and diabetes among 2329 coronary patients with unstable angina or acute MI. Patients with hypertension or diabetes had more frequent multivessel disease and higher age-adjusted mortality during a mean follow-up period of 8 years [14]. A Drug Eluting Stents in Primary Angioplasty database analysis of more than 6,000 patients with STEMI undergoing percutaneous coronary intervention found that hypertension was associated with decreased TIMI blood flow after percutaneous coronary intervention and with higher mortality, reinfarction, and target vessel revascularization during more than three years of observation. However, another study documented no significant association between hypertension and scintigraphic infarct size in 830 STEMI patients undergoing primary PCI [15].

Results. Hypertension is a common risk factor in patients hospitalized with STEMI. Therefore, blood pressure should be well controlled. In addition to lifestyle changes, including reduced salt intake, increased physical activity, and weight loss, pharmacotherapy should be initiated with a target systolic blood pressure < 140 mmHg. In elderly, frail patients, the target may be more lenient, whereas in very high-risk patients who tolerate multiple blood pressure-lowering drugs, a target of < 120 mmHg may be considered. Despite the proven effectiveness of this treatment, non-adherence to lifestyle and medication can affect the treatment effect [16, 20].

Joint active efforts of the patient and medical professionals are necessary to control risk factors. The risk of cardiovascular diseases in patients with acute myocardial infarction complicated by arterial hypertension can be significantly reduced with effective hypotensive therapy [17, 21].

Conclusions. Despite the fact that arterial hypertension is one of the main risk factors for cardiovascular death, the evidence regarding its role in increasing cardiovascular risks in certain phases of recovery treatment and in certain categories of patients with acute coronary syndrome has not yet been studied. Arterial hypertension can act cardioprotectively, for example, in the acute phase of myocardial infarction, when patients with hypertension have a better prognosis in the acute inpatient phase of recovery treatment. At this stage, research data on blood pressure levels are ambiguous, there are no data on target levels in certain categories of patients, especially those with combined comorbid pathologies. Therefore, the search for optimal programs for the management of arterial hypertension in patients with acute coronary syndrome and myocardial infarction is currently an urgent and promising task.

LITERATURE

1. Guidelines on Management of Acute Myocardial Infarction in Patients Presenting with ST-Segment Elevation. ESC Clinical Practice Guidelines / F. Van de Werf, J. Bax, A. Betriu [et al.] // *European Heart Journal*. – 2008. – Vol. 29 (23). – P. 2909–2945.
2. World Health Organization. Global atlas on cardiovascular disease prevention and control. Access mode: http://www.who.int/cardiovascular_diseases/publications/atlas_cvd/en/. Accessed August 12, 2014.
3. Collet J. P. The 'Ten Commandments' for the 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation / J. P. Collet, Thiele H. – 2020.
4. 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH) / B. Williams, G. Mancia, W. Spiering [et al.] // *European Heart Journal*. – 2018. – Vol. 39 (33). – P. 3021–3104.
5. Comparison of characteristics of patients aged ≤ 45 years versus >45 years with ST-elevation myocardial infarction (from the AIDA STEMI CMR substudy) / S. J. Reinstadler, C. Eitel, M. Thieme [et al.] // *Am. J. Cardiol.* – 2016. – Vol. 117. – P. 1411–1416.
6. Izzo J. L. Jr. Mechanisms and management of hypertensive heart disease: from left ventricular hypertrophy to heart failure / J. L. Jr. Izzo, A. H. Gradman // *Med. Clin. North Am.* – 2004. – No. 88 (5). – P. 1257–1271.
7. Neal B. Blood Pressure Lowering Treatment Trialists' Collaboration. Effects of ACE inhibitors, calcium antagonists, and other blood-pressure-lowering drugs: results of prospectively designed overviews of randomised trials / B. Neal, S. MacMahon, N. Chapman // *Lancet*. – 2009.
8. Thrombolysis in Myocardial Infarction (TIMI) Study Group. Association of a history of systemic hypertension with mortality, thrombotic, and bleeding complications following non-ST-segment elevation acute coronary syndrome / R. Dumaine, C. M. Gibson, S. A. Murphy [et al.] // *J. Clin. Hypertens.* – 2006. – No. 8. – P. 315–322.
9. Levytska L. V. Functional characteristics of patients with myocardial infarction with concomitant diseases of peripheral arteries and peculiarities of approach to their rehabilitation treatment / L. V. Levytska // *Здобутки клінічної і експериментальної медицини*. – 2019. – № 1 (37). – С. 17–22.
10. Pedrinelli R. Hypertension and acute myocardial infarction: an overview / R. Pedrinelli // *J. Cardiovasc. Med. (Hagerstown)*. – 2012. – Vol. 13, No. 3. – P. 194–202.
11. Sola M. Ratio of systolic blood pressure to left ventricular end-diastolic pressure at the time of primary percutaneous coronary intervention predicts in-hospital mortality in patients with ST-elevation myocardial infarction / M. Sola // *Catheter. Cardiovasc. Interv.* – 2017. – Vol. 90, No. 3. – P. 389–395.
12. Impact of hypertension on infarct size in ST elevation myocardial infarction patients undergoing primary angioplasty / G. De Luca, G. Parodi, R. Sciagrà [et al.] // *J. Hypertens.* – 2013. – No. 31 (12). – P. 2433–2437.
13. Acute coronary syndromes – the prognostic impact of hypertension, diabetes and its combination on long-term outcome / M. Lingman, J. Herlitz, L. Bergfeldt [et al.] // *Int. J. Cardiol.* – 2009. – No. 137. – P. 29–36.
14. Admission blood pressure and 1-year mortality in acute myocardial infarction / D. Roth, R. Van Tulder, B. Heidinger [et al.] // *Int. J. Clin. Pract.* – 2015. – No. 69. – P. 812–819.
15. Prognostic significance of presenting blood pressure in non-ST-segment elevation acute coronary syndrome in relation to prior history of hypertension / D. Lee, S. G. Goodman, K. Fox [et al.] // *Am. Heart. J.* – 2013. – No. 166. – P. 716–722.
16. International Society of Hypertension. Global burden of blood-pressure-related disease, 2001 / C. M. Lawes, S. Vander Hoorn, A. Rodgers // *Lancet*. – 2008. – No. 371 (9623). – P. 1513–1518.
17. American Heart Association Council for High Blood Pressure Research; American Heart Association Council on Clinical Cardiology; American Heart Association Council on Epidemiology and Prevention. Treatment of hypertension in the prevention and management of ischemic heart disease: a scientific statement from the American Heart Association Council for High Blood Pressure Research and the Councils on Clinical Cardiology and Epidemiology and Prevention / C. Rosendorff, H. R. Black, C. P. Cannon [et al.] // *Circulation*. – 2007. – No. 115 (21). – P. 2761–2788.
18. Shved M. I. Approaches to the assessment of the risks and functional reserves of the cardiovascular system in patients with myocardial infarction with comorbid pathology, who are in the acute period of cardio-rehabilitation / M. I. Shved, L. V. Levytska // *World of Medicine and Biology*. – 2018. – P. 124–130.
19. Levytska L. V. Estimation of functional reserves of the body and risk of cardiovascular events in patients with myocardial infarction with comorbid pathology undergoing rehabilitation / L. V. Levytska, M. I. Shved, M. M. Koroda // *Health Problems of Civilization*. – 2019. – P. 178–186.
20. Levytska L. V. Early marker and limited factors of functional state in patients with myocardial infarction in combination with arterial hypertension / L. V. Levytska // *Herald of scientific research*. – 2019. – P. 33–38.
21. Diagnosis and Treatment of Acute Coronary Syndromes: A Review / Deepak L. Bhatt, Renato D. Lopes, Robert A Harrington // *JAMA*. – 2022. – No. 327 (7). – P. 662–675.

REFERENCES

1. Van de Werf, F., Bax, J., Betriu, A., Blomstrom-Lundqvist, C., Crea, F., ... & Rutten, F. (2008). Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation: the Task Force on the Management of ST-Segment Elevation Acute Myocardial Infarction of the European Society of Cardiology. *European Heart Journal*, 29(23), 2909-2945.
2. World Health Organization (2011). Global atlas on cardiovascular disease prevention and control: published by the World Health Organization in collaboration with the

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World Heart Federation and the World Stroke Organization. World Health Organization. Regional Office for Europe. Retrieved from: http://www.who.int/cardiovascular_diseases/publications/atlas_cvd/en/. Accessed August 12, 2014.

3. Collet, J.P., & Thiele, H. (2020). The 'Ten Commandments' for the 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation.

4. Williams, B., Mancia, G., Spiering, W., Agabiti Rosei, E., Azizi, M., Burnier, M., ... & Desormais, I. (2018). 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH). *European Heart Journal*, 39(33), 3021-3104.

5. Reinstadler, S.J., Eitel, C., Thieme, M., Metzler, B., Poess, J., Desch, S., ... & Eitel, I. (2016). Comparison of characteristics of patients aged ≤ 45 years versus > 45 years with ST-elevation myocardial infarction (from the AIDA STEMI CMR substudy). *The American Journal of Cardiology*, 117(9), 1411-1416.

6. Izzo, J.L., & Gradman, A.H. (2004). Mechanisms and management of hypertensive heart disease: from left ventricular hypertrophy to heart failure. *Medical Clinics*, 88(5), 1257-1271.

7. Blood Pressure Lowering Treatment Trialists' Collaboration. (2000). Effects of ACE inhibitors, calcium antagonists, and other blood-pressure-lowering drugs: results of prospectively designed overviews of randomised trials. *The Lancet*, 356(9246), 1955-1964.

8. Dumaine, R., Gibson, C.M., Murphy, S.A., Southard, M., Ly, H.Q., McCabe, C.H., ... & Braunwald, E. (2006). Association of a history of systemic hypertension with mortality, thrombotic, and bleeding complications following non-ST-segment elevation acute coronary syndrome. *The Journal of Clinical Hypertension*, 8(5), 315-322.

9. Levytska, L.V. (2019). Functional characteristics of patients with myocardial infarction with concomitant diseases of peripheral arteries and peculiarities of approach to their rehabilitation treatment. *Zdobutky klinichnoyi i eksperymentalnoyi medytsyny – Achievements of Clinical and Experimental Medicine*, 1(37), 17-22

10. Pedrinelli, R., Ballo, P., Fiorentini, C., Denti, S., Galderisi, M., Ganau, A., ... & Zacà, V. (2012). Hypertension and acute myocardial infarction: an overview. *Journal of Cardiovascular Medicine*, 13(3), 194-202.

11. Sola, M., Venkatesh, K., Caughey, M., Rayson, R., Dai, X., Stouffer, G. A., & Yeung, M. (2017). Ratio of systolic blood pressure to left ventricular end-diastolic pressure at the time of primary percutaneous coronary intervention predicts in-hospital mortality in patients with ST-elevation myocardial infarction. *Catheterization and Cardiovascular Interventions*, 90(3), 389-395.

12. De Luca, G., Parodi, G., Sciagrà, R., Bellandi, B., Comito, V., Vergara, R., ... & Antonucci, D. (2013). Impact of hypertension on infarct size in ST elevation myocardial infarction patients undergoing primary angioplasty. *Journal of Hypertension*, 31(12), 2433-2437.

13. Lingman, M., Herlitz, J., Bergfeldt, L., Karlsson, T., Caidahl, K., & Hartford, M. (2009). Acute coronary syndromes—the prognostic impact of hypertension, diabetes and its combination on long-term outcome. *International Journal of Cardiology*, 137(1), 29-36.

14. Roth, D., Van Tulder, R., Heindinger, B., Herkner, H., Schreiber, W., & Havel, C. (2015). Admission blood pressure and 1-year mortality in acute myocardial infarction. *International Journal of Clinical Practice*, 69(8), 812-819.

15. Lee, D., Goodman, S.G., Fox, K.A., DeYoung, J.P., Lai, C.C., Bhatt, D.L., ... & Yan, A.T. (2013). Prognostic significance of presenting blood pressure in non-ST-segment elevation acute coronary syndrome in relation to prior history of hypertension. *American Heart Journal*, 166(4), 716-722.

16. Lawes, C.M., Vander Hoorn, S., & Rodgers, A. (2008). Global burden of blood-pressure-related disease, 2001. *The Lancet*, 371(9623), 1513-1518.

17. Rosendorff, C., Black, H.R., Cannon, C.P., Gersh B.J., Gore, J., & Izzo, J.L. (2007). American Heart Association Council for High Blood Pressure Research; American Heart Association Council on Clinical Cardiology; American Heart Association Council on Epidemiology and Prevention. Treatment of hypertension in the prevention and management of ischemic heart disease: a scientific statement from the American Heart Association Council for High Blood Pressure Research and the Councils on Clinical Cardiology and Epidemiology and Prevention. *Circulation*, 115(21), 2761-2788.

18. Shved, M.I., & Levytska, L.V. (2018). Approaches to the assessment of risks and functional reserves of the cardiovascular system in patients with myocardial infarction with comorbid pathology, who are in the acute period of cardio-rehabilitation. *World of Medicine and Biology*, 4(66), 124-130.

19. Levytska, L., Shved, M., & Korda, M. (2019). Estimation of functional reserves of the body and risk of cardiovascular events in patients with myocardial infarction with comorbid pathology undergoing rehabilitation. *Health Problems of Civilization*, 13(3), 178-186.

20. Levytska, L.V. (2019). Early marker and limited factors of functional state in patients with myocardial infarction in combination with arterial hypertension. *Visnyk naukovykh doslidzhen – Herald of Scientific Research*, (1), 33-38.

21. Bhatt, D.L., Lopes, R.D., & Harrington, R.A. (2022). Diagnosis and treatment of acute coronary syndromes: a review. *JAMA*, 327(7), 662-675.

Огляди літератури, оригінальні дослідження, погляд на проблему, випадок з практики, короткі повідомлення

ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ ОПТИМАЛЬНОГО ЛІКУВАННЯ АРТЕРІАЛЬНОЇ ГІПЕРТЕНЗІЇ У ХВОРИХ З ГОСТРИМ КОРОНАРНИМ СИНДРОМОМ ТА ІНФАРКТОМ МІОКАРДА

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РЕЗЮМЕ. Артеріальна гіпертензія (АГ) є одним із основних факторів ризику розвитку гострого коронарного синдрому (ГКС) та інфаркту міокарда (ІМ). З клінічної точки зору артеріальний тиск (АТ) слід ретельно контролювати у пацієнтів з гострим коронарним синдромом з багатьох причин, насамперед для запобігання подальшому пошкодженню органів-мішеней і ускладнень. Проте єдиної точки зору щодо цільових рівнів АТ у окремих категорій хворих на різних етапах відновного лікування інфаркту міокарда на сьогодні немає.

Гіпертензія в анамнезі хворих на інфаркт міокарда найбільше асоціюється з гіршим прогнозом. Навпаки, деякі дослідження показали, що підвищення систолічного артеріального тиску в гострій фазі ІМ має компенсаторний і захисний ефект і пов'язане з нижчою смертністю протягом 1 року від коронарної оклюзії. Тому пошук оптимальних програм ведення артеріальної гіпертензії у хворих з гострим коронарним синдромом та інфарктом міокарда на сьогодні є актуальним і перспективним завданням.

КЛЮЧОВІ СЛОВА: артеріальна гіпертензія; гострий коронарний синдром; інфаркт міокарда; цільові рівні артеріального тиску.

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