EXPERT OPINION
by Prof. Dr. Ivan Georgiev Poromanski, MD
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Re: Dissertation paper on topic **PERIOPERATIVE MYOCARDIAL INFARCTION - CLINICAL, DIAGNOSTIC, AND THERAPEUTIC FEATURES** for awarding a doctoral degree in Cardiology (Code 03.01.47) to **Dr. Ivan Petrov Martinov** in professional field 7.1 Medicine, higher education field 7. Health and Sports

Structure of the dissertation paper
The dissertation paper is structured in accordance with the generally accepted requirements in the Republic of Bulgaria and consists of 202 pages illustrated with 45 tables and 45 figures. The bibliographic reference contains 323 literary sources, of which 6 by Bulgarian and 317 by foreign authors.

Relevance of the dissertation paper
The dissertation topic chosen by Dr. Ivan Martinov, i.e. **Perioperative Myocardial Infarction - Clinical, Diagnostic, and Therapeutic Features,** is a modern and relevant one due to the increasing morbidity and mortality from cardiovascular diseases, on the one hand, and, on the other hand, the growing number of surgical interventions in adult patients with concomitant diseases such as hypertension, diabetes mellitus, cancer, and inflammatory diseases, as well as in patients on medication therapy after interventional or surgical treatment. Of particular importance is the assessment of perioperative risk and the complex behaviour of interdisciplinary teams to achieve better results in the treatment and prognosis of perioperative acute coronary syndrome (PACS). The study is a step forward in elucidating the risk factors for the occurrence of perioperative acute coronary syndrome with ST-elevation (PACS-STEMI), the course, diagnosis, medication and interventional treatment, and prognosis.

The literature review presents in detail current literature data on definitions and classification of myocardial infarction, data on acute myocardial infarction with ST-elevation suffered in an outpatient setting, with its specifics in terms of logistics, diagnosis, treatment, prognosis, and prevention. The main

part of the review views perioperative acute myocardial infarction as a significant medical issue: frequency, diagnosis, pathophysiology, risk factors (surgical, cardiovascular, anaemic syndrome), risk assessment, interventional and medication therapy, prognosis.

The review ends with conclusions that summarize the solved and unsolved problems and provide guidelines for justifying the goals and objectives of the dissertation paper.

The literature cited covers 323 titles, of which 50.3% are from the last 10 years and 51.9% from the last 5 years, and testifies to the excellent knowledge of the doctoral candidate on the issue.

The goal of the dissertation paper is clearly formulated: to study the clinical, diagnostic, and therapeutic features of perioperative myocardial infarction (PMI) in patients with non-cardiac surgery compared to those of spontaneous myocardial infarction (SMI) that occurs without surgery.

To achieve the goal, there are 7 **tasks**, all of which precisely and logically defined and related to the main goal. The goal and tasks are formulated and justified in accordance with the conclusions of the literature review.

Clinical contingent
1) The study includes a total of 112 patients diagnosed with acute myocardial infarction with persistent ST-elevation, of a mean age of 67.5 years (50 to 88 years), of whom 75 (67.0%) are male and 37 (33.0%) women.
For the purposes of the study, the patients are divided into two groups: • Group 1 - main group consisting of 35 patients with perioperative STEMI undergoing non-cardiac surgery and • Group 2 - control group consisting of 77 patients with primary coronary intervention in spontaneous STEMI.

2) For the same 5-year study period, a total of 155,502 surgeries were performed, of which 121,021 were to patients over 18 years of age. There were 44,346 surgeries (36.6%) with high and very high complexity and severity, and 13,108 (35%) complex and very difficult surgeries. In the age group over 65, the total number of surgeries was 36,981.

The diagnostic methods for diagnosing all the patients with myocardial infarction included clinical examination by a cardiologist (medical history, status), 12-channel ECG with standard recording parameters, clinical and laboratory tests, echocardiography, specific diagnostic criteria for risk factors such as diabetes mellitus, hypertension, dyslipidaemia, chronic kidney disease, anaemia.

Therapeutic methods: medication and interventional (selective coronary angiography - SCAG and percutaneous transluminal angioplasty - PTA).

Statistical methods (analyses): descriptive, variational, graphical, alternative, correlation, Fisher's exact test and $\chi2$ test, nonparametric Kolmogorov-Smirnov and Shapiro-Wilk tests, Student's T-test, nonparametric Mann-Whitney test, binary logistic regression, ROC curve, criteria for validation of screening tests.

The data were entered and processed using the IBM SPSS Statistics 25.0 statistical package.

Results and discussion

Results and analyses of comparative data on numerous parameters between the main and control group of the patients with STEMI are presented, as well as analyses of parameters specific to the respective group, either main or control.

The analysis of the indicators related to the surgical intervention of the patients with perioperative STEMI shows that the distribution is proportional to the surgical activity of the clinics: surgical, traumatological, vascular, etc.

The distribution of the patients with perioperative STEMI on the basis of the urgency of surgery shows a large proportion of patients whose surgery can be delayed up to 12 hours and a small number of "ultra-urgent" surgeries within 1 hour.

The distribution of the patients with perioperative STEMI on the basis of the postoperative day of onset of infarction shows a trend for the first 3 days or in 63% of the patients, with peaks at 48 hours and 72 hours.

Especially valuable is the comparative analysis of the indicators and dependencies related to anaemia in the two studied groups of patients and the established higher incidence of anaemia among PMI, both severe and moderate. On the other hand, the presence of anaemia leads to problematic treatment: limits the performance of stenting, causes problems with blood transfusions, changes the therapy upon discharge, and increases mortality.

In addition, for the main group of the patients with PMI, the importance of the time from surgery to infarction according to the patient's condition, procedural parameters in interventional treatment, i.e. procedural time, scopic time, contrast, complications, and outcome are discussed.

The summary of the results of the study outlines several problems related to gaps in the perioperative assessment of the patients in terms of cardiovascular risk, severity of surgery, and type of anaesthesia and monitoring, as well as to changes in the medication therapy in the patients with perioperative STEMI and the protocol for interventional treatment of perioperative STEMI.

For rethinking the strategy for preoperative assessment of patients and closer collaboration between specialists from various surgical specialties, anaesthesiologists, resuscitators, and cardiology consultants to determine the diagnostic and therapeutic strategy, Dr. Martinov proposes a written and schematically presented **Hospital Algorithm for Behaviour in Perioperative Myocardial Infarction (STEMI).**

There are 7 **conclusions** from the dissertation paper, presenting a logical summary of the own results of the author in the sequence of the tasks planned.

The **contributions** of the dissertation paper are original: 3 of them are of scientific and theoretical nature and 3 of scientific and applied nature. Of significant scientific and scientific-practical value is the algorithm created for the first time in the country for assessment of the perioperative risk of AMI, implementation of hospital logistics by an interdisciplinary team, and interventional treatment of patients with acute myocardial infarction after emergency non-cardiac surgery.

There are 5 **scientific publications** related to the dissertation paper: two publications in *Speshna Meditsina* (Emergency Medicine) journal and 3 participations in the National Congress of Cardiology, the National Congress of Emergency Medicine, and the Bulgarian course in Coronary Physiology and Non-Coronary Vascular Physiology.

In conclusion, the dissertation paper of Dr. Ivan Martinov, **Perioperative Myocardial Infarction - Clinical, Diagnostic, and Therapeutic Features,** is an in-depth, multifaceted study of an interdisciplinary nature, with a pronounced relevance for the cardiac, surgical, and intensive science and practice. The long experience of Dr. Martinov as an internist as well as clinical and invasive cardiologist, who has mastered and applied various diagnostic and therapeutic non-invasive and invasive methods to thousands of patients at N. I. Pirogov University Multi-Profile Hospital for Active Treatment and Emergency Medicine EAD, allows him to make multifaceted analyses, summaries, and conclusions about the clinical, diagnostic, and therapeutic features of perioperative myocardial infarction in comparison with spontaneous myocardial infarction. Of special scientific and practical value is the **Hospital Algorithm for Behaviour in Perioperative Myocardial Infarction (STEMI)** created and presented by Dr. Martinov.

The dissertation paper fully meets the requirements of the Development of Academic Staff in the Republic of Bulgaria Act and the Regulations for the development of the academic staff at N. I. Pirogov University Multi-Profile Hospital for Active Treatment and Emergency Medicine EAD, Sofia and I strongly recommend to the members of the respected scientific committee to award Dr. Ivan Petrov Martinov, Head of the Invasive Department at the Cardiology Clinic of N. I. Pirogov University Multi-Profile Hospital for Active Treatment and Emergency Medicine EAD, a doctoral degree in Cardiology.

03.05.2021   Prof. Dr. Ivan Georgiev Poromanski, MD

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