USEFUL BIOMARKERS IN CARDIOPATHY DIAGNOSIS

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Key words: *acute coronary syndrome, biomarkers, monitoring*

INTRODUCTION

Acute coronary syndromes (ACS) include acute myocardial infarction (with or without ST-segment elevation), unstable angina and sudden cardiac death. These are the first cause of morbidity and mortality in Romania.

Anamnesis, clinical examination and electrocardiogram, initially performed and dynamic, may guide the diagnosis of ACS, but have limited prognostic value.

Loss of cardiomyocyte membrane integrity, which occurs after necrosis, allows intracellular macromolecules to diffuse into the interstitium and then into circulation. These macromolecules, known as biochemical markers of myocardial necrosis, can thus be detected in the bloodstream.

The role of cardiac markers in the diagnosis, risk assessment, and treatment of patients with coronary-type pain and suspected acute coronary syndrome is central to the new diagnostic and treatment guidelines for patients with SCA (American College of Cardiology / American Heart Association).

The present paper proposes the serum determination of troponin I, pro BNP, CRP, CK, CK-MB, AST, in patients admitted to the sections: cardiology, internal medicine and ATI.

MATERIAL AND METHODS

The studies were performed on 100 patients, between May 2018 and April 2019.

The biological material was venous blood collected from patients investigated in the anticoagulant vacutainer (EDTA / Na heparin / Li heparin) for troponin and NT-pro BNP dosing, and the anticoagulant vacutainer for CRP, AST, CK- MB.

The research activity was carried out within the Clinical Laboratory of the Bacău County Emergency Hospital.

Determinations of troponin I and NT-proBNP were performed on the PATHFAST analyzer (Fig.1). The principle of the method consists in the electrochemiluminescence-based immunoenzymatic analysis using the "MAGTRATION" methodology, for bound / free separation in several reaction stages.

Serum determinations of CK-MB, CRP, AST were performed on the COBAS 6000 automatic analyzer (fig. 2). The reagents were supplied by Roche, Germany.

Fig.1. Pathfast analyzer

Fig. 2. "COBAS 6000" automatic analyzer

RESULTS AND DISCUSSIONS

Of the 100 patients 52 were female and 48 were male (fig. 3).

The distribution by age group of the male patients is shown in fig. 4. From the graph it is

observed that the highest weight has the male patients in the age segment 65-78 years, and the smallest in the last age group, ie 93-106 years. The distribution by age groups of the female patients is shown in fig. 5.

In the case of patients, the maximum limit is observed on the 57-66 years segment with 21 cases, and in the minimum limit the age group 86-95 years is registered, having registered only three cases.

Following the determinations made **in the male patients** the following results were obtained.

From figure 6 it follows that the highest average values were registered in the age group 79-92 years, the lowest being in the age group 93-106 years.

For the age group 36-50 years the values registered for TGO were moderately increased.

In the case of creatinine kinase MB (CK-MB) the highest results were obtained as in the case of TGO in the age group 79-92 years, with the average value of 78.83 U / L being recorded, in the other cases the same is recorded average values raised above the normal limit, with the exception of the 93-106 age group, which records the average value within normal limits (fig. 7).

The maximum values in the case of CRP are recorded in the second age group 51-64 years, the average value of 20.59 which falls within the permissible normal limits (fig. 8).

In the case of NT-proBNP analyzes, the age of the patients is taken into account first, so the values are:
> 450 pg / ml in patients <50 years of age;
> 900 pg / ml in patients aged 50-75 years;
> 1800 pg / ml in patients> 75 years of age.

The highest average values were obtained in the age group 78-92 years, it should be mentioned that in the case of the age groups 36-50 years and 93-106 years, the average values obtained are below the normal limit (fig. 9).

The 32 patients (66.66%) had normal TGO values, the same percentage was also found in the case of troponin, followed by CRP which recorded the value of 54.17%, meaning a number of 26 patients, CK-MB has values that it falls within the normal limit for 22 patients (45.84%), followed by 9 patients (18.75%) who recorded normal values for NT-proBNP (fig. 10)

Following the determinations **in the female patients**, the following values of the investigated biochemical parameters were obtained.

In the case of the age group 36-50 years, 3 patients are registered, all patients register values within normal limits, the last patient of 49 years registers a slight increase of TGO (fig. 11).

In the age group 51-64 years, there are generally high values of CRP, the 60-year-old patient declared dead is among them, in the case of ProBNP significant increases are obtained, the 60-year-old patient records 23233 values being declared dead.

The age group 65-78 years, records patients of 66 years, 67 years with high values of ProBNP, the 69-year-old patient recorded increased values for troponin. There is a significant increase of the CRP analyte.

In the age group 79-92 years, the deceased person of 80 years has registered high values of CRP, all this patient registers high values also in the case of TGO, CK-MB, ProBNP, Troponina, the dead person of 88 years reaches values peaks of CK-MB, CRP, ProBNP, while Troponin values fall within normal limits in all patients in the group.

The highest average TGO value was recorded in the fourth age group, namely 79-92 years with a value of 233.38 U / L.

In the case of CK-MB (fig. 12) the highest average value was registered at the last age group 79-92 years, with the value of 68.9 U / L, followed by the group of 65-78 years, followed by 51-64 years, and the group 36-50 years, register an average value that falls within normal limits.

The average value for CRP recorded a maximum in the age group 79-92 years, and a minimum in the age group 36-50 years, all values in all age groups were above the normal reference limit, except the first age group (Fig. 13).

NT-proBNP, as well as CRP, has high values, but in the 79-92 age group it has a value of 11504.43 which is well above the limit (fig. 14).

TnI registers values above the limit in the case of the age groups 51-64 years, 65-78 years, 79-92 years, and the latter registers the maximum value (fig. 15).

Patients in the 79-92 age group are therefore in the risk group, as they have the highest average values.

From the analysis of figure 16 it is found that CRP, CK-MB and TGO recorded the highest average values in the age group 79-92 years. It is worth noting that TGO, CK-MB registered maximum values in this age group and in the case of men.

It was found that 32 patients (61.54%) had normal TGO values, 30 patients (57.70%) had normal CK-MB values. The number of patients with normal values for CRP reached 16 (30.76%), in the case of NT-proBNP the number drops to 6 persons (11.54%) who had normal values, and in the case of troponin it increases to 37 (71, 15%).

From the analysis of figure 17, we can see that for troponin the best results were registered, most people falling within the reference limit, followed by TGO, CK-MB. A lower value was observed in the case of the other investigated biomarkers.

We can notice that in the case of NT-proBNP the lowest number of women with normal values was registered.

Comparative analysis of troponin I in female patients and male patients led to the following results (Fig. 18):

Interesting is that if female patients had the highest value of troponin I, it was recorded in the age group 79-92 years, in men as well, whereas in the age group 65-78 years, women recorded values higher than men.

Analyzing figure 19 much higher values of NT-proBNP are found in female patients compared to male patients. The highest values of the investigated analyte for women were in the 65-78 and 79-92 age groups, and for the male patients in the 79-92 age group. The lowest values of NT-proBNP in female patients were recorded in the 36-50 age group, as was the case in men.

From the analysis fig. 20 it is worth noting the analytical Troponina which registered the highest number of people who had values within the admitted limits, also positive percentages (more than 50%) also recorded TGO and CK-MB. Male patients who had troponin within normal limits were fewer in number compared to female patients. Also, women who registered NT-pro BNP within normal limits were lower in number with men.

Fig. 3. Gender distribution of the investigated patients
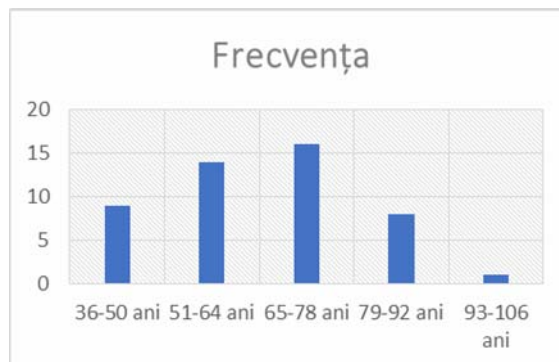
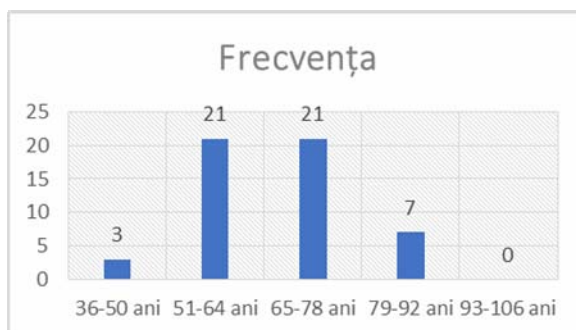Fig. 4. Age distribution of male patients

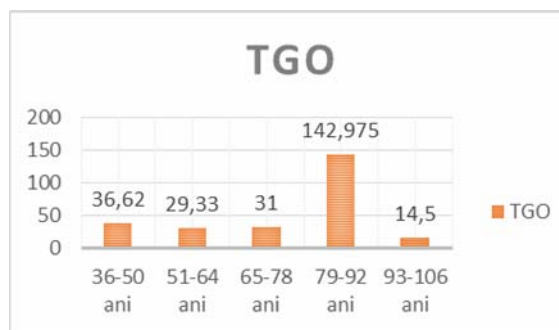Fig. 5. Age distribution of female patients

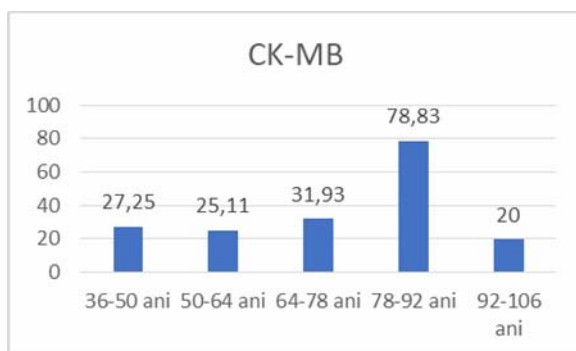Fig.6. Mean TGO values in male patients

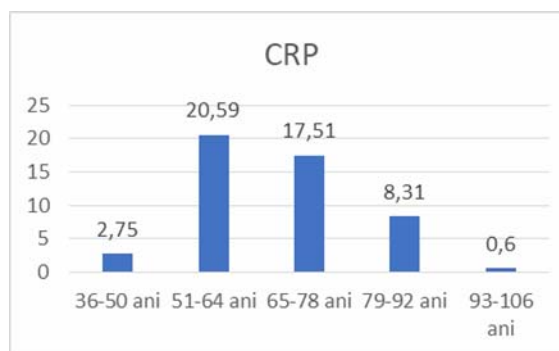Fig.7. Mean CK-MB values in male patients

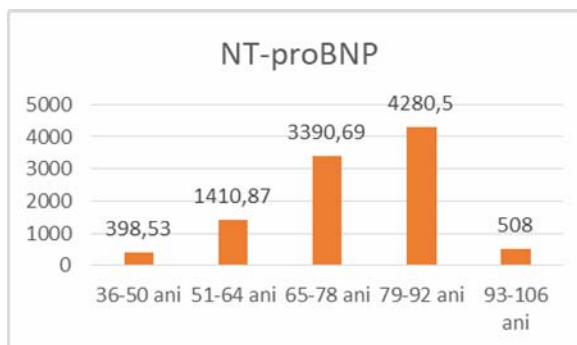Fig. 8. Mean values of CRP in male patients

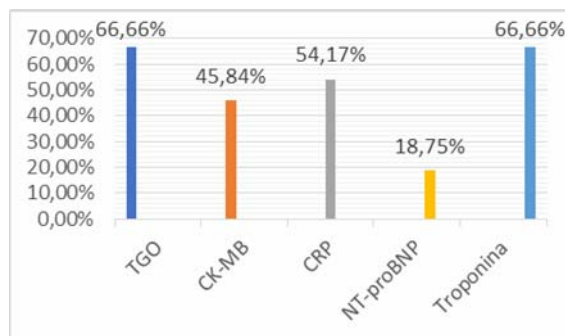Fig. 9. Valorile medii ale NT-proBNP la pacienții de sex masculin

Fig.10 Percentage distribution of male patients with normal values of the investigated parameters
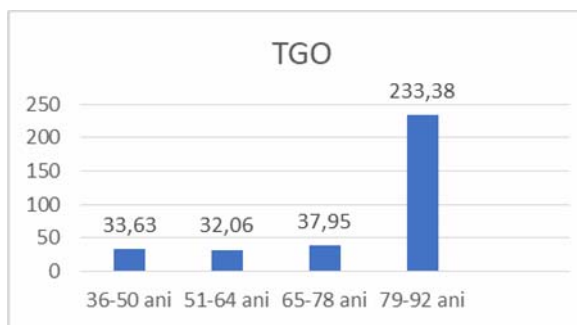

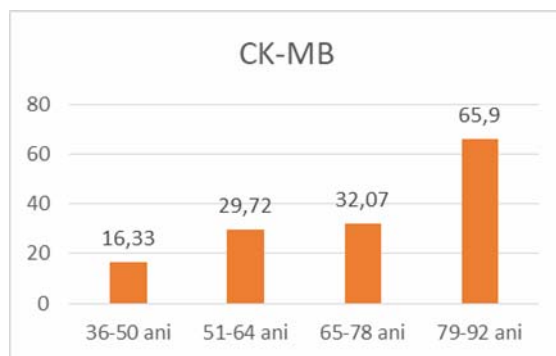Fig.11. Mean values of TGO in patients female

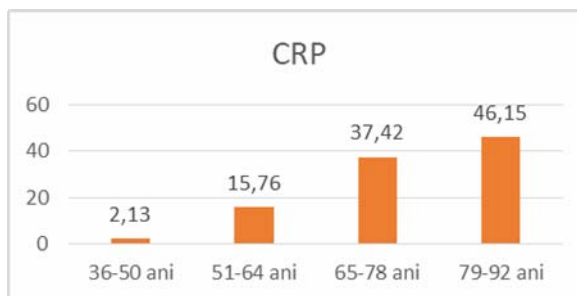Fig. 12. Mean CK-MB values in female patients

Fig. 13. Mean CRP values in patients female
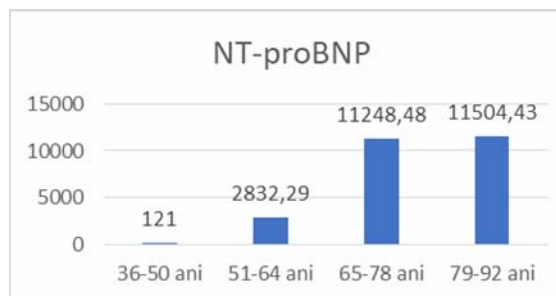

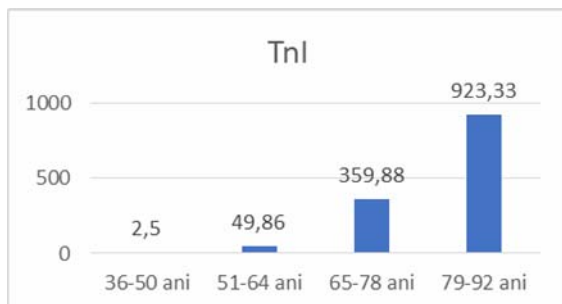Fig. 14. Frequency of NT-proBNP in patients female

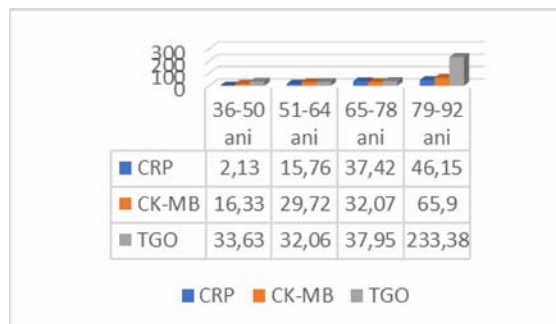Fig. 15. Mean values of TnI in patients female

Fig. 16. The average values of the biochemical parameters investigated in female patients
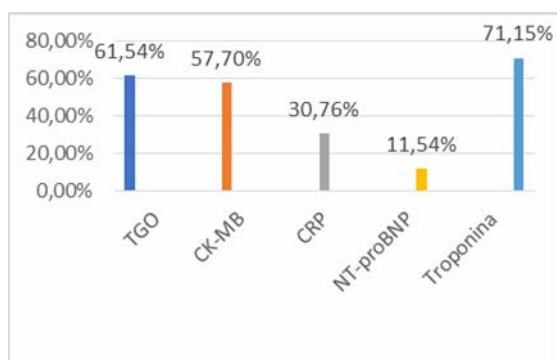
Fig. 17 Percentage distribution of women with normal values of the investigated parameters
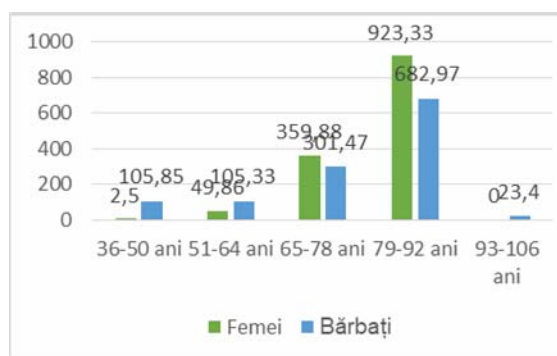

Fig. 18 Comparative analysis of mean troponin I values in the investigated patients

CONCLUSIONS

The average age of people with heart disease dropped below the age of 50, with women being more affected than men.

By modifying the concentrations of cerebral natriuretic peptide (BNP) and C-reactive protein (CRP), the possibility of diagnosis, stratification of growth risk and adverse prognosis in patients with chronic heart failure has been demonstrated. The severity of chronic heart failure, assessed by functional class, has a significant correlation with the levels of NT proBNP, CRP.

The study of the dynamics of procalcitonin and BNP concentration showed significant statistical differences between the deceased group and the group of surviving patients with infectious endocarditis; the concentration of procalcitonin and BNP in the deceased group was significantly higher, which is significant for the prognosis and choice of therapeutic tactics. The persistent increase in tumor necrosis factor concentration in the dynamics of the disease probably indicates a chronic infection of the endocarditis without its growth.

In the case of bacterial endocarditis, it is recommended to monitor procalcitonin and BNP, the increase of which has a prognostic value for death.

Cardiac troponins are the preferred markers for highlighting myocardial necrosis, because they are specific and more accurate than traditional cardiac enzymes such as CK and CK-MB.

Troponin levels may remain elevated for 10 days, and their measurement is preferable in patients with suspected myocardial infarction. Any increase in levels is considered to reflect irreversible myocardial necrosis.

Compared with CK-MB, troponins are specific for myocardial injury, grow faster and remain high for longer, and are more sensitive to muscle damage.

Male patients who had troponin within normal limits were more in number compared to female patients.

The values obtained for NT-proBNP should be interpreted in correlation with the patient's clinical data and other paraclinical investigations.

Age and sex can influence the values of NT-proBNP, NT-proBNP levels are higher in women than men and more than that there is an increase with their age.

Male individuals with normal NT-proBNP values were higher than female subjects.

CRP has prognostic value in patients with negative troponin results and no obvious myocardial necrosis.

CRP is useful for the risk of stratification even in healthy subjects.

Cardiac markers play a key role in the diagnosis and management of patients with cardiovascular disease.

Given all this wide range of tests, it remains to be established which of them have a predictive clinical value and to build a multi-marker strategy that involves different pathophysiological aspects, useful in prevention, prognosis, diagnosis and treatment.

ABSTRACT

This paper aims to demonstrate the utility of biochemical markers of myocardial necrosis in diagnosing and managing patients with cardiovascular disease. The studies were performed on 100 patients, between May 2018 - April 2019. Thus, in the peripheral venous blood, the following markers were determined: troponin I, pro BNP, CRP, CK, CK-MB, AST, in patients with heart disease, hospitalized in the sections of cardiology, internal medicine and ATI.

All the markers used proved to be useful. Given all this wide range of tests, it remains to be established which of them have a predictive clinical value and to build a multi-marker strategy that involves different pathophysiological aspects, useful in prevention, prognosis, diagnosis and treatment.

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