

# METABOLIC SYNDROME IN PATIENTS WITH CORONARY ARTERY BY-PASS GRAFTING AND ITS VASCULAR CONSEQUENCES

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## REZUMAT

**Objective:** Studiul analizează prevalența sindromului metabolic (SMET) și relația dintre componentele sale și alterarea vasculară la coronarienii cu by-pass aorto-coronarian (CABG) în antecedente. **Material și metode:** Studiu retrospectiv asupra 258 pacienți cu CABG (monovasculari = 11,3%; bivasculari = 20,5%; multivasculari = 68,2%). A fost determinat  $R^2$  pentru următorii parametri ai SMET: glicemia  $\geq 110$  mg/dl, tensiunea arterială cu valori de 120-139/80-89 mmHg, trigliceridemia  $\geq 150$  mg/dl, obezitatea abdominală ( $\geq 102$  cm la bărbați și  $\geq 88$  cm la femei); de asemenea,  $R^2$  dependent de: LDL  $\geq 100$  mg/dl, hipertensiune arterială ( $\geq 140/90$  mmHg), sex și vârstă (bărbați  $\geq 55$  ani și femei  $\geq 65$  ani). **Rezultate:** SMET a avut o prevalență de 52%. SMET, definit prin cele 4 componente analizate, contribuie la severitatea alterărilor vasculare la pacienții de sex masculin monovasculari peste 55 ani ( $R^2 = 0.33$ ) și hipertensivi bivasculari ( $R^2 = 0.36$ ). Pacienții multivasculari cu 4 componente ale SMET au prezentat o creștere semnificativă a trigliceridelor în relația cu hipertensiunea ( $p = 0,003$ ), cu LDL  $\geq 100$  mg/dl ( $p = 0,0002$ ) și cu sexul și vârsta - bărbați peste 55 ani ( $p = 0,003$ ). **Concluzii:** La pacienții cu CABG, prezența SMET a fost în relație cu alterarea vasculară severă. Considerând și alți factori de risc alături de cele patru componente analizate ale SMET, severitatea bolii coronariene crește. La pacienții cu boală coronariană, prezența nivelului înalt de trigliceride și a altor factori majori de risc poate fi considerată un indicator al riscului vascular înalt.

**Cuvinte cheie:** CABG, sindrom metabolic, factori de risc cardiovasculari

## ABSTRACT

**Objective:** We investigated the prevalence of METS and the relationship between its components and vascular damage in patients with history of coronary artery by-pass grafting (CABG). **Material and methods:** In our retrospective study on 258 patients with history of CABG (monovascular = 11.3%; bivascular = 20.5%; multivascular = 68.2%) we assessed  $R^2$  for following METS parameters: fasting plasma glucose  $\geq 110$  mg/dl; high normal blood pressure (120-139/80-89 mmHg); fasting triglycerides  $\geq 150$  mg/dl; abdominal obesity ( $> 102$  cm in men and  $> 88$  cm in women). We assessed  $R^2$  depending on: LDL  $\geq 100$  mg/dl; hypertension ( $\geq 140/90$  mmHg); gender and age (men  $\geq 55$  years and women  $\geq 65$  years). **Results:** METS had a prevalence of 52%. METS contributes to the severity of vascular damage in male univascular patients above 55 years ( $R^2 = 0.33$ ) and in bivascular hypertensive patients ( $R^2 = 0.36$ ). Multivascular patients with the 4 components of METS had a significant increase of triglycerides in relation with hypertension ( $p = 0.003$ ), LDL  $\geq 100$  mg/dl ( $p = 0.0002$ ) and gender and age - men above 55 years ( $p = 0.003$ ). **Conclusions:** (1) In patients with CABG, the presence of METS was related with severe vascular damage. (2) Adding other risk factors to the four METS analyzed components, the severity of coronary artery disease (CAD) increased. (3) In patients with CAD, the presence of both high fasting triglyceride levels and other major risk factors may be considered as an indicator of high vascular risk.

**Key Words:** CABG, metabolic syndrome, cardiovascular risk factors

## INTRODUCTION

The metabolic syndrome initially defined as an entity which sustains the cardiovascular risk in asymptomatic subjects was recently reconsidered:<sup>1</sup>

a. It represents a powerful predictor of cardiovascular mortality, even more powerful than its individual components.

b. It amplifies the cardiovascular risk independent of traditional risk factors.

c. It has predictive value for atherothrombotic cardiovascular events independent of LDL-cholesterol.

## MATERIAL AND METHOD

Our retrospective study - approved by the University's Ethics Committee - on 258 coronary patients with a history of CABG has quantified: the coronary lesion (angiographic), the presence of non-modifiable

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Received for publication: Oct. 20, 2005. Revised: Apr. 13, 2006.

risk factors (M ≥ 55 years, F ≥ 65 years), the dysmetabolic status and the metabolic syndrome components (ATPIII): waist circumference (B > 102 cm, F > 88 cm), glycemia ≥ 110 mg/dl, TG ≥ 150 mg/dl, BP ≥ 130/85 mmHg, HDL-cholesterol < 40 mg/dl (M), or < 50 mg/dl (F).<sup>2</sup>

We have analyzed the multiple regression equation defined by the following variables: BMI, BP-normal/high, triglyceride & glycemia, in relationship with the severity of coronary lesions.

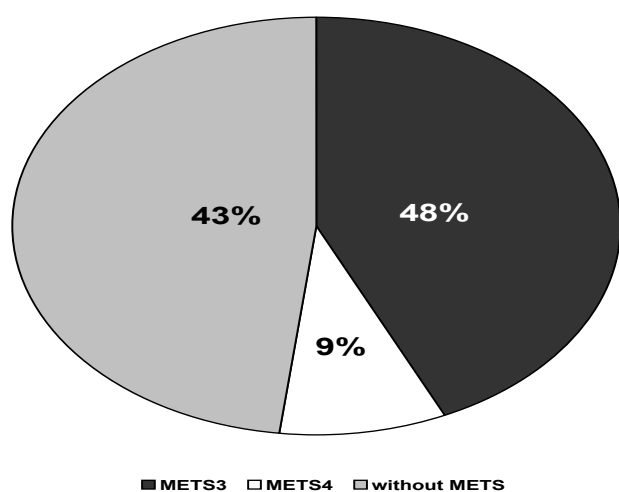
**Statistical processing:** percentage of lot, average and standard deviation, correlation factor (p), multiple regression coefficient (R<sup>2</sup>).

## RESULTS

Of the 258 coronary patients with CABG, the most significant category was represented by the multivascular (68.2%) vs 11.3% monovascular. In the presence of non-modifiable risk factors, the bivascular lesion becomes major (62.10%) in the group of coronary males > 55 years.

What evidence have we obtained regarding the presence of METS in coronary patients with a history of CABG?

a. The prevalence of METS was 52%. (Fig. 1)

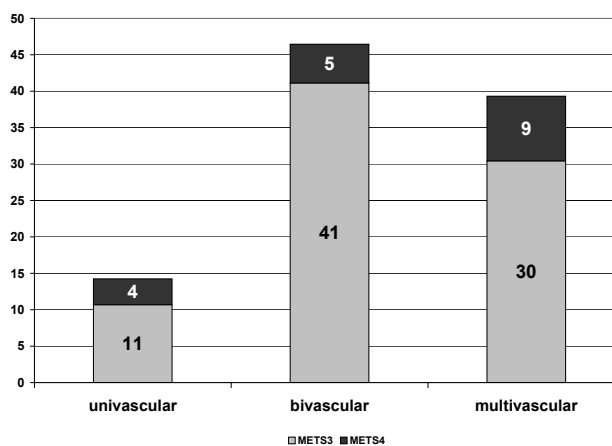


**Figure 1.** METS prevalence in operated coronary patients.

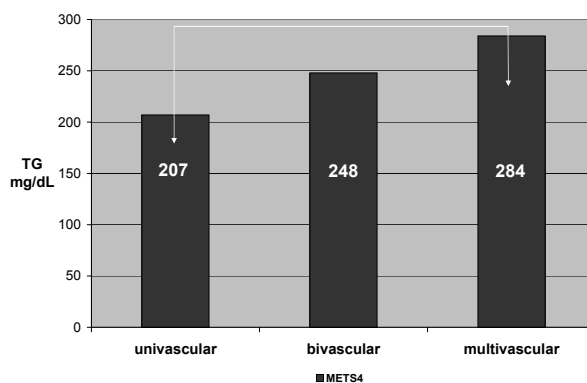
b. The prevalence of METS defined by 4 components was significantly higher in bi- and multivascular patients with non-modifiable risk factors in comparison with monovascular patients. (Fig. 2)

c. Multivascular patients with METS defined by 4 components presented a significant increase of triglycerides as related with:

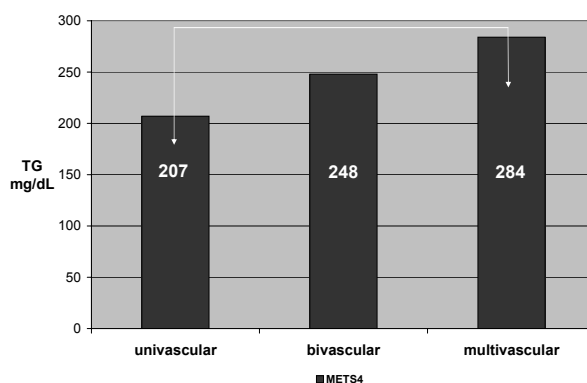
- the hypertension condition (p = 0.003); (Fig. 3)
- LDL-cholesterol values ≥ 100 mg/dL (p = 0.0002); (Fig. 4)



**Figure 2.** Prevalence of METS defined by 4 components.

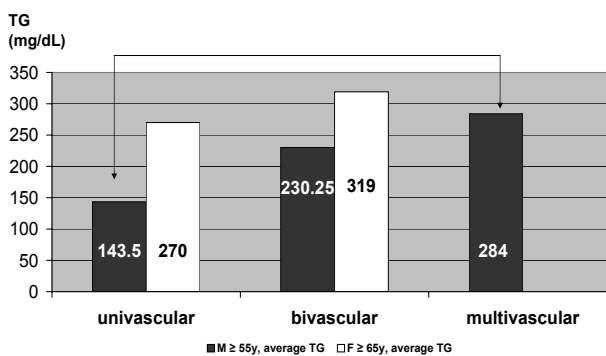


**Figure 3.** TG changes in METS4 with defined hypertension (p = 0.003).



**Figure 4.** METS4 and LDL (p = 0.0002).

- non-modifiable risk factors: M ≥ 55 years, F ≥ 65 years (p = 0.003). (Fig. 5)



**Figure 5.** TG changes in METS4 (p = 0.003).

The severity of atherothrombotic lesions was quantified by a multiple regression model, depending on the following variables: BMI, BP – normal/high, fasting TG and fasting plasma glucose. Thus, these parameters had a powerful correlation with the severity of atherothrombotic lesions in coronary men with mono and bivascular coronary lesions ( $R^2 = 0.33$  and  $0.36$ , respectively). (Fig. 6)

### R square ( $R^2$ ) in coronary patients with CABG

(BMI, high-normal BP, fasting TG, fasting plasma glucose)

Coronary patients (men $\geq$ 55 years)	<b>n = 121</b> <b><math>R^2</math></b>
Univasular	<b>0.33</b>
Bivasular	<b>0.36</b>
Multivasular	<b>0.08</b>

**Figure 6.** R square in coronary patients with CABG.

## DISCUSSIONS

Metabolic syndrome in the apparently healthy population but also in those with different localization of atherothrombotic vascular disease, alters the prognostic and doubles the risk for fatal or non-fatal cardiovascular events.<sup>3-5</sup>

In the coronary patients, METS prevalence defined by 3 criteria (ATPIII) was of 45% in SMART study and of 43% in our study.<sup>1,2</sup>

The studied lot, characterized by a high incidence of abdominal obesity, BP and hypertriglyceridaemia also presented severe coronary lesions, correlated with the dismetabolic status.

The natural question in this context would be: which of the coronary patients with METS has the highest risk?<sup>6</sup> Some answers ought to be kept in mind:

a. Dyslipidemia is an early and constant component of the insulin-resistance, therefore dyslipidemia and metabolic syndrome should be considered as an inseparable couple responsible for the frequency of vascular complications.<sup>7-9</sup>

b. In subjects followed for up to 10 years after CABG, survival is inversely correlated with the number of risk factors composing the “deadly quartet” (obesity, hypertension, diabetes, hypertriglyceridaemia), relatively close to the

metabolic syndrome definition.<sup>10,11</sup> It has been shown that survival after CABG decreases with the number of metabolic syndrome components present in a single patient.<sup>12-15</sup>

## CONCLUSIONS

1. In patients with CABG, the presence of METS was in relation with severe vascular damage.

2. Adding other risk factors to the four METS analyzed components, increases the severity of coronary artery disease (CAD).

3. In patients with CAD, the presence of both high fasting triglyceride levels and other major risk factors may be considered as an indicator of high vascular risk.

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