Correlation between presence and degree of atherosclerosis in the carotideal and coronaric district respectively evaluated by doppler US and coronary-CT

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**Purpose**

Identification of patients running the risk of myocardic ischemia represents today a true challenge to obtain an early diagnosis and a preventive intervention that is to say before the patient develops major ischemic events.

Numerous are the studies that prove a correlation between the carotid Intima Media Thickness (IMT) value and the risk/incidence of major cardiovascular and not only cerebro-vascular events; positivity to super-aortic trunks doppler ultrasound is therefore considered as an additional risk factor for ischemic diseases of myocardium.

In the last years, with the coming of the cardiac-CT, the diagnostics of cardiac imaging has changed: we have started to pay attention also to diffuse coronaric disease and to not critical stenoses attaching greater importance to the type of plaque rather than to the entity of the stenosis.

The aim of our study was to detect the presence and entity of carotid atherosclerosis in a group of patients who underwent also cardiac-CT and to correlate the results of these two techniques.
Methods and Materials

Among 193 patients studied by cardiac multidetector computed tomography (MDCT) between January 2008 and June 2009 we selected 73 who had undergone also carotid doppler US. Cardiac-MDCT examination had been conducted on a Dual Source Computed Tomography. We analysed MDCT reports and grouped patients as with no coronary disease, not significant disease and significant disease (# 50%). We then evaluated US reports and grouped patients as with no disease, not significant disease and significant (# 70% stenosis) disease. We also considered, in 55 patients, IMT values.

Selection of patients

We selected 193 consecutive patients who underwent a cardiac-MDCT in the period October 2008 - June 2009 for whatever indication. Among these the ones who might have undergone either previously or afterwards an eco doppler of super-aortic trunks were further selected. Therefore, the study population consisted of 73 patients (62 M, 11 F; mean age 63 years; range 39-84 years).

Cardiac-MDCT

Cardiac-MDCT exam was carried out using a dual source apparatus (Somatom Definition, Siemens, Forchheim, Germany) with retrospective ECG gating, with an unenhanced acquisition to evaluate calcium score followed by a contrast enhanced acquisition with the intravenous injection of iodate contrast media (Iopamidol 370 mgI/ml, 90 ml) at a rate of about 5 ml/sec, followed by the injection of a mixed bolus of contrast media (20%) and saline solution (80%) at the same rate of injection.

The examination was acquired using the technique of bolus test (or bolus tracking in cases of aorto-coronaric by-pass grafts) with following acquisition parameters: 100-120 kVp, 700 effective mAs, cephalo-caudal acquisition from carina to diaphragm, automatic pitch variation, care dose deactivated.

Patients with heart frequency >65 bpm and no contra-indications were given oral beta-blockers (metoprolor 50-100 mg) one hour before the examination to obtain a reduction of hearth frequency. In cases of stable rhythm and frequency between 65 and 70 bpm, it was decided to go on with the examination. All patients were given sublingual nitrates just before starting the examination.

Interpretation of MDCT data

All MDCT examinations were interpreted by a radiologist, specialized in cardiac-CT. We considered the presence of coronaric disease in the native vessels and in the BPAC.
The presence of at least one plaque conditioning over 50% stenosis of coronaric lumen was classified as significant disease. The presence of one or more plaques conditioning less than 50% stenosis was classified as not significant disease. In patients with not significant disease the prevailing characteristics of the plaques were considered: calcific, not calcific and mixed.

*Doppler-US of super-aortic trunks*

The eco-doppler investigations were carried out at the same Center, by different people. The evaluation of said investigations was based on written reports.

*Interpretation of doppler-US data*

The presence of plaques and the degree of stenosis were considered, the last one being expressed as percentage of the vessel diameter. The plaques conditioning over 70% stenosis were defined as significant (on the basis of today valid guide lines that fix said cut-off as indication of surgical therapy in asymptomatic patients with surgical risk lower than 3%).

The site of the plaques (fork, bulb, inner carotid) and the kind of plaque (calcific, fibrous, fibro lipid, mixed) were also evaluated.

If indicated in the report data of Intima Media Thickness (IMT) were then added, considering as presence of disease an IMT value > 1,1. As IMT value we have taken the highest value.

*Statistic analysis*

The results of cardiac-CT and doppler-US were compared, taking into account both the percentage of stenosis and the IMT value.

The statistic evaluation was made calculating the estimate of the correlation coefficient for each of the two analysis, a significance level equal to 95% and the sufficient t statistic of Student to confirm or not the correlation assumption.
Results

We found a statistically significant correlation between the presence of atherosclerosis at CT and at US considering stenosis percent (p=0.035) but the correlation between entity of the disease in the two different districts examined was not significant (p=0.05). Correlation between IMT and coronaric atherosclerosis resulted statistically significant (p=0.02).

Of the patients with atherosclerosis in the coronaric district (both significant or not) 73% (30/41) did show an IMT value > 1,1 and 76% (42/55) carotid plaques.

Of the patients with significant atherosclerosis in the coronaric district 78% (19/24) did show an IMT=1,1 and no one did show a number of significant plaques in the carotid district (0/32).

The incidence of disease in the two districts we have considered is represented in Fig 1 on page 7 and 2 on page 7, while the distribution of IMT in the population of patients with coronaric disease is reported in Fig 3 on page 8.

In figures 4 on page 9 and 5 on page 9 the prevalence of different plaques kind in the two districts considered is shown.
Fig. 0

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Coronaric Plaques Kind

Fig. 0

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Fig. 0

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Conclusion

High IMT or the presence of a stenosis in the carotid district can be an index of disease even in the coronary arteries. Being most people who undergoes both these exams at low-intermediate risk of disease, this correlation could be used to screen people at the early stage of the disease and to rule out the ones who are negative.
References

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