Th# characteristic of morphological changes of the coronary bypass grafts in different terms of the late postoperative period with CT-bypass angiography

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Aims and objectives

The diagnosis of coronary vessels and grafts patency after revascularisation surgery is one of the most actual problems of diagnostic and cardiology. Effectiveness of coronary artery bypass surgery in improving the quality of life is directly related to grafts patency. Due to the fact that effective functioning time of arterial and venous grafts is different, graft type selection plays an important role.

Multislice computed tomography is widely used in routine clinical practice and as minimally invasive procedure allows to assess the patency of coronary grafts and native arteries. Diagnostic accuracy of 64-slice CT-bypass angiography in the diagnosis of coronary bypass grafts stenosis is 97-99%, grafts occlusion - close to 100%.

The literature contains general information about morphological changes of arterial and venous grafts at different terms of the late postoperative period, while data on patency of the grafts to different coronary arteries is found only in a few articles and does not always coincide. Also there is no information about the control terms of the CT-bypass angiography in patients after coronary bypass surgery.

The aim of the study was to determine the frequency of occlusions and stenoses of the grafts for each coronary artery at different terms of late postoperative period using CT bypass angiography; to determine the control terms of CT-bypass angiography on the basis of morphological changes in the grafts.
Methods and materials

A total of 128 patients (110 men, 67.2±8.2 years) with 375 coronary bypass grafts (118 arterial and 257 venous) were examined by a 64-slice CT-bypass angiography (Aquilion 64, Toshiba, Japan) using the following scan parameters: 400 ms gantry rotation time, detector collimation 64#0.5 mm, tube voltage of 120 kV, the pitch was 0.2, scanning time ~ 12-14 sec. Contrast agent - Iopamidol-370 mg 100 ml.

All patients (n=128) were divided into 7 groups for assessment of correlation the morphological changes in arterial and venous grafts and the time after coronary bypass surgery: I group - 6 months-1 year (n=27; 21.1%); II group - 1-2 years (n=30; 23.4%); III group - 2-3 years (n=17; 13.3%); IV group - 3-5 years (n=11; 8.6 %); V group - 5-7 years (n=15; 11.7%); VI group - 7-10 years (n=12; 9.4%); VII group - more than 10 years (n=16; 12.5%).
Results

The revascularisation of pools of right coronary and circumflex arteries and their branches was carried out mainly by means of vein grafts: the greatest quantity of venous grafts were to the main trunks of the right coronary artery (n=65; 25.6%) and the circumflex artery (n=60; 23.3%) as well as to the obtuse marginal branches (n=54; 21%).

93 occluded grafts (24.8%) were found, of which 77 venous and 16 arterial. Grafts to the right coronary artery constituted greatest quantity among all occluded venous grafts (n=27; 35%). Venous grafts were closed more frequently during the periods 7-10 years and more than 10 years after surgery.

Occluded arterial grafts to the left anterior descending artery constituted greatest quantity in term 6 months-2 years after surgery.

Thus, the frequency of vein grafts occlusions was 2.2 times higher than arterial grafts occlusions by comparing their patency (p<0,001). It should be noted if the amount of venous grafts occlusions increases proportionally to the time after bypass operations, the critical period for arterial grafts occlusions is the first two years (Fig.1).

52 significant stenoses of 375 grafts available for diagnostics were found in 41 venous grafts and in 11 arterial grafts. Significant stenoses in venous grafts most often developed in periods 6 months-1 year (14.6%), 1-2 years (12.2%), 7-10 years and more than10 years after surgery (22% and 34%, respectively). The greatest quantity of all stenoses was verified in the right coronary artery (29.3%).

Significant stenoses were found only in the arterial grafts to the left anterior descending artery and diagonal branches. The greatest quantity of stenoses was in groups 6 months-1 year, 7-10 years and more than 10 years after surgery, while the highest rate in development of stenoses of arterial grafts was in the group more than 10 years after surgery (27,3%; p<0,005)(Fig.2).

The distribution of stenoses and occlusions of coronary bypass grafts on each coronary artery is shown in Figure 3: the highest incidence of occlusion was observed in venous grafts to the right coronary artery (40%) and the highest incidence of stenoses - in venous grafts to the left anterior descending artery - 28% (p<0.005).

The least susceptible for stenoses were venous grafts to the circumflex artery (8.3%) and arterial grafts to the left anterior descending artery (9.2%), and for occlusions - venous grafts to the diagonal branches (11.5%) and arterial grafts to the left anterior descending artery - 12% (p<0.005).
The distribution of stenoses and occlusions of coronary bypass grafts on terms after surgery for each coronary artery is presented on Figures 4 and 5. The similar pattern was observed for all coronary arteries: the smallest number of stenoses and occlusions of venous and arterial grafts occurred in periods 2-3 years and 3-5 years after surgery, while the greatest number was in period more than 10 years after surgery (p<0.001). Moreover, the amount of occlusions and stenoses was greater in groups 6 months-1 year and 1-2 years than in groups 2-3 years and 3-5 years after surgery, that indicates the importance of monitoring of patency of coronary artery and bypass grafts in period < 2 years after surgery.
Fig. 1: The distribution of occlusions of arterial and venous coronary bypass grafts on terms after surgery.

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Fig. 2: The distribution of stenoses of arterial and venous coronary bypass grafts on terms after surgery.

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Fig. 3: The distribution of stenoses and occlusions of coronary bypass grafts on each coronary artery. LAD-left anterior descending artery; Db-diagonal branches; CxA-circumflex artery; OM-obtuse marginal branches; RCA-right coronary artery; PDA-posterior descending artery; LAD(a)-arterial graft to left anterior descending artery.

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Fig. 4: The distribution of stenoses of coronary bypass grafts on terms after surgery for each coronary artery. LAD-left anterior descending artery; Db-diagonal branches; CxA-circumflex artery; OM-obtuse marginal branches; RCA-right coronary artery; PDA-posterior descending artery; LAD(a)-arterial grafts to left anterior descending artery.

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Fig. 5: The distribution of occlusions of coronary bypass grafts on terms after surgery for each coronary artery. LAD-left anterior descending artery; Db-diagonal branches; CxA-circumflex artery; OM-obtuse marginal branches; RCA-right coronary artery; PDA-posterior descending artery; LAD(a)-arterial grafts to left anterior descending artery.

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Conclusion

The highest incidence of occlusions was observed in venous grafts to the right coronary artery and the highest incidence of stenoses - in venous grafts to the left anterior descending artery (p<0.005).

The least susceptible for stenoses were venous grafts to the circumflex artery and arterial grafts to the left anterior descending artery, and for occlusions - venous grafts to the diagonal branches and arterial grafts to the left anterior descending artery (p<0.005).

The lowest frequency of stenoses and occlusions of both venous and arterial grafts was in period 2-5 years after surgery.

Control terms of CT-bypass angiography for patients after bypass surgery are 2 years, 7 and 10 years.
References


