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INTRODUCTION

Frequency of acute coronary syndrome in teenagers and young people, third-fourth decade of life, consist of 1.5 – 5.8 % among general patient population with acute coronary syndrome all age groups (1-4). This autonomy category of patients, characterized with more aggressive clinical manifestation of the disease and spectrum of risk predictors differ from patients of older age. Treatment tactics of acute coronary syndrome in young

Features of coronary artery bypass grafting in young patients with acute coronary syndrome

Abstract

Aim: Purpose of the study was retrospective analysis of hospital and early (up to six months after operation) results of the surgical myocardial revascularization in patients, third and fourth decades of life, with acute coronary syndrome.

Material and Methods: Since 2012 year up to November, 2018 year in CCH by the same brigade, performed 500 coronary artery bypass grafting operations in the patients with acute coronary syndrome, at the age of 30-83 years old, including 15 operations in patients ≤ 40 years old (3%). Clinical manifestation of acute coronary syndrome was presented: unstable angina in 13 (86.7%) patients, 6 (40%) of them with past myocardial infarction in anamnesis; acute myocardial infarction, accompanied by S-T segment elevation (STEMI) in 2 (13.3%) patients. In coronarography: multivessel lesion of coronary arteries was revealed in 10 (66.7%) patients, 3 of them with lesion of trunk of the left coronary artery; bivascular lesion in 4 (26.7%) patients, single vessel lesion in 1 (6.6%). In 13 (86.7%) patients were performed coronary artery bypass grafting under the cardiopulmonary bypass (CPB). Average duration of the CPB= 127±9.66 min. Mean aortic clamp time = 68±6.91 min. Number of shunts for the whole group of 15 operated were from 1 to 5, at the average (3.28±0.31). In 6 patients (40%) performed three-branches CPB, in 5 patients (33.3%) fourth-branches, in 1 patient (6.7%) fifth-branches, in 2 patients (13.3%) double-branches and in 1 patient (6.7%) single branch CPB. Used conduits: left internal mammary artery in all 15 patients (100%), autovein in 12 (80%), radial artery in 10 (66.7%) patients. In last group with using radial artery, average amount of shunts was 1.5±0.1.

Results: The structure of postoperative complications consist: low cardiac output syndrome in two patients; bleeding in 2 patients. In analyzed series, no lethal outcomes watched in duration up to 30 days after operation. All patients were watched during 6 months after discharge. It was not watches necessity for reinterventions and lethal outcomes.

Conclusion: Hospital and immediate results of myocardial revascularization in young people with acute coronary syndrome very encouraging, while long-term results are not so optimistic and unsatisfactory. Therefore, considering the long life expectancy and higher functional and social demands of the patients at age ≤ 40 years, preference is given to hybrid interventions or isolated shunting using arterial conduits in both variants of revascularization.

Keywords: Acute coronary syndrome, revascularization of myocard, radial artery

people is orientated taking into account the expected longer life span and great functional social needs of the patients after revascularization of myocard. In this case, the distinctive features of revascularization of myocard in young people with acute coronary syndrome is high frequency of urgent interventions.

Results of the myocardial revascularization in patients with acute coronary syndrome, ≤40 years old, were presented in relatively few publications, and remains debatable: a) choice

of revascularization method (stenting, coronary artery bypass surgery, or hybrid myocardial revascularization); b) timing and character of the surgical intervention (with CPB or in beating heart); c) preference for conduits (partial or complete arterial revascularization).

Purpose of the study was retrospective analysis of hospital and early (up to six months after operation) results of the surgical myocardial revascularization in patients, third and fourth decades of life, with acute coronary syndrome (5).

MATERIAL AND METHODS

Since 2012 year up to November, 2018 year in CCH by the same brigade, performed 500 coronary artery bypass grafting operations in the patients with acute coronary syndrome, at the age of 30-83 years old, including 15 operations in patients ≤ 40 years old (3%). All 15 patients were male at the age of from 30 to 40 years old, average 36.71 ± 0.78 y.

Clinical manifestation of acute coronary syndrome was presented: unstable angina in 13(86.7%) patients, 6(40%) of them with early myocardial infarction in anamnesis; acute myocardial infarction, accompanied by S-T segment elevation (STEMI) in two (13.3%) patients. Congestive heart failure was observed in the patient, who had two previous myocardial infarction.

Baseline risk factors were presented: persistent smoking in 10(66.7%) patients; burdened family history of coronary heart disease in 9 (60%); arterial hypertension in 9(60%); non-insulin dependent diabetes in 1(6.7%). Dyslipidemia was observed in 8(53.3%) patients. Total cholesterol level was, on average 284.75 ± 19.84 mg/dl, triglycerids 205.75 ± 35.33 mg/dl.

EF of the left ventricle was from 29 to 61%, on average $47.6 \pm 3.29\%$. Left ventricular myocardial dysfunction ($EF \leq 43\%$) registered in 4 (26.7%) patients, including in 3 of them severe dysfunction with decreased $EF \leq 35\%$. EDV LV in patients with myocardial dysfunction was 57.5 ± 4.86 ; ESV LV 40 ± 4.13

In coronarography: multivessel lesion of coronary arteries was revealed in 10(66.7%) patients, 3 of them with lesion of trunk of the left coronary artery; bivascular lesion in 4(26.7%) patients, single vessel lesion in 1(6.6%). In 13(86.7%) patients were performed coronary artery bypass grafting under the cardiopulmonary bypass (CPB). Average duration of the CPB = 127 ± 9.66 min. Mean aortic clamp time = 68 ± 6.91 min. Myocardial protection was performed using combined antero-retrograd isothermal blood cardioplegia without topical cooling of the myocardium.

Total arterial revascularization was performed in two patients with CPB. 13.3% of the patients (2 out of 15) were operated in beating heart, using stabilizer Estech Synergy Plus.

RESULTS

Thirteen of the patients (86.7%) were operated in duration of 2.5 hours to 2 days after admission. Seven patients were operated in first 24 hours after admission to the clinic, including 5 of them

were operated from 2.5 to 12 hours after admission. From last five patients: three with lesion of the trunk of the left coronary artery and two with acute myocardial infarction (STEMI). Six patients were operated on the second day after admission and two patients on third and fifth days after admission, respectively. In the group of patients, undergone urgent intervention, one of the patients (38 years old) with acute posterior diaphragmatic myocardial infarction, in two hours after admission was performed balloon angioplasty of the right coronary artery and stenting of the anterior interventricular artery, complicated by stratification the diagonal branch. After 40 min. the patient was transferred to the operating room and performed urgent coronary artery bypass grafting with CPB, on time of 2.5 hours after admission, with a good outcome.

To the second patient (34 years old), with acute posterior diaphragmatic myocardial infarction (STEMI) and burdened family history of coronary heart disease (both of relatives, and brothers), were performed three-branches complete arterial myocardial revascularization during four hours after admission. Mother and the brother of the patient were operated on by us a year ago for ischemic heart disease, but father died from complication of natural course of myocardial infarction.

In both patients operated on the background of acute infarction, imposition of proximal anastomoses with the aorta was performed in aortic clamp. After removing the clamp from the aorta in patients were performed cold blood myocardial reperfusion at 26°C during 20 min, with gradual warming by 1°C each 2 min.

Two of the patients were operated with beating heart. In both of the patients, indication for revascularization on beating heart was severe left ventricular myocardial dysfunction. In the first case was diagnosed unstable angina with a history of myocardial infarction in anamnesis, single vessel lesion and decreasing EF LV up to 33%; in the second case severe myocardial dysfunction with decreasing EF LV up to 29%, three-vesel lesion and organized parietal thrombosis of the left ventricle in the region of the apex. Needs for conversion to CPB in non of the patients operated on beating heart was observed.

Number of shunts for the whole group of 15 operated were from 1 to 5, at the average (3.28 ± 0.31). In 6 patients (40%) performed three-branches CPB, in 5 patients (33.3%) fourth-branches, in 1 patient (6.7%) fifth-branches, in 2 patients (13.3%) double-branches and in 1 patient (6.7%) single branch CPB. Used conduits: left internal mammary artery in all 15 patients (100%), autovein in 12 (80%), radial artery in 10 (66.7%) patients. In last group with using radial artery, average amount of shunts was 1.5 ± 0.1 .

The complete arterial revascularization were performed in two patients with CPB. In one case was performed double branch shunting using left mammary and radial arteries; in this case, proximal anastomosis of the radial artery imposed with mammary artery.

In the second patient with myocardial infarction and two-vessel lesion was performed three-branch shunting: revascularization of the right interventricular artery via the internal mammary artery; diagonal and envelop branches-sequentially, via radial artery. The proximal anastomosis of the last one was imposed with internal mammary artery.

In 5(33.3%) out of 15 patients were revealed diffuse lesion of the coronary arteries, required, in two cases, performing eversion endarterectomy from the pool of right interventricular branch with subsequent imposition mammary-coronary side to side anastomosis according to the patch-plasty type. Postoperative complications of endarterectomy as retrombosis, bleeding and rhythm disturbances were not observed. In 3 out of 5 patients of this group do not performed endarterectomy, but imposition of the distal anastomosis also were performed as patch-plasty type: in two patients – mammary-coronary anastomosis with right interventricular branch; in one patient – autovenous bypass of the posterior interventricular artery.

Duration of Artificial Pulmonary Ventilation in whole group of the operated was, on average, 6.83 ± 0.71 hours. Inotropic support with Dopamine required in 20% of the patients (3 out of 15) during 10 -112 hours after the operation.

In one of the patient (with unstable angina, myocardial infarction in anamnesis, single vessel lesion and EFLV 33%), operated on beating heart, was implemented combined support (Dopamine + Adrenalin) and stopped on fourth day after operation. Staying in the intensive care unite 13(86.7%) of the patients from one to 3 days, of the two patients – 4 and 6 days, relatively. Average staying in resuscitation department was 2.64 ± 0.39 days.

DISCUSSION

The structure of the postoperative complications included: low cardiac output syndrome - in 2 of the patients; bleeding - in 2 of the patients. In the last group, in one case was required re sternotomy. In another case В дрыгом – increased bleeding after urgent coronary artery bypass grafting (CABG), performed in the patient with complicated stenting of right interventricular artery, and was associated with the using of antiplatelet agents.

In analyzed series, no lethal outcomes watched during up to 30 days after operation. All patients were watched during 6 months after discharge. The need for repeated reinterventions and lethal outcomes were also not observed.

Analysis of literature and our data show that spectrum of risk predictors of acute coronary syndrome in young people more often represented by smoking, burdened family history of coronary artery disease, overweight and/or obese, dyslipidemia (6-9). Epidemiological studies of recent years also emphasize genetic predictors of acute myocardial infarction in young people (10). Arterial hypertension, diabetes and renal failure are usually prerogative of patients of older age groups. In the series presented by us, smoking, family history of coronary artery disease and dyslipidemia were noted in 66.7%, 60% and 53.3%

of the patients, relatively (11-15). A feature of our series was the high frequency of arterial hypertension, revealed in 66.7% patients (16).

Most observations of acute coronary syndrome in young people and adolescent presented by male patients, predominantly with single-vessel coronary artery disease, but with high frequency of left ventricular myocardial dysfunction (17).

The difference of our group was multivessel (≥ 2 and ≥ 3) coronary artery disease in 93.3% operated patients. At the same time, myocardial dysfunction of the left ventricle ($EF \leq 43\%$) was registered in 26.7% of the patients, but severe dysfunction ($EF \leq 33\%$) - in 20% of whole group. Multivessel coronary artery disease in people ≤ 40 years old is met relatively rare, however the frequency of multivessel lesion in these series reaches 36.5 - 64%. The development acute coronary syndrome in women ≤ 40 years old is rarity and, usually, is a consequence of spontaneous dissection of the coronary arteries in the pre- or postpartum period. Our series operated with acute coronary syndrome consisted exclusively of male patients.

Clinical manifestation of acute coronary syndrome in young people in 67% was presented with acute myocardial infarction (STEMI), in 20% acute myocardial infarction without S-T segment elevation (NSTEMI), and only in 14% with unstable angina (18-21). In our series, clinical spectrum of manifestation of acute coronary syndrome was presented: unstable angina in 86.7% of the patients, having a history of early myocardial infarction in 40%; acute myocardial infarction (STEMI) - in 13.3% of the patients.

Given the high frequency of complications and mortality in the natural course of acute coronary syndrome in persons ≤ 40 years, their myocardial revascularization should be performed as urgent as possible: stenting or coronary artery bypass grafting (22-25). In our series 86.7% of the patients (13 out of 15) were operated on from 2.5 hours to 2 days after hospitalization: 5 patients 12 hours after hospitalization, 2 by the end of the first 24 hours and 6 on the second day after hospitalization. No lethal outcomes watched during up to 30 days after operation.

All patients were watched during 6 months after discharge. The need for repeated myocardial revascularization and lethal outcomes were also not observed.

Hospital and immediate results of myocardial revascularization in young people with acute coronary syndrome very encouraging, while long-term results are not so optimistic and unsatisfactory (26-32). The reasons are: 1. continued smoking; 2. progression of atherosclerotic disease; 3. high frequency of recurrence of coronary symptom complex after stents and autovenous shunts. Therefore, considering the long life expectancy and higher functional and social demands of the patients at age ≤ 40 years, preference is given to hybrid interventions or isolated shunting using arterial conduits in both variants of revascularization. We also adhere to the preferred use of arterial conduits, applied in

73.3% (11 out of 15) operated by us patients.

Conflict of Interests: The author declares that there are no conflict of interests.

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Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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