UDK: 616.132.2-089:616.379-008.64

ANALYSIS OF CORONARY ATHEROSCLEROSIS IN PATIENTS WITH OR WITHOUT DIABETES MELLITUS TYPE 2 IN 12 MONTHS AFTER CABG ACCORDING CORONAROGRAFTGRAPHY

A.Rudenko, V.Gutovskiy, V.Ursulenko, S. Rudenko, O. Gogayeva

GF "National Amosov's institute of cardiovascular surgery AMS of Ukraine"

A comprehensive analysis of graft function and dynamics of the duration of coronary atherosclerosis according to angiography 1 year after coronary artery bypass grafting (CABG) in 39 patients with coronary artery disease and coexisting type 2 diabetes mellitus (DM), and 34 patients without DM. Analysis of coronarograftgraphy (CGG) revealed a clear correlation of relationship between compliance with the recommended treatment and the progression of coronary atherosclerosis and normal functioning grafts. When comparing the results of CGG, the number of patients with non-functioning grafts was higher in 2 times for patients operated with DM. In the group operated on without DM with good compliance patency of grafts was 96.6 % compared to 92.1% in patients with DM. In the case of course therapy - graft patency in patients operated without DM was 91.7 % compared to 85.9 % in operated with DM. The worst results were observed in the group where there were not only a complete rejection of treatment, but renewal of bad habits and unhealthy lifestyle - the patency of grafts in the group operated without diabetes was 85.1 % compared to 68.4 % in patients with DM. The data obtained in our study in general match the status of the problem in all areas of medicine and requires long-term treatment as in Ukraine as in a whole world.

Key words: ischemic heart disease, type 2 diabetes mellitus, coronary artery bypass graft

Despite the undeniable progress made by conservative methods of treatment of coronary artery disease (CAD), there effectiveness in some cases was inadequate [1, 2]. Therefore, one of the main methods of treatment of severe CAD is coronary artery bypass grafting (CABG), which significantly improves the quality (disappear angina symptoms, improved physical activity) and duration of life of patients [3, 4, 5, 6].

At the same time, some comorbidities impair the effectiveness of CABG as the method of treatment of CAD. Among these diseases the diabetes mellitus (DM) is on the first place. Proportion of patient with DM undergoing CABG has been steadily increasing in recent years [7]. This is due primarily to the growth of the incidence and prevalence of diabetes in the population.

With increasing experience of implementation procedures, the improvement of anesthesia and myocardial protection techniques improves the results of operations. However, despite the significant achievements of coronary surgery, the results of surgical treatment in patients with concomitant DM significantly worse than in patients without concomitant DM. Postoperative mortality in patients with diabetes is several times higher than in patients without diabetes [8, 9, 10]. In these patients postoperative complications such as heart failure, intraoperative myocardial infarction, cerebrovascular accident renal failure, septic complications are often develop [11]. Except to the immediate results, important criterion of surgical treatment is long-term results. According to majority of studies, the presence of diabetes adversely affects remote prognosis in operated patients: lowest survival rates, the greater incidence of repeat procedures, worse quality of life [12, 13].

Aspects of the clinical features of CAD in patients with concomitant type 2 DM, the data of non-invasive and invasive examinations, improving techniques of surgery and postoperative treatment of patients is relevant not only theoretically but also has practical importance for optimizing short-and long-term outcomes of revascularization and improvement of effectiveness of secondary prevention of CAD in patients with concomitant DM type 2.

The aim of the study: a comprehensive analysis of graft function and dynamics of the duration of coronary atherosclerosis according to angiography in 1 year

after coronary artery bypass surgery in patients with coronary artery disease with coexisting type 2 diabetes mellitus.

Material and methods.

In GF "National Amosov's Institute of Cardiovascular Surgery NAMS of Ukraine" for the period from 1 January 2010 to 31 December 2011 performed 73 repeated CGG in patients with isolated CAD in 12 months after CABG. Among them: 39 operated patients with coexisting type 2 diabetes who where the main group. In comparison group were 34 patients after CABG without DM.

In order to visualize the patency of venous and arterial grafts in the remote period after CABG was performed coronarograftgraphy (CGG). The technique is similar to the method of coronarography. Study of coronary grafts followed contrasting right and left coronary arteries in standard projections. Contrasting of each shunt performed in at least two projections. We analyzed the nature of coronary blood flow, the presence of stenosis, collateral flow, narrowing of the distal part of coronary arteries (CA). The degree of stenosis of venous or arterial grafts was evaluated by the same scheme as the CA. Because of the frequent discrepancy of diameter of the graft and reference artery, shunt narrowing correlated with the diameter of the CA to the exclusion of overdiagnosis stenotic lesions of distal anastomosis. The dynamic of atherosclerotic injury of CA according to repeated angiograms was evaluated by an original method, with calculation of the average increase of atherosclerotic foci P by the formula:

$$P = \frac{(a_1 + a_2 + ... + a_n)}{n},$$

Where a_n - an indicator of atherosclerotic foci increase in percentage is defined as the difference between the current and the previous size of the plaque, which is expressed as a percentage of the lumen of the CA;

n - number of lesions, where detected changes.

Compared groups were divided into three subgroups based on treatment adherence:

- Sub-group 1 - patients with high compliance, performing all treatment recommendations;

- Sub-group 2 - patients with secondary affection, taking therapy is not constant or not in full amount;

- Section 3 - Patients who discontinued treatment completely on their own.

Adherence to therapy was assessed using a modified Morisky questionnaire [14] with definition points (high commitment - ≥ 3 points, the average commitment - from 1 to 2.9 points, low commitment - less than 1 point).

Results and discussion.

Dynamics of angiographic data was assessed by the results of CGG, which was conducted as screening for patients, regardless of the presence of deterioration. Planned control CGG in 12 months after surgery was performed in 73 patients, where 39 patients with concomitant diabetes. Depending on the adherence of patients to medical treatment recommended in the postoperative period, we formed three groups: group 1 - constant therapy, group 2 - course therapy, group 3 – no therapy. In the analysis of CGG revealed a clear correlation of relationship between compliance with the recommended treatment (Table 1). In the first group we noted grafts patency for 92.1% patients, in the second - 85.9%, in the third - 68.4 %.

Table. 1. Graft patency in a year after CABG for patients with DM type 2

Groups of patient	Number of patients, n	Number of grafts	Quantity of occluded grafts	Graft patency, %
Group 1 (constant therapy)	12	38	3	92,1
Group 2 (course therapy)	21	64	9	85,9
Group 3 (no therapy)	6	19	6	68,4
Total	39	121	18	85,1

In 12 months after CABG CGG was performed in 34 patients without concomitant DM. To study the effect of adherence to medical recommendations for

long-term results of operations are also formed three groups: group 1 - constant therapy, group 2 - course therapy, group 3 – no therapy. In a detailed analysis of CGG, as well as in the study group, we found dependence of adherence to recommended treatment and lifestyle for long-term results of CABG. So, in 1 group with good compliance 96.6 % of patients had patency of grafts, while in group 2 - 91.7 %, and in the 3rd, which have been not only a complete rejection of treatment, but renewal of bad habits and unhealthy lifestyle - only 85.1 % (Table 2).

Table .2. Graft patency in a year after CABG for patients without DM

Groups of patients	Number of patients, n	Number of grafts	Quantity of occluded grafts	Graft patency, %
Group 1 (constant therapy)	10	29	1	96,6
Group 2 (course therapy)	15	48	4	91,7
Group 3 (no therapy)	9	27	4	85,1
Total	34	104	9	91,3

When comparing results of CGG in patients with 2 type DM quantity of non-functioning grafts was two times higher than operated without DM, in each of three groups based on adherence to treatment (Table 3).

Tab. 3. Comparison of the number of non-functioning grafts in one year after CABG surgery in patients with and without concomitant DM

Parameter	DM		Without DM		OR (95%CI)*	p
	N-n	%	N-n	%		
Group 1 (constant therapy)	38-3	7,9	29-1	3,4	2,4 (0,2-	> 0,05

					24,3)	
Group 2 (course therapy)	64-9	14,1	48-4	8,3	1,8 (0,5-6,2)	> 0,05
Group 3 (no therapy)	19-6	31,6	27-4	14,8	2,7 (0,6-11,2)	> 0,05
Total	121-18	14,9	104-9	8,7		> 0,05

N - number of grafts, n - number of occluded shunts.

Except checking of grafts patency we analyzed duration of atherosclerotic process in coronary blood for patients with diabetes. In the first group (contant therapy) identified significantly less progression of atherosclerosis than in the second group (course therapy) (43% vs. 75%). In the third group (no treatment) revealed progression of atherosclerosis in all patients (tab.4).

Tab.4. The analysis of CGG in one year after CABG surgery in patients with concomitant DM

Parameter	Group 1 (constant therapy) (n=12)		Group 2 (course therapy) (n=21)		Group 3 (no therapy) (n=6)	
Progression of atherosclerosis	5	41,7%	16	76,2%	6	100%
No progression of atherosclerosis	7	58,3%	5	23,8%	0	0%

Analyzing CGG was shown that progression of atherosclerosis was due formation of new atheroma «De novo», increasing old plaques or by combination of both

mechanisms. Percentage correlation between the progression of coronary atherosclerosis in the pool of right coronary artery is presented in Table 5.

Table. 5. Percentage ratio between different variants of progression of coronary atherosclerosis in the pool of RCA in patients with DM after CABG.

Groups of patients	Variants of progression of coronary atherosclerosis		
	New atheroms, %	Progressing of old plaques, %	Both variants of progression, %
Group 1 (constant therapy) n=12	25	8,3	0
Group 2 (course therapy) n=21	19	33,3	9,5
Group 3 (no therapy) n=6	66,7	16,7	16,7

Percentage variations between the progression of coronary atherosclerosis in the pool of left coronary artery are presented in Table 6.

Table.6. Percentage between different variants of the progression of coronary atherosclerosis in the pool of LCA in patients with DM after CABG

Groups of patients	Variants of progression of coronary atherosclerosis		
	New atheroms, %	Progressing of old plaques, %	Both variants of progression, %
Group 1 (constant therapy) n=12	41,7	25	25
Group 2 (course therapy) n=21	66,7	57,1	47,6

Group 3 (no therapy) n=6	100	33,3	33,3

In all groups of patients with DM atherosclerosis progression was observed mainly due to the appearance of new atheroms «De novo», mostly in the group 3.

In the study group, the results of angiographic examination showed that 3 patients need repeat revascularization, but only one of then had clinical signs of angina pectoris. Repeat revascularization was performed by stenting of hemodynamic significant narrowing of CA. Thus, it should be noted that the presence of significant progression of coronary atherosclerosis by angiographic data in patients with IHD, type 2 DM and multiple coronary atherosclerosis does not always coincide with clinical deterioration. It can be concluded that there are certain limitations for monitoring of these patients by routine diagnostic methods is the reason for the wider usage of control angiography.

Conclusions. In the analysis of CGG we revealed a clear correlation of relationship between adherence to recommended treatment and the progression of coronary atherosclerosis and normal functioning grafts. Given this, as well as the number of refusals from re-examination, adherence of patients to long-term drug treatment is unsatisfactory. The data obtained in our study in general match the status of the problem in all areas of medicine and requires long-term treatment as in Ukraine as in a whole world.

Literature:

1. The BARI 2D Study Group. A Randomized Trial of Therapies for Type 2 Diabetes and Coronary Artery Disease // N. Engl. J. Med. – 2009. – Vol. 360. – P. 2503-2515.

2. The impact of revascularization on mortality in patients with nonacute coronary artery disease / A. Jeremias, S. Kaul, T. K. Rosengart [et al.] // Am. J. Med. - 2009. - № 122. - P. 152-161.

3. Five-Year Outcomes After Coronary Stenting Versus Bypass Surgery for the Treatment of Multivessel Disease The Final Analysis of the Arterial Revascularization Therapies Study (ARTS). Randomized Trial / P. W. Serruys, A. T. Ong, L. A. van Herwerden [et al.] // J. Am. Coll. Cardiol. – 2005. – Vol. 46. – P. 575-581.

4. The Final 10-Year Follow-Up Results From the BARI Randomized Trial. BARI Investigators // JACC. – 2007. – Vol. 49, № 15. – P. 1600-1606.

5. Comparison of coronary bypass surgery with drug-eluting stenting for the treatment of left main and/or three-vessel disease: 3-year follow-up of the SYNTAX trial / A. P. Kappetein [et al.] // Europ. Heart J. – 2011. – Vol. 32. – P. 2125-2134.

6. Treatment of complex coronary artery disease in patients with diabetes: 5-year results comparing outcomes of bypass surgery and percutaneous coronary intervention in the SYNTAX trial / A. P. Kappeteina, S. J. Head, M.-C. Morice [et al.] // Eur. J. Cardiothorac Surg. – 2013. – Vol. 43, № 5. – P. 1006-1013.

7. Compiled by Ben Bridgewater and Jan Gummert on behalf of the European Association for Cardio-Thoracic Surgeon. Fourth EACTS Adult Cardiac Surgical Database Report 2010. Towards global benchmarking. 96-101.

8. Diabetes is not a risk factor for hospital mortality following contemporary artery bypass grafting / F. Filsoufi, P. B. Rahmanian, J. G. Castillo [et al.] // Interact. CardioVasc. Thorac Surg. – 2007. – Vol 6, № 6. – P. 753-758.

9. Effect of risk-adjusted Diabetes on Mortality and Morbidity after CABG / C. Kubal, A. K. Srinivasan, A. D. Grayson [et al.] // Ann. Thorac. Surg. – 2005. – Vol. 79, № 5. – P. 1570-1576.

10. The effect of diabetes mellitus on patients undergoing coronary surgery: a risk-adjusted analysis // C. Rajakaruna, C. A. Rogers, C. Suranimala [et al.] // J. Thorac. Cardiovasc. Surg. – 2006. – Vol. 132, № 4. – P. 802-810.

11. Diabetes mellitus increases short-term mortality and morbidity in patients undergoing coronary artery bypass graft surgery / J. L. Carson, P. M. Scholz, A. Y. Chen [et al.] // J. Am. Coll. Cardiol. – 2002. – Vol. 40, № 3. – P. 418-423.

12. Early and late outcome after coronary artery bypass surgery in diabetic patients / T. Hakala, O. Pitkanen, P. Halonen [et al.] // Scand. Cardiovasc. J. – 2005. – Vol. 39, № 3. – P. 177-181.

13. Effect of Diabetes and Associated Conditions on Long-Term Survival After Coronary Artery Bypass Graft Surgery / B. J. Leavitt, L. Sheppard, C. Maloney [et al.] // Circulation. – 2004. – Vol. 110, Suppl. II. – P. II-41–II-44.

14. *Morisky D. E.* Concurrent and predictive validity of self-reported measure of medical adherence / D. E. Morisky, L. W. Green, D. M. Levine // Med. Care. – 1986. – Vol. 24. – P. 67–73.

АНАЛІЗ ПЕРЕБІГУ КОРОНАРНОГО АТЕРОСКЛЕРОЗУ В ПАЦІЄНТІВ ІЗ ЦУКРОВИМ ДІАБЕТОМ 2 ТИПУ ТА БЕЗ НЬОГО ЧЕРЕЗ 12 МІСЯЦІВ ПІСЛЯ ОПЕРАЦІЇ АОРТОКОРОНАРНОГО ШУНТУВАННЯ ЗА ДАНИМИ КОРОНАРОШУНТОГРАФІЙ

Руденко А.В., Гутовський В.В., Урсуленко В.І., Руденко С.А., Гогаєва О.К.

Проведено комплексний аналіз функції шунтів та динаміки перебігу коронарного атеросклерозу за даними ангіографій через 1 рік після операції аортокоронарного шунтування (АКШ) у 39 хворих ІХС із супутнім цукровим діабетом (ЦД) 2 типу та у 34 оперованих без ЦД. При аналізі коронарошунтографій виявлено чітку кореляційну залежність між дотриманням рекомендованого лікування і прогресуванням коронарного атеросклерозу та забезпеченням нормального функціонування шунтів. При порівнянні результатів повторних КВГ виявилося, що в пацієнтів із ЦД кількість нефункціонуючих шунтів удвічі більша, ніж у оперованих без ЦД. У групі оперованих без ЦД за сумлінного дотримання рекомендацій прохідність шунтів склала 96,6% проти 92,1% у оперованих із ЦД. При курсовій терапії прохідність шунтів у групі оперованих без ЦД склала 91,7% проти 85,9% у оперованих із ЦД. Найгірші результати спостерігались у групі, де мали місце не тільки повна відмова від

лікування, а й відновлення шкідливих звичок та нездорового способу життя: прохідність шунтів у групі оперованих без ЦД склала 85,1% проти 68,4% в оперованих із ЦД. Дані, отримані в нашому дослідженні, в цілому співпадають зі аналізом стану цієї проблеми в усіх галузях медицини, де необхідне довготривале лікування, як в Україні, так і загалом у світі.

Ключові слова: *ішемічна хвороба серця, цукровий діабет 2 типу, коронарне шунтування*

АНАЛИЗ ТЕЧЕНИЯ КОРОНАРНОГО АТЕРОСКЛЕРОЗА У ПАЦИЕНТОВ С САХАРНЫМ ДИАБЕТОМ 2 ТИПА И БЕЗ НЕГО ЧЕРЕЗ 12 МЕСЯЦЕВ ПОСЛЕ ОПЕРАЦИИ АОРТОКОРОНАРНОГО ШУНТИРОВАНИЯ ПО ДАННЫМ КОРОНАРОШУНТОГРАФИЙ

Руденко А.В., Гутовский В.В., Урсуленко В.И., Руденко С.А., Гогаева Е.К.

Проведен комплексный анализ функции шунтов и динамики течения коронарного атеросклероза по данным ангиографий через 1 год после операции аортокоронарного шунтирования у 39 больных ИБС с сопутствующим СД 2 типа и у 34 оперированных без СД. При анализе коронарошунтографий выявлена четкая корреляционная зависимость между соблюдением рекомендованного лечения и прогрессированием коронарного атеросклероза и обеспечением нормального функционирования шунтов. При сравнении результатов повторных КВГ установлено, что у пациентов с СД количество нефункционирующих шунтов вдвое больше, чем у оперированных без СД. В группе оперированных без СД при добросовестном соблюдении рекомендаций проходимость шунтов составила 96,6% против 92,1% у оперированных с СД. При курсовой терапии проходимость шунтов в группе оперированных без СД составила 91,7% против 85,9% у оперированных с СД. Худшие результаты наблюдались в группе, где имел место не только полный отказ от лечения, но и возврат к вредным привычкам и

нездоровому образу жизни, – проходимость шунтов в группе оперированных без СД составила 85,1% против 68,4% у оперированных с СД. Данные, полученные в нашем исследовании, в целом совпадают с анализом состояния этой проблемы во всех областях медицины, где необходимо длительное лечение, – как в Украине, так и в мире.

__Ключевые слова:__ ишемическая болезнь сердца, сахарный диабет 2 типа, коронарное шунтирование