Percutaneous angioplasty of chronically occluded coronary arteries: long-term clinical follow-up

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Abstract

Background: Percutaneous coronary intervention (PCI) of a chronic total occlusion (CTO) is one of the most demanding procedures in interventional cardiology. In spite of growing experience and technological progress, efficacy of PCI of CTO remains lower than that of standard PCI.

Aim: To evaluate long-term clinical results of PCI in patients with stable angina and CTO.

Methods: The study involved 459 consecutive patients who underwent the procedure of CTO recanalisation between 1996 and 2003. All procedures were performed using the standard technique. Follow-up examination was carried out based on a written questionnaire, and the mean follow-up period was 30±18 months.

Results: The average success rate of intervention was 64.9% and 63.8% of patients underwent successful and uneventful procedures. Clinically significant in-hospital complications were noted in 8 (1.6%) patients including 1 (0.2%) death, 2 (0.4%) cases of myocardial infarction and 4 (1.0%) repeated revascularisations. Long-term survival following either successful or failed recanalisation was similar (97.5% *vs* 97.3%, NS) as was incidence of acute coronary syndromes (12.5% *vs* 12.1%, respectively; NS). Patients after successful recanalisation less frequently underwent surgical revascularisation (3.6% *vs* 8.1%, respectively; $p < 0.05$) and also suffered less frequently from angina (CCS 0/CCS I: 20.4% *vs* 12.1%, $p < 0.00005$). Otherwise, they were at higher risk of repeated PCI due to restenosis (13.2% *vs* 6.7%, respectively; $p < 0.05$).

Conclusions: Success rate of PCI in patients with chronically occluded coronary arteries and stable angina is moderately high with relatively low incidence of complications. Late benefits from successful recanalisation of coronary artery depend predominantly on improved coronary reserve and decreased need for surgical myocardial revascularisation. Successful recanalisation does not reduce the risk of death or myocardial infarction but is associated with higher frequency of repeated PCI due to restenosis.

Key words: percutaneous coronary angioplasty, chronic coronary occlusion, stable angina

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Introduction

Percutaneous coronary intervention (PCI) of a chronically total occlusion of coronary artery (CTO) is one of the most demanding procedures in interventional cardiology. It requires extensive experience and patience, more therapeutic equipment and longer exposure to radiation in comparison with the procedure performed on stenotic lesions of the coronary arteries. Unfortunately, attempts of CTO recanalisation are less frequently successful than routine PCI procedures. Although the efficacy of these procedures is constantly increasing in line with growing experience and owing to use of modern tools, angiographic guidewires for use in particular situations, the success rate of CTO PCI is still only 70-80% in comparison with the 95-98% efficacy of standard PCI. Moreover, the risk of restenosis as well as reocclussion is also increased even after procedures with implantation of intracoronary stents. Additionally, CTO recanalisation is often recognised as an intervention of less importance than angioplasty of the stenotic artery, probably because most cases are diagnosed only after myocardial infarction (MI).

In spite of these obvious difficulties, it seems that successful recanalisation may improve patient survival and reduce the risk of coronary adverse events.

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The purpose of this study was to evaluate the benefits of successful CTO recanalisation in long-term follow-up in patients with stable angina.

Methods

This study involved 459 consecutive patients who underwent CTO recanalisation procedures in the Department of Cardiology, Medical University in Lublin between 1996 and 2003. This is a retrospective and single-centre study. Indications for the procedure included symptoms of angina, heart failure aggravation and rhythm disturbances (complex ventricular arrhythmia) induced by myocardial ischaemia. Besides the clinical history, selection for the procedure was based on a positive result of the treadmill test. In the case of multi-vessel disease, an attempt of recanalisation was carried out only after confirmation of myocardial viability in the occluded artery related area in dobutamine stress echocardiography. Patients with chronic occlusions of coronary artery bypass grafts and reocclussion following previous coronary interventions were excluded from this study.

Time of occlusion was established based on history of acute coronary syndrome with documented ischaemia of myocardium in the occluded artery related area or by previously performed coronary angiography showing patent coronary artery. Occlusion was defined as chronic only when sustained for at least one month. On the coronary angiographic image, total occlusion was characterised by complete interruption of vessel continuity with no (TIMI 0) or minimal (TIMI 1) contrast medium flow to the distal part of the coronary artery.

Method of recanalisation procedure was standard with the use of available angioplasty guidewires, balloon catheters and intracoronary stents. The choice of method depended on operator preference. During each procedure, a routine anticoagulation regimen including heparin (low molecular weight heparin or unfractionated heparin) and antiplatelet drugs, such as aspirin (for permanent use) and ticlopidine or clopidogrel (for 4 weeks after the procedure), was employed.

The procedure was considered angiographically successful when grade TIMI 2/3 flow accompanied by residual stenosis below 30% (after stent implantation below 10%) was achieved. Recanalisation intervention was clinically successful when it was not associated with major in-hospital complications.

Complications following the procedures were divided into major and minor events. Major complications included death, MI, repeated urgent PCI or surgical myocardial revascularisation during the same hospitalisation or coronary artery perforation requiring surgical intervention; minor events included coronary artery perforation requiring percutaneous drainage or conservative treatment only, and vascular access-related complications (extensive haematoma accompanied by a drop in haemoglobin concentration of more than 2 g% or requiring blood transfusion, false aneurysm formation or other complications requiring surgical intervention).

Data on late follow-up were collected by written questionnaire from patients discharged from hospital without major complications (n=452). The survey was conducted at mean 30±18 months (12 to 96, median 24 months) after PCI procedure. Questions asked concerned death, MI, unstable angina, necessity of repeated PCI or surgical myocardial revascularisation and angina severity (according to CCS scale). If more than one complication in late follow-up was noted, the first of them was considered significant in survival analysis. In case of any doubts or need for additional information, investigators contacted the patient directly.

Statistical analysis

Was performed using STATISTICA 5.0 software. Categorical variables are presented as numbers and percentages and the differences between them were assessed by means of Kruskal-Wallis test or χ^2 test with Yates correction for small quantities. A value of $p \leq 0.05$ was considered significant.

Results

In the analysed period of time, 4948 PCI procedures of percutaneous angioplasty were performed in our department, including 459 first interventions of native coronary artery recanalisation in patients with stable angina (9.3% of all PCI procedures). Chronic occlusion of artery was diagnosed in 1760 (35.6%) patients; thus, the procedure was performed on one in every four (26.1%) patients. There were 369 (80.4%) men and the mean age was 57.3±9.4 years in the studied group of patients. More than 70% of patients had previous MI. Clinical symptoms of stable angina in CCS class III prevailed (60.3%) and 49.3% (226/459) of patients had multi-vessel disease. Epidemiological data are outlined in Table I.

Angiographic efficacy of the procedures was 64.9% (298/459, Table II). The most frequent cause of procedure failure was intramural penetration with angioplasty guidewire (49.7%) or no possibility to cross the occlusion site (42.9%). Analysis of the impact of either occluded artery anatomy or employed technique on coronary intervention efficacy was the subject of another study performed by the investigators [1].

Clinical success rate was 63.8% (293/459). The number of complications was not related to the procedure's efficacy and did not increase in consecutive years in spite of an improvement in angiographic efficacy from 60% in 1996 to 75% in 2003.

Complete percutaneous myocardial revascularisations were performed in 70% of patients with single-vessel disease and in 32.3% with double-vessel disease but in no patient with triple-vessel disease (Table II).

Major complications were relatively rare. There was one (0.2%) death caused by haemodynamic heart failure which developed during the early stage of percutaneous intervention in a patient after MI with single-vessel disease. No mechanical damage of the coronary artery was seen. There was one case of MI with new Q-wave appearance after occlusion of large side branch of the targeted coronary artery by the implanted stent. In another case, MI without new Q-wave was diagnosed as a result of subacute occlusion within the implanted stent. Five repeated urgent PCI procedures were carried out with stent implantation because of significant coronary dissections left during primary intervention. Unfortunately, in one of them PCI failed and this patient had to be referred for surgical coronary artery bypass grafting. Among 5 patients with coronary artery perforation during PCI, only one required percutaneous pericardial drainage because of clinical symptoms of cardiac tamponade. Vascular complications at the puncture of the femoral artery were observed in 3.3% of patients. The difference in complication rate, either major or minor, between groups of patients with successful and failed recanalisation was not significant (Table III).

Four hundred and twenty-nine patients out of 452 (94.9%) who were discharged from hospital free of major complications, including 280 (95.6%) after successful and 149 (93.7%) after failed recanalisation, responded to the questions of the follow-up written questionnaire (Table IV). Mortality was similar in both groups. Survival free of major clinical events (MACE) was not significantly higher in the group of patients after successful CTO recanalisation (74.6% *vs* 71.1%, NS). In the group after successful recanalisation, a trend of more frequent repeated PCI was observed (9.7% *vs* 4.0%, NS) and more often the procedure was performed on the same artery because of restenosis (13.2% *vs* 6.7%, NS), particularly in patients with single-vessel disease (13.3% *vs* 2.8%, p=0.01). In patients with multi-vessel disease the differences were not significant. Repeated attempts of CTO recanalisation in the group of patients after failed primary PCI were carried out because of persistent clinical symptoms.

Table I. Epidemiological data of patients who underwent successful (CTO(+)) or failed (CTO(–)) recanalisation of CTO

	Whole group N=459 (100%)	CTO (+) N=298 (65%)	CTO (–) N=161 (35%)
Age [years]	57.3±9.4	57.0±9.6	57.7±98.9
Men [%]	369 (80.4%)	241 (80.9%)	128 (79.5%)
Diabetes	52 (11.3%)	34 (11.4%)	18 (11.2%)
Arterial hypertension	237 (51.6%)	160 (53.7%)	77 (47.8%)
Hyperlipidaemia	263 (57.3%)	176 (59%)	87 (54)
Smoking	169 (36.8%)	111 (37.2%)	58 (36%)
Family history	135 (29.4%)	92 (30.9%)	43 (26.7%)
History of MI	324 (70.6%)	218 (73.2%)	106 (65.8%)
CCS 1 class	66 (14.4%)	40 (13.4%)	26 (16.5%)
CCS 2 class	277 (60.3%)	186 (62.4%)	91 (56.5%)
CCS 3 class	116 (25.3%)	72 (24.2%)	44 (27.3%)
NYHA class ≥II	72 (15.6%)	43 (14.4%)	29 (18.0%)
Arrhythmia	13 (2.8%)	9 (4.3%)	4 (2.5%)
Duration of occlusion			
1-3 months	28 (6.1%)	16 (5.4%)	12 (7.5%)
3-6 months	58 (12.6%)	47 (15.8%)	11 (6.8%)
>6 months	241 (52.5%)	154 (51.7%)	87 (54%)
Unknown	132 (28.8%)	81 (21.2%)	51 (31.7%)

CTO (+) - successful recanalisation of chronically occluded artery; CTO (–) - failed recanalisation of CTO; MI – myocardial infarction; CCS - scale of Canadian Cardiovascular Society

The rate of hospitalisations for acute coronary syndrome was comparable between groups (12.5% *vs* 12.1%, after successful *vs* failed intervention, NS). A need for surgical direct myocardial revascularisation was more frequent in patients after failed recanalisation 3.6% *vs* 8.1%, p=0.046). In the group after successful recanalization, a significant improvement in angina symptoms was noted: 31.4% *vs* 18.1% of patients were found in CCS class 0 and 20.4% *vs* 12.1% in CCS class 1 (successful *vs* failed PCI). This difference was not significant in patients suffering from triple-vessel disease (CCS 0: 22.6% *vs* 30.8%). It must be remembered that nobody with triple-vessel disease underwent complete revascularisation.

Table II. Efficacy of CTO recanalization in patients with single-, double- and triple-vessel disease

	Overall N=452 (100%)	Single-vessel disease N=230 (50.9%)	Double-vessel disease n=174 (38.5%)	Triple-vessel disease n=48 (10.6%)
Technical efficacy	298 (65.9%)	161 (70%)	102 (58.6%)	33 (68.8%)
Clinical efficacy	293 (64.8%)	158 (68.9%)	102 (58.6%)	33 (68.8%)
Complete revascularisation	218 (48.2%)	161 (70%)	57 (32.3%)	0 (0.0%)

Table III. In-hospital complications following CTO recanalisation procedures

	Overall	CTO (+)	CTO (–)
Major complications	8 (1.7%)	6 (1.3%)	2 (0.4%)
Death	1 (0.2%)	0 (0.0%)	1 (0.2%)
Myocardial infarction	2 (0.4%)	1 (0.2%)	1 (0.2%)
NonQ-MI	1 (0.2%)	1 (0.2%)	0 (0.0%)
Q-MI	1 (0.2%)	0 (0.0%)	1 (0.2%)
Repeated revascularisation:	5 (1.1%)	5 (1.1%)	0 (0.0%)
PCI	5 (1.1%)	5 (1.1%)	0 (0.0%)
CABG	1 (0.2%)	1 (0.2%)	0 (0.0%)
*Coronary artery perforation	0 (0.0%)	0 (0.0%)	0 (0.0%)
Minor complications	20 (4.4%)	13 (2.8%)	7 (1.5%)
Coronary artery perforation	5 (1.1%)	1 (0.2%)	4 (0.9%)
Pericardiocentesis	1 (0.2%)	0 (0.0%)	1 (0.2%)
Medical treatment	4 (0.9%)	0 (0.0%)	4 (0.9%)
Local	15 (3.3%)	12 (2.5%)	3 (0.6%)
Haematoma	12 (2.5%)	10 (2.1%)	2 (0.4%)
False aneurysm	2 (0.4%)	2 (0.4%)	0 (0.0%)
Surgical treatment	1 (0.2%)	0 (0.0%)	1 (0.2%)
Total number of complications	28 (6.1%)	19 (4.1%)	9 (0.2%)

**requiring surgical intervention; † p <0.05*
nonQ-MI – myocardial infarction without new Q-wave appearance, Q-MI – Q-wave myocardial infarction, PCI – percutaneous coronary intervention, CABG – coronary artery bypass grafting; other abbreviations: see Table I.

Discussion

In many patients with CTO, no transmural MI is seen, mainly due to well developed collateral coronary circulation. Collateral coronary circulation is able to partially preserve myocardial viability but it usually becomes insufficient during stress-inducing angina. Insufficient perfusion of the relevant area of myocardium is also responsible for impaired contractile performance, which is reversible according to the *hibernation* theory [2]. The *open artery* theory was confirmed in the experimental studies – where the presence of occluded coronary artery following MI was found to promote apoptosis of cardiomyocytes and left ventricular remodelling [3]. We are not aware of any studies comparing various therapeutic strategies in the management of CTO patients (pharmacological, PCI or CABG). However, it was found that medical therapy in patients with a single-vessel disease and CTO is associated with annual mortality of 2% throughout 5 years of follow-up and this figure is similar to mortality of patients with critical stenosis of the coronary artery [4]. Successful CTO recanalisation alleviates symptoms of angina, improves myocardial contractility [5] and reduces the risk of late cardiac complications.

Many reports on the efficacy of CTO recanalisation procedures, the relationship between success rate and anatomical circumstances, time of coronary artery occlusion, equipment employed and operator experience, have been published so far. It is known that this procedure is less effective (53-75% *vs* 90-95%) [6-11] and stenosis recurrence is more frequent and more spread out in time than after standard PCI on stenotic coronary arteries (43-75%) [8, 9, 12, 13]. Although these interventions require longer exposure to radiation and are more expensive, they are considered equally safe as standard PCI [6, 10, 14, 15].

It is also emphasised that stent implantation is of paramount importance in the prevention of coronary artery restenosis [16-19]. Intracoronary stents reduce the risk of restenosis in long-term follow-up even by half, from 57%-74% to 28-32%, as well as the necessity of repeated PCI, and improve coronary flow reserve. However, it was not found that stent implantation reduced the risk of death or MI when compared to balloon angioplasty alone.

The question regarding late clinical benefits of CTO recanalisation, based on published reports, is still open. In spite of the theoretical background, we did not confirm that successful PCI had any impact on patient survival. Additionally, it was not shown to reduce the risk of repeated MI. This may be due to the fact that the morphology of the occluded coronary artery does not influence atherosclerosis progression in the remaining coronary vessels. Similar conclusions were drawn from studies published earlier [8, 14, 20, 21]. For example, Bell et al. [14] in a 7-year follow-up found that successful recanalisation was not an independent factor of decreased mortality (18% *vs* 25%) or risk of MI (7% *vs* 12%). However, it can be assumed that repeated MI may be associated with higher risk of death due to more extensive myocardial area at risk in case of acute closure of the artery providing collateral circulation to CTO. The very small number of such complications in our group did not justify any statistical analysis regarding this issue.

In a recent study, Suero et al. [10] noted that during 10-year follow-up survival probability after successful recanalisation was higher (76.4% *vs* 67.8%) and prognosis comparable to the control group of patients undergoing standard PCI. Olivari et al. [11] in 1-year follow-up found that patients after successful recanalisation had lower risk of cardiac death (1.05% *vs* 7.23%) and a decreased rate of surgical myocardial revascularisation necessity (2.45% *vs* 15.7%). However, the above mentioned studies dealt with patients with

Table IV. Long-term clinical follow-up of patients after CTO recanalisation procedure in relation to its efficacy and number of stenotic coronary arteries

	Overall 429/452			Single-vessel disease 220/230			Double-vessel disease 165/174			Triple-vessel disease 44/48		
	CTO (+) 280/293 (%)	CTO (–) 149/159 (%)	p	CTO (+) 150/ (68%)	CTO (–) 70/ (32%)	p	CTO (+) 99/ (60%)	CTO (–) 66/ (40%)	p	CTO (+) 31/ (70%)	CTO (–) 13/ (30%)	p
Death*	7 (2.4%)	5 (3.1%)	NS	2 (1.3%)	2 (2.9%)	NS	3 (3.0%)	1 (1.5%)	NS	2 (6.5%)	2 (15.4%)	NS
cardiac	4 (1.4%)	3 (1.9%)	NS	2 (1.3%)	2 (2.9%)	NS	0 (0.0%)	1 (1.5%)	NS	2 (6.5%)	1 (7.7%)	NS
Other	3 (1.1%)	2 (1.2%)	NS	0 (0.0%)	0 (0.0%)	NS	3 (3.0%)	0 (0.0%)	NS	0 (0.0%)	1 (7.7%)	NS
ACS	35 (12.5%)	18 (12.1%)	NS	15 (10.0%)	7 (9.8%)	NS	13 (13.0%)	8 (12.0%)	NS	7 (22.6%)	3 (23.1%)	NS
MI	10 (3.6%)	4 (2.7%)	NS	6 (4.0%)	1 (1.4%)	NS	2 (2.0%)	2 (3.0%)	NS	2 (3.0%)	1 (7.7%)	NS
UA	25 (8.9%)	14 (9.4%)	NS	9 (6.0%)	6 (8.4%)	NS	11 (11.1%)	6 (9.0%)	NS	5 (13.0%)	2 (15.4%)	NS
PCI	43 (15.4%)	18 (12.1%)	NS	25 (16.7%)	5 (7.0%)	0.05	16 (16.2%)	10 (15.0%)	NS	2 (6.5%)	3 (23.1%)	NS
TLR	37 (13.2%)	10 (6.7%)	0.038	20 (13.3%)	2 (2.8%)	0.01	15 (15.2%)	7 (10.5%)	NS	2 (6.5%)	1 (7.7%)	NS
TVR	7 (2.5%)	8 (5.4%)	NS	6 (4.0%)	3 (4.2%)	NS	1 (1.0%)	3 (4.5%)	NS	0 (0.0%)	2 (15.4%)	0.027
CABG	10 (3.6%)	12 (8.1%)	0.046	4 (2.7%)	3 (4.2%)	NS	6 (6.0%)	8 (12.0%)	NS	0 (0.0%)	1 (7.72%)	NS
MACE	71 (25.4%)	43 (28.9%)	NS	34 (22.7%)	14 (20.0%)	NS	28 (28.3%)	23 (34.8%)	NS	9 (29.0%)	6 (46.2%)	NS
CCS 0	89 (31.2%)	27 (18.1%)	0.00005	44 (29.3%)	12 (17.1%)	0.0023	37 (37.4%)	11 (16.5%)	0.007	7 (22.6%)	4 (30.8%)	NS
CCS I	57 (20.4%)	18 (12.1%)		33 (22.0%)	7 (10.0%)		19 (19.2%)	11 (16.5%)		5 (13.0%)	0 (0.0%)	
CCS II	48 (17.1%)	43 (28.9%)		30 (20.0%)	22 (31.4%)		11 (11.1%)	18 (27.3%)		7 (22.6%)	3 (23.1%)	
CCS III	15 (5.4%)	18 (12.1%)		9 (6.0%)	15 (21.4%)		3 (3.0%)	3 (4.5%)		3 (9.7%)	0 (0.0%)	

** it applies to in-hospital stay and follow-up; ACS – acute coronary syndrome; MI – myocardial infarction, UA – unstable angina; TLR target lesion revascularisation – angioplasty of restenosis following CTO recanalisation; TVR target vessel revascularisation – angioplasty of another segment of the recanalised artery; MACE – death+ACS+PCI+CABG; value of TLR+TVR is higher than sum of PCI during follow-up, because 1 patient had both TLR and TVR simultaneously; other abbreviations: see Table I*

multi-vessel disease. It was noted in both reports that patients after failed recanalisation more frequently suffered from multi-vessel disease and underwent subsequent CABG operations. This population of patients is likely to benefit the most from successful recanalisation and that has been documented several times in patients undergoing surgical revascularisation.

It should be remembered that patients in this group quite often require repeat revascularisation, mainly re-PCI after CTO due to restenosis after successful PCI or CABG following failed recanalisation [8, 21]. Patients after failed CTO recanalisation are referred much more frequently for surgical revascularisation (by as much as 58% *vs* 18% after failed *vs* successful recanalisation, respectively) [14, 20]. These clinical events usually occur within the first year of follow-up after PCI [14] and are noted more frequently in patients after PCI of stenotic but patent coronary artery (40% *vs* 23%) [6].

Herein we found that the predominant clinical benefit of CTO recanalisation was angina relief; 51.4% of patients were found in CCS class 0/1 as compared with 30.2% patients with unsuccessful recanalisation. Similar conclusions have been reported by others [8, 11, 12, 21]. A difference in severity of angina was not found in the follow-up studies published by Bell et al. [14] and Ivanoe et al. [20], although in the latter two thirds of patients were free of angina symptoms, which was probably a result of the fact that 77% of them had single-vessel disease. Incomplete revascularisation in our patients, mainly those suffering from triple-vessel disease, is the reason for the high rate of symptomatic patients in follow-up. We must remember that in many cases (even up to 44% according to Warren et al. observations [8]) restenosis after recanalisation may not be accompanied by symptom recurrence.

Therapeutic difficulties as well as limited clinical benefits justify the careful selection of CTO patients for PCI. The predominant indication should be angina refractory to medical treatment, presence of a large area of viable myocardium supplied by the occluded coronary artery and anatomical features enabling safe and effective procedure.

Technical advances in the recanalization techniques and methods of restenosis prevention may increase the number of CTO patients who will benefit from PCI procedures.

Study limitations

This was a single-centre and retrospective study. Selection of patients for CTO recanalisation was liberal, carried out by the operator and based on the presence of angina and chance of procedure success. Electrocardiographic and echocardiographic stress tests were employed only in patients with mild symptoms or multi-vessel interventions. In the case of 132 (28.8%) patients we were not able to assess the time of coronary artery occlusion. Nowadays each patient undergoing CTO recanalisation has an intracoronary stent implanted. This study was initiated in 1996 when access to intracoronary stents was very limited. It was not routine clinical practice in those days to monitor cardiac markers (CK-MB, then cardiac troponins) after angioplasty procedures, and thus the number of periprocedural infarctions may be underestimated. Additionally, more than 5% of patients did not respond to the questionnaire.

Conclusions

1. Success rate of PCI in patients with chronically occluded coronary arteries and stable angina is moderately high with relatively low incidence of complications.
2. Late benefits of successful recanalisation of the coronary artery depend predominantly on improved coronary reserve and decreased need for surgical myocardial revascularisation.
3. Successful recanalisation does not reduce the risk of death or MI but is associated with higher frequency of repeated PCI due to restenosis.

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Przezskórna angioplastyka przewlekle zamkniętych tętnic wieńcowych – odległa obserwacja kliniczna

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Streszczenie

Celem badania jest ocena odległych klinicznych efektów leczenia przezskórną interwencją wieńcową (PCI) chorych ze stabilną dusznicą bolesną i przewlekle zamkniętymi tętnicami wieńcowymi (CTO). Badaniem objęto 459 kolejnych chorych, którzy poddani zostali zabiegowi rekanalizacji CTO w latach 1996–2003. Technika zabiegów była standardowa. Obserwacja odległa została przeprowadzona w oparciu o ankietę listowną – czas obserwacji wyniósł 30±18 mies. Średnia skuteczność zabiegu wyniosła 64,9%, a u 63,8% chorych zabiegi były skuteczne i zakończone bez powikłań. Istotne powikłania wewnątrzszpitalne wystąpiły u 8 chorych (1,6%), w tym: 1 zgon (0,2%), 2 zawały serca (0,4%), 4 ponowne rewaskularyzacje (1,0%). Przeżycie odległe zarówno w grupie po skutecznej, jak i nieskutecznej rekanalizacji było jednakowe: 97,5% *vs* 97,3% (NS), podobne jak częstość występowania ostrych zespołów wieńcowych: 12,5% *vs* 12,1% (NS). Chorzy po skutecznej rekanalizacji rzadziej poddawani byli rewaskularyzacji chirurgicznej (3,6% *vs* 8,1%, p <0,05), rzadziej skarżyli się na bóle wieńcowe (CCS 0: 20,4% *vs* 12,1%, p <0,00005), ale częściej byli narażenie na ponowny zabieg PCI z powodu restenozy (13,2% *vs* 6,7%, p <0,05).

Wnioski: Skuteczność PCI przewlekle zamkniętej tętnicy wieńcowej u chorych z objawami stabilnej dusznicy bolesnej jest umiarkowanie wysoka, a częstość powikłań niska. Odległe kliniczne korzyści wynikające ze skutecznego udrożnienia tętnicy wieńcowej polegają przede wszystkim na poprawie wydolności wieńcowej i zmniejszeniu częstości rewaskularyzacji chirurgicznej serca. Skuteczność rekanalizacji nie wpływa na zmniejszenie ryzyka zgony i zawału, wiąże się natomiast z większą częstością ponownej PCI z powodu restenozy.

Słowa kluczowe: przezskórna angioplastyka wieńcowa, przewlekłe zamknięcie tętnicy wieńcowej, stabilna dusznica bolesna

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