



The Role of the Heart Team in Making Decisions on Myocardial Revascularization in Patients with Non-ST Segment Elevation Acute Coronary Syndrome

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Received: July 01, 2022

Published: July 29, 2022

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Abstract

Objective: To analyze the significance of the Heart Team in planning and performing myocardial revascularization in patients with Non-ST segment elevation acute coronary syndrome (NSTEMI-ACS).

Materials and Methods: A retrospective cohort study involving 53 patients with NSTEMI-ACS with multivessel atherosclerotic lesions of the coronary bed. 3 time periods were considered: 2014, when there was no Heart Team (16 patients), 2015, when the Heart Team was formed (15 patients), 2019, when the Heart Team worked for several years (22 patients). The follow-up period was 1 month in 2014-15 and 6 months in 2019. In 2019, the study included only those clinical cases that were considered at scheduled meetings of the Heart Team. A comparative assessment of the number and type of surgical interventions was carried out, and the reasons for refusal of myocardial revascularization were analyzed.

Results: In 2015, there was a tendency to increase the number of myocardial revascularizations (9 out of 15 - 60%) compared to 2014 (7 out of 16 - 43.8%), $p > 0.05$. In 2015, preference was given to minimally invasive interventional surgery - 9 PCI versus 4 in 2014. In 2015, thanks to the work of the Heart Team, 6 selective PCI was performed (in 2014 - 1), $p < 0.05$. Patients who did not undergo myocardial revascularization: 9 people (56.2%) in 2014. and 6 (40%) - in 2015, were discharged without a final conclusion on further treatment tactics. In 2019 the proportion of revascularizations was 68% - 11 CABG and 4 PCI, the number of CABG performed significantly increased ($p < 0.01$). All patients without exception received recommendations for myocardial revascularization.

Conclusion: In the planning and implementation of invasive tactics for the treatment of patients with NSTEMI-ACS with multivessel coronary artery disease, the work of the Heart Team is more effective than the consultations of specialists.

Keywords: Acute Coronary Syndrome; Heart Team; Multivessel Coronary Artery Disease; Percutaneous Coronary Intervention; Coronary Artery Bypass Grafting

Introduction

Myocardial revascularization is a recognized method of effective treatment of acute coronary pathology, with preference given to minimally invasive interventional surgery. However, if we are talking about patients with non-ST segment elevation acute coro-

nary syndrome (NSTEMI-ACS), only 1/3 of them have a single-vessel lesion, which allows for immediate PCI [1]. Approximately 40-50% of patients have multivessel multifocal atherosclerosis of the coronary arteries (CA), and there are often clinical situations when the symptom-responsible artery(-ies) cannot be identified and/or

stented [1-4]. An alternative method of myocardial revascularization may be coronary bypass surgery (CABG).

It is advisable to solve the issue of myocardial revascularization collectively, by a consultation of specialists consisting of a cardiologist, an X-ray endovascular surgeon, a cardiac surgeon, with the possible involvement of an anesthesiologist, as well as a specialist in the patient's concomitant disease [1-5]. In the European recommendations, the consultation was called the Heart Team [1-3,5]. Heart Team makes a conclusion about the possibility, method, timing of myocardial revascularization or about the choice of conservative treatment tactics.

One of the features of the organization of the Heart Team is that NSTEMI-ACS is an acute pathology, and the most common format of the cardiac surgery department is planned. In such cases, the consultation is forced to be held without the participation of a cardiac surgeon by doctors on duty. An urgent decision is made to perform the PCI immediately or to refrain from it. Here, the team approach fits seamlessly into the clinical practice of the emergency service and does not require special efforts to implement it.

A different situation develops when the decision on myocardial revascularization needs to be taken in a delayed or planned manner. The patient should be informed in detail about the prognosis of the disease, methods of treatment, their risks and complications [1-4]. In cases of refusal of CABG surgery or contraindications to it, discuss the possibility and scope of interventional intervention (complete/incomplete revascularization, one-stage or staged). In addition, the patient's concomitant pathology forces other specialists to be involved in the discussion of treatment tactics. Only a multidisciplinary approach allows to develop optimal treatment tactics.

The purpose of this study was to analyze the importance of the Heart Team in planning and conducting myocardial revascularization in patients with NSTEMI-ACS.

Materials and Methods

In 2015, a Heart Team was formed at the S. S. Yudin City Clinical Hospital. Since that time, experience has been accumulated, which may be useful for other medical institutions. Three time periods were selected for the study: 2014 (absence of a HeartTeam), 2015 (start of the HeartTeam) and 2019 (functioning of the HeartTeam for several years). The period of inclusion of patients in the study was one month in 2014 and 2015, and 6 months - in 2019. The

tactics of management of patients with NSTEMI-ACS and multivessel atherosclerotic lesions of the coronary bed and the results of their treatment were analyzed. Multivessel lesions were considered to be stenoses of two or more coronary arteries detected on CAG, the degree of which was > 70%, left coronary artery trunk (LCA) > 60%.

Prior to the formation of the Heart Team (2014), the standard tactic for managing a "multivessel" patient was to call a cardiac surgeon for a scheduled consultation. The cardiac surgeon made a conclusion about the possibility and timing of CABG. The interventional surgeon was not involved in the discussion of myocardial revascularization.

In 2015, the tactics were discussed by a team of duty doctors - a cardiologist, an X-ray endovascular surgeon and an anesthesiologist, who collectively decided on the feasibility of interventional intervention, and this decision was recorded in the CAG protocol. The practice of holding urgent consultations persists at the present time, however, in some cases this is not enough to determine the further treatment strategy. In 2015, the Heart Team had just started its work, and the organization of scheduled meetings was not properly adjusted. Thus, during this period of time, the results of urgent consultations were mainly analyzed.

In 2019, the time of inclusion in the study was 6 months, but only those clinical cases were analyzed for which planned consultations were held, i.e., the most controversial and difficult to determine the optimal tactics.

Results and Discussion

In 2014 and 2015, an almost identical number of patients with multivessel lesions of the coronary bed were treated within a month - 16 and 15, respectively (Table 1). The groups were comparable in average age, gender, final clinical diagnosis and severity of atherosclerotic lesions of the coronary arteries (two- or three-vessel localization of plaques). No angiographic assessment on the SYNTAX Score scale was performed during the time period under review [6-8].

In 2015, there was a tendency to increase the number of myocardial revascularization (9 out of 15 - 60%) compared to 2014 (7 out of 16 - 43.8%), however, this difference is statistically unreliable ($p > 0.05$). The types of surgical interventions differed: in 2014, 4 PCI and 3 CABG operations were performed, in 2015 - 9 PCI and 1 CABG. In general, in 2015 there was a clear trend towards

Year Index		2014	2015
Total number of patients		16	15
Age range		56-79	49-88
Average age		68,4	70,1
Male		12	10
Female		4	5
NSTE- MI		7	10
Unstable angina		9	5
Two - vessel lesion		3	3
Three - vessel lesion		13	12
Myocardial revascularization was performed		7	9
Type of surgical intervention	PCI	4	9
	CABG	3	1 (after PCI)

Table 1: General characteristics of patients with multivessel coronary lesion and myocardial revascularization in 2014 and 2015.

a wider use of minimally invasive interventional interventions - 9 versus 4 in 2014.

Table 2 shows indications for myocardial revascularization; all these surgical interventions have been performed. The indication for myocardial revascularization was mainly a complicated course of ACS.

Year Index		2014 n = 7	2015 n = 9
PCI Diagnosis of myocardial infarction (revision of conservative tactics) Primary complete revascularization in MI and two-vessel lesion Ventricular fibrillation in the cardiology department Positive stress test	Recurrence of ischemia	2	2
	-	3	
	-	3	
	1	-	
CABG	1	1	
	Recurrence of ischemia	1	1
	Ischemic mitral valve dysfunction, grade III mitral regurgitation	1	-
	Three-vessel lesion involving the proximal segment of the left anterior descending artery	1	-

Table 2: Indications for myocardial revascularization in 2014 and 2015.

In 2014, only one selective PCI was performed (i.e., not on all affected vessels, but only on the symptom-responsible artery) in a 76-year-old patient with early postinfarction angina. In 2015, thanks to the work of the Heart Team 6 selective PCI was already performed ($p < 0.05$). Half of these patients were diagnosed with MI, and their age exceeded 80 years. Referral to CAG and interventional intervention was the result of a revision of the initially chosen conservative tactics (Table 2). The merit of the Heart Team was that the availability of surgical treatment of ACS for senile patients has increased. This trend is confirmed by the results of studies, including Russian ones, proving the advantage of X-ray endovascular treatment of ACS in elderly patients, despite the high risk of complications [9-12].

An analysis of the work of the HeartTeam would be incomplete without an assessment of tactics in relation to “multivessel” patients who did not receive revascularization: 9 people (56.2%) in 2014 and 6 (40%) - in 2015. All patients had a three-vessel atherosclerotic lesion of the coronary bed. The patients were divided into 3 groups depending on the intended tactics: patients who were shown to perform CABG (group 1), patients with contraindications to surgery (group 2) and patients with unclear tactics who had previously refused CABG (group 3).

Index Year	Number of patients	Group 1 Shows CABG surgery	Group 2 CABG is contra-indicated	Group 3 Further tactics are not clear (those who refused CABG)
2014	9	4	2	3
2015	6	3	3	0

Table 3: Patients with ACS without STEMI who did not undergo revascularization in 2014 and 2015.

In 2014, 4 patients with ACS, and in 2015 - 3, CABG was recommended as planned without specifying the exact timing of the operation. The patients were discharged from the hospital, their further fate remained unknown. This was a negative moment of the “loss” of the patient after discharge, characteristic of the time period under consideration, and the presence of a HeartTeam did not change the situation.

Of particular interest for the analysis of treatment tactics are patients with contraindications to CABG - 2 people in 2014 and 3 in 2015.

In two patients (2014), low EF (26%) was detected during the examination and a malignant neoplasm of the lung was diagnosed for the first time. Three patients treated in 2015 had low EF (19%), morbid obesity and senile dementia (an 82-year-old patient).

All patients are consulted by a cardiac surgeon; in 2015 - separately from the HeartTeam. Patients with low EF were refused CABG due to high operational risk. Performing CABG to a patient with a lung neoplasm was considered inappropriate, the tactics were not discussed with the oncologist. The operation was recommended to the rest of the patients, however, the patients eventually refused it. The question of the possibility of an elective PCI was not considered.

Patients with unclear tactics, 3 people with unstable angina (2014) are patients with a known multivessel lesion who previously refused CABG and were hospitalized with another recurrence of ischemia. The cardiac surgeon and interventional surgeon were not examined during the current hospitalization.

Thus, another tactical flaw was revealed - the lack of alternative to the conservative approach to the treatment of "multivessel" patients who refused CABG or who were denied CABG.

The analysis showed that despite certain successes, the interaction of the specialists could not be considered satisfactory. It took several years to accumulate experience, take into account mistakes and optimize the work. First of all, it became clear that not all tactical problems could be solved at urgent consultations: it was not always possible to gather the right specialists, and a number of issues, for example, re-hospitalization for surgical treatment, were beyond the competence of the duty brigade.

The modern HeartTeam of the S. S. Yudin City Clinical Hospital includes heads of cardiological, cardioreuscitation, cardiac surgery departments, the department of X-ray surgical methods of diagnosis and treatment, anesthesiology and resuscitation in the profile of cardiovascular surgery. If necessary, other specialists also participate. The agenda of the consultations is drawn up in advance, the time limit is 1 hour, the frequency is 1-2 times a week. Representatives of the hospital administration are present at the meetings to resolve organizational issues.

In 2019, during the six months of the emergency cardiology department, 22 "multivessel" patients with NSTEMI-ACS were presented, who were treated at the S. S. Yudin City Clinical Hospital in the

period from July to December. The study excluded cases when the issue of myocardial revascularization was successfully resolved by the HeartTeam on duty.

A presentation was prepared for each patient with a summary of the anamnesis of life and disease, the results of analyses and instrumental studies; a record of the CAG was provided. The patient's attitude to the upcoming surgical treatment was necessarily taken into account. The conclusion of the HeartTeam was entered in the medical history and in the discharge epicrisis. Thus, no patient was discharged without a final conclusion on myocardial revascularization.

Table 4 presents the characteristics of patients with NSTEMI-ACS with multivessel lesion observed in 2019.

Year Index		2019
Total number of patients		22
Age range		41-83
Average age		66,5
Male		16
Female		6
NSTEMI- MI		8
Unstable angina		14
Two - vessel lesion		13
Three - vessel lesion		9
Average score on Syntax		31
Myocardial revascularization was performed		15
Type of surgical intervention	PCI	4
	CABG	11

Table 4: General characteristics of patients with multivessel coronary lesion and myocardial revascularization in 2019.

The age range turned out to be quite wide (41-83 years) with a predominance of men (16 people) and patients diagnosed with unstable angina (14), which is quite natural, given the planned nature of the meetings of the Heart Team. If the patients were not clinically severe, then the anatomy of the coronary lesion turned out to be quite complicated - according to the Syntax Score scale, the average score was 31. Theoretically, CABG was the preferred method of revascularization here, if other factors are not taken into account - the distal nature of the coronary lesion, which does not allow for shunts, contraindications to open-heart surgery, including existing chronic or competing diseases. Two-vessel lesion was detected in

13 patients, of which 6 had involvement of the LCA trunk, and 9 had a three-vessel lesion (LCA trunk - in 3).

Myocardial revascularization was performed in 15 patients out of 22 (68%) - 11 CABG and 4 PCI. All surgical interventions were performed during the current hospitalization or within a week after discharge (CABG). In two cases of CABG, simultaneous carotid endarterectomy was performed in patients with significant carotid artery stenosis. All patients survived, only one of them had an ischemic cerebral infarction in the postoperative period with satisfactory recovery in the future. The oldest patient who underwent CABG on a working heart was 81 years old.

The decisions of the HeartTeam were presented in the form of four variants of the conclusion: CABG, PCI, drug treatment or additional examination, with justification of the decision and indication of the timing of possible surgical intervention. The initial decision of the HeartTeam differed from its results (Table 5).

Index	Surgical treatment		Drug treatment	Additional examination
	CABG	PCI		
Decisions	13	2	4	3
Results	11	4	5	The result is unknown*
				2

Table 5: Comparison of HeartTeam decisions and treatment results in 2019.

*The patients refrained from the recommended CABG, their further fate remained unknown.

Surgical treatment is recommended for 15 patients: CABG was initially planned for 13, and PCI for two. In 4 cases, a decision was made on conservative tactics, in three cases a final conclusion was not made, as additional examination was required. In fact, 11 CABG operations were performed, 4 PCI, 5 - drug therapy was recommended, the fate of two patients remained unknown: the patients refrained from the recommended CABG.

If the indications for CABG do not require discussion with a high angiographic risk of Syntax Score, then the remaining solutions of the HeartTeam are of some interest.

PCI in two patients was planned due to contraindications to CABG and technically possible PCI. Both of them underwent stent-

ing of the LCA trunk during the current hospitalization with a good angiographic and clinical result, without complications. Indeed, one of them, a 69-year-old man with unstable angina, had severe respiratory failure due to post-radiation fibrosis of the lungs (lung cancer with a history of radiation therapy). In another patient, 83 years old, myocardial infarction was complicated by recurrent left ventricular insufficiency, of the concomitant diseases, stage 4 CKD was noted (GFR 17 ml/min/1.73 m²).

Medical treatment is recommended for 4 patients with contraindications to CABG, who found it impossible and/or impractical to conduct PCI. Contraindications to CABG were morbid obesity of the 3rd degree (2 patients), multifocal atherosclerosis (significant lesion of the carotid, iliac and femoral arteries) and senile dementia. Patients who were denied surgical treatment could, if desired, consult in another medical institution: the decision of the HeartTeam was entered into the discharge epicrisis and the patient was given a CD with a CAG record.

The conclusion of the HeartTeam on the need for further examination concerned three patients with malignant neoplasms of various localizations, and two of them were diagnosed for the first time. In these cases, to participate in the HeartTeam were involved narrow specialists - gynecologist (uterine cancer in a woman 60 years old with MI) and a surgeon (stomach cancer in a 68-year-old man with unstable angina). These cancer patients underwent PCI with holometallic stents. This tactic was chosen to minimize, to one month, the time of mandatory double antiplatelet therapy in case of surgical treatment of malignant neoplasms.

In a patient with a previously verified history of prostate cancer, computed tomography of the pelvic organs revealed the progression of the process with multiple metastatic bone lesions. PCI proved to be technically impossible due to the severe anatomy of the coronary lesion. The only possible solution was a conservative treatment strategy for unstable angina.

The patients were discharged under the supervision of an oncologist and a cardiologist. In cases with cancer patients, the conclusion of the HeartTeam allowed to break the deadlock (or at least try), when a multivessel lesion with manifesting myocardial ischemia did not allow oncologists to fully treat their pathology, and the oncological process in the active stage limited the possibilities of myocardial revascularization.

Conclusion

- The scheduled meetings of the HeartTeam in 2019 allowed to give recommendations on myocardial revascularization to all patients with NSTEMI-ACS without STEMI with multivessel atherosclerotic lesions of the coronary bed (22 people -100%). In 2014 and 2015. "multivessel" patients were discharged without recommendations on further treatment tactics - 56.2% and 40%, respectively.
- In 2019, surgical treatment recommended by the Heart Team was performed in 15 patients out of 22 (68%). Only in two patients (9%) CABG was not performed due to their refusal of surgery,
- The work of the Heart Team turned out to be more effective than consultations of specialists: in 2015, compared with 2014, the number of selective PCI increased statistically significantly ($p < 0.05$), in 2019 - the number of CABG performed ($p < 0.01$).
- Patients with multivessel lesion and competing oncological pathology received recommendations on further treatment tactics (PCI was performed on two of them), while surgical treatment of NSTEMI- ACS was not carried out in cancer patients before the scheduled meetings of the HeartTeam.

Key Messages

What is already known about the subject?

- The Heart Team is a mandatory standard for managing patients with multivessel atherosclerotic lesions of the coronary bed, prescribed in clinical guidelines.
- The implementation of a multidisciplinary approach in clinical practice is associated with organizational and methodological difficulties

What might this study add?

The significance of the Heart Team in the implementation of an invasive strategy for the treatment of patients with NSTEMI-ACS is shown.

How might this impact on clinical practice?

Properly organized work of the Heart Team increases the effectiveness of the treatment of NSTEMI-ACS in patients with multivessel atherosclerotic coronary disease.

Conflict of Interest

The authors state that this work, its topic, subject and content do not affect competitive interests.

Sources of Funding

The authors state that there is no funding for the study.

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