

Simultaneous Procedures in Patients with Cardiac Surgical Diseases and Colorectal Cancer

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ABSTRACT

Background: We made an attempt to assess the safety and efficacy of simultaneous operations in patients with cardiac surgery diseases and colorectal cancer (CRC). **Methods:** From January 2019 to December 2020, 7 patients with CRC underwent simultaneous operations. The average age was 74.1 ± 7.4 years. Ischemic heart disease was diagnosed in 6 (85.7%) patients; 2 - aortic valve defect; 2 - hemodynamically significant stenosis of the internal carotid artery; 1 - aneurysm of the ascending aorta; 1 - atrial septal defect. Colorectal tumors were localized mainly in the sigmoid colon, in 4 patients; in the rectum - 2; in the head of the cecum - 1. **Results:** The duration of simultaneous operations averaged 480 ± 175 minutes. The average blood loss was 958 ± 265 ml. In the early postoperative period, one patient died caused by pulmonary embolism on the 7th day after surgery. The maximum observation period was 16 months. The progression of the disease was diagnosed 5 months after the operation in 1 patient who had not received chemotherapy. No cardiac complications were revealed during follow-up examinations. **Conclusion:** Simultaneous procedures in patients with heart disease and colorectal cancer are safe and prove to be satisfactory.

Keywords: Simultaneous Operations, Colorectal Cancer, Heart Disease, Polymorbid Patients

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Introduction

Despite numerous scientific publications on the successful treatment of cardiovascular diseases and colorectal cancer, there are only a few informative reports on the performance of simultaneous cardiac and oncological surgeries, including minor patient stories. This indicates a cautious approach in the treatment of this category of polymorbid patients, whose number is steadily increasing in surgical cohorts.

Currently, cardiovascular diseases are considered to be the main cause of death. Colorectal cancer also occupies one of the leading positions in terms of prevalence and is in the 3rd place among the causes of death from malignant tumors of the gastrointestinal tract [1]. Oncological diseases of various organ localization are diagnosed in 3.4 - 7% of patients

suffering from diseases of the heart and large vessels [1-3]. The problem of tactics, and in particular the stage priority of treatment of these patients, is very difficult, since the oncological process itself is a contraindication to cardiac surgery, and vice versa: a severe somatic status does not allow performing a radical surgery for cancer [1-4]. The main contraindication to cardiac surgery in patients with colorectal cancer is the high risk of bleeding from the tumor due to the administration of large doses of heparin [5, 6]. The use of extracorporeal circulation also leads to changes in the hemostatic system and provokes a systemic inflammatory response of the body [6]. Individuals suffering from malignant diseases have an increased risk of both thrombosis and bleeding. The oncological process contributes to the activation of the blood coagulation of the human body, which

leads to a hypercoagulability and chronic disseminated intravascular coagulation syndrome (DIC syndrome) [7]. In this study, we are making an attempt to assess the safety and efficacy of simultaneous operations in patients with cardiac surgery diseases and colorectal cancer.

Materials and Methods

From January 2019 to December 2020, 358 cardiac surgery patients underwent planned treatment at the Sechenov University Clinic of Faculty Surgery. Among them, 18 patients (5%) underwent simultaneous operations for malignant tumors of various localization, including 7 (2%) for colorectal cancer. The medical histories of these patients were retrospectively analyzed with regard to the type of surgery, early complications and length of hospital stay. Long-term results (more than 6 months) were assessed via direct contact with patients and / or their relatives.

Five men and two women were involved in the study (Table 1). The average age was 74.1 ± 7.4 years. Ischemic heart disease (IHD) was diagnosed in 6 (85.7%) patients, while in 2 patients it was combined with aortic valve disease; in 2 patients, with hemodynamically significant stenosis of the internal carotid artery (ICA); in 1 patient with ascending aortic aneurysm and in 1 patient with an atrial septal defect. The ejection fraction was estimated by transthoracic echocardiography. It was 56% and did not exceed 63%. Besides, all patients underwent coronary angiography before the operation.

In accordance with the ASA (American Society of Anesthesiologists) Physical Status Classification System, 6 patients corresponded to class VI, 1 patient - to class III. According to the ECOG (Eastern Cooperative Oncology Group) scale, 1 patient corresponded to grade 1, 3 patients - to grade 2 and 3 patients - to grade 3.

All the patients were examined by multidisciplinary cancer

council before surgery. None of the research patients underwent pre-surgical chemotherapy (CT) to avoid cardiotoxicity and a high risk of complications due to aggravated somatic status. Colorectal tumors were localized mainly in the sigmoid colon, in 4 patients; in the rectum of two patients; in the head of the cecum in one patient. All tumors were locally advanced, more often with a high degree of differentiation (G1) - in 4 patients, G2 and G3 - in 1 and 2 patients, respectively. MSCT showed metastatic lesions of the VI and VII liver segments in one patient. The most common symptoms associated with malignant tumors of the colon and rectum were anemia, weight loss, gastrointestinal bleeding and chronic partial tumoral obstruction. One patient underwent endoscopic stenting of a rectal tumor to resolve intestinal obstruction and ensure adequate preoperative preparation.

Results

All 7 patients underwent simultaneous operations, and in all cases the surgical interventions began with the cardiac stage (Table 2). The cardiovascular surgeries included: coronary artery bypass grafting (CABG) in 6 patients (5 of them performed off pump) via standard sternotomy and aortic valve replacement with PERCEVAL biological prosthesis through mini J-sternotomy in 1 patient. In 2 patients, classical carotid endarterectomy was performed simultaneously with CABG, one patient underwent Ozaki procedure, and supracoronary aortic replacement was performed in one patient.

Colorectal surgeries were performed upon completing cardiac and / or vascular interventions, after neutralizing heparin and ensuring adequate hemostasis. All bowel surgeries were performed in compliance with oncological resection and lymph node dissection standards. In 5 patients, the abdominal procedure was performed by laparoscopic method: abdominoperineal extirpation in 1 patient; Hartmann's

Table 1: Characteristics of patients in the observation group (n=7)

Patient	Gender	Age, years	ECOG, grade	ASA PS Classification	EF, %	Organ	pTNM 8	Stage, TNM 8	Stage of differentiation	Cardiovascular diseases
1	F	83	3	IV	55	rectum	T4aN2M0	IIIC	G3	Combined AV disease: Critical AV stenosis, aortic insufficiency 2nd stage.
2	M	64	1	III	63	rectum	T3N2bM0	IIIB	G2	Ascending aorta aneurysm, AV disease (insufficiency 1-2 stage). CHD: Stable angina 2-3 grade.
3	M	64	2	IV	56	caecum	T3N0M0	IIA	G1	CHD: PICS. Stable angina 2-3 grade.
4	M	72	2	IV	49	sigma	T3N1M1 (HEP)	VIA	G3	CHD: PICS. Stable angina 3 grade.
5	M	74	3	IV	55	sigma	T3N0M0	IIA	G1	CHD: PICS. Stable angina 3 grade. Carotid artery atherosclerosis.
6	M	75	2	IV	58	sigma	T3N0M0	IIA	G1	CHD: PICS. Stable angina 3 grade. Carotid artery atherosclerosis.
7	F	87	3	IV	57	rectum	T3N0M0	IIA	G1	CHD: PICS. Stable angina 2-3 grade. AV stenosis. ASD.

ASA PS – American Society of Anesthesiologists Physical Status Classification System; ASD – atrial septal defect; AV – aortic valve; CHD – coronary heart disease; ECOG – Eastern Cooperative Oncology Group performance score; EF – ejection fraction; PICS – postinfarction cardiosclerosis

procedure in 1 patient; right hemicolectomy in 1 patient and resection of the sigmoid colon in 2 patients. One patient with sigmoid colon cancer and liver metastases underwent anatomical resection of the VI and VII segments, cholecystectomy and another patient underwent anterior resection of the rectum via laparotomic method.

The duration of simultaneous operations averaged 480 ± 175 minutes (from 330 to 620 minutes). The average blood loss was 958 ± 265 ml (from 350 to 1385 ml). Intraoperatively, one patient developed ventricular fibrillation during laparoscopic anterior resection, after CABG and closure of the sternotomy wound, which required resternotomy and direct cardiac massage. The patients spent an average of 2.8 ± 1.4 days (from 1 to 5 days) in the intensive care unit. The duration of prolonged ventilation of the lungs averaged 29 ± 14 hours (from 9 to 84 hours). The average length of postoperative hospital stay was 13.8 ± 5.7 bed-days (from 7 to 19 bed-days). In the early postoperative period, 3 patients developed complications: death caused by transient ischemic attack on the 5th and subsequent pulmonary embolism on the 7th day after surgery; the development of acute renal failure on the 1st day after the operation, which required connecting to extracorporeal ultrafiltration machine; development of a ligature fistula, which required excision.

Five people received postoperative chemotherapy, 4 patients underwent full 6 courses of chemotherapy.

The maximum observation period was 16 months. During the observation period, the patients remained active; the progression of the disease in the form of metastatic lesions of the liver was diagnosed 5 months after the operation in 1 patient who had not received chemotherapy. The patient is currently undergoing chemotherapy. No cardiac complications were revealed during follow-up examinations.

Discussion

Cardiovascular diseases and cancer are among the leading causes of death, thus occupying the first and the second places, respectively. Of all malignant tumors, colorectal cancer is the third among the causes of death. The similarity of the factors causing the development of cardiovascular comorbidity and colorectal cancer often allows to detect these diseases together. However, to date, there is no general tactics in cardiac surgery and oncology for treating this category of patients [8,9].

Elderly patients with colorectal cancer, aggravated by decompensated concomitant diseases, are often excluded from studies due to the lack of a unique treatment strategy for this category of patients [10,11,12]. The presence of concomitant diseases adds to the complexity of cancer treatment, as this can affect the prognosis and treatment. At the time of colorectal cancer detection, elderly patients

already have a high risk of death from existing concomitant diseases [13].

The presence of colorectal cancer is associated with the risk of developing cardiovascular diseases and chronic heart failure in the elderly group [14]. According to Kenzik K. M. et al., the detection of cardiovascular diseases was reported in 57% of cases in the group with a history of colorectal cancer, while in half of the cases, coronary insufficiency of varying degrees was diagnosed. In the age-matched control group of patients without CRC, these indicators were 22% and 18%, respectively [15].

The global increase in colorectal cancer incidence, aggravated by cardiac diseases, often in the stage of decompensation, is steadily leading to a growing number of patients admitted to both oncological and cardiac hospitals. Surgical treatment of colorectal cancer aggravated by cardiac comorbidity is accompanied by a high risk of early postoperative cardiovascular complications. Analyzing postoperative mortality in the treatment of colorectal cancer, Moghadamyeghaneh Z. et al. reported a high incidence of postoperative acute myocardial infarction which developed in 2% of operated patients and caused 6 times higher death rates than other non-surgical complications [16]. The high rate of mortality after surgical interventions due to acute myocardial infarction, acute coronary insufficiency is also indicated by other researchers [17-20]. Treatment of ischemic heart disease can reduce the risk of acute myocardial infarction, and therefore reduce the risk of early death. Currently, along with drug therapy for ischemic heart disease, surgical interventions aimed at restoring adequate myocardial blood flow are being actively performed, both on an open heart and via low invasive methods [21].

People with congenital and acquired heart defects make up one of the most severe groups of cardiac surgery patients. Achievements in cardiology and cardiac surgery have significantly increased the life expectancy of patients with heart disease. At the same time, the risk of developing malignant diseases in this cohort of patients has naturally increased [22,23].

The problem of treating cardiac surgery patients with colorectal cancer has existed for a long time. In the earlier periods of study, stage-by-stage treatment was the only option. At the same time, surgeries were performed in different priority - cardiac surgery followed by surgery for colorectal cancer and vice versa. With the advancement of surgical technologies, reports on simultaneous operations for cardiac disease and colon malignancy began to appear. These reports are single, include a small number of patients. However, the result of these operations looks encouraging and indicates a fairly low postoperative mortality rate of 6% [24,25].

The problem of the surgical treatment tactics of both cardiac

and oncological diseases remains unresolved. The main dilemma is the choice between staged surgery or one-stage surgical procedure. Most surgeons prefer the staged tactics, reasonably believing that significantly prolonged operative duration and greater surgical aggression in simultaneous operations increase the risks of postoperative complications and postoperative mortality [25].

On the other hand, the choice of the staged treatment may cause a number of problems. For example, when the cardiac surgery is performed before the oncological intervention, the risk of major tumor bleeding increases due to the need of heparin administration during the extracorporeal circulation [26]. Besides, during the interval until the second operation, which normally takes from about 3 to 6 weeks, with the regular course of the postoperative period, progression of CRC may occur. Also, during the oncological stage there is a risk of intra- and postoperative cardiac complications which can lead to death [27].

In the world literature, there are isolated reports summarizing the experience of treating patients with concomitant cardiac and oncological diseases [25,28,29].

For example, Eagle KA et. al. and Komokata T. et. al. report in their works that simultaneous interventions do not increase and sometimes even significantly reduce the risk of cardiac complications in colorectal cancer. At the same time, long-term oncological results do not differ from those in patients without cardiovascular diseases [30].

At the same time, other authors are inclined to two-stage surgery, due to the large intraoperative trauma resulting from the surgical procedure in two major anatomical areas, the chest and abdominal cavities, which in their opinion increases the risk of complications, both during the operation and in the long-term period [30,31].

Based on our own, more than ten-year experience of one-stage and two-stage treatment of this patient category, the simultaneous approach looks more preferable in comparison with two-stage surgery: the patient undergoes general anesthesia and intensive care only once; there is no need to wait for recovery after cardiac surgery in order to go on to the second stage, thereby reducing the risk of intestinal tumor progression [4]. We would like to point out that, if possible, it is preferable to perform the cardiac surgical stage avoiding extracorporeal circulation in order to level the risk of developing complications it might cause.

Today, almost the entire range of colorectal operations, in most clinics, is performed by laparoscopic and/or robot-assisted techniques [32]. Minimally invasive technologies in heart and cardiovascular surgery are also gradually becoming commonplace in a number of hospitals [33]. Conducting simultaneous interventions via hybrid methods within our

research made it possible to reduce surgical trauma, shorten the length of hospital stay, reduce pain and minimize the risk of infectious complications.

Conclusion

In conclusion, we would like to say that simultaneous procedures in patients with heart disease and colorectal cancer via both traditional and laparoscopic methods are safe and prove to be satisfactory. Such interventions should be performed in large multidisciplinary medical centers by skilled surgeons with sufficient experience in performing cardiac and oncological interventions. Of course, this category of patients need further study of the immediate and long-term results of treatment as well development of choice criteria and optimal tactics for pre and postoperative management.

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