A case of acute coronary syndrome during operation, resulting in ventricular fibrillation

Title

A case of acute coronary syndrome during operation, resulting in ventricular fibrillation

Author(s)

Yoshitomi, Osamu; Ichinomiya, Taiga; Inadomi, Chiaki; Murata, Hiroaki; Shibata, Itsuko; Maekawa, Takuji; Nagayasu, Takeshi; Hara, Tetsuya

Citation

Acta medica Nagasakiensia, 61(1), pp.27-31; 2017

Issue Date

2017-01

URL

http://hdl.handle.net/10069/37080

NAOSITE: Nagasaki University’s Academic Output SITE

http://naosite.lb.nagasaki-u.ac.jp
Case Report

A case of acute coronary syndrome during operation, resulting in ventricular fibrillation

Osamu Yoshitomi¹, Taiga Ichinomiya¹, Chiaki Inadomi¹, Hiroaki Murata¹, Itsuko Shibata¹, Takuji Maekawa¹, Takeshi Nagayasu², Tetsuya Hara¹

¹Department of Anesthesiology, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan
²Departments of Surgical Oncology, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan

A case of 68-year-old woman. The patient was scheduled for laparoscopic transverse colectomy, due to early colorectal cancer diagnosis. Right after the surgery began, electrocardiogram showed a R-on-T phenomenon premature ventricular contraction leading to ventricular tachycardia and ventricular fibrillation. Although chest compression and electric defibrillation made the rate come back to sinus rhythm, we used emergency coronary angiography after halting the surgery since an elevation in ST segment had been confirmed in precordial leads on 12-lead electrocardiogram. As there was complete occlusion in left anterior descending coronary artery (LAD), the patient appeared to have a high-grade stenosis before surgery. Placing a stent on LAD, we carried out laparoscopic transverse colostomy once again at a later date. In this case, given that the coronary artery had had a high-grade stenosis before the surgery, it is highly likely that some kind of disruption in the myocardial oxygen balance caused myocardial ischemia, but that was difficult to predict by preoperative assessment. However, we successfully resuscitated the patient through swift and proper treatments and the case successful ended up being radical operation without any after effects thanks to a proper judgment made by cooperation between surgeons and internal cardiologists. (195 words)

Key words: acute coronary syndrome, myocardial ischemia, ventricular fibrillation, non-cardiac surgery, myocardial oxygen balance, percutaneous coronary intervention

Introduction

A non-cardiac surgery hardly involves cardiac arrest during the operation, still it should be deeply concerned. Perioperative myocardial infarction, even if non-life-threatening, has a significant impact on prognosis after surgeries. We will report the case in which lethal arrhythmia occurred at the time of the laparoscopic colon resection in the patient whose coronary stenosis, which had existed before the surgery, was found.

Case report

The patient was 68-year-old-woman, an elevated lesion in transverse colon was found by endoscope for lower intestinal tract in check-up, which resulted in the diagnosis of early colorectal cancer in work-up. The patient, therefore, was scheduled for laparoscopic transverse colectomy. Her previous history showed that she was taking Valspertan 40 mg for hypertension. The pre-operative test found negative T waves without an abnormal Q wave in leads V3-V6 on 12-lead electrocardiogram (Figure 1), but an ischemic cardiac disease was not retrospectively recognized. Echocardiography...
before the surgery was not put into practice. Chest X-ray test, biochemical exam, respiratory function test didn’t detect any abnormality for that matter, the patient had no alcohol and smoking history. She was reported to do usual household chores and be able to walk up more than two flights of stairs. Epidural anesthesia and general anesthesia were scheduled.

Vital signs just before induction of anesthesia were blood pressure 151/88 mmHg, heart rate 65 /min, SpO₂ 99%. An epidural tap was inserted through between the eleventh and twelfth dorsal vertebra, and a catheter was indwelled there. The epidural anesthesia was in an attempt to alleviate postoperative pain, only the test for 2% adrenaline-added lidocaine 2 mL was conducted before the surgery. The anesthesia was inducted with propofol 50 mg and remifentanil 0.5 µg/kg/min, then intubation followed after administering rocuronium 30 mg, after the induction, a catheter was inserted into left radial artery and invasive arterial pressure was conducted. Maintaining anesthesia with sevoflurane1.5% and remifentanil 0.2-0.3 µg/kg/min, rocuronium was properly added. Although etilefrine was administered when blood pressure temporarily decreased after the induction of anesthesia, the systolic blood pressure was 90-100 mmHg and the heart rate was 50-60 /min, within the sinus rate, an arrhythmia was not detected, neither was a significant change after surgery initiation. There was no abnormality in arterial blood gases and electrolyte. 5 minutes after the surgery initiation, in electrocardiogram, a R-on-T phenomenon premature ventricular contraction led to ventricular tachycardia and ventricular fibrillation. Surgeons immediately put a chest compression and used electrical cardioversion (2000 × 1) after administering lidocaine 50 mg, 3 minutes later, the rhythm was back to the sinus rhythm. After that, systolic blood pressure recovered to 120 mmHg, but ST segment elevated in leads V1-V4 on 12-lead electrocardiogram (Figure 2b). Following intubating a central intravenous catheter, nicorandil 4 mg/h, dopamine 4 µg/kg/min, lidocaine 40 mg/h started being continuously administered into the vein. After consulting to internal cardiologists, Wall movement decreased from front wall and septum in transthoracic echocardiogram, so the surgery had no alternative but to halt and the surgeon closed a surgical incision. And we aroused the patient and extubated the tracheal tube. The patient was lucid and didn’t have any paralysis in four limbs, so we sent the patient directly to an angiography room and put emergency coronary angiography into practice. In the test, proximal LAD was completely occluded (Figure 3a). Since we found a collateral vascular flow from right coronary artery, we assumed that high-grade stenosis had existed before the surgery. After leaving a bare metal stent on LAD, a blood flow recovered up to LAD’s periphery (Figure 3b). In left ventriculography, wall movement abnormality was found from front wall to ventricular apex, and the left ventricular ejection fraction (LVEF) was down to 49%, so the patient was admitted to intensive care unit with the circulation support by IABP. Blood exams showed a significant elevation in NT-proBNP by 2777 pg/mL, troponin T level by 1.09 ng/mL and elevated cardiac enzymes which suggested the patient suffered acute cardiac infarction in LAD area due to unknown reasons because the patient had the high grade stenosis before the surgery. The condition stabilized in intensive care unit. After removing IABP on the day after the surgery, the patient was moved to a general ward on day three after the surgery, without neurological sequelae.

Figure 1. Pre-surgery 12-lead electrocardiogram, showing a negative T wave without an abnormal Q wave in the leads V3-V6.
The patient provisionally left the hospital and another laparoscopic transverse colectomy was scheduled on day 45 after the first surgery. Before the second surgery, the wall movement improved in transthoracic echocardiogram, and LVEF showed 73%, in which hemodynamics was also stable. The post second surgery condition was on a stable recovery track, and the patient left hospital on day 27 after the surgery.

**Discussion**

Cardiac complications during surgeries are clinical conditions which should be deeply concerned. According to a survey of accidental cases from 2009 to 2011, released by Japanese Society of Anesthesiologist, with regard to accidentally critical cases, the number of cases, where patients developed
acute coronary syndromes during surgeries, is as few as
0.241/1000 cases\(^1\). Acute coronary syndromes can be cate-
gorized into 2 patterns: one in which myocardial ischemia
was recognized in patients diagnosed as ischemic heart dis-
ease in pre-surgery check-up and the other in which myocar-
dial ischemia was recognized in patients without diagnosis
of ischemic heart disease or patients with asymptomatic
ischemic heart disease. In non-cardiac surgeries, about 75%
of myocardial ischemia cases showed patients didn’t have
angina in their medical history, which suggested that it was
highly likely to be triggered by surgery or anesthesia\(^5\,6\). Our
case also revealed that the patient with no ischemic-heart-
disease history developed lethal arrhythmia, it was later
found that coronary stenosis had existed before the surgery.

The cardiac complication is the most probable cause of
death in non-cardiac surgery. And cardiac infarction report-
edly accounts for 10-40% of perioperative mortality rates\(^1\). The
perioperative myocardial infarction, even if non-lethal,
highly affects prognosis after surgery. The biggest goal in
perioperative management for high-risk patients is the pre-
vention of the perioperative myocardial infarction. As a
guideline for cardiovascular evaluation in preoperative pe-
riod in non cardiac surgery, including ischemic heart diseas-
es, ACC/AHA guideline\(^7\) is useful. The percentage of pa-
ients with ischemic heart diseases compared to the total
number of surgery is significantly fewer than that in the U.S.
The incidence rates of the perioperative complication for pa-
tients with ischemic heart disease in Japan, however, is not
as different, which makes pre surgery evaluation based on
U.S’s data possible\(^8\).

A preoperative management includes taking patient’s
medical history, physiological findings, evaluating the car-
diac risk represented by cardiac infarction, congestive heart
failure and death, by electrocardiogram findings. If needed,
a non-invasive testing and pre-surgical treatment should also
be added, considering patient’s functional capacity, age,
complication and operative procedure. ACC/AHA guideline
shows algorithm based on patient’s risk, functional capacity
and operative procedure\(^8\). In our case, the patient was a
healthy 60-year-old woman without any disorder in medical
history, except hypertension. Revised Cardiac Risk Index
(RCRI)\(^9\), used for predicting perioperative cardiovascular
events, was not confirmed. Pre-surgery electrocardiogram
showed a giant negative T wave, but there was no suspicion
for ischemic heart diseases in the past and the level of phys-
ical activities in daily life was evaluated as better-than 4
METs. Further cardio testings, therefore, were not consid-
ered necessary. Considering the electrocardiogram prior to
the surgery and the hypertension in history, in addition, that
the patient can be categorized into a medium-risk group
based on risk classification in non-cardiac operation, transt-
horacic echocardiography could be necessary before the sur-
gery. But it isn’t necessarily useful for judging the risk of
perioperative cardiac infarction in non-cardiac operation
while it is non-invasive and plays a vital role in detecting
abnormality in heart and valvular function and structural ab-
normality\(^9\). Besides, according to the ACC/AHA guideline,
exams for myocardium pressure are recommended for pa-
tients highly suspicious of myocardial ischemia or patients
with exercise tolerance less than 4 METs\(^9\). That makes it
significant for pre-surgery evaluation in non-cardiac surgery
to assess to what extent patients do daily activities. Even for
cardiac catheter exams before surgery, which are invasive, it
is recommended only when there is a possibility of halting
all surgical procedures or a possibility of either prioritizing
or simultaneously carrying out cardiovascular procedure\(^9\).
Therefore, in our case, it was highly likely that further heart
exams would not have been necessary even if we had con-
ducted transthoracic echocardiography before the surgery.

Generally, myocardial ischemia, decreased circulating
volume, electrolyte abnormality, hypoxemia, hypothermia,
effects of medicines are named as a cause for lethal arrhyth-
mia during surgeries. Only a few studies have taken into
consideration the frequency of ventricular arrhythmia in pe-
rioperative cardiac surgery and prognostic implication. The
incidence rate of ventricular fibrillation and sustained ven-
tricular tachycardia after surgery is reportedly 0.5-1% in car-
diac surgery\(^8\), in non cardiac surgery, the rate is only a few\(^9\).
In most cases a ventricular premature contraction suddenly
occurs without any sign of primary illness, but it could wors-
en a life prognosis when organic diseases such as dilated
cardiomyopathy or myocardial ischemia gets involved,
which sometimes leads to ventricular tachycardia or fibrilla-
tion. Especially in the case where a coronary artery diseases
were recognized before a surgery and the diseases were
caused by the disturbance in myocardial oxygen balance,
which is one of the unique perioperative issues, the rate of
perioperative myocardial infarction accelerates. It is also re-
ported that a ventricular premature contraction which re-
quires perioperative treatments often involves myocardial
ischemia\(^10\). In our case, although electrocardiogram did not
show any change in ST segment or arrhythmia until surgery
initiation, a single onset of R-on-T phenomenon premature
ventricular contraction led to ventricular tachycardia and
ventricular fibrillation. It is doubtful that electrolyte abnor-
mality, hypoxemia, hypothermia and effects of medicines
caused them. Coronary angiography after the cardiac event
predicted high-grade stenosis in coronary artery before the
surgery, even a slight change in circulatory blood volume or its decrease appears to disrupt myocardial oxygen balance and cause myocardial ischemia. It is highly likely that the lethal arrhythmia was triggered by the myocardial ischemia, but there is no solid proof to support the theory. That is because it was impossible to perfectly recognize all ischemia before arrhythmia had occurred, since 12-lead electrocardiogram after resuscitation showed an elevation in ST segment in the leads V1-V4 but it showed only the lead II during the surgery. We should have monitored precordial leads even during the surgery, considering figures in preoperative electrocardiogram.

As for ventricular premature contractions and non-sustained ventricular tachycardia, a special treatment is not reportedly necessary unless hemodynamic abnormality or myocardial ischemia gets involved, it is also reported that a single arrhythmia will not increase either the rate of perioperative myocardial infarction or death rate11). On the other hand, in the active cardiac condition, such as unstable coronary artery diseases or critical arrhythmia, ACC/AHA guideline recommends that it should be treated and stabilized before non-cardiac surgeries4). Although, in our case, unpredictable cardiac events occurred, which were hard to detect based on preoperative evaluation, the swift and proper treatment resulted in resuscitation, and the cooperation between surgeons and internal cardiologists helped make a swift judgment for halting the surgery, which led to percutaneous coronary intervention. That left no after effect and ended up the radical operation.

References
3) Auerbach AD, Goldman L. Beta-Blockers and reduction of cardiac events in noncardiac surgery: clinical application. JAMA 287: 1445-1447, 2002
5) Hara T, Sumikawa K. Preoperative evaluation of patients with ischemic heart disease. Masui 59: 844-848, 2010
Osamu Yoshitomi et al.: Acute coronary syndrome during operation