Gastrointestinal Complications Following Cardiac Surgery.

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Abstract

Aim: Gastrointestinal complications (GIC) following open heart surgery usually are rare but with high morbidity and mortality. The aim of this study was to see the outcome of these patients after complication, compared with a similar study found in literature. Identifying risk factors preoperatively and postoperatively in our patient's series, for GIC.
Materials and methods: Between January 2012 and December 2017 from 1990 operated cardiac patient 34 of them developed GIC, presenting gastro duodenal bleeding due to active ulcer, liver failure, pancreatitis, cholecystitis, or intestinal ischemia. We performed a retrospective analysis.
Results: From all consecutive patient only 1.7 % developed GIC. Mortality rate was 55.8%, especially 100 % mortality in intestinal ischemia patient. Regarding risk factors, those were the same found in other similar study (age, atherosclerosis disease, by pass time, postoperative ARF, Low cardiac output syndrome.)
Conclusion: GIC after cardiac surgery are rare but when it happens the mortality is very high not even of late diagnosis. In ages patients, diabetes, long by pass time, long hypoperfusion state. It is recommended to be alert for GIC for detection in early phase, and for reducing as much as possible morbidity and mortality.

Keywords: *cardiac surgery, gastroduodenal ulcer, non-occlusive intestinal ischemia. cholecystitis*.

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Full Text

Introduction

Gastro-intestinal complications (GIC) such as: gastroduodenal ulcer, hepatopancreatitis, colecistits, paralitic ileus, non-occlusive intestinal ischemia are one of the serious extra-cardiac events following open heart surgery. These complications are increasing as population ages, frequently reported in high risk patients. The incidence varies from 0.2-14% to 5.5% [1-4]. The morbidity and mortality is very high in cases when complication occur; it ranges from 13.9% to 100% [5-7]. Cardiac surgery is a risk factor for intra-abdominal complication. [8].The main reason is the visceral hypoperfusion during intra and postoperative period, also systemic inflammatory syndrome (SIRS) triggered by extracorporeal circulation [9]. It, s difficult to diagnose the complication because most of the patient are sometimes fully sedated in ICU, or under postoperative analgesia. Sometimes diagnosis is confirmed very late. GICs may compromise the life of the patient and increase the hospital costs and prolonged ICU stay. *The purpose of this study was to investigate predictors of development of GICs in order to protect against these complications.*

Methods

We retrospectively analyzed 1990 consecutive patients, during January 2012 and December 2017 timeframe, who underwent open heart surgery with cardio- pulmonary by pass (CPB). Off pump and pediatric congenital surgery were excluded from this study. Operation procedure consisted in isolated valve surgery, coronary by–pass grafting (CABG), combined CABG valve, combined CABG with carotid endatherectomy, type A aortic dissection. Emergency operations were also included in the study. Whole information regarding patient illnesses, history and other comorbities like: diabetes (DM), peripheral and vascular (PVD), chronic renal damage (CRD), chronic hepatitis (CH), chronic pulmonary obstructive disease (COPD), life style (smoking, alcool) were collected to determine risk factors. Preoperatively, all patients were premedicated with Midazolam 7,5 mg. In operative room anesthesia was inducted with Fentanyl 5 µg/kg and Propofol 3 mg/kg and pancuronium 0.1 mg/kg (depending in a left ventricular function). Anesthesia was maintained with fentanyl total dose 30 µg/kg, propofol 10mg/kg and sevoflurane 1-2%. Tranexamic acid 1 gr was used as antifibrinolytic drug, after cannulation of three lumen 7,5 FR central venous catheter. For prophylaxis cefuroxime 1,5 g was used as antibiotic. Pantoprazole 40 mg was used as proton pump inhibitor (PPI) from the first to fourth postoperative and day H2-receptor antagonists in successive days. All the interventions were performed through median sternotomy and CPB with fiber membrane oxygenation. Pulsatile blood flow 2.5 L/min was used and normothermia was maintained during operation. Tepid cardioplegia was used (first dose in 4°C St Thomas Solution, and after 20 min blood potassium cardioplegia in normal temperature). Weaning from CPB in case of low cardiac output, inotropic drugs were used and in case of excessive inotropic support and hemodynamic instability intra- aortic ballon pump (IABP) was inserted.

Statistical analysis was performed using SPSS (Statistical Package for Social Sciences), Results are given as mean SD. To evaluate independent risk factors for GICs, significant multivariate risk factors were examined using stepwise logistic regression analysis. P-values of less than 0.05 were considered statistically significant.

Results

The total number of patient who underwent open heart surgery with CPB was 1990. All of them were divided in 1225 (61.5%) only CABG patients, 732 (37%) valve patients, 34 (1.7%) aortic dissection patients, and 85 (4,2%) combined operation patients. Seriously abdominal complications were seen only in 34 (1,7%). Mortality was 55,8% in patients with gastrointestinal complications. Whole characteristics of comorbidities and surgical procedures were collected and seated in *table 1 and 2.*

Variables	Control (1990 cases)	GICs (34 cases)	p
Clinical characteristics			
Age (y)	54.3±9.4	70.0±8.9	0.01
Age 63	660		0.02
Sex (male/female)	1512/388	30/4	
Cardiac data			
Coronary surgery	1176 (59.1%)	21 (61.7%)	0.051
Valve surgery	695 (34.9%)	10 (29.4%)	0.42
Aortic dissection	34 (1.7%)	3 (9%)	0.34
Combined patient	85 (4.2%)	1	
Emergent operation	89 (4.4%)	3	0.075
LV EF (%)	43.5±16.2	43.4±10.3	0.01
LV EF ≤40	108	11	0.01
Coronary risk factors			
Hypertension	375 (26,1%)	7(20,6%)	0.32
Diabetis mellitus	366 (18.3%)	15 (44%)	0.002
Cerebrovascular disease	45	8	0.005
Peripheral arterial disease	135 (6.7%)	9 (26%)	0.002
COPD	122 (6%)	2 (5,8%)	0.50
Smoking	580 (29.14%)	9 (26,4)	0.28
CRF	104 (5.2%)	10 (29.4%)	0.002

Table 1: *Patients clinical characteristics and comorbidities.*

	Control (1990 cases)	GICs (34 cases)	P
Emergency surgery	103 (5.2%)	7 (20%)	0.006
ECC time (min)	92.8 ± 48.3	125 ± 52	0.001
Aortic cross clamp time (min)	63.4 ± 37.8	79.48 ± 56.5	0.07
Time of surgery (min)	215 ± 72	255.5 ± 76.8	0.007
Major complication			
Reexploration for bleeding	88 (4.4%)	2 (5,8%)	0,15
Blood transfusion (pack)	640 (32.1%)	(94.1%)	<0.0001
Low card syndrom	260 (13%)	18 (52.9%)	0.001
IABP use	27	2	0.4
Hemofiltration	48 (2.4%)	4 (11.7%)	0.016
Postoperative stay (day)	25.1±16.7	44.9±17.9	0.005
Lactates	1.15 ± 0.1	5.34 ± 3.4	<0.002

Table 2. *Operative and postoperative data.*

Regarding the patients who developed GIC all the data are presented in table 3. Patients with gastric duodenal ulcer were diagnosed after anemia and melena were the first signs. After fibro-gastroscopy was done, no active bleeding was noted, except in one patient with massive bleeding that ended in exitus after a few days. Other complications are discussed below.

Symptoms	Time of diagnosis	Deaths
Gastric duodenal ulcer 4	10 ± 6.5 day	1
Cholecystitis 3	10 ± 4.5day	No
Intestinal ischemia 13	8±4.3 days	All dead
Liver failure 8	3±1 days	4
Appendicitis 2	8±2 days	All alive 1
Acute pancreatitis 2	7±3 days	1
Perforation 1	15 days	0
Sigma perforation 1	14 days	0

Table 3. *Diagnosis, and outcomes in 34 patients who developed abdominal complication.*

Discussion

Gastro-intestinal complications such as: gastro-duodenal ulcer, hepato-pancreatitis, intestinal ischemia, are relatively rare after cardiac surgery with an incidence ranging from 0.2% to 5.5%[3], but mortality is very high when they occur [(range 13% - 87%) [5]. The incidence in our study was 1.7% and mortality in gastrointestinal group was 55.8%.

Witch are the major factors influencing in GICs?

All the factors who can lead to splanchnic hypoperfusion and later in ischemia are the factors for GICs. The splanchnic circulation plays an important defensive role in hypovolemia and during low output syndrome. When vasoconstriction occur due to hypovolemia or low cardiac output, splanchnic vessels may contribute in 15% of blood volume increase. The same events occur during CPB [10-12]. Splanchnic ischemia plays a key role in the initiation and perpetuation of the systemic inflammatory response syndrome (SIRS) that often follows cardiac surgery under CPB. Two controversy opinions exist regarding the principal role of CPB in initiation of SIRS and adverse of GI event. Emmiler et al [13] in a retrospective study of 2,625 patients, compared patients operated with the heart- lung machine with patients who were operated off pump. The intestinal ischemia incidence was 0.4% for the first group versus 0.2% for the latter. Similarly, mortality rate for the first group reached 0.2%, while the off pump group presented no deaths. But, Chroome et al. [14] did not find any differences of total GIC between the off- pump and on-pump group. The same results are reported by Poirier [15].

The most common GI Complication following open heart surgery is hemorrhage from upper GI tract. [16,17]. The two most common aetiologies are gastro-duodenal ulcer and erosive gastritis[18]. In our recent study the incidence of bleeding was 11.7% compared with 31% in other studies. Interestingly, in numerous published papers, we noted that GIC especially, hemorrhagic episodes did not decline through the years despite constant improvement in medical management. In our case is different.

The most devastating complication was severe intestinal ischemia which later progresses in necrosis. It is attributed to hypoperfusion during extracorporeal circulation or perioperative hemorrhage, as well as to thromboembolic episodes occasionally influenced by heparin-induced thrombocytopenia. It is possible that presence of coronary artery disease is associated with vasculopathy in mesenteric bed, thus potentially predisposing a patient to more ischemia in peri-operative period. The pathophysiological mechanism of intestinal ischemia is not yet understood. Acute mesenteric ischemia after cardiac procedure is due to non-occlusive mesenteric ischemia (NOMI), rather than embolic one. [19]. In our series, the incidence was 0.05 in total population but 38% in gastrointestinal group. The mortality was 100% because of delayed diagnosis. Schoots [20] reported an overall mortality rate of about 95% for non-surgically

treated patients. The diagnosis was made with contrast CT and confirmed after laparotomy.

Hepatic failure is associated with high mortality about 74% but is very rare (0.1 – 1.1%) [21]. Characteristics of hepatic failure are 10 to 20 times elevated hepatic enzyme and high bilirubinemia due to liver ischemia. [22]. There is connection between low cardiac output syndrome, high elevated lactatemia and multi organ failure.

Acute pancreatitis during perioperative period is rare and it ranges from subclinic to hemorrhagic form. The pathogenesis is unclear. Out of two patients, one of them ended in exitus.

Acute cholecystitis is another abdominal complication following cardiac surgery. Usually the cholecystis are acalculous and pathophysiology is still unclear. Visceral hypoperfusion, endotoxemia, and overproduction of inflammatory mediators have been suggested as mechanisms for AC [23]. In our patients, 3 of them were diagnosed in an average of 10 to 15 days. All the cases had a good prognosis after cholecystectomy.

Regarding risk factors, we found that diabetes, CRF, smoking, peripheral vascular disease, mostly are seen in GIC patients. Perioperative and postoperative data we found that, long by-pass time, usage of IABP, blood transfusion, high lactates level, acute renal failure with hemofiltration, low cardiac output syndrome, are risk factors for GIC.

Conclusion

This is the first study made in Albania for GIC after open heart surgery. We found that our data were the same with the other studies found in literature. When GIC occurs, particularly ischemic intestinal ischemia, the mortality is very high. In a cases of: low cardiac output syndrome, acute renal failure, high quantity of blood transfusion, in cerebrovascular and diabetic patients we should be alert for GIC. Early diagnosis, more chance to survive.

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