



GASTRO-INTESTINAL COMPLICATIONS POST OPEN HEART SURGERY-NONOCCLUSIVE MESENTERIC ISCHEMIA

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ABSTRACT

Purpose: Nonocclusive mesenteric ischemia (NOMI) is rare but often lethal complication after cardiac surgery. The use of vasopressors, age, implantation of intra-aortic balloon pump, the duration of cardio-pulmonary bypass are the main risk factors described in the literature. The purposes of this study are to be represented the most typical prognostic factors and clinical manifestations of NOMI, condition which is not so effortlessly diagnosed.

Methods: The study was designed as a retrospective study of all patients who underwent cardiac surgery in our institution from October 2002 to December 31, 2017. Data from clinical trials worldwide was also used for the preparation of this study.

Results: 9298 patients were operated in our institution for the period 2002-2017. 114 (1.2%) developed abdominal complications after cardiac surgery. In 17 (0.2%), explorative laparotomy with bowel resection for nonocclusive mesenteric ischemia was performed. Nonocclusive mesenteric ischemia (NOMI) is rare but often lethal complication. The progression of NOMI is associated with poor prognosis for the patients. Despite the surgical exploration and necrotic bowel resection, the mortality rate in these patients is dramatically high (over 80%).

Conclusion: Diagnosis and treatment of non-occlusive mesenteric ischemia (nomi) remain challenging in modern clinical practice, requiring accurate and punctual evaluation of all patients with predisposing factors for development of this dramatic and often fatal condition.

Keywords: Nonocclusive mesenteric ischemia, cardiac surgery, gastro-intestinal complications,

INTRODUCTION:

Nonocclusive mesenteric ischemia (NOMI) is rare but often lethal complication after cardiac surgery. [1] The use of vasopressors, age, implantation of intra-aortic balloon pump, the duration of cardio-pulmonary bypass

are the main risk factors described in the literature. Patients undergoing cardiac surgery today are at significantly increased risk compared to those of two decades ago, because of the aging of the population and the increased co-morbidity in these patients. [2, 3]

Diagnosis of abdominal complications after cardiac surgery is often delayed due to the lack of early specific clinical signs. [4] According to data from multiple clinical trials, risk factors for the development of these complications are: advanced age, long duration of cardiopulmonary bypass, low cardiac output, intra-aortic balloon pump. [5, 6] Unfortunately, in most of the patients the typical clinical manifestation of abdominal complications after cardiac surgery can often be masked due to prolonged sedation [7].

OBJECTIVES:

The objectives of this study are to be represented the most typical prognostic factors and clinical manifestations of NOMI, condition which is not so effortlessly diagnosed.

METHODS:

The study was designed as a retrospective study of all patients who underwent cardiac surgery operation in our institution from October 2002 to December 31, 2017. Data from clinical trials worldwide was also used for the preparation of this study.

RESULTS:

9298 patients were operated in our institution for the period 2002-2017. 114 (1.2%) developed abdominal complications after cardiac surgery. In 17 (0.2%), explorative laparotomy with bowel resection for nonocclusive mesenteric ischemia was performed. In the group of abdominal complications were also included: paralytic ileus - 50 (57%), gastrointestinal haemorrhage - 29 (33.06%), acute cholecystitis - 10 (11.4%)

Fig. 1. Abdominal complications as follows.

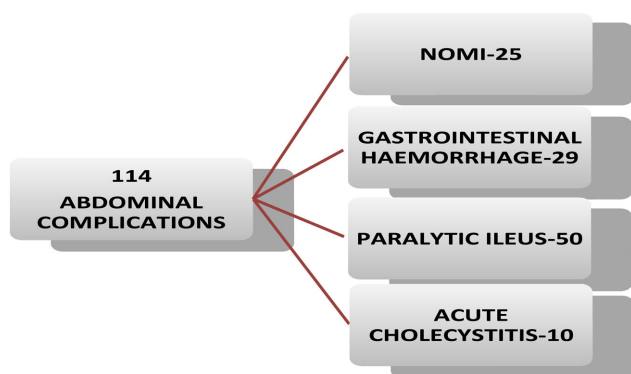


Table 1. Characteristic of the patients.

Age	61.2±19.7
	950/706
Comorbidities	
Arterial hypertension	1245
Diabetes mellitus	844
PMH of Myocardial infarction	421
Heart failure	974
Elective surgeries	1325
Urgent surgeries	331
Type of surgical intervention	
CABG	642
Valve replacement/ valve annuloplasty	320
CABG+	
Valve replacement/ valve annuloplasty	540
ATAAD - operations	154

All 114 patients with abdominal complications were divided in two groups in order to establish and determine the risk factors for development of NOMI.

In **group-A**, we included all (25 of 114) of the patients with confirmed NOMI and in **group-B** – the remaining cases (89 of 114).

Table 2. Group division of the patients with abdominal complications.

PARAMETERS	GROUP “A”	GROUP “B”
<i>PREOPERATIVE PARAMETERS</i>		
MEAN AGE	75.4±4.5	64.3±3.2
MALE GENDER (%)	18(72%)	40(44.9%)
Peripheral artery disease (PAD) (%)	16(64%)	35(39.3%)
Stroke or TIA	14(56%)	25(28.1%)
COPD	8(32%)	16(17.9%)
Smoking	19(76%)	54(60.6%)
Mean EuroSCORE	18.4±2.3	9.2±3.4
<i>INTRAOPERATIVE PARAMETERS</i>		
Cardiopulmonary bypass(min)	139±60.5	106±72.3
Aortic cross-clamp time	74±61.1	51±53.2
% IABP	13(52%)	20(22.5%)
<i>POSTOPERATIVE PARAMETERS</i>		
Low cardiac output syndrome (LCOS)	18(72%)	23(25.8%)
Ventilation duration> 48 h	20(80%)	29(32.5%)

DISCUSSION:

Abdominal complications following cardiac surgery, despite their low frequency, remain a serious problem for the surgeons, leading to high mortality, prolonged hospital stay and significant treatment costs. [8] The incidence of abdominal complications after cardiac surgery is 1-3%, but are associated with a mortality rate of 15-80%, according to meta-analyses and clinical trials worldwide [9]. Based on data from our retrospective study, the incidence of abdominal complications was 1.2%.

Nonocclusive mesenteric ischemia (NOMI) is rare but often lethal complication after cardiac surgery. Alterations in intestinal microcirculation during CPB contributes to intestinal hypoperfusion. [10, 11, 12] Impaired blood flow leads to compromised integrity of intestinal mucosa, which activate inflammatory reaction and bacterial translocation. Early diagnosis of NOMI is crucial for the prognosis of this severe condition. [13, 14] Hypotension, oliguria, increased serum lactate levels are not so uncommonly observed after cardiac surgery procedures, which results in delayed recognition of this disorder. [15, 16]

Angiography of the mesenteric artery is the gold standard test in "NOMI" evaluation by providing both diagnostic and therapeutic options (possibility of intravascular administration of vasodilators-papaverine). Less invasive and widely used diagnostic test is computed tomography (CT) with contrast enhancing of the abdomen.

The progression of NOMI is associated with poor prognosis for the patients. Despite the surgical exploration and necrotic bowel resection, the mortality rate in these patients is dramatically high (over 80%).

In our study in 25 patients, NOMI was observed in the early postoperative period. In 17 of them, explorative laparotomy with bowel resection was performed. In the remaining 8 cases, conservative treatment with heparin and vasodilators was performed. Unfortunately, the mortality rate of this patients was extremely high- 93%.

In conclusion, the main risk factors for mesenteric ischemia development are represented in table 3:

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REFERENCES:

1. Popova V, Vazhev Z, Peshev J, Geneva-Popova M, Paskaleva D, Ivanova M, et al. Abstract: P291. Analysis of serum levels of opg at 24 and 48 hours in patients with acute coronary syndrome and inflammatory joint disease. *Osteoporosis International (Abstract Book)*. 2018 Apr;29(Suppl 1):S214. [Internet]
2. Ott MJ, Buchman TG, Baumgartner WA. Postoperative Abdominal Complications in Cardiopulmonary Bypass Patients: A Case-Controlled Study. *Ann Thorac Surg*. 1995 May;59(5):1210-3. [PubMed]
3. Gaer JA, Shaw AD, Wild R, Swift RI, Munsch CM, Smith PL, et al. Effect of Cardiopulmonary Bypass on
4. Perugini RA, Orr RK, Porter D, Dumas EM, Maini BS. Gastrointestinal Complications Following Cardiac Surgery. An Analysis of 1477 Cardiac Surgery Patients. *Arch Surg*. 1997 Apr; 132(4):352-7. [PubMed]

Table 3. Risk factors for the development of early abdominal complications following cardiac surgery.

Preoperative:

Age > 75y.
BMI > 30kg/m²
Cardiac index < 30ml/m²
Hypoalbuminemia
Urgent operation

Intraoperative:

CPB > 140min.

Postoperative:

Hematocrit level < 30%
Mean arterial pressure (MAP) < 90mmHg
Cardiac index < 3.0L/min/m²

Abdominal dysfunction, associated with:

Postoperative increased creatinine levels
Neurological complications
Nosocomial infections
Prolonged mechanical ventilation
Prolonged stay in ICU
Death

CONCLUSION:

Early diagnosis and well-timed treatment are the key to successful reduction and prevention of abdominal complications following cardiac surgery. Diagnosis and treatment of non-occlusive mesenteric ischemia (nomi) remain challenging in modern clinical practice, requiring accurate and punctual evaluation of all patients with predisposing factors for development of this dramatic and often fatal condition.

5. McSweeney ME, Garwood S, Levin J, Marino MR, Wang SX, Kardatzke D, et al. Adverse Gastrointestinal Complications After Cardiopulmonary Bypass: Can Outcome Be Predicted From Preoperative Risk Factors? *Anesth Analg*. 2004 Jun;98(6):1610-7. [[PubMed](#)]
6. Mangi AA, Christison-Lagay ER, Torchiana DF, Warshaw AL, Berger DL. Gastrointestinal Complications in Patients Undergoing Heart Operation: An Analysis of 8709 Consecutive Cardiac Surgical Patients. *Ann Surg*. 2005 Jun;241(6):895-901. [[PubMed](#)]
7. Ashfaq A, Johnson DJ, Chapital AB, Lanza LA, DeValeria PA, Arabia FA. Changing Trends in Abdominal Surgical Complications Following Cardiac Surgery in an Era of Advanced Procedures. A Retrospective Cohort Study. *Int J Surg*. 2015 Mar 1;15:124-8. [[PubMed](#)]
8. Chaudhuri N, James J, Sheikh A, Grayson AD, Fabri BM. Intestinal Ischaemia Following Cardiac Surgery: A Multivariate Risk Model. *Eur J Cardiothorac Surg*. 2006 Jun;29(6):971-7. [[PubMed](#)]
9. Golitaleb M, Kargar F, Aghai FG, Harorani M, Jadidi A, Abkenar HB, et al. Hyperbilirubinemia after open cardiac surgery. *Iranian Heart Journal*. 2017 Jun 1;18(2):30-5.
10. Golitaleb M, Haghazali M, Golaghaie F, Ghadrdoost B, Sahebi A, Kargar F. Changes in Liver Enzymes in the Patients Undergoing Open Cardiac Surgery and Related Factors. *Int J Adv Biotechnol Res*. 2017 Jan 1;8(3):2086-91.
11. Egleston CV, Wood AE, Gorey TF, McGovern EM. Gastrointestinal Complications After Cardiac Surgery. *Ann R Coll Surg Engl*. 1993 Jan;75(1):52-6. [[PubMed](#)]
12. Andersson B, Nilsson J, Brandt J, Höglund P, Andersson R. Gastrointestinal Complications After Cardiac Surgery. *Br J Surg*. 2005 Mar;92(3):326-33. [[PubMed](#)]
13. Geissler HJ, Fischer UM, Grunert S, Kuhn-Rågnier F, Hoelscher A, Schwinger RHG, et al. Incidence and Outcome of Gastrointestinal Complications After Cardiopulmonary Bypass. *Interact Cardiovasc Thorac Surg*. 2006 Jun;5(3):239-42. [[PubMed](#)]
14. Sakorafas GH, Tsiotos GG. Intra-abdominal Complications After Cardiac Surgery. *Eur J Surg*. 1999 Sep;165(9):820-7. [[PubMed](#)]
15. Khan JH, Lambert AM, Habib JH, Broce M, Emmett MS, Davis EA. Abdominal Complications After Heart Surgery. *Ann Thorac Surg*. 2006 Nov;82(5):1796-801. [[PubMed](#)]
16. Chaudhry R, Zaki J, Wegner R, Pednekar G, Tse A, Sheinbaum R, et al. Gastrointestinal Complications After Cardiac Surgery: A Nationwide Population-Based Analysis of Morbidity and Mortality Predictors. *J Cardiothorac Vasc Anesth*. 2017 Aug;31(4):1268-74. [[PubMed](#)]

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