

Case Report

<https://doi.org/10.23934/2223-9022-2025-14-2-448-452>

Endovascular Methods of Stopping Arterial Bleeding: Experience of a City Multidisciplinary Hospital

T.I. Gaygiev^{1, 2}✉, G.M. Kostanyan^{1, 2}, N.A. Nikolaev²

Department of X-ray Surgical Methods of Diagnosis and Treatment

¹ Clinical Medical and Sanitary Unit No. 9

5-Kordnaya Str. 73, Omsk, Russian Federation 644018

² Omsk State Medical University

Lenin Str. 12, Omsk, Russian Federation 644099

✉ **Contacts:** Tagir I. Gaygiev, Assistant, Department of Extreme and Evidence-Based Medicine, Omsk State Medical University; Specialist in the Field of X-ray Endovascular Diagnosis and Treatment, Department of X-ray Surgical Methods of Diagnosis and Treatment, Clinical Medical and Sanitary Unit No. 9. Email: dag-0515@mail.ru

ABSTRACT Bleeding continues to be an urgent problem of emergency medicine, posing a threat to the patient's life. Generally accepted methods of stopping bleeding are for the most part highly effective, but there are unusual clinical cases where these methods are ineffective. The widespread introduction of angiographic devices in multidisciplinary hospitals has created opportunities for the use of endovascular methods of temporary and final bleeding arrest. The article provides a brief literature review and description of clinical cases of endovascular bleeding arrest.

Keywords: bleeding, surgery, endovascular methods, clinical case

For citation Gaygiev TI, Kostanyan GM, Nikolaev NA. Endovascular Methods of Stopping Arterial Bleeding: Experience of a City Multidisciplinary Hospital. *Russian Sklifosovsky Journal of Emergency Medical Care*. 2025;14(2):448–452. <https://doi.org/10.23934/2223-9022-2025-14-2-448-452> (in Russ.)

Conflict of interest Authors declare lack of the conflicts of interests

Acknowledgments, sponsorship The study has no sponsorship. The study was carried out in accordance with the scientific research plan of Omsk State Medical University

Affiliations

Tagir I. Gaygiev	Assistant, Department of Extreme and Evidence-Based Medicine, Omsk State Medical University; Specialist in the field of X-ray Endovascular Diagnosis and Treatment, Department of X-ray Surgical Methods of Diagnosis and Treatment, Clinical Medical and Sanitary Unit No. 9; https://orcid.org/0000-0002-1409-7531 , dag-0515@mail.ru; 50%, concept and design of the study, collection and processing of material, surgical intervention, text writing
Garegin M. Kostanyan	Assistant, Department of Topographic Anatomy and Operative Surgery, Omsk State Medical University; Head, Department of X-ray Surgical Methods of Diagnosis and Treatment, Clinical Medical and Sanitary Unit No. 9; https://orcid.org/0000-0001-8266-9215 , manches28@mail.ru; 30%, concept and design of the study, collection and processing of material, surgical intervention
Nikolai A. Nikolaev	Doctor of Medical Sciences, Associate Professor, Head, Department of Extreme and Evidence-Based Medicine, Omsk State Medical University; https://orcid.org/0000-0002-3758-4930 , med@omsk-osma.ru; 20%, concept and design of the study, text editing

GSD — gallstone disease

MN — malignant neoplasm

INTRODUCTION

Bleeding remains a pressing problem in emergency medical care. Its relevance is primarily due to high mortality and the need for additional socio-economic costs for the treatment of this category of patients. Timely diagnostic and therapeutic endoscopy allows stopping bleeding from the gastrointestinal tract in 98% of cases [1]. Older age, concomitant pathology, and the need for multiple blood transfusions of blood components are

factors that worsen the prognosis. Mortality rate during surgical interventions at the height of bleeding is 20–40% [2].

Endovascular arterial bleeding control is considered as an alternative to open surgery, especially in high-risk surgical patients, and in cases of endoscopically uncontrolled bleeding [3]. In some cases, endovascular cessation of arterial bleeding is a temporary measure to preserve vital functions, and prepare for open surgery.

The main advantages of the method are the ability to perform the intervention immediately during diagnostic angiography, a rapid hemostatic effect, and the absence of the need to perform open access in order to isolate the damaged vessel [4].

Problems may include the development of post-embolization syndrome in individual cases (but it should be noted that it is more typical for embolization performed to ensure ischemia of individual areas of the organ rather than for hemostasis) [5]. Contrast-induced nephropathy is a relatively rare complication [6].

In endovascular surgery, similarly to open surgery, bleeding control methods are divided into temporary and final ones. Temporary methods of stopping bleeding primarily include the use of an intra-aortic balloon, as well as selective use of a balloon catheter. Embolization with a gelatin or fibrin sponge is also a temporary measure, as it allows reperfusion of the embolized area after some time. Definitive methods of endovascular hemostasis include: superselective embolization with microparticles, N-butyl-2-cyanoacrylate, and polyvinyl alcohol; selective coil block; stent graft or occluder implantation [7]. Within the framework of a specific clinical case, it is possible to use various methods of both temporary and final stopping of bleeding in order to achieve an optimal clinical result [8].

The three clinical cases presented below demonstrate different options for an individual multidisciplinary approach to stopping bleeding using endovascular techniques in patients in a multidisciplinary hospital.

Clinical observation 1

Female patient T., 82 years old, was admitted to the emergency department complaining of pain in the right hypochondrium and yellowing of the skin. It is known from the anamnesis that pain in the right hypochondrium has been bothering her for 2 weeks, while she noted gradual yellowing of the skin. She did not seek medical help. She was examined by a surgeon at the emergency room, and a preliminary diagnosis was made: gallstone disease (GSD). Acute cholecystitis. A number of laboratory and instrumental research methods were prescribed to clarify the diagnosis. A

complete blood count reveals a decrease in hemoglobin concentration (95 g/l), leukocytosis (12×10^9 U/l), and an increase in the erythrocyte sedimentation rate (40 mm/hour). Blood biochemistry: total bilirubin 109.4 (1.7–20.5) μ mol/l, aspartate aminotransferase 96.0 (1.0–50.0) U/l, alanine aminotransferase 178.0 (1.0–45.0) U/l, C-reactive protein 18 (0–6) mg/l. Coagulogram (express): activated partial thromboplastin time 37 (22–40) s, prothrombin time 11.00 (10–12) s, prothrombin index 41.00 (70–130)%.

During ultrasound examination of the abdominal cavity, an enlarged gallbladder (120×80 mm) with isohyperechoic contents of the cavity without a clear acoustic shadow, an enlarged common bile duct, and intrahepatic ducts were visualized. Isoechogenic contents were visualized in the lumen of the bile ducts. The patient was hospitalized in the surgical department. Upper midline laparotomy, cholecystectomy, revision, sanitation and drainage of the common bile duct (the Kehr procedure) were performed. Drainage of the abdominal cavity. Macroscopic specimen of the gallbladder: the walls of the gallbladder were thickened, compacted, whitish in color. There was a large amount of blood in the cavity, filled with multiple stones with polished surfaces.

Against the background of relative well-being in the early postoperative period, a hemorrhagic component in the bile was noted through the choledochostomy. The multidisciplinary team decided to perform aortography of the abdominal aorta and selective angiography of the hepatic artery in order to identify the source of bleeding.

Selective angiography of the hepatic artery revealed an aneurysmal dilation of the hepatic artery branch in the projection of IV segment with an arteriobiliary fistula (Fig. 1). A decision was made to embolize a branch of the hepatic artery. Superselective catheterization of the target branch of the hepatic artery to the aneurysm neck was performed, followed by embolization with HILAL 2.0–2 embolization coils (Fig. 2). Control angiography shows blockade of the target branch of the artery. The operation was uneventful. In the postoperative period, despite optimal drug therapy, hemobilia along the choledochostomy was not determined. On the 2nd day after the installation of the choledochostomy, the drainage was removed.

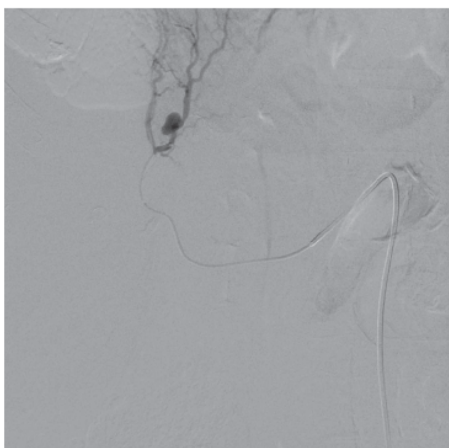


Fig. 1. Selective angiography of branches of the hepatic artery



Fig. 2. Selective angiography after embolization of the target branch of the hepatic artery

The patient was discharged on the 16th day in a satisfactory condition. Discharge diagnosis: GSD. Chronic calculous cholecystitis. Hepatic artery aneurysm. Arterio biliary fistula. Hemobilia with tamponade of the gallbladder and bile ducts. Biliary hypertension. Cholangitis. Moderate anemia. Atherosclerotic heart disease. Chronic heart failure stage I, functional class II. Senile asthenia. Cognitive impairment.

Clinical observation 2

Female patient R., 41 years old, was admitted to the emergency department with complaints of scanty blood discharge from the anus, about 10 days; the patient also noted a pulling pain in the left hypochondrium. It was known from the anamnesis that more than a year ago the patient had been treated in

hospital with the diagnosis of acute destructive pancreatitis. After conservative treatment, the patient was discharged in a satisfactory condition. Before this hospitalization, she did not seek medical help, she eliminated discomfort in the left hypochondrium by taking antispasmodic and analgesic drugs. The patient was hospitalized in the surgical department to clarify the diagnosis. Laboratory and instrumental research methods were performed according to current clinical guidelines. A general blood test showed a decrease in the hemoglobin level (85 g/l); other indicators, including biochemical ones, corresponded to reference values. Colonoscopy and fibrogastroduodenoscopy were performed - cardia insufficiency, mild atrophic pangastritis, superficial duodenitis, a developing polyp up to 4 mm was detected in the middle third of the sigmoid colon, removed during biopsy. The source of bleeding was not found.

For the purpose of further diagnostic search, multispiral computed tomography with intravenous contrast was performed - signs of pancreatitis with the formation of pseudocysts, cystoarterial fistula in the area of the tail of the pancreas.

The multidisciplinary team decided to perform direct aortography to clarify the source of bleeding. Selective angiography in the distal third of the splenic artery visualizes active contrast discharge into the cavity of the pancreatic pseudocyst (Fig. 3). It was decided to implant a stent graft in the distal third of the splenic artery. After selective catheterization of the splenic artery with a guiding catheter and insertion of the guiding catheter into the distal third of the splenic artery, a Papyrus 5.0×26 mm coronary stent-graft was implanted. During control angiography, contrast discharge into the pseudocyst cavity was not detected, blood flow in the splenic artery was preserved (Fig. 4). On the 10th day after stent graft implantation, a repeat multispiral computed tomography with intravenous contrast was performed - contrast discharge through the splenic artery was not detected, blood flow in the splenic artery was preserved.

The patient was discharged from the hospital on the 16th day in a satisfactory condition. Diagnosis at discharge: postnecrotic cyst of the tail of the pancreas as a result of acute destructive pancreatitis. Erosive defect of the distal third of the splenic artery with formation of a cystoarterial fistula. Established intestinal bleeding. Forming colon polyp. Mild anemia (hemoglobin 101 g/l). Dual antiplatelet therapy (clopidogrel 75 mg and aspirin 100 mg) for 6 months was recommended.

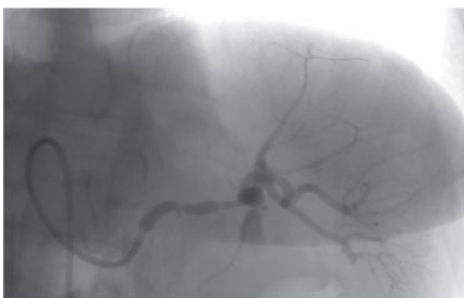


Fig. 3. Selective angiography of the splenic artery. A cystoarterial fistula is visualized



Fig. 4. Selective angiography of the splenic artery after stent graft implantation

Clinical observation 3

Patient E., 61 years old, was admitted to the emergency department. According to him, profuse bleeding from the anus began 2 hours ago. The patient was examined in the emergency department according to the nosology. A general blood test showed a decrease in hemoglobin (69 g/l). Other laboratory parameters were unchanged. Due to the severity of the condition and ongoing bleeding, the patient was hospitalized in the intensive care unit. It was known from the anamnesis that the patient had previously been consulted by an oncologist regarding a malignant neoplasm of the colon, but refused treatment. The multidisciplinary team decided to perform direct angiography of the inferior mesenteric artery and embolization of the target branch of the artery. Selective catheterization of the inferior mesenteric artery was performed in the X-ray operating room using the transbrachial access. Angiography showed active discharge of contrast into the rectal cavity from the superior rectal artery (Fig. 5). Superselective embolization of the target artery was performed using HILAL 1.0-3, TORNADO 4.0-2 and TORNADO 8.0-5 embolization coils. Control angiography revealed occlusion of the superior rectal artery and cessation of bleeding from the anus (Fig. 6). The patient underwent blood transfusion, the condition was stabilized. On the 2nd day, there was a repeated deterioration in the

condition, severe pain in the left half of the abdomen. There was no evidence of recurrence of bleeding. An emergency surgical intervention was performed in the following volume: mid-lower midline laparotomy, revision of the abdominal organs. Examination of the sigmoid colon revealed segmental necrosis. Resection of the sigmoid colon with formation of an end colostomy was performed. In the postoperative period, there was an improvement in the patient's condition. The patient was discharged from the hospital on the 17th day in a satisfactory condition. Discharge diagnosis: rectal malignant neoplasm complicated by bleeding. T4 Nx Mx; St: IIb. Clinical group II. Embolization of the superior rectal artery with embolization coils. Segmental necrosis of the sigmoid colon. Sigmoid colon resection with end colostomy. Moderate posthemorrhagic anemia. Optimal drug therapy and oncologist consultation were recommended.



Fig. 5. Selective angiography of the superior rectal artery. Contrast relief into the lumen of the rectum is visualized



Fig. 6. Selective angiography after embolization of the superior rectal artery

CONCLUSION

The presented clinical cases confirm the wide possibilities of endovascular hemostasis. The use of temporary methods of stopping bleeding allows stabilizing the patient's condition and preparing for open surgery. Selective occlusion of arteries ensures stopping bleeding in hard-to-reach locations, which eliminates the risk of additional surgical trauma. By introducing angiographic units into multidisciplinary hospitals, it is possible to

significantly reduce the incidence of complications and the overall mortality rate in injuries and bleeding of various localizations. However, the lack of sufficient funding to provide the necessary instruments and, more importantly, the lack of basic knowledge in the field of endovascular surgery with a low level of interaction between doctors within multidisciplinary teams are the leading factors hindering the active implementation of these treatment methods into widespread clinical practice.

REFERENCES

1. Liou TC, Lin SC, Wang HY, Chang WH. Optimal injection volume of epinephrine for endoscopic treatment of peptic ulcer bleeding. *World J Gastroenterol*. 2006;12(19):3108–3113. PMID: 16718798 <https://doi.org/10.3748/wjg.v12.i19.3108>
2. Kvashin AI, Atamanov SA, Mel'nik AV, Bykov AO, Pomkin AA, Shirkin MG, et al. Endovaskulyarnyy gemostaz pri duodenal'nom krovotachenii. *International Journal of Interventional Cardioangiology*. 2012;(31):19–25. (In Russ)
3. Loffroy R, Guiu B. Role of transcatheter arterial embolization for massive bleeding from gastroduodenal ulcers. *World J Gastroenterol*. 2009;15(47):5889–5897. PMID: 20014452 <https://doi.org/10.3748/wjg.15.5889>
4. Yurova MV, Budanov PV. Transcatheter embolization of iatrogenic renal artery pseudoaneurysms (literature review). *Trudnyy patsient*. 2018;16(5):44–47. (In Russ)
5. Delgal A, Cercueil JP, Koutlidis N, Michel F, Kermarrec I, Mourey E, et al. Outcome of transcatheter arterial embolization for bladder and prostate hemorrhage. *J Urol*. 2010;183(5):1947–1953. PMID: 20303518 <https://doi.org/10.1016/j.juro.2010.01.003>
6. Tan L, Venkatesh SK, Consigliere D, Heng CT. Treatment of a patient with post-TURP hemorrhage using bilateral SAPE. *Nat Rev Urol*. 2009;6(12):680–685. PMID: 19956198 <https://doi.org/10.1038/nrurol.2009.215>
7. Sayani R, Azeemuddin M, ul Haq T, Hamid RS, Salam B. An institutional review of transarterial embolization in haemorrhagic urological emergencies. *J Pak Med Assoc*. 2012;62(2):107–111. PMID: 22755368
8. Bonne L, Gillardin P, De Wever L, Vanhoutte E, Joniau S, Oyen R, et al. Endovascular management of severe arterial haemorrhage after radical prostatectomy: A case series. *Cardiovasc Intervent Radiol*. 2017;40(11):1698–1705. PMID: 28593393 <https://doi.org/10.1007/s00270-017-1715-0>

Received on 07/06/2024

Review completed on 22/08/2024

Accepted on 24/03/2025