

Endovascular treatment of a ruptured aneurysm of the right gastric artery — case report

Lukasz Hapka¹, Grzegorz Halena²

¹Department of General Surgery, Specialist Hospital in Chojnice, Poland

²Department of Cardiac and Vascular Surgery, Medical University in Gdansk, Poland

Abstract

Due to the increasing number of imaging studies performed by various medical specialties we observe a significant increase in the incidentally discovered visceral arterial aneurysms, most of which are asymptomatic. In this paper, we present a case of 71-year-old woman admitted to another hospital in a hemorrhagic shock and bleeding to the peritoneal cavity. After emergency laparotomy, which failed to find and control the source of bleeding, the patient was transferred to our institution. During CTA a bleeding visceral aneurysm was discovered. After previous unsuccessful open surgical attempt, we decided to try the endovascular approach first and were able to implant two stentgrafts into the proper hepatic artery via brachial approach successfully controlling the bleeding. In the postoperative period there were no signs of bleeding into the peritoneal cavity, and liver function remained unimpaired. The paper discusses the epidemiology, etiology, diagnosis and treatment of this rarely described acute condition. We were also able to demonstrate the long-term durability of the emergency procedure with a 6-year follow-up showing patency of the hepatic artery without any signs of restenosis despite the use of previous generation stentgrafts.

Key words: right gastric artery, ruptured visceral artery aneurysm, endovascular treatment, common celiacomesenteric trunk

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Introduction

We present a case of a 71-years-old female patient, admitted to the district general surgery department in hemorrhagic shock. After admission an emergency exploratory laparotomy was performed, during which 1500 mL of blood and clots were evacuated from the peritoneal cavity. The laparotomy revealed a hematoma in the region of transverse colon, hepato-gastric ligament and smaller omentum. After abdominal cavity inspection and failure to find the source of bleeding, the patient was transferred to the Department of Cardiac and Vascular Surgery, Medical University of Gdansk.

The patient arrived intubated, with systolic blood pressure of 90 mm Hg. The CTA performed upon arrival demonstrated bleeding from a small, 16 mm

aneurysm arising from the common hepatic artery (Fig. 1A); it also revealed a vascular anomaly in the form of a common celiacomesenteric trunk (Fig. 1B). Considering the failure of previous laparotomy it was decided to attempt endovascular treatment first given the favorable anatomy for endovascular access from the upper extremity.

After the puncture of the left brachial artery, selective angiography of the common visceral vessel confirmed a small aneurysm of vessel fed by the proper hepatic artery (most likely the right gastric artery) (Fig. 1C). No active bleeding was detected during selective contrast injection into the hepatic artery. Introducer sheath was exchanged for a 9F short sheath and two overlapping stentgrafts (Wallgraft 7/20 mm and 8/20 mm, Boston Scientific, Natick, MA, USA) were implanted

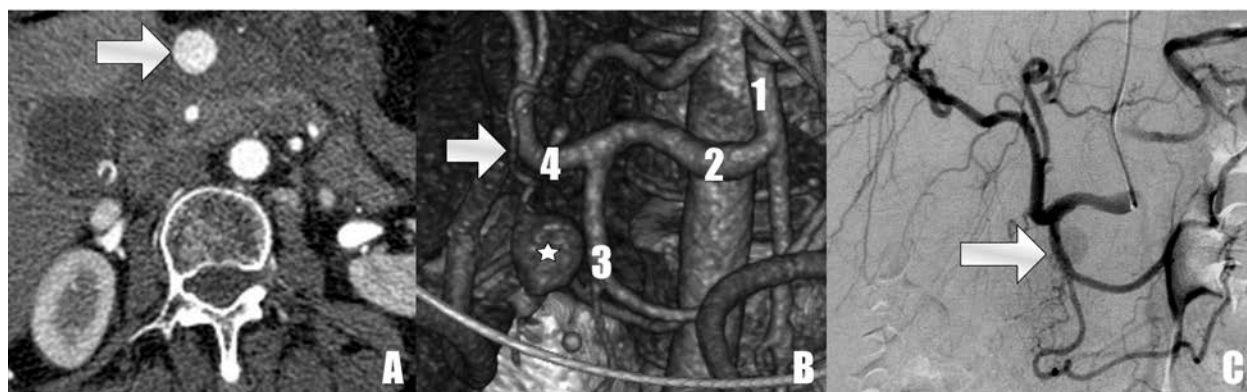


Figure 1A. CTA: aneurysm of the right gastric artery (arrow); **B.** CTA reconstruction: RGA — arrow, star — RGA aneurysm, 1 — common celiacomesenteric trunk, 2 — common hepatic artery, 3 — gastroduodenal artery, 4 — proper hepatic artery; **C.** Aneurysm seen on selective angiography

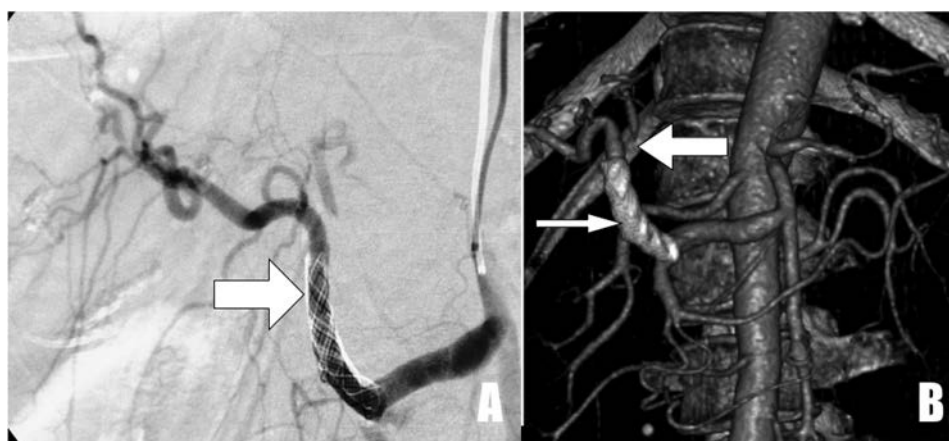


Figure 2A. Visceral vessels angiography post stentgraft implantation to the common hepatic artery; **B.** CTA reconstruction: stentgraft in the common hepatic artery (small arrow), filling of the left hepatic artery (bigger arrow) despite stentgraft coverage

over the 300 cm SupraCore guide wire (Abbott Vascular, Santa Clara, CA, USA) covering the proper hepatic artery from the take-off of the gastro-duodenal artery to the division of the proper common hepatic artery (Fig. 2A). Left hepatic artery was inadvertently covered with the second stentgraft (Fig. 2B). Completion angiography confirmed exclusion of the aneurysm and no active bleeding. Due to the large sheath size, the left brachial artery was repaired surgically after the sheath had been removed.

Despite the need to cover the left hepatic artery, no postoperative liver function impairment was observed; there were no signs of bleeding into the peritoneal cavity.

After 48 hours in the ICU unit the patient was extubated and further postoperative course was uneventful. The patient was discharged home on the 8th postoperative day with liver function tests being within normal limits and primary healing of the laparotomy incision. During the 80-month observation period, we confirmed

successful exclusion of the aneurysm, patency of the hepatic artery and no recurrent bleeding.

Case study

We present an infrequent case of a patient with bleeding and shock as a result of small visceral artery aneurysm rupture into the peritoneal cavity. Based on CT reconstructions we estimated that the vessel feeding the aneurysm was the right gastric artery; however, this opinion can be challenged as we dealt with a rare anatomical variation (common celiacomesenteric trunk). There is a feeding vessel seen on the CTA reconstruction (Fig. 1B) which we thought was the right gastric artery, although the aneurysm itself is in the vicinity of the gastroduodenal artery. Estimated incidence of this type of vascular configuration is 0.24% [1]; this embryonic anomaly may predispose arteries to congenital effects of the vessel wall leading to aneurysm formation [2].

The incidence of visceral arterial aneurysms (VAA) found at autopsy is estimated to be 0.01–0.2% [3]. Most of the VAA remain asymptomatic and are detected during abdominal imaging studies. Due to the high risk of rupture (25%), and even higher mortality (20–70%) of patients in whom they rupture [4], even incidental VAA discovery warrants surveillance and possible intervention.

Gastric artery aneurysms (GAA) comprise from 3.2% [3] to 4% [5] of all the VAA; the incidence of aneurysms of the right gastric artery is estimated to be 0.001% [6]. Most often they occur in the 6th or the 7th decade of life, predominantly in men. The etiology of GAA remains unknown [7]. Due to the frequent histological confirmation of the presence of atherosclerosis in many aneurysms it was suggested to be the main etiological factor [8]. Currently, it is believed that medial degeneration of the vessel wall is the primary cause and atherosclerosis is secondary to that process. Among other etiologic factors we can mention hypertension, blunt abdominal trauma or aneurysm formation as a result of infiltration of pro-inflammatory pseudocysts in acute pancreatitis [9].

Asymptomatic GAA are rarely described. If they become symptomatic the most common presentation is rupture (90%), followed by hematemesis (70%) and bleeding into the peritoneal cavity (30%) [10, 11]. Diagnostic imaging based on CTA and Doppler can rarely explicitly verify the cause of gastrointestinal bleeding; mucosal changes during gastroscopy are often incorrectly assessed as ulceration of the stomach wall or tumors [12]. Often the diagnosis is made during exploratory laparotomy performed because of gastrointestinal bleeding or bleeding into the abdominal cavity.

Therapeutic options depend on the general condition of the patient; in those hemodynamically unstable, emergency laparotomy is usually performed with ligation of the bleeding vessel. Endovascular treatment is preferred in patients in stable condition and also in those with coexisting cardiovascular risks for open surgery. The endovascular options include selective embolization with coils [12] or implantation of stentgrafts. Embolization of the vessel allows for precise closure of the bleeding vessels; however, at the same time it cuts off the blood supply to the target organ. If there is a coexisting tumor, embolization can also offer a bridge to the radical surgical treatment by reducing the size of the bleeding neoplasm. This method is not without its drawbacks; abscess formation around the foreign body or migration of embolization material has been reported in the literature [10]. The implantation of stentgrafts controls the bleeding while maintaining patency of the vessel and proper function of the organs supplied. However, this approach is only possible with

proper configuration of visceral vessels, which may be too tortuous (especially branches of the celiac trunk), or too small in diameter for available stentgrafts or lesions located close to vital vessel bifurcations.

Embolization should be considered especially in patients with tortuous anatomy, when stentgraft delivery is impossible, given the anatomical variation in our patient and invisible feeding vessel during selective angiography, stentgraft was chosen as the best option. Additionally with common celiacomesenteric trunk anatomy and lack of potential collateral pathways embolization of the hepatic artery was deemed too dangerous.

Another endovascular method that deserves to be mentioned is direct thrombin injection in to the aneurysm sac. It can be used as a supplementary method when incomplete exclusion of the aneurysm was achieved after stentgraft implantation or coil embolization. The delivery of the thrombin can be achieved intravascularly, but it seems that percutaneous delivery and avoiding the contact of the pro-clotting factor with blood stream may be a safer solution. The combination of stentgraft implantation and later successful percutaneous, ultrasound-guided thrombin injection into the partially thrombosed aneurysm of the superior mesenteric artery has been described in the literature [14].

The last treatment option is the use of Multilayer Flow Modulator (MFM) stents in peripheral aneurysms, including visceral vessels. Dorigo et al. [15], suggest that MFM stents can be used in selected cases of visceral aneurysms when preservation of vital collaterals is necessary. MFM stents however should not be used in cases of bleeding or rupture, as they are flow diverters converting the blood flow in the aneurysm from turbulent to laminar. It should be kept in mind that MFM stents are not stentgrafts isolating the blood stream from the aneurysm.

With the good “endovascular” anatomy and easy access from the arch vessels, implantation of a stentgraft can be preferred over potentially faster embolization techniques even in ruptured cases. We were able to achieve immediate exclusion of the aneurysm and to preserve the function of the liver. The liver enzymes and bilirubin concentrations were within normal limits on the day the patient was transferred from the ICU department. In the post intervention CTA study, the left, covered hepatic artery can be seen filling through collateral circulation.

Endovascular procedures are often regarded as not very durable and prone to reinterventions. We were able to show not only the acute procedural success, but also excellent long-term durability, preservation of the hepatic artery, freedom from reinterventions and the disappearance of the VAA. Moreover, we have not

observed restenosis in implanted stentgrafts during 80 weeks of the follow-up.

Conclusions

Despite increasing frequency of incidentally discovered visceral aneurysms, the emergency presentation (bleeding or rupture) of this entity is rare. We described this case to demonstrate the benefits of image-guided endovascular intervention over exploratory laparotomy in the emergent setting. Pre-procedural CTA not only helped us to localize the pathology, but thanks to the favorable anatomy of visceral branches also determined the feasibility of approach from the left brachial artery.

The open surgical intervention is often deemed to be more durable than endovascular approach; however after 6 years of follow-up and unimpaired patency of the hepatic artery and stentgrafts we also demonstrated durability of the emergency endovascular procedure despite using older generation stentgrafts.

Covering the whole segment of the hepatic artery with stentgrafts resulted not only in controlling the bleeding but also the and preservation of the end-organ supplied by the hepatic artery. The presented case supports the “endovascular first” approach for bleeding to the peritoneal or retroperitoneal cavity, as precise diagnosis and image-guided treatment is possible in the majority of cases.

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