Name of Journal: World Journal of Clinical Cases
Manuscript NO: 77374
Manuscript Type: CASE REPORT

Fatal bleeding due to aorto-oesophageal fistula: A case report and review of literature

Cancer and bleeding from gut

1 Davorin Čeranič, Sara Nikolić, Jernej Lučev, Aleš Slanič, Tatjana Bujas, Andreja Ocepek, Pavel Skok
Abstract

BACKGROUND
Aorto-oesophageal fistula is an extremely rare cause of acute upper gastrointestinal bleeding.

CASE SUMMARY
We present a case of an 80-year-old woman with oesophageal cancer who was admitted to our department with haemorrhagic shock due to UGIB. During the diagnostic procedure, emergency computed tomography angiography was performed, confirming aorto-oesophageal fistula. Interventional radiologists inserted a stent graft into the aorta, successfully closing the fistula. Unfortunately, the patient died later of heart failure, following irreversible haemorrhagic shock. Autopsy confirmed the aorto-oesophageal fistula, which formed one centimetre below the distal edge of the stent previously inserted into the oesophagus due to malignant stricture.

CONCLUSION
Certain causes of UGIB are very rare. Despite correct clinical decisions during the diagnostic workup of these patients, we have to be aware of the limitations of various therapeutic options, even the most contemporary.

Key Words: aorto-oesophageal fistula; upper gastrointestinal bleeding; interventional radiology; stent graft.


Core Tip: Acute upper gastrointestinal bleeding (UGIB) is a life-threatening condition. The majority of UGIB are of benign course, only a minority have a severe and fatal
outcome. Improved diagnostic and therapeutic options have been made possible in particular by technological advances in interventional endoscopy, radiology and minimally invasive, laparoscopic surgery. In the paper the authors present a patient with UGIB caused by an aorto-oesophageal fistula, which formed due to a stent inserted into the middle third of the oesophagus due to advanced cancer. Despite appropriate and timely clinical decisions, the outcome of treatment was fatal.

**INTRODUCTION**

Acute upper gastrointestinal bleeding (UGIB) is a life-threatening condition we encounter in everyday emergency medicine. Despite the progress made in the pharmacological treatment of ulcer diseases, peptic duodenal or stomach ulcers remain the leading cause of UGIB [1, 2]. Other common causes of UGIB include ruptured oesophageal and/or stomach varices, Mallory-Weiss syndrome (laceration at the site of oesophagogastric junction), and haemorrhagic erosiones of the upper gastrointestinal mucosa. Dieulafoy's lesion, angiodyplasia and aortoenteric fistula are rare causes of UGIB [3-8]. Acute UGIB is a condition requiring careful clinical evaluation, effective early symptomatic treatment, targeted diagnostic procedures to identify the cause of bleeding and effective haemostatic techniques [2]. Despite the established recommendations for the treatment of these patients as well as improved diagnostic and therapeutic options enabled by advanced interventional methods in the fields of endoscopy, radiology and minimally invasive surgery, we occasionally face challenges that cannot always be overcome successfully and in a timely manner [6-8].

We present a patient with fatal UGIB caused by an aorto-oesophageal fistula, which formed after the stent inserted into the middle third of the oesophagus due to advanced cancer.

**CASE PRESENTATION**

*Chief complaints*
An 80-year-old female patient with carcinoma of the middle third of the oesophagus was admitted to the department of gastroenterology in haemorrhagic shock, following UGIB presenting with haematemesis.

**History of present illness**

Four months prior to admission, the patient was diagnosed with squamous cell carcinoma, assessed as stage T4N2M1[Mr1],[Mr2] the middle third of the oesophagus. Due to patient’s age and associated diseases conservative non-surgical treatment was decided upon by the multidisciplinary council [Mr3] Palliative radiotherapy was performed TD 36 Gy in total, after dose fractionation 12 X 3 Gy.. Immediately after the completion of palliative radiotherapy[Mr4] an oesophageal self-expandable, fully covered nitinol stent preloaded in a delivery system (type SX - ELLA 85) was inserted across the malignant stricture.

**History of past illness**

In recent years, the patient had been treated for heart failure, atrial fibrillation, arterial hypertension and hyperlipidaemia. Her regular therapy was bisoprolol fumarate, enalapril, fluvastatin, and the anticoagulant medication warfarin.

**Personal and family history**

In the past the patient was successfully treated for breast cancer 15 years ago with surgery and radiochemotherapy. During the follow-up no signs of disease recurrence were confirmed.

**Physical examination**

At admission patient was found to have relative hypotension, BP 114/51, absolute arrhythmia with HR 88/min, signs of anaemia, traces of blood in her mouth and massive melena with blood clots in the rectal ampulla.
Laboratory examinations
A complete blood count (CBC) confirmed anaemia: red blood cell count (RBC) $2.6 \times 10^{12}$, haemoglobin (HGB) value 75 g/L, prothrombin time (PT) was 0.35 and international normalized ratio (INR) 2.03.

Imaging examinations
After initial resuscitation, including the placement of central venous access through the right femoral vein, delivery of crystalloid solutions, intravenous medications (the proton pump inhibitor pantoprazole, the antifibrinolytic agent tranexamic acid, the antiemetic thiethylperazine, and vitamin K preparation), transfusions, and infusions of fresh frozen plasma, we performed emergency computed tomography angiography (CTA). Computed Tomography (CT) imaging confirmed bleeding through the aorto-oesophageal fistula one centimetre distal to the distal edge of the oesophageal stent (Figure 1). The recommended treatment was placement of a stent graft into the aorta to close the fistula.

FINAL DIAGNOSIS
Computed Tomography (CT) imaging confirmed bleeding through the aorto-oesophageal fistula one centimetre distal to the distal edge of the oesophageal stent (Figure 1).

TREATMENT
The recommended treatment was placement of a stent graft into the aorta to close the fistula. Using a local anaesthetic, we performed an ultrasound (US)-guided retrograde femoral artery puncture and successfully placed a stent, type BeGraft, Bentley (introducer sheath 16 FR, graft BeGraft Bentley 22x48 mm), at the site of bleeding in the distal part of the descending thoracic aorta (Figure 2). A control CBC prior to intervention showed that her anaemia had progressed, with RBC $2.03 \times 10^{12}$ and HGB value 59 g/L. During the procedure, which took 15 minutes from puncture of the
femoral artery to insertion of the stent, the patient was supervised by the anaesthesiologist and received intravenous vasopressors phenylephrine and ephedrine. Once the procedure was completed, and successful closure of the fistula was confirmed angiographically we continued to treat the patient at the department of gastroenterology.

OUTCOME AND FOLLOW-UP
Despite continued resuscitation attempts and intensified symptomatic treatment, the patient’s condition gradually deteriorated during the next few hours. She died with signs of heart failure due to irreversible haemorrhagic shock. Autopsy confirmed an aorto-oesophageal fistula in addition to advanced oesophageal carcinoma (Figures 3) and an abundance of blood clots in the stomach and upper gastrointestinal tract (Figures 4).

DISCUSSION
Aortoenteric fistula is an extremely rare cause of acute UGIB [6-13]. It is a pathologic communication between the aorta and gastrointestinal tract. Aortoesophageal fistula represents communication between thoracic aorta and esophagus, which is a potentially fatal health condition and is an extremely rare cause of acute UGIB.[Mr1] Based on the mechanism of their formation, aortoenteric fistulas are classified as primary and secondary fistulas. Primary aortoenteric fistula (PAF) develops when a connection is created between the aorta and the gastrointestinal tract, usually due to aortic aneurysm, whereas secondary aortoenteric fistula (SAF) develops after the placement of endovascular prostheses or stent grafts into the aorta[10, 11]. Primary aortoenteric fistula (PAF) due to an aneurysm was first described by the famous surgeon Astley Paton Cooper in 1892, who significantly influenced the development of vascular surgery, anatomy and pathology in the 19th century[13]. According to literature, the incidence of PAF has not significantly changed during recent decades (0.04 – 0.07%). The prevalence of SAF has increased and is estimated to
be between 0.6% and 2.3%, associated with the rising number of interventions and aortic surgeries\textsuperscript{8, 10, 11}. The majority of primary fistulas (73%) develop due to atherosclerotic aneurysm of the infrarenal abdominal aorta. Cases of fistulas forming due to thoracic-abdominal aortic aneurysm are rare. Fistulas develop after an injury or as a result of a mycotic aneurysm in approximately 26% of cases. SAFs are rarely the consequence of radiation, advanced malignant disease or abdominal inflammation\textsuperscript{[14-16]}. The source of most SAFs is the infrarenal segment of the abdominal aorta, where aneurysms are more frequent, and the number of surgical and radiological interventions (placement of endovascular protheses) has increased. Aortoenteric fistulas are most common in the segment of the duodenum crossing the aorta (horizontal segment, 57%); other duodenal segments are less commonly affected (9%)\textsuperscript{[4, 5, 8]}. Fistulas can also be found in other segments of the gastrointestinal tract, including the small intestine (8%), the large intestine (4%), and the stomach or oesophagus (4%) \textsuperscript{8}. Most authors explain the development of aortoesophageal fistula as the result of multicausal esophageal ischemia, caused by the pressure on the esophageal artery, with simultaneous increased pressure due to an aneurysm on the posterior mediastinum, or, alternatively inflammation during hematoma resorption as well as anatomical changes in the aortic arch and descending aorta after inserted implants - protheses such as TEVAR (thoracic endovascular aortic repair)\textsuperscript{[10, 11, 15]}. Others believe that a perioperative infection of the prosthesis leads to the development of a pseudoaneurysm, which creates a connection with the gastrointestinal tract by exerting pressure\textsuperscript{[9, 10, 15]}. Another possible explanation relates to the development of periprosthetic fistula forming at the site of a haematoma along the suture line, which leads to the development of intestinal infection and enables the formation of a connection between the aorta and the digestive system\textsuperscript{[11, 12, 17]}. 

Our patient developed a fistula one centimetre distal to the oesophageal stent, which was inserted due to advanced carcinoma that resulted in malignant stenosis. The mechanism of fistula formation was most likely twofold - a fatal combination of aortic pulsations transferring to the oesophageal wall, creating a pseudoaneurysm below the
stent, and tumour overgrowth through the oesophageal wall. We speculated about the possible influence of radiotherapy, but this was not confirmed at autopsy. According to the data available in the literature, aorto-oesophageal fistulas are extremely rare and most frequently described as the result of aortic disease, aneurysm, a pointed foreign body in the oesophagus, or advanced malignant disease, as described in our case\textsuperscript{4, 8, 18}. The international literature also mentions less common causes, such as aortic wall haematoma or aortic ulcers, Takayasu aortitis, consumption of the Dieffenbachie picte (ornamental pot plant), radiation, lymphoma, anatomical variations of the aortic arch and a long-term nasogastric tube use\textsuperscript{16, 17, 19-22}.

Gastrointestinal bleeding followed by abdominal pain, which can radiate into lower back and lumbar region, is the most common sign in the clinical presentation of patients with aortoenteric fistula \textsuperscript{8}. A pulsating mass in the abdomen is a rare sign found in one-fifth of patients \textsuperscript{4, 5}. Another common clinical sign is a sudden and unexplained febrile condition resulting from the direct migration of microorganisms from the intestinal lumen into the vascular system\textsuperscript{5, 8, 10}. The diagnostic procedure often requires urgent upper gastrointestinal endoscopy to determine the cause of bleeding, which has limitations. At first we can assume the cause of bleeding, but if traces of blood are found in the lumen or a clot is attached to the wall, we must always consider the fistula and should not remove the clot. The sensitivity of this investigation method is supposed to range between 25 and 80\%\textsuperscript{8}. We did not opt for urgent endoscopy in our patient because of the cardiocirculatory instability, danger of aspiration with frequent vomiting of bloody contents and [Mr3] placed oesophageal stent, which could interfere with or even prevent certain haemostatic procedures (e.g., haemostasis with various clips). Modern CT angiography is one of the most precise methods for detecting aortoenteric fistula (sensitivity up to 93\%), and compared to endoscopy, offers certain advantages, namely, it is fast, noninvasive and displays high-resolution images of the abdominal organs\textsuperscript{23-25}. Angiography of the abdominal vessels has limitations and often does not confirm a connection between the gastrointestinal tract and the aorta because a blood clot covers the fistula opening. Other imaging examinations, such as US, have
limitations and are not recommended in the urgent treatment of a haemodynamically unstable patient\(^8\). Patients with aortoenteric fistula are generally surgically treated, depending on the cause of the connection and the changes in the aorta and gastrointestinal tract. Unfortunately, surgery carries a high mortality rate, ranging between 20 and 93\%\(^4,8,22\).

Recently, more data on successful endovascular treatment have been published in the international literature. This type of treatment successfully stops bleeding, but in the long run, surgical correction of the gastrointestinal wall is necessary to avoid septic complications \(^{25-30}\). A novel method of treating thoracic aorta diseases is the minimally invasive surgical procedure called TEVAR (thoracic endovascular aortic repair). It is a method used in aneurysms, traumatic aortic transections, type B dissections, ulcers and aortic intramural haematoma\(^{25}\). Its advantage is a rapid setting and therefore a rapid cessation of bleeding, while its disadvantage is the recurrence of bleeding and the possibility of reinfection, especially if the previous TEVAR infection is not completely eliminate\(^{16,29-32}\). Since this is a very rare complication most available literature on aortoenteric fistulas are individual case reports, and only an analyses of a cohort of patients over a longer period of time (usually decades) could be performed, but this would mean the treatment methods would change over time, and the comparison of different therapeutic methods would be difficult\(^{4,5,30-32}\). In recent years, recommended treatment procedures have been minimally invasive surgery and interventional radiologic techniques \(^{31,32}\).

**CONCLUSION**

The targeted diagnostic procedure and exemplary cooperation of the medical staff involved in the present case resulted in the diagnosis of aorto-oesophageal fistula and enabled the provision of modern and optimal haemostatic treatment with the successful insertion of a stent graft. Unfortunately, irreversible haemorrhagic shock led to heart failure and resulted in the death of our patient.
The diagnosis and treatment of patients with acute UGIB is usually performed in compliance with the adopted clinical guidelines. However, sometimes it is necessary to think outside the box when determining the aetiology of UGIB and conduct targeted diagnostic and therapeutic procedures. Despite accurate and timely clinical decisions, one should be aware of the fact that even the most contemporary interventional therapeutic procedures have limitations in certain rare clinical situations.
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