Management of secondary aortoenteric fistulas occurring as complications after open and endovascular repair of abdominal aortic aneurysms

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Abstract

Secondary aortoenteric fistula (SAEF) is an uncommon and life-threatening clinical complication of both open and endovascular abdominal aortic aneurysm repair surgery. The most common site of SAEF is the duodenum, especially the 3rd part. Aortoenteric fistula may initially present with transient and self-limited gastrointestinal bleeding episodes, followed by a later catastrophic life-threatening hemorrhage. Endoprosthesis excision followed by extra-anatomic by-pass grafting or in situ aortic replacement procedure is the gold standart treatment. In unstable patients with severe comorbidities endovascular intervention can serve as a bridging procedure to optimize patient's status for aortic reconstruction.

Key words: *Aortoenteric fistula; secondary; aneurysm; endovascular; open repair*

INTRODUCTION

Aortoenteric fistula is defined as a communication between the aorta and the gastrointestinal (GI) tract. Secondary aortoenteric fistula (SAEF) is an uncommon and life-threatening clinical condition that can complicate aortic reconstructive surgery [1]. It is a devastating complication of both open and endovascular abdominal aortic aneurysm (AAA) repair surgery, may be related to endoprosthesis infection and can result in gastrointestinal bleeding [2,3].

The first report of SAEF was made in 1953 when Brock described a fistula of a proximal anastomosis of an aortic homograft and the duodenum. SAEFs may occur between 2 weeks and 10 years after open repair while an annual incidence of 0.6% to 2% has been reported [3]. Aortoenteric fistula after endovascular repair (EVAR) of abdominal aortic aneurysm occurs in approximately 0.36% of cases [1,4].

SAEFs can be classified into two forms: the direct abnormal communication between the aorta and bowel lumen and the aortoparaprosthetic-enteric fistula due to intestinal erosion [5].

The purpose of this review article is to investigate the pathogenesis, clinical presentation and treatment of this frequently fatal disease.

PATHOGENESIS OF SAEF AFTER OPEN AND ENDOVASCULAR REPAIR

Pulsating mechanical pressure of the graft on the bowel wall or a pseudoaneurysm due to perigraft bacterial infection or due to a contaminated perigraft he-

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matoma are thought to be the causative mechanisms leading to this catastrophic complication [6]. SAEF most commonly occurs between the proximal aortic suture line and the duodenum after open abdominal aortic surgery.

The pathogenesis of secondary aortoenteric fistulae after EVAR is controversial with a number of different mechanisms proposed for its occurrence. It develops months to years after EVAR, although early occurrence has been also described. A strong hypothesis is that endograft infection could be secondary to the grafting procedure (bacterial inoculation during endovascular procedure) or due to a pre-existing mycotic or inflammatory aneurysm. Endograft infection could result in intestinal necrosis and fistula formation between the aneurysm sac and the intestinal wall [4]. Other causes of aortoenteric fistula include stent migration, erosion of the aorta and the duodenum by embolization coils, fabric rupture, erosion of the aorta by the hooks and barbs, Crohn's disease or other septicemic conditions that result to secondary endograft inoculation [4]. Endoleak and even endotension may also lead to aortoenteric fistula formation. Authors have suggested that this condition may result in pressure necrosis of the aneurismal sac against the intestinal wall.

CLINICAL PRESENTATION AND DIAGNOSIS

The most common site of secondary AEF is the duodenum (73%), especially the 3rd part [7]. Due to the low incidence of this condition and the nonspecific signs and symptoms, the diagnosis requires a high index of suspicion and a careful review of patient's history.

The main clinical manifestations are gastrointestinal hemorrhage (70%), septic complications (16%) or a combination of both (12%). Typically, the aortoenteric fistula may initially be presented with transient and self-limited gastrointestinal bleeding episodes ("herald bleeding"), followed by a later catastrophic life-threatening hemorrhage. Other presenting symptoms are unexplained fever, abdominal or back pain, chronic anemia, shock, or symptoms associated with compression of adjacent structures [8].

Computed Tomographic Angiography (CTA) is the preferred imaging modality for the diagnosis of SAEF. CT angiography has a relatively high sensitivity (94%) and specificity (85%) for the diagnosis of SAEF [9,10]. Imaging findings of SAEF include increased perigraft soft tissue, pseudoaneurysm formation, presence of gas or fluid around the graft, close proximity of the graft to the adjacent bowel wall and extravasation of contrast agent into the bowel lumen [11,12]. If the imaging findings of CTA are not specific and the gastrointestinal (GI) bleeding persists, it is then appropriate to proceed with esophagogastroduodenoscopy (EGD) to further investigate for the disease or seek other potential causes of GI bleeding. A typical endoscopic finding in the case of SAEF is the observation of adherent clots or bleeding at the fistula opening and the identification of the vascular graft or stent into the bowel lumen.

MANAGEMENT AND TREATMENT

OPEN REPAIR

Patient's clinical status, hemodynamic stability and the presence of preoperative sepsis are the most important determinants for the choice of the surgical strategy. Operative strategies that have been used include graft excision accomplished with extra-anatomic by-pass or in situ aortic replacement [13,14]. Extra-anatomic revascularization consists of staged or concomitant axillo-bifemoral bypass and graft explantation with aortic stump closure [13,14]. In situ reconstruction using homografts, prosthetic grafts or vein grafts- the "neo-aortoiliac system" procedure - is another open repair option [15]. Bowel repair is of great importance. Excision of the eroded part of the duodenum or the bowel and interposition of the omentum, eliminates a septic source and decreases the risk for recurrence of infection. These procedures are demanding and associated with high mortality and morbidity rates, especially when undertaken in unstable, septic patients with severe comorbidities [8,15].

ENDOVASCULAR TREATMENT

An additional treatment option has been added to our inventory, first described by Deshpande et al, who used endovascular repair for a SAEF in a high-risk patient [16]. The advantages of endovascular approach are the rapid control of hemorrhage and the avoidance of an intervention in a hostile abdomen or in patients with severe comorbidities, unfit for open surgery. In unstable patients with severe sepsis endovascular intervention can serve as a bridging procedure to open repair offering immediate control of hemorrhage and time to improve the patient's clinical status. On the other hand, endovascular approach has great limitations as bowel defect is not repaired, infection if present persists and retroperitoneum debridement is not feasible [4].

A review study on outcome after endovascular repair of SAEF showed that endovascular approach is associated with a high incidence of persistent/recurrent/new infection or recurrent bleeding which significantly limits patient's survival. Preoperative evidence of sepsis was found to be an indicating factor for unfavorable outcome [2]. Another study showed that endovascular repair was associated with lower morbidity and in-hospital mortality rates compared with open repair. However, there was a trend for worse recurrence-free, sepsis-free, re-operation-free and AEF-related death-free rates after endovascular repair. The early survival advantage of EV-AEFR was lost after two years. Preoperative sepsis was associated with worse two-year overall survival [17]. A more recent meta-analysis concluded that endovascular surgery is associated with better early survival than open surgery for secondary AEFs but most of this benefit is lost during long-term follow-up. The authors recommended that the method can be used as bridging to early conversion using in situ vein grafting [18].

As a bridging method, endovascular repair of SAEF has demonstrated promising results, but as a definitive therapy for SAEF it should be considered only in high-risk patients unfit for open repair, where sepsis or systemic infection is not present. These patients should remain under rigorous follow-up for recurrence of infection or bleeding.

CONCLUSIONS

Secondary aortoenteric fistula (SAEF) is a life-threatening complication of prior aortic reconstructive surgery. Endoprosthesis excision followed by extra-anatomic by-pass grafting or in situ aortic replacement procedure is the gold standard treatment. In unstable patients with severe comorbidities, endovascular intervention can serve as a bridging procedure to optimize patient's status for aortic reconstruction. In high-risk and elderly non-septic patients, endovascular repair can be a permanent solution requiring however close surveillance and long-term antibiotic therapy.

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