Case Report

Two Cases of Successful Inferior Mesenteric Artery Preservation with Bare Metal Stent in Endovascular Iliac Artery Aneurysm Repair

Kimihiro Igari, MD,1 Toshifumi Kudo, MD, PhD,1 Kouichi Mori, MD, PhD,2 Masahiro Oonuki, MD, PhD,3 Kazunobu Hirooka, MD, PhD,3 and Yoshinori Inoue, MD, PhD1

During endovascular aneurysm repair, interruption of the inferior mesenteric artery (IMA) or internal iliac arteries (IIAs) is thought to be associated with postoperative pelvic ischemic complications, including ischemic colitis. However, preserving the IIA does not guarantee protection against ischemic colitis. We herein report two cases of bilateral common iliac artery aneurysms, which were treated with bifurcated stent grafting with bilateral IIA embolization and simultaneous IMA stent placement to prevent colonic ischemia. This procedure might be effective for both preserving the IMA circulation and preventing ischemic colitis.

Keywords: endovascular aneurysm repair, inferior mesenteric artery, ischemia colitis

INTRODUCTION

Endovascular aneurysm repair (EVAR) has become a first-line therapy for treating abdominal aortic aneurysms (AAAs) and common iliac artery aneurysms (CIAAs). The endovascular treatment for CIAAs must consist of two parts: first, the branching vessels of the internal iliac artery (IIA) are embolized using coils, and second, a covered stent is placed in the common iliac artery (CIA) and the external iliac artery (EIA) covering the ostium of the IIA. Bilateral IIA and inferior mesenteric artery (IMA) interruption carries risks of colonic ischemia, which might be fatal complication of EVAR. An 80-year-old male with a history of warfarin use due to atrial fibrillation was referred to our institution for treatment of bilateral CIAAs and the left internal iliac artery aneurysm (IIAA). He had previously undergone laparotomy for gastric carcinoma. A contrast-enhanced computed tomography (CT) scan revealed a right CIAA measuring 34 mm, a left CIAA measuring 42 mm, a left IIAA measuring 25 mm and a patent IMA (Fig. 1a). In this case, ischemic complications, particularly ischemic colitis, were likely due to IMA coverage with a bifurcated stent graft following bilateral IIA occlusion. The

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Case 1

An 80-year-old male with a history of warfarin use due to atrial fibrillation was referred to our institution for treatment of bilateral CIAAs and the left internal iliac artery aneurysm (IIAA). He had previously undergone laparotomy for gastric carcinoma. A contrast-enhanced computed tomography (CT) scan revealed a right CIAA measuring 34 mm, a left CIAA measuring 42 mm, a left IIAA measuring 25 mm and a patent IMA (Fig. 1a). In this case, ischemic complications, particularly ischemic colitis, were likely due to IMA coverage with a bifurcated stent graft following bilateral IIA occlusion. The
length between the orifice of the IMA and the iliac bifurcation was 60 mm, and the property of infrarenal aorta was healthy. Even though there is a little worrying about the dissection of IMA, the use of a device in the short main body with stent placement in the IMA for ‘bail out’ could be employed to maintain the IMA circulation. Therefore, we decided to perform endovascular surgery after the approvals of patient and the ethical committee of our institute were obtained.

After administering general anesthesia, through the common femoral arteries, both IIAs were catheterized via contralateral 6-Fr guiding sheath and embolized with coils. We mainly used the platinum coils (Guglielmi Detachable Coils [GDC™], Boston Scientific, Cork, Ireland). Coil embolization of the origin of right IIA was performed to achieve an appropriate distal fixation zone and to avoid a type II endoleak. On the left side, the distal branches of the left IIA were coil-embolized due to the aneurysmal change involving the left IIA. After that, through the left brachial artery, a 4-Fr guiding sheath was placed to cannulate to the IMA. Angiography showed a patent IMA (Fig. 2b), and main body of the bifurcated stent graft, which measured 25 × 60 mm in size (Endologic Powerlink® IntuiTrak, Endologix, Inc. Fig. 2 Case 1. Intraoperative angiography. (a) Bilateral common iliac artery aneurysms and left internal iliac artery aneurysms. (b) The inferior mesenteric artery was patent (white arrow). (c) After the main body was placed, the inferior mesenteric artery was made patent using a bare stent (white arrow). (d) Complete angiography showed a patent inferior mesenteric artery and good exclusion by the stent graft without endoleaks.

Fig. 1 (a) Case 1. Preoperative 3-dimensional contrast-enhanced computed tomography (CT) showed a right common iliac artery aneurysm measuring 34 mm, a left common iliac artery aneurysm measuring 42 mm and a left internal iliac artery aneurysm (IIAA) measuring 25 mm with a patent inferior mesenteric artery (IMA) (black arrow). (b) Case 1. Postoperative 3-dimensional contrast-enhanced CT showed no obvious endoleaks with a patent IMA (black arrow) and a bare stent.
Igari K, et al.

In this case, the length between the orifice of the IMA and the iliac bifurcation was 50 mm; therefore, using the device in the short main body with stent placement in the IMA for snorkel technique, we could maintain the IMA circulation to prevent ischemia colitis. We performed endovascular surgery.

After administering general anesthesia, through the common femoral arteries, both IIAs were catheterized via contralateral 6-Fr guiding sheath and embolized with coils. The origins of both IIAs, which were free from aneurysmal change, were embolized by mainly using platinum coils (GDC™, Boston Scientific, Ireland). After that, through the left brachial artery, a 4-Fr guiding sheath was placed to cannulate to the IMA. With occlusion of the orifice of IMA using angioplasty balloon, the stump mean pressure of IMA 40 mmHg, and systemic mean blood pressure was 70 mmHg, which might fear the postoperative ischemia colitis. Therefore, a 4 × 19-mm bare stent (Express SD®, Boston Scientific, Ireland) was inserted into the IMA through the left brachial sheath, and main body and the bare stent were simultaneously dilated (Fig. 2c). Both EIIAs required iliac extenders to cover the IIA orifice. Complete angiography showed a patent IMA and a patent stent graft without endoleaks or enhancement of either CIAA (Fig. 2d). The operation lasted 243 minutes, and the amount of intraoperative blood loss was 380 ml. The patient’s postoperative course was uneventful without the development of colonic ischemia, and he was discharged from the hospital 10 days after surgery. On the seventh postoperative day, a CT scan showed a patent IMA without enhancement of either CIAA (Fig. 1b).

Case 2

A 78-year-old male with past medical history of subarachnoid hemorrhage, and comorbidity of spinocerebellar degeneration, was referred to our institution for treatment of bilateral CIAAs. A contrast-enhanced CT showed a right CIAA measuring 30 mm, a left CIAA measuring 36 mm, and a patent IMA (Fig. 3a). In this case, the length between the orifice of the IMA and the iliac bifurcation was 50 mm; therefore, using the device in the short main body with stent placement in the IMA for snorkel technique, we could maintain the IMA circulation to prevent ischemia colitis. We performed endovascular surgery.

After administering general anesthesia, through the common femoral arteries, both IIAs were catheterized via contralateral 6-Fr guiding sheath and embolized with coils. The origins of both IIAs, which were free from aneurysmal change, were embolized by mainly using platinum coils (GDC™, Boston Scientific, Ireland). After that, through the left brachial artery, a 4-Fr guiding sheath was placed to cannulate to the IMA. With occlusion of the orifice of IMA using angioplasty balloon, the stump mean pressure of IMA 40 mmHg, and systemic mean blood pressure was 70 mmHg, which might fear the postoperative ischemia colitis. Therefore, a 4 × 19-mm bare stent (Express SD®, Boston Scientific, Ireland) was inserted into the IMA through the left brachial access, and main body of the bifurcated stent graft, which measured 28 × 60 mm in size (Endologic Powerlink® IntuiTtrak, Endologix, Inc., USA) was inserted and deployed. The main body and the bare stent were simultaneously dilated. Complete angiography showed a patent IMA and a patent stent graft without endoleaks or enhancement of...
Successful IMA Preservation with EVAR

EVAR employing bifurcated grafts indicated failure to preserve the IMA circulation. In this case, a 60-mm-long main body bifurcated stent graft was placed, and the bail-out or snorkel technique using a bare stent was used to prevent occlusion of the IMA. To our knowledge, these two cases are the first report of EVAR using a bifurcated graft in which preservation of the IMA circulation was successful.

**DISCUSSION**

The incidence of clinically significant colonic ischemia after EVAR has been reported to be as high as 6%. With respect to the endovascular treatment of bilateral CIAAs, bilateral IIA embolization is frequently required; however, this procedure increases the risk of pelvic ischemic complications. To minimize these risks, many attempts have been made to preserve IIAs using IIA revascularization with EIA to IIA bypass, iliac branch devices. These procedures could reduce the risks of pelvic ischemic complications, especially buttock claudication; however, there is little data to support a direct association between the proposed risk factors and ischemic colitis, and contradictory results have been reported with respect to the impact of IIA exclusion on colonic perfusion. The role of IIA occlusion in the development of colon ischemia is a subject of some controversy, with some studies reporting that interruption of one IIA or even both IIAs is not a major cause of ischemic colitis in patients treated with EVAR procedures. Although the IIA revascularization with bypass surgery needs the open surgery, EVAR with the stent placement in the IMA is unnecessary to perform open bypass surgery, and could maintain the IMA perfusion to prevent ischemia colitis. Therefore, we performed this new procedure, and achieved good outcomes without ischemia colitis.

The role of the IMA in preventing colonic ischemia is highly controversial in the setting of open surgery for AAAs. Some authors believe that reimplantation of the IMA does not reduce the incidence of colon ischemia, and Iwai, et al. reported that transanal doppler ultrasound examinations are a useful method for determining the need for IMA reimplantation. However, in the setting of EVAR, there are no reports concerning preservation of the IMA, which may reduce the risk of colonic ischemia. Furthermore, all previous reports of the use of EVAR employing bifurcated grafts indicated failure to preserve the IMA circulation. In this case, a 60-mm-long main body bifurcated stent graft was placed, and the bail-out or snorkel technique using a bare stent was used to prevent occlusion of the IMA. To our knowledge, these two cases are the first report of EVAR using a bifurcated graft in which preservation of the IMA circulation was successful.

**CONCLUSION**

Although this procedure has been attempted in only selected cases, this technique might be a good option for preventing postoperative ischemic colitis in EVAR patients accompanied with bilateral IIA embolization.

**DISCLOSURE STATEMENT**

Igari and the other co-authors have no conflicts of interest to declare.

**REFERENCES**