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Surgical Experience of Persistent Type 2 Endoleaks with Aneurysmal Sac Enlargement after Endovascular Aneurysm Repair

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Herein, we present a case of a successful treatment of persistent type 2 endoleaks associated with aneurysmal sac enlargement after endovascular aneurysm repair in an elderly patient. We confirmed the diagnosis by abdominal computed tomography and selective angiography revealing an 11.0-cm aneurysm sac with type 2 endoleaks. An attempt for the endovascular embolization of collateral arteries was unsuccessful due to anatomic variations and their multiple complex communications. Instead, transperitoneal sacotomy and direct suturing on the feeding target vessels was successfully performed without any endograft damage. In conclusion, sacotomy appears to be a feasible therapeutic substitute where endovascular or other techniques have a high risk of failure and lead to unsuccessful results.

Key words: 1. Sacotomy
2. Endovascular stent
3. Complication
4. Prosthesis

CASE REPORT

A 73-year-old man visited Konkuk University Medical Center with a complaint of severe abdominal pain. He had been diagnosed with chronic renal failure and treated with hemodialysis for seven years. The patient had undergone endovascular aneurysm repair (EVAR) for abdominal aortic aneurysm (AAA) (size: 82 mm) utilizing bifurcated excluder prosthesis (W. L. Gore Associates Inc., Flagstaff, AZ, USA) at another hospital in 2006. Upon the completion of the EVAR procedure, there was no evidence of an endoleak, and the renal arteries as well as the internal iliac arteries were intact. Six years later, he had developed a type 2 endoleak sustained by several lumbar arteries; further, the maximum transverse diameter of AAA had increased to 110 mm. On his physical examination, he was found to have mild hypertension (138/95 mmHg) with a regular heartbeat of 69 beats/min and body temperature of 36°C. Mild abdominal thrill was observed upon palpation, but no other specific abnormalities were identified. A computed tomographic angiography revealed endoleaks passing posteriorly into the enlarged aneurysm sac that was measured to be 110 mm in size (Fig. 1). First, we performed selective angiography with left internal iliac artery catheterization for coil embolization. An angiography verified a contrast material entering the aneurysm sac via the lumbar arteries (Fig. 2). We subsequently proceeded to the coli em-

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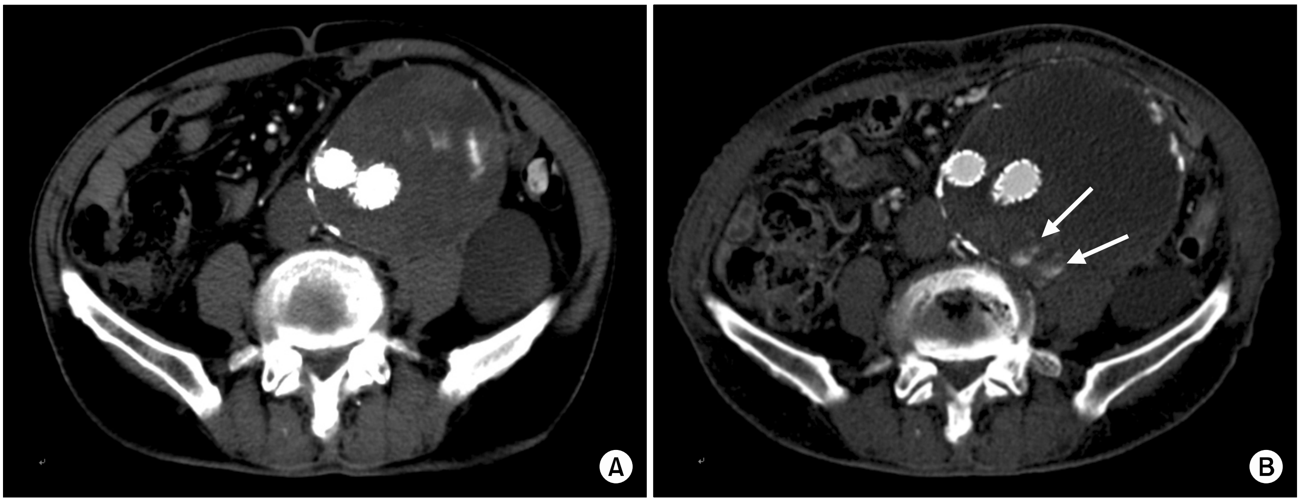

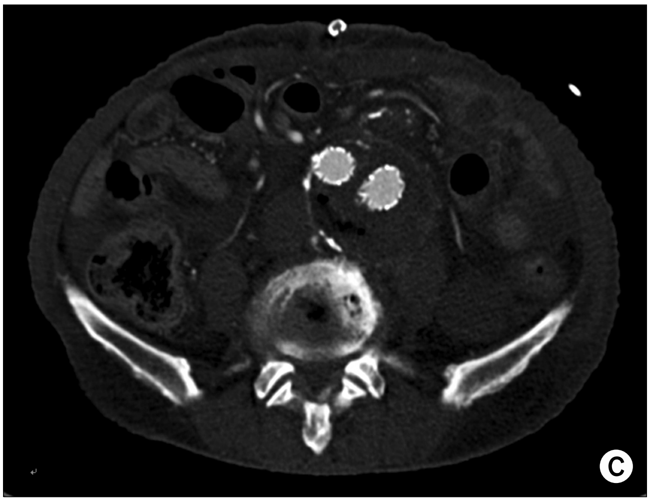

Fig. 1. (A) Contrast-enhanced abdominal computed tomography (CT) at 1 month after endovascular aneurysm repair. (B) Contrast-enhanced abdominal CT shows the extravasation of the contrast material into the thrombosed abdominal aortic aneurysm sac (arrows) in the arterial phase. (C) A type 2 endoleak is not observed in the contrast-enhanced abdominal CT at 1 week after the operation.

bolization of the penetrating lumbar arteries. However, an attempt for the endoluminal embolization of the lumbar arteries was unsuccessful due to anatomic variations and their complex interrelations, which impeded the access to the endovascular catheter.

Therefore, we adopted a surgical approach. A midline laparotomy was performed to expose the aneurysm sac after further informed consent. We cautiously dissected around both the renal arteries to secure the route for emergency aortic cross clamping. Prior to opening the aneurysm sac, a 16-gauge catheter was inserted, confirming the sac to be rather solid to the touch and the presence of a serosanguineous fluid. Upon opening the sac, old hematoma and blood clots were identified, and the endovascular graft was intact; otherwise, pulsatile backflow bleeding from several lumbar arteries and the inferior mesenteric artery was noted. We evacuated all the blood clots and thrombi, and then, the two lumbar arteries on the posterior wall of the aneurysm sac and the inferior mesenteric artery were oversewn with a 5-0 prolene suture. After confirming that there was no evidence of any other source of bleeding, we also applied autologous fibrin glue at the suture sites for hemostasis. The remnant sac was then carefully closed with an absorbable suture to protect the endograft.

The patient was transferred to the general ward from the intensive care unit 2 days after the operation. A postoperative follow-up computed tomography (CT) revealed satisfactory results displaying no evidence of the endoleak and a decreased aneurysm sac size of approximately 56 mm (Fig. 1). The patient recovered uneventfully and was discharged on postoperative day 10. The follow-up CT at 1 month after the

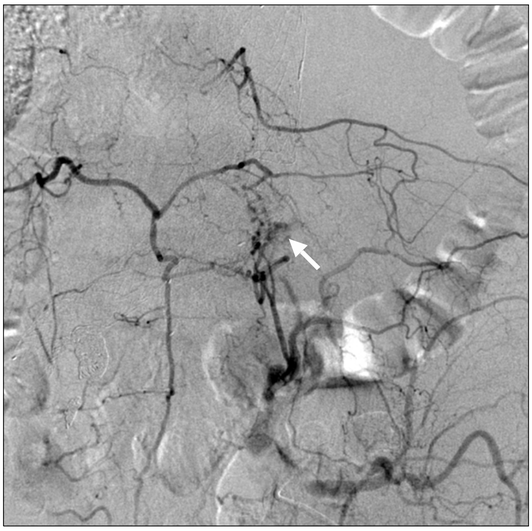

Fig. 2. An angiogram obtained with selective catheterization through the left internal iliac artery shows that the patent lumbar arteries flow into the aneurysm sac (arrow).

surgery revealed no evidence of an endoleak with a completely excluded aneurysm sac. For 12 months after surgery, the patient visited the outpatient clinic periodically in good condition.

DISCUSSION

Nowadays, EVAR has been considered a safe and effective treatment for abdominal AAAs. EVAR has many benefits, which include relatively low operative mortality, morbidities, relatively short operative time, and short duration of hospitalization. In general, the early and midterm outcomes of EVAR are not poor; however, long-term durability remains elusive due to the presence of endoleaks. An endoleak is the existence of a continuous blood flow outside the endograft and within the aneurysmal sac. In general, patients get a medical check up such as the physical examination, the abdominal simple X-ray, and the contrast enhanced CTA at the 1 month after EVAR, at 6 month and yearly thereafter. There are several types of endoleaks with different causes requiring specific individual plans. Endoleaks have been reported to be up to 60% of the complications after EVAR and are responsible for more than 45% of all reinterventions [1]. Type 1 or type 3 endoleaks could be considered a failure of endovascular repair and require immediate reintervention because of a highly potential aortic aneurysm rupture, whereas type 2 endoleaks have been regarded as a benign condition. Some studies have reported that type 2 endoleaks occurs in 20% to 30% of the patients at some interval after EVAR but does not require further treatment because they are usually transient and resolve by themselves [2]. However, other researchers advocate that more aggressive management is needed to control the type 2 endoleaks persisting for more than 6 months, irrespective of the changes in the aneurysmal sac [1]. Although the significance of asymptomatic type 2 endoleaks has been debated, persistent type 2 endoleaks associated with an increase in the diameter of the aneurysm sac actually increase the possibility of rupture. Successful endovascular aneurysm repair has been reported to be the cause of a decrease in the aneurysm sac volume of more than 10% at intervals of 6 months with continuous regression. Aneurysm enlargement or shrinkage is generally dependent on the pressure in the aneurysm sac, and type 2 endoleaks may be responsible for the pressurization of AAA [3]. Persistent type 2 endoleaks are usually defined as aneurysm enlargement that remains for more than 6 months after EVAR. A more aggressive management may be suggested in patients with persistent type 2 endoleaks not resolving spontaneously within 6 months, even without aneurysm enlargement. Various methods have been proposed for the treatment of type 2 endoleaks without any universal agreement, while distinct indications of reintervention or surgical repair still remain controversial. Further treatment is usually recommended to prevent rupture if continuous endoleaks persist for more than 6 months or an aneurysm sac enlargement (>5 mm) is identified after EVAR [4]. The most common technique for type 2 endoleaks is the transarterial embolization of the feeding vessels with coils or glue materials. Transarterial embolization is mostly targeted at the lumbar arteries, hypogastric arteries, and inferior mesentery artery, which are directly concerned with the type 2 endoleaks. However, selective catheterization of these target vessels may be technically difficult, even when multiple small complex communicating vessels are intertwined. Although the failure and recurrence rates after the transarterial embolization can be as high as 80%, another technique that embolizes both the feeding and the draining vessels inside the aneurysm sac with a microcatheter may be challenged [5]. In addition, translumbar embolization, transcaval embolization, and laparoscopic ligation can be proposed. The success rate of these methods is slightly higher than that of transarterial embolization, but there is a risk of hemorrhagic complications during the translumbar and transcaval procedures because these procedures involve the penetration of the aortic aneurysmal wall. In case multiple patent feeding arteries are noted, laparoscopic ligation would be a better option. However, it requires advanced skill and is more invasive than embolization techniques. Open surgery could be regarded as an option after the failure of embolization techniques. However, it might be better to avoid a late surgical graft replacement if possible because of the higher morbidity and mortality risk due to the frequent need for aortic cross clamping, endogaft-induced inflammatory change around the vena cava, and the increase in the chances of anastomotic bleeding because the aortic wall is too thin. Recently, the idea of a surgical alternative to open endograft removal has been considered, which is sacotomy followed by the removal of the thrombus from the aneurysm sac and ligation or sutures on the collateral feeding vessels. Hinchliffe et al. [6] first reported successful transperitoneal sacotomy applied to a persistent type 2 endoleak in an elderly patient with multiple patent lumbar arteries and an inferior mesenteric artery. In 2005, Ferrari et al. [7] also described their surgical experience of sacotomy in four patients with sac opening and direct suturing without exposing the proximal and distal necks. More recently, Faccenna et al. [8] reported two cases treated with sacotomy, one of whom is a ruptured aneurysm because of the sac expansion. There are a couple of advantages of sacotomy. This approach can allow a direct inspection of the aneurysm sac without aortic cross clamping. It also causes a regression of the aneurysm sac size by the removal of hematoma or thrombus and lowers the recurrence rate by the localization of the bleeding vessel and direct suturing on the target vessels. Furthermore, we can achieve the time-saving effect by avoiding endograft removal or reimplantation, which may cause endograft damage.

In summary, transperitoneal sacotomy and direct suturing endoleaks can be a feasible and alternative method of treating patients with persistent type 2 endoleaks and increasing diameter of the aneurysm sac. It may also be performed in a case wherein multiple communicating endoleak channels are encountered or endovascular techniques are contraindicated or in dangerous situations. Although rare, persistent type 2 endoleaks after EVAR can be treated successfully if the diagnosis is confirmed in detail and sufficient information is available preoperatively.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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