Intravascular bare metallic stents have used in treat-
ment for the recanalization of obstruction or stenosis of
vessels (1), and they have also been used for the treat-
ment of dissecting carotid aneurysms and subclavian
artery aneurysms (2–5). Traditionally, the treatment of
splenic artery aneurysm (SAA) is surgery or a tran-
catheter arterial embolization. However, the technique
of treating SAA with stent-grafts has been recently re-
ported (6). To our knowledge, there has been no report
of the usefulness of self-expandable double overlapping
stents for the treatment of SAA. The acute angle at the
origin of the splenic artery in the celiac axis, as well as
the tortuous nature of the splenic artery, is sometimes
responsible for the failure of the aneurysm treatment
with the use of stent graft.

We report here a case of SAA that was successfully
treated with double overlapping metallic stents.

Case Report

A 61-year-old man was admitted to our hospital with
the incidental finding of microscopic hematuria. His
routine laboratory tests including blood chemistry, liver
function tests, and test for tumor markers were all nor-
mal. A conventional abdominal CT scan performed at
the local clinic revealed a well-demarcated round, 10×
11-mm aneurysm in the proximal portion of the splenic
artery at the level of the head of the pancreas. The
aneurysm was not enhanced on the scan due to an inap-
propriate scan technique. The MRI was then performed
and we detected the SAA. The aneurysm was well enhanced with the contrast medium,
and the lesion was without intraluminal thrombosis (Fig. 1).

On celiac angiography, there is the well-circumscribed
aneurysm at the angulated portion of the splenic artery
(Fig. 2). A stiff, 0.038-inch, angled-tip, hydrophilic guide
wire (Terumo, Tokyo, Japan) was inserted to a point just
beyond the aneurysmal neck. Considering the artery’s
small diameter and tortuous nature of splenic artery, we
decided to treat this aneurysm with double overlapping
stents. A 6-mm×4-cm, self-expanding bare metallic
stent (Wallstent; Schneider, Zurich, Switzerland) was initially deployed, and it covered the vessel segment distal to the neck of aneurysm as well as the neck itself. In addition, an overlapping 6-mm×4-cm, self-expanding bare metallic stent was carefully positioned to traverse and cover the first stent. After the arteriography confirmed that the second stent partially overlapped the first stent as well as the aneurysmal neck and, the second stent was re-deployed at the vessel segment proximal to the neck of the aneurysm.

Celiac angiography that performed at the end of the procedure revealed a patent splenic artery and good coverage of the aneurysmal neck by the two overlapping stents (Fig. 3). The aneurysm size was unchanged and there was stagnation of contrast material in the aneurysm. There were no technical complications. The anticoagulation therapy was administered with aspirin at a dosage of 300 mg daily for 6 months.

The patient was followed with ultrasonography and CT scan at 3, 6 and 12 months. On the three-month follow-up CT scan, the SAA had decreased in size. On the one-year follow-up thin-section CT scan, the SAA had completely disappeared (Fig. 4). In addition, the splenic artery was well preserved and there were no splenic complications such as infarction or abscess.

**Discussion**

Aneurysms of the visceral arteries are uncommon lesions, yet they are a potentially lethal form of vascular
The management of SAAs includes surgical operation, transcatheter embolization, stent-supported coil embolization and stent graft (5-11). The surgical treatment consists of aneurysmectomy, or ligation and exclusion if the aneurysm is located in the proximal splenic artery. Arterial ligation of the aneurysm can be appropriate if the lesion is located in the mid-portion of the splenic artery or if it is embedded in the pancreas. Splenectomy is often necessary if the aneurysm is located within the splenic parenchyma (7). However, this kind of surgery has a high mortality rate and therefore, it should be reserved for cases of rupture (11). The use of transcatheter embolization in the management of SAA, particularly for high-risk patients, has been described in several reports (7, 11), but transcatheter embolization of the splenic artery can be complicated by the development of splenic abscess and septicemia if a large portion of the main spleen is infarcted as a result of the embolization (7).

We successfully performed a stent-graft for treatment of the SAA (6). The merit of this procedure is the preservation of continuous arterial blood flow to the spleen. The limitations and difficulties of stent graft for repairing the SAA repair include the acute angle of origin from the celiac axis, the small diameter and twisted course of the splenic artery, and risk of thrombosis and splenic infarction. The twists and turns of the splenic artery make it difficult to introduce the currently available stent-graft because the size of the introducer is larger than that of the stent without the graft.

The endovascular stent has been successfully employed in the treatment of carotid and subclavian artery aneurysms (2-5), but this procedure had to be yet performed in the visceral artery aneurysm with single or double bare metallic stent placement. Geremia et al. (12) have reported that a metallic stent bridging the aneurysmal neck might alter the flow pattern within the aneurysm, thereby promoting thrombus formation and aneurysmal occlusion. Yu and Zhao (13) also have showed that the damping the intra-aneurysmal flow with stents is effective if the ratio of the effective mesh area and the total surface of the stent are sufficiently small, and this is regardless of the size of the aneurysm. The blood flow movement inside the aneurysmal pouch can be suppressed to less than 5% of the average volume flow velocity of the artery, thereby inducing intra-aneurysmal thrombus formation. Benndorf et al. (2, 3) have reported good results from using overlapping stents for the treatment of dissecting carotid artery aneurysms. Reducing a stent’s porosity by overlapping the devices causes significant hemodynamic changes inside the aneurysm sac, and it accelerates intra-aneurysmal thrombosis. In our opinion, the two overlapping self-expandable bare metallic stents covering the aneurysmal neck may reduce the ratio of the effective mesh area to the total surface of the stent, thereby ensuring preservation of continuous arterial blood access to the spleen.

On the one-year follow-up CT scan, the SAA had completely disappeared, and the splenic artery was also well-preserved. There were no complications at all.

In summary, we can present an alternative therapeutic option for managing SAA by employing double overlapping self-expandable bare metallic stents to cover the aneurysm. This method has the advantage of preserving continuous arterial blood flow to the spleen. Using the double overlapping self-expandable bare metallic stents for aneurysms located in of the tortuous angles of the splenic artery can provide a safe and effective method for treating these particular lesions. Additional clinical experience and comparison of this technique with other non-surgical management methods will be needed in order to determine the value of this novel procedure.

References