

## Splenic artery to mesenteric artery bypass due to intraoperative injury

*Cerrahi sırasında yaralanmaya bağlı olarak splenik arterin mezenterik artere baypası*

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Iatrogenic injury of the superior mesenteric artery (SMA) during pancreatectomy is a serious vascular condition with increased morbidity and mortality rates. In this article, we report a 47-year-old female case with pancreatic head carcinoma who had SMA injury during pancreaticoduodenectomy. Splenectomy was performed on the patient and splenic artery was used for revascularization of SMA. The patient had no complications after discharge. The overall condition of the patient was good without post-prandial abdominal pain at six months after discharge.

**Key words:** Pancreaticoduodenectomy; splenic artery; superior mesenteric artery injury; whipple procedure.

Superior mesenteric artery (SMA) injury rarely occurs during a pancreatectomy.<sup>[1]</sup> Although surgery is usually not plausible for patients with cancer in the head of the pancreas who have this type of injury, one group of authors has suggested en block resection of the SMA in cases of tumoral invasion.<sup>[2]</sup> There are some surgical interventions for SMA injury.<sup>[3-5]</sup> The splenic artery can be alternative solution for revascularization of the SMA.

### CASE REPORT

A 47-year-old female was referred to our hospital with carcinoma in the head of the pancreas. A preoperative evaluation was performed, and there was no contraindication for the operation. A pancreaticoduodenectomy was planned using the classic Whipple technique, and we obtained the informed consent of the patient for the surgery.

Pankreatektomi sırasında superior mezenterik arterin (SMA) iyatrojenik yaralanması, artmış morbidite ve mortalite oranları ile birlikte seyreden, ciddi bir vasküler durumdur. Bu yazıda, pankreatikoduodenektomi sırasında SMA yaralanması meydana gelen, pankreas başı karsinomu olan 47 yaşında kadın bir olgu sunuldu. Hastaya splenektomi yapıldı ve SMA'nın revaskülarizasyonu için splenik arter kullanıldı. Hasta taburcu olduktan sonra herhangi bir komplikasyon gelişmedi. Taburculuğunun altıncı ayında hastanın genel durumu iyiydi ve yemek sonrası karın ağrısı yoktu.

**Anahtar sözcükler:** Pankreatikoduodenektomi; splenik arter; superior mezenterik arter yaralanması; whipple prosedürü.

She was taken to the operating room, and invasive monitoring was initiated. After general anesthesia, a Mercedes type laparotomy incision was performed. Next, a mass located at the pancreatic head was palpated, but there was no ascites or liver metastasis.

The head of the pancreas and the duodenum were then mobilized utilizing the Kocher maneuver. While dissecting the pancreatic head, the SMA was iatrogenically injured. It was fragile because of adhesions and the inflammatory process and was nearly transected; hence, repair was not possible. The patient was then systemically heparinized (5,000 IU) before the SMA cross-clamping, and the proximal SMA was ligated by transfixion sutures at its origin. The splenic artery was then identified by its origin in the splenic hilum and was mobilized above the superior border of the pancreas over a segment approximately 7 cm in length to allow for a tension-free anastomosis

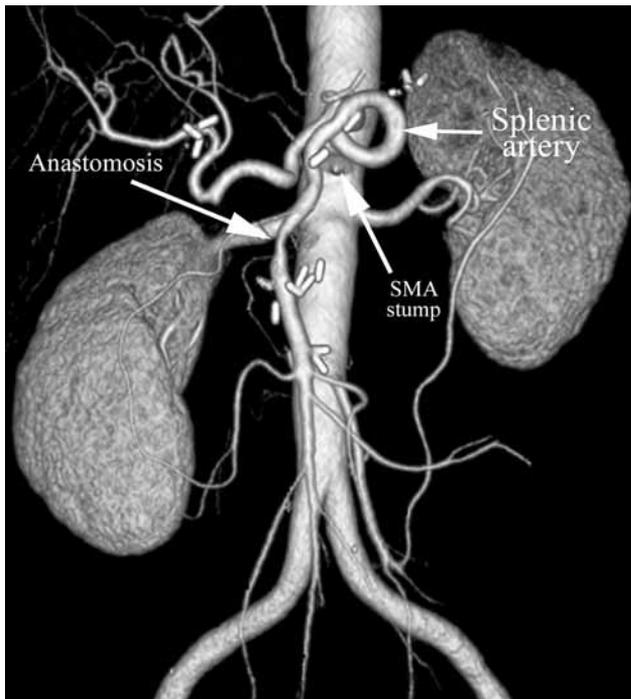


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**Figure 1.** The splenic artery transposed over the pancreas and anastomosed end-to-end to the superior mesenteric artery.

to the SMA. The pancreatic branches arising from the splenic artery were then ligated and divided, and this artery was transected near the hilum of the spleen and transposed over the pancreas. Following this, it was anastomosed end-to-end to the SMA. After the completion of this procedure, the anastomosis and homeostasis were carefully inspected, and pulsatile flow was confirmed by palpation. Next, the splenic vein was ligated, and a splenectomy was performed. The distal stomach, gallbladder, common bile duct, head of the pancreas, duodenum, proximal jejunum, and regional lymphatics were resected, and a pancreaticojejunostomy, choledochojejunostomy, and gastrojejunostomy were performed to restore gastrointestinal continuity.

A second laparotomy was performed 10 days postoperatively to repair bleeding from the SMA stump. Afterwards, the patient had an uneventful postoperative course and was discharged on the 15<sup>th</sup> postoperative day. Computed tomography angiography obtained at the postoperative sixth month demonstrated a patent splenic artery-to-SMA bypass (Figure 1). Furthermore, the patient has had no postprandial abdominal pain.

## DISCUSSION

Vascular complications, such as portal vein, hepatic artery, celiac trunk, superior mesenteric vein, and

SMA injuries as well as en bloc resections, are seen in 23% of patients<sup>[5]</sup> following pancreatic surgery, with SMA injuries being the least common event. These complications tend to occur in the presence of pancreatitis or cancer due to dense adhesions and the inflammatory process. In addition, the varied anatomy of this area contributes to vascular injuries.

Current surgical intervention for SMA injury or resection involves aorta-to-SMA or iliac artery-to-SMA bypass using a vein (internal jugular, saphenous, inferior mesenteric) or synthetic graft, transposition and reimplantation of SMA into a healthy area of the aortic wall and end-to-side anastomosis.<sup>[3-5]</sup> As an additional option the splenic artery could be chosen for revascularization of SMA when celiac axis is patent.

The splenic artery is an arterial conduit that offers plenty of the length required to reach the SMA with long-term patency, and it has been used successfully for direct left renal artery reconstruction. Using the splenic artery makes cross-clamping of the aorta unnecessary, thereby lessening the risk of producing cardiac ischemia, declamping hypotension, and atherosclerotic plaque displacement. Additionally, only one anastomosis has to be performed.

The risk of splenectomy versus the benefits of a less complicated arterial reconstruction that avoids aortic cross-clamping must be evaluated for each patient.

We preferred not to use a prosthetic graft in our patient because of concerns associated with long-term patency and the predisposition of cancer patients to thrombosis.

An autologous vein interposition using the internal jugular, saphenous, or inferior mesenteric vein and the reimplantation of the SMA into the aorta are other treatment options, but we did not choose them because of the reasons described above.

End-to-end anastomosis could also be an alternative option for some patients, but it was not feasible for ours because tension-free reconstruction of the arterial continuity was not possible.

In conclusion, the use of the splenic artery should be considered as an additional option for arterial reconstruction of the SMA in selected patients.

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