A Case of Intraabdominal Bleeding Following Pancreatoduodenectomy Successfully Treated by Transcatheter Arterial Embolization

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Summary: A 58-year-old male underwent pancreatoduodenectomy based on a diagnosis of middle bile duct cancer. Because abdominal drainage revealed bile leakage 5 days postoperatively, leakage at the site of cholangiojejunostomy was diagnosed, and continuous aspiration was performed. Seventeen days postoperatively, pus was discharged through the abdominal drain. Because bleeding was detected by abdominal drainage, and shock ensued 20 days postoperatively, emergency abdominal angiography was carried out to identify the bleeding site. A false aneurysm in the proper hepatic artery and extravasation from the gastroduodenal artery stump were recognized, and therefore, the proper hepatic artery and common hepatic artery were embolized at a site distal to the false aneurysm using microcoils. Celiac arteriography after transcatheter arterial embolization (TAE) did not show extravasation, and revealed blood flow from the right inferior phrenic artery to the liver. Liver function was normal after TAE, and the patient recovered and was discharged from the hospital 54 days postoperatively. This paper presents a patient in whom intraabdominal bleeding due to leakage at the site of cholangiojejunostomy complicated by infection was successfully treated by hemostasis with TAE.

Key words pancreatoduodenectomy, intraabdominal bleeding, transcatheter arterial embolization

INTRODUCTION
Along with improvement in surgical maneuvers, pancreatoduodenectomy for biliopancreatic malignant tumors has become a comparatively safe procedure. However, as postoperative complications, anastomotic leakage, pancreatic fistula, and intraabdominal abscess are reported to occasionally develop, causing intraabdominal bleeding after surgery. In many such cases, the bleeding site can not be identified even during laparotomy, and massive bleeding can lead to death prior to surgery. In this article, we present a patient in whom emergency abdominal angiography and TAE provided beneficial effects on control of postoperative intraabdominal bleeding.

CASE REPORT
A 58-year-old male consulted a local hospital complaining of right hypochondrial pain. Because cholelithiasis was diagnosed, laparoscopic cholecystectomy was carried out. Intraoperative cholangiography demonstrated irregular stenosis in the middle bile duct, and therefore, the patient was admitted to our department for detailed examination (Fig. 1). With regard to the presenting symptoms on admission, the patient was 163 cm tall, and weighed 61 kg, and there was neither anemia nor jaundice in the palpebral conjunctivas or bulbar conjunctivas. The abdomen was flat without tenderness or any palpable mass. Biochemical blood test did not show any abnormal findings. Abdominal ultrasonography and computed tomography (CT) demonstrated lymph
Fig. 1. Intraoperative cholangiography. There was irregular stenosis in the middle bile duct.

Fig. 2. Preoperative abdominal angiography. There were no obvious abnormal findings.

Fig. 3. Abdominal angiography before TAE. There was a false aneurysm in the proper hepatic artery and extravasation from the gastroduodenal artery stump.

node swelling, but neither of them showed dilatation of the bile duct or any mass. Magnetic resonance imaging (MRI) revealed a ringed enhancement with gadorinium in the bile duct and lymph node swelling. Abdominal angiographic findings were unremarkable (Fig. 2). On hypotonic duodenography, there were no abnormalities in the duodenum. Cytological findings of bile were class II, and did not demonstrate appearance of atypical cells. However, based on findings of open biopsy using cholangioscopy, tubular adenocarcinoma was diagnosed.

Because the results described above indicated a diagnosis of middle bile duct cancer, pancreatoduodenectomy was performed. The modified Child's procedure was used for gastrointestinal reconstruction, and pancreaticojejunal insertion, an end-to-side anastomosis, was carried out in pancreaticojejunostomy. In cholangiojejunostomy, the right and left hepatic ducts were separately anastomosed with the jejunum, and a drainage tube was inserted into each bile duct.

On resected specimens, a nodular invasive mass was noted in the middle bile duct, and 2 skips and one skip were observed in the bile duct on the hepatic side and that on the duodenal side, respectively. The histopathologic diagnosis was moderately differentiated tubular adenocarcinoma (se, pnc1a, hmo, dmo, emo, stage III).

Five days postoperatively, bile leakage was detected through an abdominal drain placed in
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Fig. 4. Abdominal angiography after TAE. TAE was carried out in the proper hepatic artery and common hepatic artery at a site distal to the false aneurysm using microcoils. Celiac arteriography following TAE did not show extravasation, but demonstrated blood flow from the right inferior phrenic artery to the liver.

Morrison’s pouch. Leakage at the site of the choledochojejunostomy was diagnosed, and continuous aspiration was performed. The subsequent course was uneventful, and food ingestion was initiated 17 days postoperatively, but, then, pus was discharged through the abdominal drain. Because bleeding was detected by abdominal drainage, and shock ensued 20 days postoperatively, emergency abdominal angiography was carried out to identify the bleeding site. A false aneurysm in the proper hepatic artery and extravasation from the gastroduodenal artery stump were recognized, and therefore, the proper hepatic artery and common hepatic artery were embolized using microcoils (Fig. 3). Celiac arteriography following TAE did not reveal extravasation, and showed blood flow from the right inferior phrenic artery to the liver (Fig. 4). There were no abnormalities in liver function after TAE, and the patient recovered and was discharged from the hospital 54 days postoperatively.

DISCUSSION

Pancreatoduodenectomy has become a comparatively safe procedure, and severe postoperative complications have tended to evidently decline along with improvement in surgical maneuvers and advances of preoperative and postoperative management. Among complications after pancreatoduodenectomy, anastomotic leakage is a severe complication that causes intraabdominal bleeding and intraabdominal abscess. For treatment of intraabdominal bleeding, hemostasis during laparotomy had been previously performed, but hemostatic operations are frequently incomplete in hemostasis during laparotomy because the bleeding site can not be identified. In our department as well, among 11 patients with intraabdominal bleeding, 2 of 3 patients receiving conservative treatment and 5 of 7 undergoing laparotomy died. TAE was initially performed by Rösch et al. [1] in 1972 to stop bleeding of a duodenal ulcer using autologous clot. Recently, with advances in interventional radiology, TAE has been applied not only to gastrointestinal bleeding, but also to intraabdominal bleeding [2-4]. In TAE, because the bleeding site can be angiographically identified, we can immediately proceed to treatment, and obtain a favorable hemostatic effect. More beneficial effects have been reported with TAE than with laparotomy [4,5]. Hemostasis during laparotomy is invasive, and is associated with high risks showing high mortality rates when the patient is in a state of shock due to massive bleeding. Komatsu et al. [6] reported that 16 of 565 patients receiving pancreatoduodenectomy demonstrated postoperative bleeding attributable to anastomotic leakage at the site of the pancreatojejunostomy, and 4 patients undergoing conservative treatment and all 8 patients receiving laparotomy died, while 3 of 4 patients undergoing TAE survived. They suggested that because postoperative bleeding could be a fatal complication, TAE should be the first choice of treatment, giving first priority to emergency hemostasis. The causes of intraabdominal bleeding after pancreatoduodenectomy include pancreatic fistula and infection [6,7]. Anastomotic leakage at the site of the pancreatojejunostomy is the most frequent cause. In the present case, leakage at the cholangiojejunostomy site complicated by infection was considered to have induced intraabdominal bleeding. The prognosis is poor in patients receiving hemostasis during laparotomy for intraabdominal bleeding, and therefore, TAE should be the first choice of treatment under the present situation. To obtain certain hemostasis by TAE, simultaneous embolization in a distal part and a central part so that the bleeding site is sandwiched between them is ideal. However, problems concerning TAE are complications attributable to ischemia of the embolized organs. Yamasaki et al. [8] performed TAE in 7 of 8
patients with intraabdominal bleeding, and reported that 4 patients not receiving hepatectomy survived, but that 3 of 4 patients receiving hepatectomy died of hepatic failure caused by hepatic ischemia after TAE. They described that hepatic arterial flow was blocked and reduced after TAE, causing ischemia in the remaining liver, thereby leading to hepatic failure. In general, when there is either a complete right or left hepatic artery, liver injury does not become a problem. Komatsu et al. [6] and Kanai et al. [9] also reported that there were no severe complications after embolization of the proper hepatic artery. For the liver, collateral blood supply including the phrenic artery, intercostal artery, gastroduodenal artery, left gastric artery, and internal thoracic artery can be expected as well as portal blood supply. In the present case, a false aneurysm in the proper hepatic artery and extravasation from the gastroduodenal artery stump were observed, and therefore, the proper hepatic artery and common hepatic artery were embolized using microcoils, giving first priority to hemostasis, although the possibility of hepatic failure existed. Angiography following TAE showed blood flow from the right inferior phrenic artery to the liver, indicating that liver function was normal postoperatively. In TAE, not only bleeding vessels, but also feeding vessels of organs are embolized. To avoid this, we should embolize bleeding vessels as selectively as possible. Embolic materials used for TAE include gelatin sponge, coils (stainless steel coil or microcoil), and cyanoacrylate [10,11]. Recently, permanent embolic materials such as coils are widely used, but the size of embolic materials should be selected based on the size of the bleeding vessel. TAE can be performed under local anesthesia, is less invasive, allows certain identification of the bleeding site, has a sufficient hemostatic effect, and causes less frequent rebleeding. Therefore, emergency abdominal angiography and TAE should be the first choice of treatment for intraabdominal bleeding.

REFERENCES