Transcatheter Arterial Embolization with N-Butyl 2-Cyanoacrylate for Ruptured Pseudoaneurysm of Gastroduodenal Artery Complicated by Traumatic Pancreatitis: report of a case

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A patient presented abdominal pseudoaneurysm after traumatic pancreatitis. Computed tomography and visceral arterial angiography showed a ruptured pseudoaneurysm at gastroduodenal artery (GDA). Superselective transcatheter arterial embolization of the pseudoaneurysm was performed by applying liquid adhesive suspension to stop bleeding. Bleeding pseudoaneurysm is a rare, but potentially a life-threatening complication of acute or chronic pancreatitis. Arteriographic embolization of visceral artery pseudoaneurysms is a safe and highly effective technique for the identification and treatment of hemorrhage.

Key words: Aneurysm, therapy; Arteries, therapeutic embolization; Pancreatitis

Ruptured pseudoaneurysm is a rare but life-threatening complication of pancreatitis. Computed Tomography (CT) is useful for the diagnosis of pancreatitis and complicated pseudocysts and pseudoaneurysms. Surgical resection of the pseudoaneurysm is usually combined with pancreatectomy. Transcatheter arterial embolization is considered as a less invasive, safe and effective management. Traditionally, lots of metallic coils would be used for effective treatment. We present a case of successfully treated ruptured pseudoaneurysm due to traumatic pancreatitis by the administration of diluted N-butyl 2-cyanoacrylate into the pseudoaneurysm through gastroduodenal arterial approach.

CASE REPORT

A 45-year-old man suffered from a blunt trauma of his abdomen and dull pain of his epigastric region because of a traffic accident. Initially, abdominal computed tomography was arranged and showed marked hemoperitoneum and suggestive of pancreatic laceration. In addition, fluid collection was demonstrated especially around the pancreatic head. Elevated serum amylase (243 IU/L) and lipase (397 IU/L) level were also noted. Conservative treatment was given including fluid and nutrition supply and pain control. Two weeks later, however, progressive jaundice developed and his total bilirubin was 10.7 mg/dL and direct bilirubin was 5.5 mg/dL. The follow-up abdominal CT showed dilated biliary tree and distended gall bladder and massive fluid collection at sub-hepatic space and porta hepatic, suggestive of biliary tract obstruction. Emergent percutaneous transhepatic cholangio-drainage (PTCD) for decompress-
sion is undertaken. Three days later, the patient’s hemoglobin concentration continuously decreased. The subsequent abdominal CT revealed the PTCD drainage tube was in place but there was a large enhancing mass at the porta hepatis with high density fluid collection at the subhepatic region and abdominal cavity, suggestive of a ruptured psuedoaneurysm of gastroduodenal artery (GDA) or common hepatic artery (Fig. 1). Emergent abdominal arterial angiography was performed and showed a lobulated and pedunculated out-pouching structure arising from the GDA with interruption of this vessel below this lesion (Fig. 2). Due to small stalk of the pseudoaneurysm, we placed a 4-Fr RC-1 catheter (Terumo Optitorque, Tokyo, Japan) in the common hepatic artery as a guiding catheter. Then, a 2.9-Fr microcatheter (Terumo Progreat, Tokyo, Japan) was introduced through the guiding catheter with coaxial method into the neck of the pseudoaneurysm on GDA. Permanent embolizer, N-butyl 2-cyanoacrylate (NBCA, Ingenor, Paris, France) mixed with lipiodol (Guerbet, Aulnay-Sous-Bois, France) at 1:1 ratio, was used to closed the neck of the pseudoaneurysm. The follow-up angiography after embolization showed complete obliteration of the pseudoaneurysm with patency of the other intrahepatic arteries (Fig. 3). But
three days later, the follow-up abdominal angiography still showed blood flow into the pseudoaneurysm. We repeated embolization with diluted NBCA in the lumen and neck of the aneurysm (Fig. 4). The patient stood well throughout the whole procedure with stable conditions and regression of previous GDA pseudoaneurysm packed with glue in the aneurysm was seen in the follow-up CT for one week later (Fig. 5). The patient was discharged one month after embolization without any complication. After two months of embolization, the CT showed no evidence of regression of pseudoaneurysm. The PTCD drainage tube was removed. The patient's laboratory data including GOT, GPT, bilirubin, hemoglobin returned to normal range.

**DISCUSSION**

There are some hypotheses of pseudoaneurysm formation after pancreatitis, including (1) autodigestion of the wall of the artery by elastase and other pancreatic enzymes that are released as a result of the inflammatory process; (2) expanding pseudocyst eroding into an adjacent artery; (3) formation of enzyme rich pseudocysts due to ductal rupture in chronic pancreatitis, which incorporates an adjacent artery [1, 2].

Pseudoaneurysm of GDA is a well-recognized rare complication of acute and chronic pancreatitis [3]. The ruptured pseudoaneurysm of GDA can result in melena, hematemesis, intraperitoneal and retroperitoneal bleeding [4]. Therefore, if a patient with pancreatitis also present with GI bleeding, the possibility of pseudoaneurysm shall be taken into consideration. A contemporary report suggests a mortality rate of 20% in patients with ruptured arterial aneurysms [5]. Therefore once a pseudoaneurysm has been identified, it should be treated, even if there is no active bleeding [1].

Imaging modalities have an important role in the diagnosis and management of pseudoaneurysms of the peripancreatic arteries. Even the CT scan with contrast enhancement has high accuracy in detecting pseudoaneurysm formation [6], it still has limitation in the evaluation of small pseudoaneurysms and for unstable patients with massive GI bleeding; therefore, angiography still remains the gold standard for the diagnosis of vascular lesions in pancreatitis [7].

Surgical procedure is classical treatment of visceral artery aneurysm, but the operative mortality
of traumatized or comorbid patients is high and ranges from 30% to 50% [8]. Combined resection of adjacent organ of pseudoaneurysm is usually performed. Transcatheter embolization provides a minimally invasive, and effectively alternative treatment [9]. Several embolization agents have been used successfully for treatment of visceral pseudoaneurysm, such as metallic coils, Gelfoam sterile sponges [10]. Many investigators found that it was difficult to control the distribution of Gelfoam particles, and they did not approve the use of Gelfoam in embolization of aneurysms [8]. Superselective catheterization with coaxial systems and embolization with platinum coils are effective in most cases [10, 11]. However most of the failures were related to difficulties in catheterizing the neck of aneurysm and beyond the pseudoaneurysm into the small or severely affected vessels. Although catheterization is possible, coils may not be delivered because of the tortuosity of vessel.

N-Butyl 2-Cyanoacrylate (NBCA) is a rapidly hardening liquid tissue adhesive agent, which has been used surgically since the 1960s and radiographically in the embolization of arteriovenous anomalies since 1972 [8]. NBCA can be injected via a narrow-lumen catheter to embolize small arteries and collaterals, where it is difficult to place coils. There are some potential limitations of NBCA. The NBCA mixture has different viscosity to liquid contrast medium and the polymerization time of NBCA is very short. Therefore, considerable experience is required to achieve optimal results. The polymerization time can be delayed by titration of the iodized-oil. As more iodized-oil is added, polymerization is delayed and radiopacity is improved. But the longer the polymerization time, the greater the risk of the embolizer may be washed away and caused serious complications such as abdominal organ infarction [10].

In our patient, the GDA pseudoaneurysm was well demonstrated by abdominal CT and angiography. The pseudoaneurysm was too large and the neck was too short to place coils properly. Besides, the patient's biliary tree obstruction was associated with local compression caused by subhepatic hematoma. To avoid biliary tree compressed by mass effect of metallic coils, we choose NBCA for superselective embolization. Our NBCA mixture is made by mixing with iodinized-oil (lipiodol) in a ratio of 1:1. The blood flow of pseudoaneurysm was stop successfully. Due to the abundant collateral circulation around GDA territory, recurrence of pseudoaneurysm is not uncommon. Therefore we decided to arrange follow-up angiography three days later. Though the pseudoaneurysm relapsed in the followed up abdominal angiogram, we performed transcatheter arterial embolization with NBCA mixture again; partial lumen of pseudoaneurysm and the neck of pseudoaneurysm were embolized successfully. The patency of intrahepatic aretries was preserved and no definite complication was noted after TAE.

In conclusion, since the surgical therapy for pseudoaneurysm is associated with high mortality rate, we consider transcatheter embolization is a safe and highly effective treatment of choice for pseudoaneurysm caused by chronic pancreatitis. Repeated embolization by NBCA is also a feasible and useful treatment for ruptured pseudoaneurysms.

REFERENCES

使用N-Butyl 2-Cyanoacrylate經動脈栓塞術治療因外傷性急性胰臟炎所造成之假性動脈瘤破裂：病例報告

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因急性胰臟炎所造成之假性動脈瘤是一少見但是可能致命的併發症。我們在此報告一成功的使用N-Butyl 2-Cyanoacrylate經動脈栓塞術治療因創傷造成的急性胰臟炎所引發的假性動脈瘤破裂。我們不僅成功的栓塞了假性動脈瘤，並且也保留了附近血管的暢通以及避免了正常組織的傷害。

關鍵詞：動脈瘤，治療：動脈栓塞術：胰臟炎