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Case Report

Embolization using both n-butyl cyanoacrylate and gelatin sponges in a patient with a posterior superior pancreaticoduodenal artery pseudoaneurysm that ruptured and bled into the drain tube ☆,☆☆

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ABSTRACT

Transcatheter arterial embolization is a useful treatment for postpancreatectomy hemorrhage, a severe complication of pancreatic surgery. N-butyl cyanoacrylate is a liquid and permanent embolic material that is widely used in transcatheter arterial embolization. However, its use can lead to the adherence of the catheter to the vessel wall and occlusion of the catheter lumen. This case report presents the case of a 63-year-old man with a postpancreatectomy posterior superior pancreaticoduodenal artery pseudoaneurysm, which ruptured and bled into a drain tube. The patient underwent transcatheter arterial embolization using N-butyl cyanoacrylate and a gelatin sponge without the incidence of adherence or occlusion of the drain tube. Gelatin sponge, which was used as a temporary embolic material, was effective in preventing the drain tube from adhering and occluding.

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Introduction

Postoperative hemorrhage (PPH), a severe complication of pancreatic surgery, is associated with a high mortality rate. Pancreatic fistulas are a major risk factor for PPH, and pancreatic fistulas account for 3%-16% of cases of PPH [1–3]. Therapeutic techniques, such as transcatheter arterial embolization (TAE) and stenting, have been performed for the treatment of PPH [1,2,4,5]. Several embolization materials, such as N-butyl cyanoacrylate (NBCA), gelatin sponge (GS), and metallic coils have been used for TAE. NBCA is a liquid embolic material that has been widely used for the embolization of active bleeding and pseudoaneurysms [6,7]. However, its use is associated with an increased risk of adherence of the catheter to the vessel wall and occlusion of the catheter lumen [8,9].

This case report presents the case of a patient who presented with postpancreatectomy posterior superior pancreaticoduodenal artery (PSPDA) pseudoaneurysm that ruptured and bled into the drain tube and underwent TAE using NBCA and GS without the incidence of adherence or occlusion of the drain tube.

Case report

A 63-year-old man underwent distal pancreatectomy for an intraductal papillary mucinous carcinoma and received treatment for a pancreatic fistula, septic shock, disseminated intravascular coagulation (DIC), acute respiratory distress syndrome, and small intestinal perforation postoperatively. Bloody drainage was observed in the drainage tube placed near the pancreatic stump on postoperative day 26, and the blood pressure was found to have decreased. Contrast-enhanced computed tomography (CT) revealed a PSPDA pseudoaneurysm with a hematoma on the abdominal wall. The PSPDA pseudoaneurysm was located adjacent to the drain tube placed near the pancreatic stump (Fig. 1). Thus, emergency TAE was performed.

A 5 French (Fr) introducer sheath was placed in the left femoral artery under local anesthesia. Celiacomesenteric trunk, common hepatic artery, and gastroduodenal artery angiograms confirmed the presence of PSPDA pseudoaneurysm with extravasation into the drain tube near the pancreatic stump (Figs. 2A–C). We attempted to isolate the PSPDA pseudoaneurysm by embolizing the PSPDA at the distal and proximal sites of the pseudoaneurysm. A triple coaxial system with a 2.6 Fr microcatheter (Masters HF, ASAHI INTECC, Aichi, Japan) and a 1.9 Fr microcatheter (Carnelian Marvel, Tokai Medical Products, Aichi, Japan) were used because both metallic coils and NBCA could be used as the embolic materials with these catheters. Although it was difficult to advance the 1.9 Fr microcatheter into the distal site of the PSPDA pseudoaneurysm through a 4 Fr catheter (SH-K, MEDIKIT, Tokyo, Japan) placed in celiacomesenteric trunk, it was successfully advanced into the PSPDA eventually. The PSPDA angiogram confirmed the presence of the PSPDA aneurysm with extravasation into the drainage tube near the pancreatic stump and the placement of the microcatheter tip at the neck of the PSPDA pseudoaneurysm (Fig. 2D). The patient went into hemorrhagic shock at this point, necessitating rapid embolization. We planned to embolize the PSPDA pseudoaneurysm using NBCA to reduce the procedure time. However, the risk of adhesion between the drain tube and PSPDA pseudoaneurysm remained a source of concern. Therefore, GS (Serescue; Nippon Kayaku, Tokyo, Japan) was injected into the PSPDA pseudoaneurysm and drain tube to prevent adhesion. PSPDA angiography performed after injecting GS revealed no blood flow in the pseudoaneurysm or extravasation into the drain tube (Fig. 2E). As the risk of adhesion of the drain tube to the PSPDA pseudoaneurysm was minimal, the PSPDA was embolized using an NBCA–lipiodol mixture (1:5) and the PSPDA pseudoaneurysm was isolated (Fig. 2F). Angiogram of the celiacomesenteric trunk acquired after embolization revealed no blood flow to the pseudoaneurysm (Fig. 2G).

Contrast-enhanced CT performed 13 hours post-TAE revealed that the NBCA–Lipiodol mixture was present in the PSPDA but not in the PSPDA pseudoaneurysm, and no blood flow was observed in the embolized PSPDA pseudoaneurysm

Fig. 1 – Abdominal contrast-enhanced computed tomography (CT) images. (A) Axial contrast-enhanced CT image showing a hematoma below the abdominal wall with extravasation (white open arrow). (B) Axial partial maximum intensity projection (MIP) and (C) reformatted coronal partial MIP images of contrast-enhanced CT showing a posterior superior pancreaticoduodenal artery (PSPDA) pseudoaneurysm (white arrows) adjacent to the drain tube placed near the pancreatic stump (black arrows). The white arrowheads, black arrowheads, and black open arrow indicate the PSPDA, gastroduodenal artery, and celiac trunk, respectively.

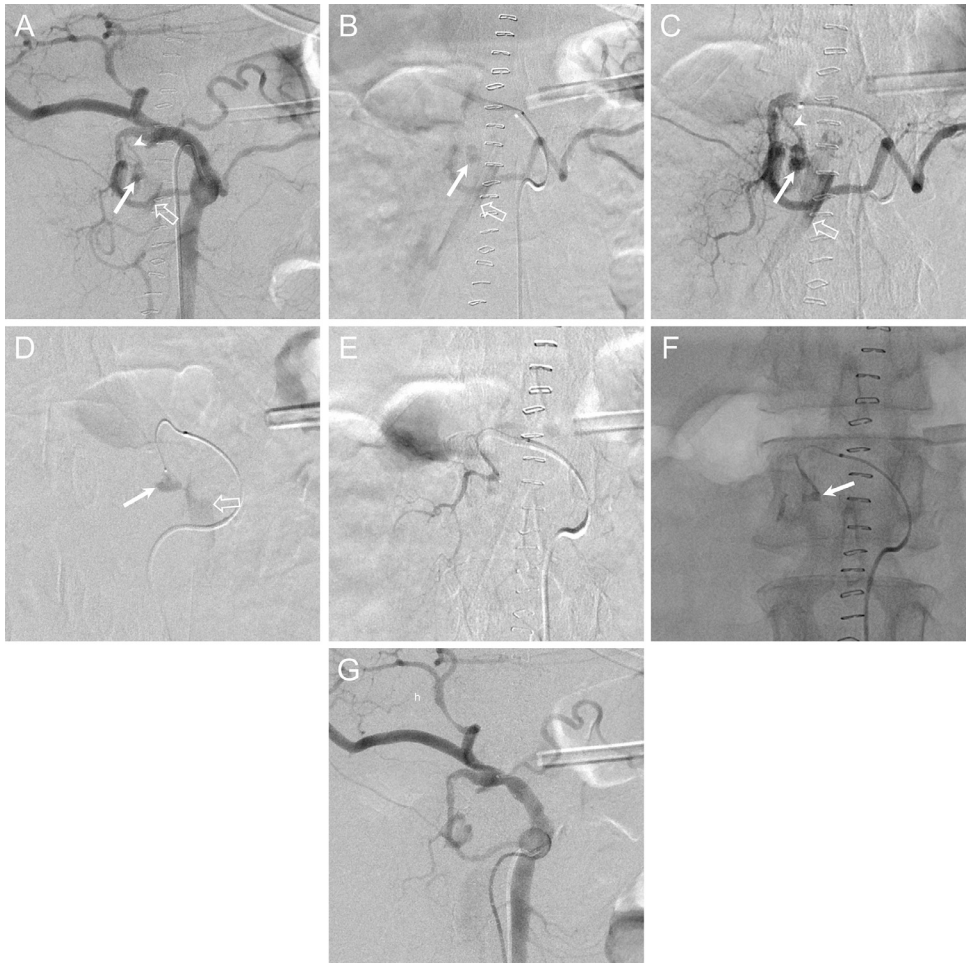

Fig. 2 – Angiograms of the posterior superior pancreaticoduodenal artery (PSPDA) pseudoaneurysm. (A) Celiacomesenteric trunk, (B) common hepatic artery, and (C) gastroduodenal artery angiograms showing the PSPDA pseudoaneurysm (white arrows) with extravasation into the drain tube placed near the pancreatic stump (white open arrows). The white arrowheads indicate the PSPDA. (D) PSPDA angiography performed after inserting a microcatheter into the neck of the PSPDA pseudoaneurysm shows the PSPDA pseudoaneurysm (white arrow) with extravasation into the drain tube (open white arrow). (E) PSPDA angiography performed after the injection of the gelatin sponge shows no blood flow in the PSPDA pseudoaneurysm and no extravasation into the drain tube. (F) The PSPDA was embolized by an NBCA–Lipiodol mixture (1:5, white arrow). (G) A postembolization celiacomesenteric trunk angiogram shows no blood flow in the PSPDA pseudoaneurysm.

(Fig. 3). The drain tube filled with GS was temporarily obstructed; however, spontaneous recanalization was observed the day after TAE. Trouble of drainage or adhesion of the drain tube was not observed. Sepsis, DIC, and renal failure worsened post-TAE, and the patient died 78 days after undergoing distal pancreatectomy.

Discussion

Retrograde infection, suture failure, bleeding, pseudoaneurysms, and injuries to other organs are some of the complications resulting from drainage tube insertion. Bleeding and pseudoaneurysms resulting from drain tube insertion may be caused by postoperative infection and vascular injuries sustained during the insertion of the drain tube [10,11]. In addition to pancreatic fistula and postoperative infection, the vascular injury caused by the drain tube could have been the cause of PSPDA pseudoaneurysm formation in the present case, as the PSPDA pseudoaneurysm was present adjacent to the drain tube and bled into it.

Multiple embolic agents, such as GS, metallic coils, NBCA, polyvinyl alcohol, and microspheres, have been used for TAE. NBCA and metallic coils are permanent embolic materials whose effectiveness in the treatment of pseudoaneurysms has been established. NBCA is a liquid embolic material used as a mixture with lipiodol that is used to perform rapid embolization; however, its use is associated with the risk of adherence of the catheter to the vessel wall, occlusion of the catheter lumen, and migration of the embolic material to other organs [12,13]. The use of metallic coils reduces the

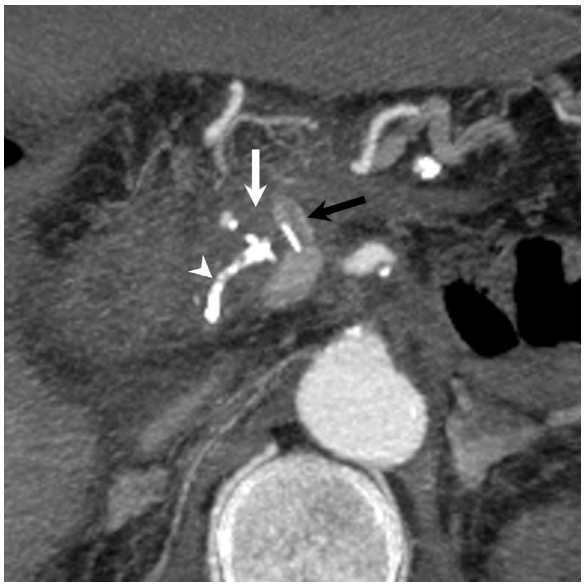

Fig. 3 – An abdominal axial reformatted partial maximum intensity projection image of contrast-enhanced CT obtained 13 hours after transcatheter arterial embolization. The N-butyl cyanoacrylate (NBCA)-Lipiodol mixture can be visualized in the posterior superior pancreaticoduodenal artery (PSPDA, white arrowhead) but not in the PSPDA pseudoaneurysm. No blood flow can be visualized in the embolized PSPDA pseudoaneurysm (white arrow). The black arrow indicates the drain tube placed near the pancreatic stump.

risk of migration of the embolic material and facilitates easier management of the embolization area. However, their use increases the procedure time for embolization [13]. GS particles achieve vascular occlusion via mechanical packing and blood clotting, are absorbed within 2-6 weeks, and embolized vessels recanalize. Consequently, GS is classified as a temporary embolic material. The primary hemostasis and rebleeding rates of GS are inferior to those of NBCA and metallic coils [14].

The isolation of the PSPDA pseudoaneurysm using metallic coils was the best embolization strategy for preventing the formation of adhesion between the drain tube and the PSPDA pseudoaneurysm in the present case. Moreover, it also prevented occlusion of the drain tube lumen and the incidence of postembolization pancreatitis and pancreatic ischemia by minimizing the embolization area. However, the patient went into hemorrhagic shock during the treatment, and the PSPDA pseudoaneurysm with extravasation into the drain tube had to be embolized using NBCA owing to the reduced procedure time. The PSPDA pseudoaneurysm was successfully embolized by filling the drainage tube with GS, resulting in no adherence or occlusion of the drainage tube. GS is a temporary embolic material. Consequently, its embolic force is inferior to that of metallic coils and NBCA, and it is considered difficult to embolize a PSPDA pseudoaneurysm using GS alone. Nevertheless, GS was effective in preventing the adherence and occlusion of the drain tube in this case.

Another treatment strategy for pseudoaneurysms includes the use of stent grafts, such as the GORE VIAVHN (W. L. Gore and Associates, AZ), which can preserve the flow of the feeding vessels [5]. Although this method would have been effective in preventing adherence and occlusion of a drain tube in this case, it was difficult to deliver the stent graft system to the PSPDA owing to its small size and tortuous route for insertion.

Conclusion

This case report presents the case of a patient with a postpancreatectomy PSPDA pseudoaneurysm with extravasation into a drain tube who underwent embolization with NBCA–lipiodol mixture and GS without the incidence of adherence or occlusion of the drain tube. GS prevented the formation of adhesion between the drain tube and the PSPDA pseudoaneurysm and occlusion of the drain tube by acting as a temporary embolic material. Understanding the characteristics of embolic materials used in emergency TAE plays an important role in achieving hemostasis.

Authors' contributions

All authors contributed to the data analysis and drafting or revision of the article, gave final approval for the version to be published, and agreed to be accountable for all aspects of this work.

Patient consent

Informed consent was obtained from the family of the patient included in this study because of his death.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2023.11.060.

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