Transcatheter microcoil and/or N-butyl-2-cyanoacrylate (NBCA) embolotherapy for ruptured pseudoaneurysm following pancreatic and biliary surgery.

Poster No.: C-1122
Congress: ECR 2015
Type: Scientific Exhibit
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Keywords: Hemorrhage, Aneurysms, Embolisation, Catheter arteriography, Pancreas, Interventional vascular, Emergency
DOI: 10.1594/ecr2015/C-1122

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Aims and objectives

To evaluate the efficacy of transcatheter microcoil and/or N-butyl-2-cyanoacrylate (NBCA) embolotherapy for bleeding pseudoaneurysms complicating major pancreatic and biliary surgery.

Methods and materials

Patients populations

#Between April 2009 and November 2014, 7 patients were encountered who developed massive bleeding from pseudoaneurysms 14-39 days (mean 22.8 days) following major pancreatic and biliary surgery.

#Urgent transcatheter microcoil and/or NBCA embolotherapy was performed in all 7 patients. Two embolization technique was employed: isolation (n=5) and selective embolization (n=2).

#Bleeding site, technical success, rebleeding, clinical outcome were determined.

Intervention technique

#Transcatheter microcoil and/or NBCA embolotherapy was performed using 4F shepherd-hook with coaxially introduced 2.4F microcatheter.

#Isolation technique was performed as an initial technique in 5 patients. Microcoils and/or NBCA were deployed from distal to proximal sites of pseudoaneurysm. NBCA was usually performed if blood flow in the target artery was still too high after microcoils had been placed.

#Selective embolization using NBCA was performed as an initial technique in 2 patients (Case3, 4).

#Case 3, attempts to catheterize in the distal side of the ruptured aneurysm with the microcatheter were unsuccessful because right colic artery branches were narrow.

#Case 4, selective embolization of the GDA stump and/or pseudoaneurysm was carried out to preserve the hepatic arterial flow.
# Technical success was considered as elimination of active bleeding and pseudoaneurysm as documented by angiography at the end of each intervention.

# Clinical success was considered as the sustained cessation of hemorrhage with the absence of a need for additional angiography or surgery during the same admission.

## Results

### Table 1

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>Underlying Disease</th>
<th>Surgery</th>
<th>Hemorrhage Dry</th>
<th>Bleeding Site</th>
<th>Technique</th>
<th>Initial Embolic Agent</th>
<th>Re-bleeding</th>
<th>Follow</th>
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<tbody>
<tr>
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<td>M</td>
<td>gall bladder cancer</td>
<td>PD/Partial hepatectomy</td>
<td>22</td>
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<td>coil</td>
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<td>dead</td>
</tr>
<tr>
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<td>F</td>
<td>pancreatic cancer</td>
<td>PpPD</td>
<td>17</td>
<td>splenic</td>
<td>isolation</td>
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<td>NBCA</td>
<td>alive</td>
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<tr>
<td>3</td>
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<td>M</td>
<td>bile duct cancer</td>
<td>PpPD</td>
<td>39</td>
<td>RCA</td>
<td>selective</td>
<td>NBCA</td>
<td>—</td>
<td>alive</td>
</tr>
<tr>
<td>4</td>
<td>64</td>
<td>M</td>
<td>bile duct cancer</td>
<td>PpPD</td>
<td>16</td>
<td>GDA</td>
<td>selective</td>
<td>NBCA</td>
<td>GDA</td>
<td>alive</td>
</tr>
<tr>
<td>5</td>
<td>72</td>
<td>M</td>
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<td>PpPD</td>
<td>28</td>
<td>GDA</td>
<td>isolation</td>
<td>coil</td>
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<td>dead</td>
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<td>6</td>
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<td>14</td>
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<td>pancreatic pseudocyst</td>
<td>DP</td>
<td>22</td>
<td>GDA</td>
<td>isolation</td>
<td>coil</td>
<td>NBCA</td>
<td>alive</td>
</tr>
</tbody>
</table>

**PD**: pancreatoduodenectomy  
**PpPD**: pylorus preserving pancreatoduodenectomy  
**DP**: distal pancreaticoduodenectomy  
**LHA**: left hepatic artery  
**RCA**: right colic artery  
**GDA**: gastroduodenal artery

**Table 1**: Table1. Characteristics of patients with ruptured pseudoaneurysm following pancreatic and biliary surgery.

**References**: Okinawa Red Cross Hospital - Naha/JP

Bleeding site
The site of pseudoaneurysm was the gastroduodenal artery in 4 patients, and the left hepatic, the splenic, the right colic arteries in one patient each.

Technical success

Active bleeding and a pseudoaneurysm were completely eliminated by transcatheter embolotherapy (isolation and selective embolization) in all patients.

Clinical success

Transcatheter embolotherapy was successful in 5 patients (71%), failed in one (CASE 4) due to NBCA migration 3 days after the first embolotherapy. We treated again successfully with coil embolization eventually. Another one patient (CASE 6) developed recurrent bleeding 14 days after the first embolotherapy from a newly developed pseudoaneurysm, which was again treated successfully with coil and NBCA embolization.

Follow-up

3 of the 5 patients with successful embolotherapy were alive at 6-54 months, other 2 patients died of associated malignancies and multiple organ failure during the same admission. 2 patients failed embolotherapy were alive and discharged.

Intervention technique of treatment;

Aim of treatment is to eliminate pseudoaneurysm and extravasation.

Fig. 1: isolation with coil and NBCA Case 2; Intraperitoneal hemorrhage after pancreatoduodenectomy for pancreatic carcinoma in a woman in her 70s.

a. Celiac arteriogram shows a huge pseudoaneurysm (black arrow) of the splenic
artery. b. We could insert microcatheter into the distal portion of the splenic artery beyond the extravasation and embolized with coil. Then, the tip of the microcatheter is placed within the pseudoaneurysm (white arrow), embolized with NBCA-Lp mixture (1:1). Finally, the proximal portion of the splenic artery was embolized with coil. c. Celiac arteriogram shows a complete embolization of the pseudoaneurysm and no extravasation.

References: Okinawa Red Cross Hospital - Naha/JP

Fig. 2: Fig.2 : selective embolization with NBCA Case3 ; 59-year-old man who had undergone pancreatoduodenectomy due to bile duct carcinoma presented with pseudoaneurysm of right colic artery (RCA). a. SMA arteriogram shows extravasation (black arrow) in the RCA branch. b. We could not insert the microcatheter into the distal portion of the RCA branch beyond the extravasation, the RCA branch embolized from the proximal portion of the extravasation with NBCA-Lp mixture (1:2). c. SMA arteriogram shows no extravasation. The RCA branch was completely embolized with NBCA-Lp mixture (white arrow), and then there was no recurrent bleeding.

References: Okinawa Red Cross Hospital - Naha/JP

Fig. 3: Fig.3 : selective embolization with NBCA Case4, 1st TAE ; Intraperitoneal hemorrhage after pancreatoduodenectomy for bile duct carcinoma in a man in his 60s. a. Contrast enhanced CT reveals pseudoaneurysm (black arrow). b. Celiac arteriogram shows a pseudoaneurysm (white arrow) of the gastroduodenal artery. c. The tip of the microcatheter is placed within the pseudoaneurysm (black arrowhead), embolized with NBCA-Lp mixture (1:4). d. After the embolization, celiac arteriogram shows complete embolization of the pseudoaneurysm and no extravasation. Hepatic artery was patent.

References: Okinawa Red Cross Hospital - Naha/JP
Fig. 4: Fig.4 : selective embolization with coil and thrombin Case4 2nd TAE a/b. Celiac arteriogram obtained 3days after 1st embolization shows a recurrent bleeding (black arrow), which was treated with metallic coils and thrombin.

References: Okinawa Red Cross Hospital - Naha/JP

Fig. 5: Fig.5 : isolation with coil Case4 3rd TAE a. Celiac arteriogram obtained 3days after 2nd embolization shows a pseudoaneurysm (black arrow) and reveals migration of metallic coils (white arrow). b. Eventually coil embolization from the proper hepatic artery to the common hepatic artery was performed.

References: Okinawa Red Cross Hospital - Naha/JP
# Conclusion

Transcatheter microcoil and/or NBCA embolotherapy is effective for bleeding pseudoaneurysms complicating pancreatic and biliary surgery, and should be considered the first treatment of choice.

Selective embolization of the GDA stump and/or pseudoaneurysm is not a durable solution. We believe that isolation technique is a safe and effective treatment of pseudoaneurysms of the GDA stump.

# Personal information

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# References


