Case Report

Hepatic Artery Embolization to Control Liver Hemorrhages by Interventional Radiologists: Experiences from Khon Kaen University

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Between 2001 and 2005, nine patients with liver hemorrhage underwent non-surgical embolotherapy. There were six males and three females, ranging in age from 9 to 58 years. All patients were symptomatic with hypotension and decreasing hematocrit. Causes of liver hemorrhage included liver laceration following blunt abdominal injury (2 patients), pseudoaneurysms of hepatic artery following blunt abdominal trauma (4 patients), post-traumatic hepatic artery and portal vein pseudoaneurysm (1 patient), hemobilia following liver resection for cholangiocarcinoma (1 patient) and hepatic artery aneurysm with fistula to the common bile duct (1 patient). All patients had successful embolization of artery to control liver hemorrhage. No acute complication occurred. In conclusion, embolotherapy is an effective treatment with a low complication rate to stop liver hemorrhage, especially from an artery.

Keywords: Embolotherapy, Embolization, Liver, Hemorrhage, Bleeding

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The liver is the organ most frequently injured by abdominal blunt trauma[1]. Both delayed hemorrhage and intrahepatic pseudoaneurysm after blunt liver trauma are rare but can be the causes of late complication. The most common cause of hepatic arterial bleeding is abdominal trauma, accounting for 85% of all cases. Presently, it is believed that nearly 40% of these bleedings are due to iatrogenic injuries such as percutaneous transhepatic procedures or liver biopsies. Gall stone-related diseases, systemic infections, aneurysm, tumors or pre-eclampsia are other rare causes of hemobilia[2-7]. In the present report, the authors present their experience embolotherapy to control liver hemorrhage in 9 patients.

Material and Method

Between 2001 and 2005, 9 patients with liver hemorrhage underwent non-surgical embolotherapy. There were 6 males and 3 females, ranging in age from 9 to 58 years. All patients were symptomatic with hypotension and decreasing hematocrit. Causes of liver hemorrhage included liver laceration following blunt abdominal injury (2 patients), pseudoaneurysms of hepatic artery following blunt abdominal trauma (4 patients), post-traumatic hepatic artery and portal vein pseudoaneurysm (1 patient), hemobilia following liver resection for cholangiocarcinoma (1 patient) and hepatic artery aneurysm with fistula to common bile duct (1 patient) (Table 1). Of these, 1 case was due to iatrogenic etiology.

In all patients, diagnostic angiography was performed prior to embolization to clarify the type and site of blood loss. Selective hepatic angiography was performed, using a standard 4-F or 5-F cobra or 4-F simple curve or 5-F sidewinder catheter. The catheter
was inserted as deep as possible near the site of blood loss. The authors used a coaxial microcatheter in the patient who had hepatic artery aneurysm with fistula to the common bile duct in order to perform superselective catheterization into the aneurysm. Most patients (6/9) were embolized by Gelfoam particles with or without coils (Cook, Bloomington).

Results
All patients had successful embolization to control liver hemorrhage. Diagnosis, clinical and radiological findings, and treatment are summarized in Table 1. Four patients (case I, II, VIII, IX) with post-traumatic hepatic artery pseudoaneurysms (Fig. 1A, B) presented hemobilia. The hemorrhage was controlled within 48 hours after embolization. No acute complication was occurred. One to two weeks after the procedure, follow up color Doppler sonogram and contrast enhanced CT were performed and showed no remaining flow within the pseudoaneurysms.

Two patients (case III, IV) with liver laceration and hematoma (Fig. 2) developed hypotension, decreasing hematocrit and shock, so the authors had to embolize them urgently.

One patient (case V) presented with post-traumatic hepatic artery and portal vein pseudoaneurysms (Fig. 3A, B). Two weeks after hepatic artery embolization, transileocecal vein portography was performed in the operating room demonstrating large portal vein pseudoaneurysm arising from a branch of

Table 1. Patient characteristics and details of management

<table>
<thead>
<tr>
<th>Patient Pathology</th>
<th>Embolization materials</th>
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<tbody>
<tr>
<td>1. M, 23 yrs Post-traumatic hepatic artery pseudo-aneurysm</td>
<td>Gelfoam + coil</td>
</tr>
<tr>
<td>2. M, 20 yrs Post-traumatic hepatic artery pseudo-aneurysm</td>
<td>Gelfoam</td>
</tr>
<tr>
<td>3. M, 31 yrs Liver laceration and hematoma</td>
<td>Gelfoam + coil</td>
</tr>
<tr>
<td>4. F, 27 yrs Liver laceration and hematoma</td>
<td>Coils</td>
</tr>
<tr>
<td>6. M, 44 yrs DSA shows extravasation of contrast medium following liver resection for cholangiocarcinoma</td>
<td>Gelfoam + coil + glue</td>
</tr>
<tr>
<td>7. M, 58 yrs Hepatic aneurysm with fistula to common bile duct</td>
<td>Gelfoam + coil + glue</td>
</tr>
<tr>
<td>8. M, 30 yrs Hepatic aneurysm</td>
<td>Gelfoam + coil</td>
</tr>
<tr>
<td>9. F, 28 yrs Hepatic artery pseudoaneurysm</td>
<td>PVA (Polyvinyl acetates)</td>
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Fig. 1A Selective right hepatic artery; demonstrating a large pseudoaneurysm arising from the right hepatic arterial branch. Fig. 1B Selective right common hepatic artery; demonstrating a pseudoaneurysm arising from the right hepatic arterial branch (arrow).
the right portal vein, and subsequent embolization was successfully done.

The earliest bleeding was observed in a case of hepatic aneurysm with fistula to the common bile duct (case VII) (Fig. 4A, B), 2 weeks after the procedure. This aneurysm was firstly embolized by glue, unfortunately, the glue refluxed and blocked the right hepatic artery, massive bleeding via fistula to common bile duct occurred. The patient developed hypotension, dyspnea and impending shock, so the authors had to occlude the proper hepatic artery by using glue, Gelfoam and coils to obtain immediately control of the bleeding. Repeated diagnostic angiography showed total occlusion of the hepatic artery with no evidence of arterial bleeding. CT scan showed small liver abscesses. Gastroscopy revealed mucosal bleeding which would be treated conservatively. The patient was finally discharged 1 month later.

Another patient with post-operative hemobilia (case VI) presented obstructive jaundice because of recurrent cholangiocarcinoma, 2 and a half years after embolization, he was treated by percutaneous trans-hepatic biliary drainage (PTBD).

Discussion

Hemorrhage from the hepatic arteries due to liver injuries is an uncommon but serious problem with significant morbidity and mortality. Selective arterial embolization is the treatment of choice for initial management with a substantial rate of success and a low incidence of serious complications(8). Complications associated with technique of the transcatheter embolization include inadvertent occlusion of the wrong vessel with subsequent infarction of the normal structure, abscess formation, dislodgment and migration of the occluding device and hematoma or pseudoaneurysm at the catheter entry site. The authors presented cases of transarterial embolization and transiliocecal portal vein embolization. Only one case developed
Hepatic aneurysms are true aneurysm, pseudoaneurysm or, rarely, of the dissecting type aneurysm. True hepatic aneurysms are usually related to atherosclerosis, whereas extrahepatic pseudoaneurysms generally result from intra-abdominal inflammation, trauma and surgical procedure (9).

Hepatic artery pseudoaneurysms following blunt liver injury originate from a disruption of arterial continuity with extravasation of blood into the surrounding tissue. A fibrous capsule then enlarges the surrounding tissues due to the unrelenting arterial pressure. This has a reported prevalence of about 1% (10), and while rupture into the common bile duct may be very rare (11), which is shown in one of the presented patients. This lesion can be diagnosed by contrast enhanced CT scan, dynamic CT scan, CT angiography, color Doppler sonogram and MRF (12-14). Because Doppler sonogram and CT scan are non-invasive investigations, they may also be useful in follow up of embolized aneurysms to ensure their continued regression. However, the most sensitive and valuable investigation modality is still selective angiography, which has a sensitivity of 100% (10,15-17).

Hemorrhage from the hepatic artery can be accurately diagnosed by angiography. Angiographic findings are extravasation of contrast medium, pseudoaneurysms, arterioportal fistula, or irregularities of lacerated arteries. The most common angiographic findings in cases of percutaneous biliary drainage are irregularities of the segmental arteries (18,19).

Conventional surgical management of this type of bleeding is difficult. Surgical ligation of hepatic artery may be ineffective because there is intrahepatic collateral circulation or extrahepatic feeding arteries arising from capsular branches or arterial branch in hepatoduodenal ligament. This type of bleeding is best controlled by hepatic resection, followed by hepatic ligation and packing (18,20). The surgical treatments of hepatic aneurysm or pseudoaneurysms are aneurysmal exclusion, aneurysmectomy with arterial reconstruction and liver resection depending on the anatomic location of aneurysm. Although surgical management is appropriate in patients with stable conditions, (surgery) in high-risk patients or patients in shock, associated mortality rates are as high as 50%. Nonoperative management was established in the pediatric patients, especially those who are hemodynamically stable (19).

**Conclusion**

The authors present 9 cases of liver hemorrhage with different etiology. All patients were successfully treated by embolotherapy. Hepatic artery embolization is an effective treatment with low complication rate to stop liver hemorrhage.

**References**

การรักษาภาวะเลือดออกในตับด้วยรังสีร่วมรักษารายการศึกษา: ประสบการณ์จากมหาวิทยาลัยขอนแก่น

วัลลภ เหล่าไพบูลย์, ชลิดา อนิเวศ, พงษ์พันธ์ พุทธศิริ, นันทลักษณ์, รินทร์ธร พุทธรักษ์

คณะผู้วิจัยได้ทำการศึกษาผู้ป่วย 9 ราย ที่ได้รับการวินิจฉัยว่ามีภาวะเลือดออกในตับระหว่างปี พ.ศ. 2544 ถึง พ.ศ. 2548 ผู้ป่วยมีอายุระหว่าง 9-58 ปี เบ่งเพศชาย 6 และเพศหญิง 3 ราย มีปริมาณยุงร่ายมีความดันโลหิตต่ำร่วมกับภาวะเลือดจาง สาเหตุของภาวะเลือดออกดังกล่าวในการศึกษานี้ได้แก่ ตับฉีกขาดจากอุบัติเหตุที่ช่องท้อง 2 ราย ภาวะเส้นเลือดแดงเฮปัติคโป่งพองจากอุบัติเหตุที่ช่องท้อง 4 ราย ภาวะเส้นเลือดแดงแดงเลือดผ่านกับอุบัติเหตุที่ช่องท้อง 1 ราย ภาวะเส้นเลือดออกในตับด้วยการมาตัดตับ 1 ราย และภาวะเส้นเลือดแดงแดงเลือดผ่านกับอุบัติเหตุที่ช่องท้อง 1 ราย

ผู้ป่วยทั้งหมดได้รับการรักษาด้วยรังสีร่วมรักษารายการ ด้วยการอุดกั้นหลอดเลือดแดงเลือดผ่านกับ fisula ไปที่ common bile duct 1 ราย ผู้ป่วยที่หมดไม่ได้รับการรักษาด้วยรังสีร่วมรักษารายการ โดยวิธีการอุดกั้นหลอดเลือดแดงเลือดผ่านกับ fisula เพื่อหยุดภาวะเลือดออกในตับ คณะผู้วิจัยพบว่าการรักษาด้วยรังสีร่วมรักษารายการที่มีประสิทธิภาพ และภาวะแทรกซ้อนต่ำ