Vascular complications in percutaneous biliary interventions: A series of 111 procedures

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Learning objectives

Complications of percutaneous biliary interventions are known to occur. Most of the complications are self-limiting in nature though major complications resulting in increased level of patient care, prolonged hospital-stay as well as patient death do occur infrequently. This study was undertaken for two objectives.

* To illustrate the vascular complications of percutaneous biliary drainage procedures as important causes of mortality and morbidity.

* To understand the technical and patient related factors which contribute to such complications.

Background

Percutaneous transhepatic biliary drainage (PTBD) continues to be performed widely despite advances in the techniques of endoscopically guided biliary procedures. It is an effective method for decompressing biliary obstruction or diverting bile in leakage after ERCP has failed or not possible due to technical reasons [1]. Though percutaneous biliary decompression is associated with a low complication rate, major complications can still occur. Most common complications associated with PTBD are hemobilia, fever and catheter dislodgement [2]. Major complications like large local infection, sepsis and vascular complications can have a significant impact on morbidity and mortality. However mortality as a result of percutaneous biliary intervention is more often due to hemorrhage than sepsis [3,4]. In this series of 111 consecutive percutaneous biliary interventions from 1st June to 30th November 2012 twelve major complications occurred of which four were vascular complications resulting in death of two patients and contributing to mortality of another patient. Techniques, patient related factors and related imaging findings are described and illustrated.

Imaging findings OR Procedure details

Between 1st June and 30th November 2012, 111 consecutive percutaneous biliary interventions in 68 patients were performed. Multiple procedures (67) accounted for 60% of all interventions compared to 40% single procedures (44). Peripancreatic cancers and cholangiocarcinomas were the leading causes of biliary obstruction requiring biliary interventions.
All procedures were performed with therapeutic intentions. No stand alone diagnostic PTC was performed. Non-dilated or minimally dilated ducts were targeted by a 21G fine needle whereas obviously dilated bile ducts were punctured by an 18G needle. Ultrasound was used for guidance in all cases. Most patients had external-internal biliary drainage catheters placed at the end of the procedure though some had internal self-expanding metallic stents (SEMS), plastic stents or external biliary pigtail catheters deployed.

In this series of 111 consecutive biliary interventions in 68 patients, twelve major complications (10.8%) occurred of which 4 were vascular viz. liver rupture with bleeding, liver injury with hematomatoma formation, biliary venous fistula resulting in major blood loss and pseudoaneurysm of right hepatic artery with bleeding (Table).

<table>
<thead>
<tr>
<th></th>
<th>NUMBER</th>
<th>PERCENT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total procedures</td>
<td>111</td>
<td>100</td>
</tr>
<tr>
<td>Major complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Contributing but not directly causing death</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Sepsis</td>
<td>4</td>
<td>3.6</td>
</tr>
<tr>
<td>Local Peritonitis</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Abscess</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>10.8</td>
</tr>
<tr>
<td>Minor complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild to moderate pain</td>
<td>7</td>
<td>6.3</td>
</tr>
<tr>
<td>Mild fleeting infection</td>
<td>4</td>
<td>3.6</td>
</tr>
<tr>
<td>Low BP</td>
<td>4</td>
<td>3.6</td>
</tr>
<tr>
<td>No or reduced production</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>16.2</td>
</tr>
</tbody>
</table>

Vascular complications
Liver rupture and bleeding 1 0.9
Liver injury and hematoma 1 0.9
Pseudoaneurysm with bleeding 1 0.9
Biliary venous fistula 2 1.8
Hemobilia stopping spontaneously 2 1.8
Total 7 6.3

NB: The values represent number and percentage of procedures and not of patients as some patients had more than one complications simultaneously.

Note that liver rupture and biliary venous fistula leading to significant hemorrhage occurred in the same patient. This patient, an 83 year old female, with cholangiocarcinoma developed hemobilia under SEMS deployment due to biliary-venous fistula formation (Fig.1). It was considered necessary to put additionally an external-internal catheter which was technically very difficult due to sharp angulation at the entry point into the bile duct. Vigorous manipulation to put the catheter in place resulted in liver rupture and hematoma formation (Fig.2). Angiography was negative for arterial bleeding (Fig.3) and patient was a poor candidate for surgery due to age and co-morbidity. There was continued fall of hemoglobin level and patient died of circulatory failure after 4 days. Another patient, a 70 year old man operated with gastrectomy for stomach cancer developed duodenal blow out syndrome. After numerous unsuccessful attempts with a fine needle (21G) to cannulate intrahepatic bile ducts, an external-internal biliary catheter was eventually placed for bile diversion through gall bladder by transhepatic approach (Fig.4). Post-procedural CT scanning performed due to significant drop in hemoglobin level revealed liver injury and hematoma formation from numerous punctures during failed transhepatic biliary cannulation. No active arterial bleeding was demonstrated (Fig.5). Surgery was ruled out because of poor performance status and the patient died after one week. One more death was contributed to, though not directly caused, by pseudoaneurysm formation and bleeding after repeated biliary procedures for a patient with biliary reconstruction after removal of an intrahepatic cholodochal cyst (Fig.6,7). Pseudoaneurysm developed in the right hepatic artery was embolized with coils (Fig.8) which resulted in large areas of parenchymal ischemia and later abscess formation. The patient died 4 months later due to multiple concurrent complications viz. infection, liver necrosis and repeated bleeding. The only other case of mortality linked to biliary procedures in this series can be attributed to sepsis. One case of biliary venous fistula was well-temponaded by upsizing the biliary catheter. Two other cases of hemobilia stopped spontaneously.
Fig. 1: Biliary venous fistula (small arrows). Previously inserted internal plastic stent (long arrow) is also seen. Note sharp angulation at the entry point of bile duct.
Fig. 2: Liver fracture in relation to the PTBD catheter with active extravasation is seen.
Fig. 3: No active arterial bleeding is noted at angiography though hepatic arteries appear to be gracile and spastic.
Fig. 4: External-internal biliary catheter inserted through gall bladder.
Fig. 5: Large intrahepatic hematoma is seen. Note PTBD catheter through gall bladder.
Fig. 6: PTBD catheter (double arrows) abutting the pseudoaneurysm of rt. hepatig artery (long arrow). Central cavity after biliary reconstructive surgery is also seen (small arrows).
Fig. 7: Angiography reveals a large pseudoaneurysm of rt. hepatic artery abutting the PTBD catheter. Distal rt. hepatic artery branches are occluded.
**Fig. 8:** Embolization of the pseudoaneurysm with coils.
Conclusion

Complications of percutaneous biliary interventions varies with patient status, diagnosis and degree of biliary dilatation [5] with low complication rates, both major and minor, with the use of a 21G needle [6]. In this series all fatalities directly attributable to major vascular complications occurred after cannulation by a thin needle (21G) in non-dilated/ mildly dilated biliary tract and/or repeated or vigorous manipulation with equipment/ catheters. Patient status however had an impact on choice of therapy after development of complications. Overall rate of major complications in this series was 10.8% which is well in tune with the recommended threshold (10%) of SIR (Society of Interventional Radiology) quality improvement guidelines (QIG) [5]. Specific complications such as sepsis, hemorrhage and death were 3.6%, 2.7% and 1.8% which is well within the complication-specific thresholds of 5, 5 and 3% respectively as recommended by SIR's QIG. In conclusion, vascular complications although rare are a major cause of patient morbidity and mortality and are often due to multiple needle punctures and repeated or vigorous manipulations during percutaneous biliary interventional procedures.

References

References:
