Endovascular treatments in interventional radiology of abdominal haemorrhagic patients. Our experience of last 10 years

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Aims and objectives

Selective angiography and embolization is an effective treatment for traumatic and non-traumatic arterial hemorrhage (1-2). Endovascular embolization for abdominal arterial hemorrhage is an established treatment for managing hemodynamically unstable patients (3, 4). Accurate, prompt identification of the damaged artery during the treatment session is essential for timely control of hemorrhage. One of the most important occurrences non-traumatic is acute gastro-intestinal (GI) bleeding having mortality rate with ranges 8% to 14% (5-6) and 21%- 40% in cases of massive bleeding associated with hemodynamic instability (7, 8, 9). Transarterial embolization (TAE) represents the most viable treatment option in patients receiving anticoagulation therapy for various diseases (10,11) (atrial fibrillation, valvular heart disease, prophylaxis of deep vein thrombosis and pulmonary thromboembolism) with spontaneous extraperitoneal hemorrhage (EES) with an annual incidence of 0.2-3% (12,13). Also in the management of severe postpartum bleeding (14) and other gynecological emergencies, arterial embolization provides high clinical success rate. Intraperitoneal bleedings and severe hemobilia can occur also after percutaneous transhepatic cholangial drainage (PTCD), consequently causing life-threatening hemorrhagic shock, which has a high mortality rate (nearly 50%) (15); superselective angiography has been developed as an effective method for the diagnosis and embolization of liver arterial bleedings (16). Transarterial embolization (TAE) plays a role in the management of traumatic abdominal organs bleeding; the most commonly organs injured include spleen and liver, that occur as a result of blunt or penetrating trauma. Less frequently abdominal bleeding involves kidney, mesentery, adrenal gland, small bowel, or pancreas. In cases of liver trauma is estimated that 50 to 80% of patients are able to undergo non surgical bleeding management in 98.5% (17). Also a recent series of consensus documents on genitourinary trauma highlights the endovascular evaluation and management of renal injuries (18). Superselective TAE preserves renal function, sometimes better than surgery (19). In trauma with bone fractures some surgeons advocate prompt stabilization of the bony pelvis, although others prefer immediate TAE (20). Pelvic fractures alone are associated with mortality rates of 5.6 to 15%, but the addition of hemorrhagic shock raises mortality rates to 36.4 to 54% (21). Associated organ injuries have been found in 11 to 20.3% (21) injuries with increased morbidity and mortality. Many of these traumatic and nontraumatic eventualities were considered in this study and, on the basis of our experience of last ten years, the aim was to evaluate retrospectively the efficacy of interventional radiology (IR) procedures in the treatment of acute abdominal bleedings in these conditions; our primary goals were to evaluate the indications, methods and results of interventional treatments; our secondary goals were to evaluate the efficacy of different types of embolic materials (coils and resorbable agents) used during the procedures.
Methods and materials

We manually evaluated the archives of our PACS to identify all patients who had undergone superselective embolization of traumatic and non-traumatic abdominal arterial bleedings at our interventional radiology department between July 2005 and September 2014. All patients were examined and treated as part of routine care and gave informed consent. Our institutional review board did not require its approval or informed consent for this study. A total of 74 patients (age range 14-81 years old) were included. 40 were male (54%) and 34 (46%) were female. The abdominal arterial bleedings were traumatic or non-traumatic, distributed some in the intraperitoneal and retroperitoneal space, others involving endoabdominal organs. The etiologies were as follows: 14 patients had GI bleeding and in particular 8 patients with angiodysplasias spread between the colon and the small bowel (including 5 males and 3 females) and 6 patients with iatrogenic surgical bleeding (4 males and 2 females), including 3 with coloncarcinoma and 3 patients after removal of pancreatic head tumors. 4 (3%) on 74 patients had abdominal bleedings due to anticoagulation therapy for various diseases; in particular 2 males with atrial fibrillation and 2 females after prophylaxis of deep vein thrombosis in pulmonary thromboembolism. 15 patients (9 males and 6 females) had hemobilia after percutaneous transhepatic cholangial drainage (PTCD) including 8 patients with diffuse bleeding at the intraperitoneal perihepatic and perisplenic spaces. 8 females had ginecological emergencies; in particular 6 females presented postpartum bleeding and 2 females with abdominal bleeding due to ectopic pregnancy. 33 polytrauma had intrabdominal bleeding (9 male with sacrum fractures, 10 male with branches ischio and ileopubic fractures and 14 female. Among these 5 had lesions of the organs associated with vertebral and rib fractures and 9 only organ injuries. Common clinical presentations of all patients included recurrent abdominal pain, intermittent massive hemorrhagic bile from the drainage tube after PTCD and no alleviation of jaundice. Additional signs included recurrent high fever and chills, in particular observed in 5 patient with severe biliary tract infection. 7 polytrauma patients were able to tolerate a surgical removal of the spleen despite poor general condition.
Results

Superselective hepatic arteriography was performed in 20 patients (15 patients to stop bleedings after percutaneous transhepatic cholangial drainage (PTCD) and 5 patients with liver trauma). Out of 20 patients, 2 were diagnosed with hepatic arterio-biliary fistula, 5 were diagnosed with pseudoaneurysm, and 13 was diagnosed with biliary-portal vein fistula. For the 2 patients with arterio-biliary fistula and the 5 patients with pseudoaneurysm, gelatin sponge and detachable platinum coils were used to embolize the proximal and distal ends, respectively, of the targeted bleeding vessel through superselective catheterization. No recurrent hemobilia was detected 30 days later in patients with bleedings after percutaneous transhepatic cholangial drainage (PTCD) (Table 1)(Figure 1,2,3). Angiography showed that another small branch adjacent to the pseudoaneurysm was responsible for the rebleeding in 2 patients with liver trauma who underwent subsequent partial hepatectomy(Table 1). In 8 patients with angiodysplasia spread between the colon and the small bowel, 4 cases were treated with gelatin sponge at the level of distal arterial branches with subsequent proximal release of coils, and 4 were treated with only gelatin sponge and subsequent surgery(Table 1). Gelatin sponge was also used for treating 4 patients suffering of bleedings due to anticoagulation therapy with good hemostasis in the follow-up(Table 1). Only coils were used in 6 patients with GI iatrogenic surgical bleedings with good hemostasis control in 3 patients with pancreatic head tumors and in 1 patients with coloncarcinoma; 2 cases with coloncarcinoma had partial colon ischemia, bleeding and underwent subsequent surgery(Table 1). 8 patients with gynecological emergencies were treated with gelatin sponge and subsequent proximal release of coils with good hemostasis control in all patients; the 2 cases of ectopic pregnancy were underwent to subsequent surgery(Table 1). Coils and gelatin sponge were used in treating bleedings occurred in 6 patients with pelvic organs trauma, in 7 with sacrum fractures and in 10 patients with pelvis fractures involving ileo and ischiopubic branches with good hemostasis control. In other 2 cases of sacral fractures were needed further treatment with coil; 3 female with associated pelvic organs injuries underwent hysteroannessiectomy(Table 1). Through superselective catheterization all the materials used in this procedures to embolize respectively the distal ends and proximal branches arteries were gelatin sponge (Gelfoam, Pfizer, New York, NY) and detachable platinum coils (GDC, Boston Scientific) for stopping bleeding vessel.
Table 1. The outcomes of interventional therapy for the treatment of abdominal bleedings

<table>
<thead>
<tr>
<th>Patient number</th>
<th>Bleeding causes</th>
<th>Materials embolizations</th>
<th>Hemostasis follow-up from 15 days to 1 month</th>
<th>Complications related to embolization</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Angiodysplasia spread between the colon and the small bowel</td>
<td>Coils + Gelatin sponge</td>
<td>Good control in 4 patients. The others 4 were undergone surgery</td>
<td>None</td>
</tr>
<tr>
<td>6</td>
<td>GI iatrogenic surgical bleedings</td>
<td>Coils</td>
<td>Good control in 3 patients with pancreatic head tumors and in 1 patients with colon cancer</td>
<td>None except in 2 cases with colon cancer with partial colon ischemia, bleeding and subsequent surgery</td>
</tr>
<tr>
<td>4</td>
<td>Bleedings due to anticoagulation therapy</td>
<td>Gelatin sponge</td>
<td>Good control in all patients</td>
<td>None</td>
</tr>
<tr>
<td>15</td>
<td>Bleedings after percutaneous transhepatic cholangial drainage (PTCD)</td>
<td>Coils + Gelatin sponge</td>
<td>Good control in all patients</td>
<td>Fever and chills, in particular observed in 5 patients with severe biliary tract infection</td>
</tr>
<tr>
<td>8</td>
<td>Gynecological emergencies</td>
<td>Coils + Gelatin sponge</td>
<td>Good control in all patients</td>
<td>None. 2 cases of ectopic pregnancy were subjected to subsequent surgery</td>
</tr>
<tr>
<td>33</td>
<td>Polytrauma</td>
<td>Coils + Gelatin sponge</td>
<td>Good control in 3 cases of liver trauma, in 6 patients with pelvic organs trauma, in 7 with sacrum fractures and in others patients with pelvis fractures</td>
<td>2 patients underwent partial hepatectomy for rebleeding. In 2 cases of sacral fractures were needed further treatment with coils. 3 female were underwent to hysteroanassiestomy</td>
</tr>
</tbody>
</table>

Table 1

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**Fig. 1:** 52 year old female patient suffering of pancreatic head carcinoma and increase of transaminases and bilirubin underwent percutaneous transhepatic cholangial drainage.

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Fig. 2: CT examination documenting liver bleeding.

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**Fig. 3:** Angiography documents the bleeding intrahepatic

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**Fig. 4:** Angiography documents the microcoil embolization and intrahepatic bleeding.

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Fig. 5: CT exam documents stop extravasation of intrahepatic MDC.

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Conclusion

Interventional radiology has much to offer in the evaluation and treatment of traumatic injuries. Current literature suggests that this role may expand in time due to desire for organ preservation and avoidance of surgery as well as due to improvements in transcatheater equipment. Selective hepatic arteriography is considered the preferred method for diagnosis of severe hemobilia and bleeding liver vessels because of its high sensitivity, being capable of immediately and accurately detecting bleeding at such low rates as approximately 0.5 to 2 mL/min \(^{22}\). Many reports have emphasized the usefulness of transcatheater embolization in the control of intractable bleeding that is associated with pelvic trauma \(^{23}\). Arterial embolization has also been successfully used for the managment of postoperative \(^{24}\), postabortion \(^{25}\) and postpartum \(^{26}\) intractable bleeding. In our study we obtained in traumatic and non-traumatic condition complete stop bleeding of arterial branches in many of these situation and in particular in traumatic and non traumatic condition of arterial bleeding liver, in bleedings due to anticoagulation therapy and Ginecological emergencies. In conclusion, our study demonstrates the utility of the different methods and interventional techniques in controlling bleeding emergencies.
References