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Embolization of Post-Traumatic Pseudoaneurysm of the Proper Hepatic Artery

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Abstract

38-year old, drunken man had fell from the window and was admited to the hospital with multiple limb fractures and suspicion of traumatic liver injury. Post-contrast CT examination proved the pseudoaneurysm arising caudally from the proper hepatic artery. The indicated angiography should specify location and character of the pseudoaneurysm and allow its subsequent embolization. After placing the catheter tip into its neck the pseudoaneurysm was successfully closed by metal coils and mixture of tissue glue (Histoacryl) and contrast medium (Lipiodol Ultrafluid).

Keywords: Post-traumatic pseudoaneurysm; Proper hepatic artery; Bluntabdominal trauma; Embolization; Multisequentional CT

Introduction

Pseudoaneurysm affecting the proper hepatic artery represents rare, late complication of blunt abdominal trauma. While primary diagnosis is based mainly on CT or US and Doppler examination, angiography specifies established diagnosis and allows therapeutic procedure – selective embolization.

Case Study

38-year-old, drunken patient was hospitalized after falling out of window. He sustained multiple fractures (open fracture of proximal left tibia, fracture of distal right fibula, open facture of proximal phalanx of the right forefinger and fractures of all transverse processes of the right lumbar spine). There was a suspicion of abdominal trauma. The patient was conscious with anterograde amnesia, stable circulation and spontaneous, sufficient ventilation. Laboratory examination proved increased liver function tests - S-ALT 4.0 µkat/l, S-AST

6.35 µkat/l, S-LD 8.29 µkat/l and HCV positivity. Hematuria was present – 38 Ery/µl. The other laboratory findings were within the standard limits. Postcontrast admission CT proved contusion lesions of the dorsobasal segments of both lungs and hematoma below visceral aspect of the liver (Figure 1). The control postcontrast MSCT examination and CT angiografic studies performed within six-day period (Figure 2) showed a sacciform, partly thrombotized, pseudoaneurysma of dimensions – 37 mm x 29 mm x 41mm that originated ventrocaudally from the proper hepatic artery. Basing on this finding the angiography together with embolization was indicated.

Figure 1: Postcontrast axial CT exam at the admission. Hematoma below visceral aspect of the liver.

Figure 2: Postcontrast coronary CT exam performed on 6th day after the admission shows pseudoaneurysm of pear-shape affecting proper hepatic artery.

Digital angiography on the eighth day after patient's admission to the hospitál was performed by puncturing the left axillary artery. We introduced catheter 4 F (Cobra C2, Cook) into the common hepatic artery. Administration of the contrast agent proved the pseudoaneurysm with 3-mm wide, short neck originating ventrocaudally from lower contour of the proper hepatic artery (Figure 3). After placing the catheter tip in the pseudoaneurysm neck by means of hydrophilic guidewire (ArgoGiude, 0.035", Argon). we applied 8 metallic coils with the dimensions of 15 mm x150 mm – 3 mm x 15 mm (MReye, Cook) (Figure 4).With respect to the partial contrast filling of the pseudoaneurysm after 10 minutes lasting DSA while contrast medium had been administered into the trunk of the proper hepatic artery, we decided to close the pseudoaneurysm neck

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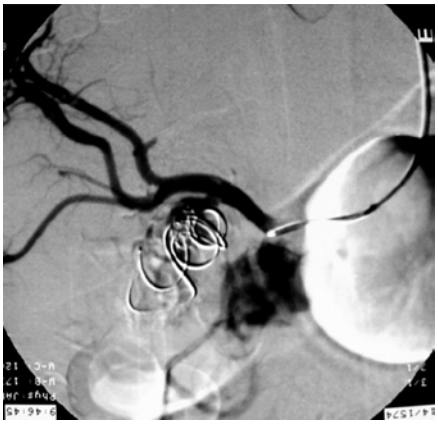

Figure 3: DSA of the proper hepatic artery demonstrates partly thrombotized pseudoaneurysm with well differentiated neck.

Figure 4: The neck is scarcely filled even after embolization by metelic coils.

by administering 1 ml mixture consisting of 1:4 ratio of tissue adhesive (Histoacryl) and contrast medium (Lipiodol Ultrafluid). Control DSA proved total closure of the neck as well as the whole pseudoaneurysm (Figure 5). CT follow-up examination performed on 9th day after the embolization showed total closure of the pseudoaneurysm while the trunk of the proper hepatic artery remained intact (Figure 6). The patient was transferred to the Orthopedic Department for finishing the fractures healing. Clinical and laboratory condition of the patient was stabilized, hematuria disappeared. The liver function tests remained slightly increased due to positive findings of hepatitis C. The controls after 3 and 6 months demonstrated standard clinical, laboratory and CT findings. The patient did not express any subjective complaints.

Discussion

Due to its relatively firm fixation the liver is one of the most frequently injured organs in patients with abdominal trauma. Prevalence of liver injury ranges from 4 to 8% of blunt trauma [1,2] and 14 % of open trauma cases [3] respectively. Diagnostic and therapeutic strategy depends particularly on hemodynamic condition of the patient and presence of active bleeding. Majority of trauma centers routinely categorize the patients into three groups. The first group consists of patients who remain hemodynamically unstable in spite of resuscitation. After proving the blood in peritoneal, pleural and pericardial cavity those patients are urgently guided to the operating room. The sekond group is formed by hemodynamically stabilized patients who probably do not require a surgery. They are indicated to urgent CT examination aimed at detection of hemoperitoneum and bleeding vessels, assessment of liver parenchyma injury, searching for fistula, biloma or pseudoaneurysm. The patients belonging to the third group are hemodynamically stable. They are indicated for CT examination in order to exclude late complications associated e.g. with leaking bile (hemobilia, biliary peritonitis, biloma), arising abscess or injury of hepatic vessels (arteriovenous or arterioenteral fistula, pseudoaneurysm) [4-6]. Posttraumatic pseudoaneurysm of hepatic artery belongs to rare and usually late complications of blunt abdominal trauma [7,8]. The clinical signs of pseudoaneurysm include abdominal upper right quadrant pain, hemoperitoneum, abdominal expansive process, icterus, bleeding to biliary ducts and gastrointestinal tract potentially associated with development of shock. Pseudoaneurysm frequently manifests by non-specific signs that occur after some time from the trauma. Its wall is formed by surrounding tissues and hematoma. Rupture of pseudoaneurysm affecting the hepatic artery followed by bleeding into the peritoneal cavity represents a serious complication in about 44 % patients [8]. Occurrence of the fistula communicating with bile ducts or gastrointestinal tract is less frequent [8]. US, CT, MR and angiographic examinations are used for diagnose of abdominal trauma. Ultrasound with Doppler examination may be used as screening method of abdominal upper quadrant pain [5].

Figure 5: After administration of Histoacryl and Lipiodol Ultrafluid the filling of the pseudoaneurysm neck is stopped.

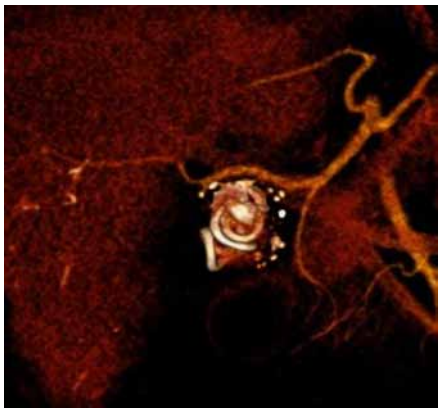

Figure 6: CT angiography demonstrates the intact proper hepatic artery and the pseudoaneuysm sac filled with metallic coils, mixture of Histoacryl and Lipiodol.

Angiography was considered a "gold standard" test for a long time. However, after introduction of CT and MR examination these non-invasive methods became most important tools for exact imaging the vascular structures. Now, the post-contrast examination by multislice CT apparatus is considered to be the method of choice thanks to dynamic imaging of the parenchymal and vascular lesions affecting abdominal, thoracic and pelvic organs as well as head and spine [7,9]. CT grading is based on liver injury assessment by using CT. CT grading detects level of parenchymal liver laceration, parenchymal and subcapsular hematoma, proves an extent of devascularization of liver parenchyma, reveals bleeding into the peritoneal cavity, occurrence of fistulas and pseudoaneurysm [10]. CT examination shows post-traumatic pseudoaneurysm in its early arterial phase as a round focal lesion with high attenuation, identical with post-contrast opacification of hepatic arteries. This complication uses to be late. It can not be demonstrated within initial CT examination like in the case of our patient. The value of the angiography lies not only in determination of the active bleeding source or imaging the pseudoaneurysm sac but particularly in allowing an instant endovascular therapeutic intervention – stopping the bleeding or closing the pseudoaneurysm by embolization or stent [11]. e.g. Schwartz et al. achieved 88 % technical success of the embolization in group of 28 patients with traumatic affection of hepatic arteries [12]. Forlee et al. successfully treated 10 patients with hemobilia due to penetrating or blunt abdominal trauma by selective embolization [13]. The embolization of pseudoaneurysm involves selective catheterization of thehepatic artery followed by placing it in the pseudoaneurysm neck and applying of some of embolization materials – metallic coils, Gelaspon particles, autologous coagula, detachable balloons, Histoacryl adhesive, PAV particles or autologous thrombin in order to produce local thrombosis and achieve effective hemostasis [4, 6,10,12,14]. The choice of the embolization material typ results from location and extent of the hepatic artery lesion. It also depends on whether the pseudoaneurysm sac occurs or not. The embolization should be performed as selective as possible in order to minimize the risk of ischemia and retrograde filling the pseudoaneurysm from distal collaterals [4,15]. If the portal circulation is preserved, majority of the hepatic arteries could be closed. However, too much aggressive, non-selective embolization is associated with the risk of intrahepatic necrosis or abscess [15]. The large pseudoaneurysm with wide neck and quick blood flow rate makes using some of the embolization materials like Gelaspon particles, autologous coagula, PAV particles or Histoacryl ineffective and risky because of potential penetration of the embolization material into the peripheral hepatic arteries [4]. In this case it is recommended closing the aneurysm sac and neck by metallic coils, detachable balloons or covered stent [6]. In our patient we applied firstly metallic coils that failed to completely close the pseudoaneurysm neck. Nevertheless, the substantial decrease of the blood flow rate allowed "gluing up" the neck by tissue adhesive - Histoacryl mixed with oily iodinated contrast medium Lipiodol Ultrafluid. A few of the mixture of Histoacryl and Lipiodol Ultrafluid penetrated to peripheral branches of the hepatic arteries without any consequence what was proved control CT and laboratory examination.

In conclusion we belive that diagnose established by multisequentional CT examination as well as subsequent angiographic embolization should be the first choice for managing post-traumatic pseudoaneurysm affecting the hepatic arteries.

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