Endovascular treatment of acute extensive porto-spleno-mesenteric venous thrombosis

A 55-year-old man affected by protein C and S deficiency came to our department complaining of abdominal pain, sickness and fever, 18 days after open-surgery sigmoid-rectum resection for colorectal cancer. Therefore the patient underwent emergency abdominal Ultrasonography (US) and Computed Tomography (CT) examinations.

Imaging Findings:

Emergency US and CT-scan showed widespread ascites and complete thrombosis of spleno-mesenteric-portal axis (Fig.1). Heparin EV therapy was begun, but after 4 days symptoms worsened. Trans-femoral angiography was performed (Fig.2): superior-mesenteric artery (SMA) was patent but spleno-mesenteric-portal axis was not opacified, suggesting a thrombosis of portal, superior-mesenteric and splenic veins (PSMT).

Endovascular fibrinolysis was required, but neither trans-hepatic nor transjugular access were available due to ascites and extensive thrombosis. An indirect therapy was performed via SMA using a Simmons-catheter performing venous thrombolysis through the capillary circle.

Control angiography (4th day after treatment) showed a progressive improvement of venous return from the bowel wall (Fig.3); portal vein was not clearly recognized but its intra-parenchymal slender branches were appreciated.

6th-8th day after treatment CT-scan depicted collateral vessels formation and minimal recanalisation of superior mesenteric vein (SMV) (Fig.4).

Follow-up CT showed reduction in thrombosis extension and development of a portal cavernoma (Fig.5-6).

Recanalisation of chronic portal vein thrombosis through collateral peri-portal circulation was confirmed by Colour-Doppler-US follow-up (Fig.7-8).

Discussion:

Acute extensive PSMT accounts for 5-10% of all abdominal ischaemic events. Since clinical presentation is often non-specific and highly variable, TPSM is frequently unrecognised, causing delayed diagnosis and high morbidity and mortality rates[1].

PSMT is usually related to an underlying hypercoagulable-state resulting from congenital thrombophilic conditions.
(antithrombin-III deficiency; protein C or S deficiency; antiphospholipid-antibody syndrome; factor V Leiden and prothrombin-gene mutation) which might be exacerbated by an elapsing event, such as pancreatitis or abdominal surgery[2, 3], like in our case.

Clinical expression might vary from asymptomatic to abdominal cramps, nausea, anorexia, vomiting, diarrhoea, and/or melaena [2]; potentially life-threatening severe manifestations include mesenteric ischaemia and variceal bleeding[4].

There is no universally accepted protocol for SPMT management and treatment[2]. Medical treatment is usually administered in all patients; in case of persistence/worsening of clinical symptoms, surgery or endovascular therapy is required.

Minimally invasive techniques, such as loco-regional fibrinolysis, have recently been introduced in therapeutical management of patients with worsening of clinical condition despite anticoagulation, in absence of bowel infarction or perforation[2, 4].

Endovascular thrombolytic agents might be administered directly (via percutaneous transhepatic or transjugular intrahepatic routes) or indirectly via SMA[3].

Indirect approach implies the puncture of femoral or radial artery with a 4-5F artery-sheath; Simmons or Cobra catheter is then inserted to perform celiac artery and SMA selective angiography and indirectly portal, superior-mesenteric and splenic venography.

Urokinase(50000 UI/h) and sodium-heparin(1000 UI/h) are selectively administered through an infusion catheter[4]. Arterial access advantages include simple technique and better dissolution of clots within capillaries and venules[2].

In particular, thrombolytic agents infusion into SMA is preferred since it allows to reach indirectly the capillary circulation and the smallest branches of the superior mesenteric vein(SMV), promoting lateral branches neoangiogenesis [2].

If compared with lysis performed through a direct access to the portal vein, intra-arterial delivery disadvantages include an increased risk of gastrointestinal bleeding, an increased incidence of complications at puncture site and the potential formation of portal cavernomas, as in our case.

Thrombolysis duration varies according to clinical condition and radiological findings. However, low-dose urokinase infusion, no simultaneous peripheral venous urokinase infusion and careful monitoring of coagulation-status during treatment is recommended to reduce haemorragic risk.

After treatment, venography and CT are required to demonstrate blood flow restoration within SMV; if clinical condition improvement is reported, thrombolysis might be administered discontinuously and anticoagulant oral intake might be undertaken.

A strict imaging follow-up with CT and Colour-Doppler-Ultrasound (after 1 week, 1 and 6 months, and than only CDUS annually) is mandatory to detect promptly any complications or disease recurrence[3].

**Differential Diagnosis List:** Acute extensive portal, superior-mesenteric and splenic veins thrombosis (PSMT), Acute pancreatitis, Acute cholecystitis, Abdominal aortic aneurysm rupture, Bowel obstruction, Acute diverticulitis, Renal colic, Perforation of a hollow viscus

**Final Diagnosis:** Acute extensive portal, superior-mesenteric and splenic veins thrombosis (PSMT)

**References:**


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intrahepatic route. Abdom Imaging 36:390-8 (PMID: 20652243)
Feng-Yong Liu, Mao-Qiang Wang, Qing-Sheng Fan, Feng Duan, Zhi-Jun Wang, Peng Song (2009) Interventional
treatment for symptomatic acute-subacute portal and superior mesenteric vein thrombosis. World Journal of
Gastroenterology 15: 5028-5034 (PMID: 1985999)
**Description:** Angiography at 4th day of treatment showing the opening of collateral venous drainage circles of the bowel wall. **Origin:** Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
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Description: Follow-up CT showing progressive recanalisation of superior mesenteric and portal vein with initial reduction of oedema of the bowel wall. **Origin:** Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
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**Figure 3**

**a**

**Description:** Follow-up Colour Doppler Ultrasound showing the portal cavernoma and the chronic portal vein thrombosis with recanalisation through collateral periportal branches. **Origin:** Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy

**b**

**Description:** Follow-up Colour Doppler Ultrasound showing blood flow afference to the liver. **Origin:** Department of Diagnostic and Interventional Radiology, University Hospital of Pisa
**Figure 4**

**Description:** Follow-up Colour Doppler Ultrasound showing chronic portal vein thrombosis with recanalisation through collateral periportal branches. **Origin:** Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Figure 5

Description: Volume rendering (VR) CT image showing catheter infusion of fibrinolytic therapy correctly placed into SMA. Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
**Description:** Maximum intensity projection (MIP) reconstruction showing formation of collateral perisplenic vessels. **Origin:** Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Description: Maximum intensity projection (MIP) showing formation of collateral perigastric vessels.

Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Description: Maximum intensity projection (MIP) showing formation of collateral periportal vessels.

Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Description: Maximum intensity projection (MIP) showing minimal recanalisation of the superior mesenteric vein (SMV). Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Figure 6

Description: Follow-up CT image showing complete recanalisation of the superior mesenteric vein (SMV). Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Description: Follow-up CT image showing SMV complete recanalisation with resolution of bowel wall oedema and absence of ascites. The development of a portal cavernoma is also depicted. Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
**Figure 7**

**Description:** Baseline CT image showing complete thrombosis of spleno-mesenteric-portal axis.

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**Origin:** Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Description: Baseline CT axial image showing the different density between portal vein and vena cava.
Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Description: CT image after contrast medium injection confirming extensive PSMT and oedema of bowel wall, with dilatation of jejunal loops. Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Description: CT image after contrast medium injection confirming extensive PSMT and showing oedema of bowel wall, dilated jejunal loops and widespread ascites. Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Figure 8

Description: Superior mesenteric artery (SMA) selective arteriography showing patency of the SMA branches. Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy
Description: Superior mesenteric artery (SMA) selective arteriography showing absence of venous return from the intestinal wall and absence of portal vein visualization. Origin: Department of Diagnostic and Interventional Radiology, University Hospital of Pisa, Italy