

POSSIBILITY OF RADIOLOGICAL DIAGNOSTICS OF SPLENIC ARTERY PSEUDOANEURYSM - A CASE REPORT AND REVIEW OF LITERATURE

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Splenic artery pseudoaneurysm (SAP) is extremely rare, but potentially fatal medical condition. In the literature to date, pseudoaneurysms of the splenic artery were described in less than 250 cases. The most frequent cause of this rare condition is pancreatitis. Patients with splenic artery pseudoaneurysms are almost always presented by severe clinical symptoms. Ruptured pseudoaneurysms can cause fatal complications. The aim of this study was to present radiological possibilities in diagnostics of SAP in a patient suffering from chronic pancreatitis. Patient was initially advised for Ultrasound and Color Doppler sonography where lesion suspicion for SAP was made. Further, CT angiography and DSA were performed to provide certain diagnosis. The patient was surgically treated and histopathological examination definitely confirmed diagnose of SAP.

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Key words: splenic artery pseudoaneurysm, radiological diagnostics, ultrasound, CT, DSA

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Introduction

Visceral artery aneurysms are a rare but potentially life-threatening form of vascular disease and represent 0.1-0.2% of all aneurysms (1). Splenic artery aneurysms (SAA) are the most common visceral aneurysms with a rate of about 60% (2). Also, splenic artery is the third most common location of intraabdominal aneurysms, after aneurysms of the abdominal aorta and the iliac arteries, with prevalence from 0.2% to 10.4% (3). They are more common in females with 4:1 predominance (4). The vast majority of the splenic artery aneurysms are discovered incidentally, with more widespread use of advanced imaging. Splenic artery pseudoaneurysm (SAP) is extremely rare condition, quite the opposite of the true aneurysms of splenic artery (5). In the literature to date, SAPs were described in less than 250 cases (6). Unlike SAA, SAPs nearly always pres-

ent with symptoms (3). The aim of this article is a case report with literature review of the clinical features, radiological appearance and management of SAP.

Case presentation

We present a 49-year-old patient with history of chronic pancreatitis and alcohol abuse. In the period of last two months, he complained about the occasional pulsating pain in the upper abdomen so he was hospitalized with suspicion of SAP.

After a clinical examination, the patient was advised for abdominal ultrasound (US) and color Doppler sonography (CDS) examination which was performed with CH 6- 2 abdominal probe on Siemens Acuson Antares ultrasound machine.

In the region of the pancreas body, US revealed an oval, well defined, multilayered, thick walled, cystic lesion, dimension 6 x 5.5 cm (Figure 1) with CDS registered turbulent blood flow (Figure 2). The lesion is with short and narrow neck associated with splenic artery. In the neck of the lesion it was registered characteristic bidirectional high-speed flows by the type so called "to and fro" with peak systolic velocity (PSV) up to 250 cm/s (Figure 3).

In a continuation of diagnostics, Computed Tomography (CT) angiography of the abdomen was performed on Toshiba Aquilion 64 CT scanner. The examination was done with intravenously administered contrast medium in the arterial, early and late venous phase.



Figure 1. Ultrasound image of SAP

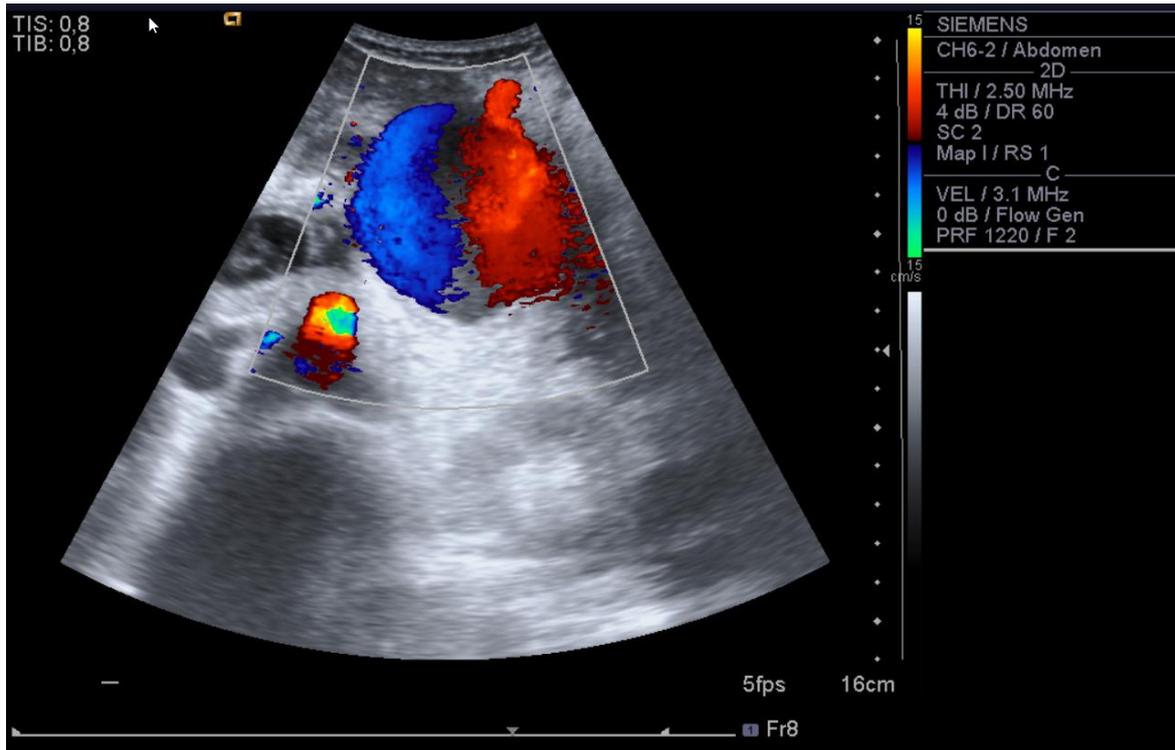


Figure 2. CDS registered turbulent blood flow

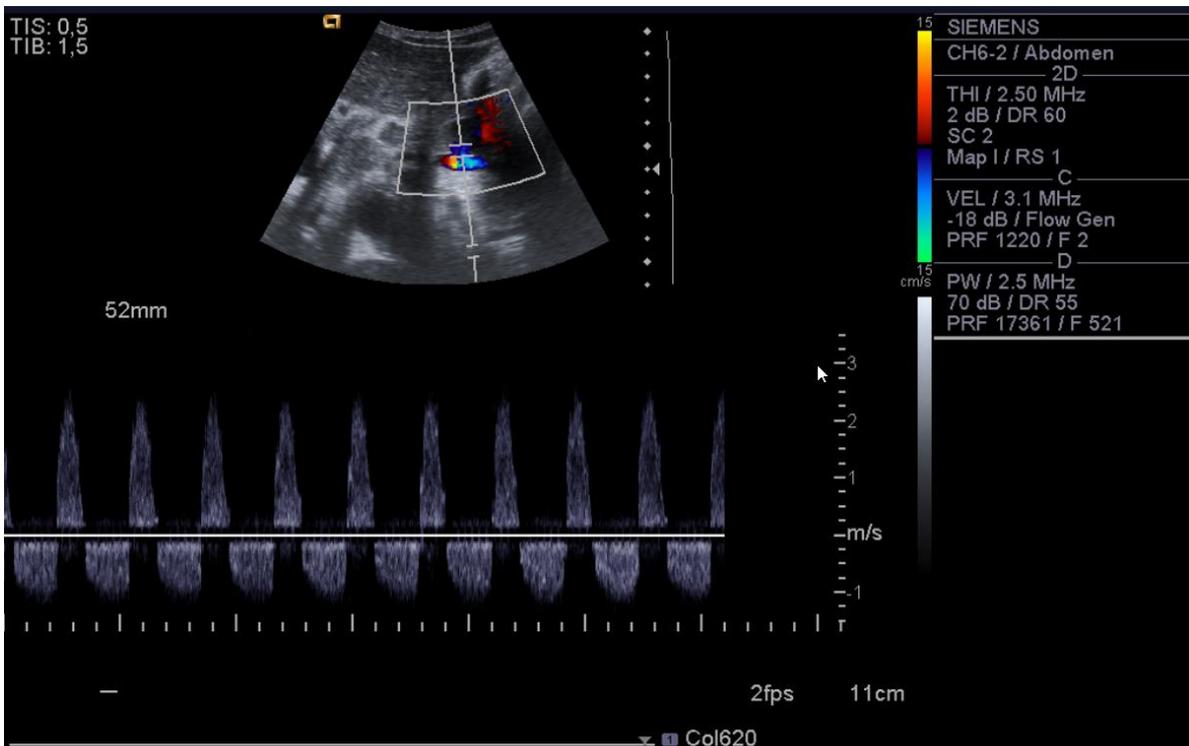


Figure 3. Characteristic bidirectional high- speed flows in the neck of SAP

An examination of the arterial phase presents the common hepatic artery, a splenic artery, and an upper mesenteric artery with its branches. In the proximal third of the splenic artery, retropancreatically, it is presented as an oval, smoothly marginated formation with thicker walls, measuring about

5 x 5 cm and showing gradual enhancement, with maximum densities reaching in the late venous phase probably because of the extremely thin SAP neck (Figure 4). The aforementioned formation could be differentiated as pseudoaneurysm of the splenic artery with thin neck.



Figure 4. CT axial image of SAP, late venous phase



Figure 5. DSA shows extravasation of the contrast medium in SAP

For the purpose of additional diagnostics, digital subtraction angiography (DSA) of the celiac trunk was indicated and implemented.

At the level of the proximal third of the splenic artery, it is observed extravasation of the contrast medium in the previously described lesion, which corresponds to the pseudoaneurysm of the splenic artery (Figure 5).

After appropriate radiological diagnostics, patient was treated surgically by radical splenic artery ligation and splenectomy with distal pancreatectomy. Histopathological verification of previously observed and resected lesion confirmed that it was a pseudoaneurysm of splenic artery.

Discussion

An insight into available literature shows that a typical patient with SAP is about 52 years old (range, 35–78 years), suffers from chronic pancreatitis and has a history of alcohol abuse as the case of our patient was (7).

The most common etiology of SAP is pancreatitis, precisely recurrent acute or chronic form, even though, less common cause is the first episode of acute pancreatitis (5). A large proportion of patients have a significant history of alcohol intake (7). It is estimated that up to 21% of patients with chronic pancreatitis and 10% patients with chronic pancreatitis and pseudocyst develop SAP as additional complication (8, 9). Blunt and penetrating trauma

as well as iatrogenic trauma or peptic ulcer disease are less common causes (10). In a small number of SAP, there is no identifiable cause (7).

Pseudoaneurysm based on pancreatitis is caused by at least three different mechanisms:

1. enzymatic digestion of the adjacent artery wall by peripancreatic fluid within a pseudocyst, forming necrotising arteritis with fragmentation of elastic tissues
2. local compression of the blood vessel wall by longstanding pseudocyst, which can cause vascular erosion and weakness of the vessel wall architecture or
3. aneurysmal rupture into pseudocyst leading to pseudoaneurysm (5, 8). Splenic artery is the most frequently affected blood vessel (30-50%) (5).

Normal diameter of the splenic artery is in range from 0.43 cm to 0.49 cm. The splenic artery is aneurysmal dilatated when a focal diameter is greater than 50% compared to the normal vessel lumen. True aneurysms involve all 3 layers (intima, media and adventitia), while pseudoaneurysms forming a false lumen, so that consist of only one or two layers (9).

Retrospective case series reported different size of splenic artery pseudoaneurysms, from 2 cm to 17 cm (mean diameter 4.8 cm), similar to our measurements 5.5 x 6 cm on US examination and 5 x 5 cm on CT angiography respectively (7). Thus, we could suspect SAP based only on the history of the disease and US and CDS examination results. Further, we were able to conclude that there was no

significant difference in the dimensions of the lesion, either measured by the ultrasound or CT examination.

The literature data leads to the conclusion that the size of SAP is not a predictor of rupture (9). Pseudoaneurysms, independent of their size, are more prone to rupture because of lack a true wall unlike true splenic aneurysms with all three intact layers wall. Larger pseudoaneurysms probably originate from rupture into a pseudocyst (8).

The most accurate term for pseudoaneurysm is pulsatile hematoma, which describes both disease and the high risk of rupture without treatment (11). Clinical diagnosis of SAP is challenge because its presentation often varies from an incidental finding to hemodynamic collapse from sudden rupture and bleeding (6). Patients with SAP are almost always presented by severe clinical symptoms such as an episode of abdominal pain - 29.5%, melena and tarry stool - 26.2%, hematochezia (vomiting blood) - 14.8% or ischemic symptoms of affected organ which is consequence of intermittent embolism. Acute and massive hemorrhage with the loss of large amounts of blood can cause hemorrhagic shock (5, 12). Ruptured pseudoaneurysms can cause fatal complications due to massive gastrointestinal bleeding in the pancreatic duct, termed "hemosuccus pancreaticus", which is the main cause of hemobilia, hematemesis, hematochezia or melena. Rupture can also occur into the nearby organs, peritoneum, retroperitoneum or form a pseudocyst (9). It is estimated that the risk of rupture of a SAP is about 37%, with the mortality rate of 90% for the untreated ones (3). Except early rupture complications of pseudoaneurysms also include, compression of nearby structures and a high frequency of aneurysm infection (11).

The US with CDS, is low cost, wide available, real time and very informative hence is usually the first diagnostic modality for abdomen and pelvic pathologies. It can be useful for detecting SAP, as well as belonging neck. Accurate and reliable diagnosis, in fact, requires additional diagnostics methods such as CT angiography and DSA. A CT is the most commonly used diagnostic tool for evaluation of all visceral pseudoaneurysms.

On US imaging, pseudoaneurysm commonly appears as multilayered lesion with central or peripheral anechoic area continuous with arterial lumen, showing continuous arterial pulsation on real time ultrasonography if SAP is from the splenic artery. Continuous arterial pulsation is not visualized if pseudoaneurysm arising from the small artery or when only small part of lesion is continuous with arterial lumen. Sonographic appearance of pseudoaneurysm depends on the size of the lesion, patency of vessel and aneurysmal lumen, presence of hemorrhage and thrombus, and level of calcification (6). This technique is depending on the surgeon and also may be limited by obesity, shadowing from bowel gas or massive arteriosclerosis which can interfere with retroperitoneal and mesenteric vessels obscuring visualisation. Limited spatial resolution may cause missing small lesions on sonography (3). On CDS examination, because of the turbulent forward and backward flow, there may be seen characteristic "yin-

yang" sign, while a "to and fro" sign may be seen with pulsed wave Color Doppler.

A CT angiography is very useful method for confirming the diagnosis as well as presenting the anatomy, size and extent of the lesion, character and continuation of pseudoaneurysm with parent vessel, detecting extent of thrombus, hemorrhage and status of adjacent organs. On CT, pseudoaneurysm appears during the arterial phase, which is most important for identifying these lesions. A SAP is at imaging similar as aneurysms with the more irregular margin, presented as hypodense or multilayered lesion which is continuous with the parent artery and typically surrounded by a hematoma (3, 5, 11). If acute hemorrhage is present, it will be demonstrated as hyperdense area. The presence of gas suggests a gastrointestinal fistula, and the lack of very high-density oral contrast suggests that the lesion does not communicate with the gastrointestinal tract (6). New generation scanners with a large number of detector rows with multiplanar reconstruction (MPR) capabilities as well as three-dimensional renderings (3D rendering) allow identification of aneurysms and pseudoaneurysms, better separation of smaller aneurysms from tortuous blood vessel or hyperattenuating islet cell tumor of the pancreas. Multiplanar reconstruction (MPR) and 3D rendering of the lesion is useful for a better evaluation of the whole condition (3). Relative contraindications to CT angiography are renal insufficiency, poor intravenous access, and allergy to contrast agents.

Magnetic resonance imaging (MRI) and MRI angiography are useful diagnostic modalities in patients with chronic renal failure, because of the use of potentially less nephrotoxic contrast agents, although MRI can detect vascular flow without applying contrast material (11). Contraindication for MRI includes patients with pacemakers or aneurysm clips, while relative contraindications include patients suffering from claustrophobia, or unable to hold their breath (3).

In hemodynamically stable patients, preoperative DSA helps confirming the diagnosis, define the character of the lesion and allows therapeutic planning. In a high-risk patient, with bleeding vessel, preoperative DSA might gain temporary control of hemorrhage by performing transcatheter embolization, thus providing a time window for operation under optimum clinical conditions (5). DSA is the most specific diagnostics, but also may be a therapeutic method, so it is the gold standard for identification of artery aneurysms and pseudoaneurysms (8). In carefully selected patients, endovascular visceral aneurysm artery reconstruction with stent graft can be a reasonable method of treatment, as a safer option and an alternative to open surgical repair (13).

Almost all visceral pseudoaneurysms require treatment because of the tendency of continuous enlargement, great risk of rupture, and consequently significant mortality (11). In the past, the most commonly used treatment of SAP was radical splenic artery ligation, splenectomy with or without pancreatotomy (distal, partial or total) (14). Nowadays, endovascular, less invasive approach, for uncomplicated pseudoaneurysms in hemodynamically stable

patients, is increasingly in use with better outcomes and less morbidity (9). The treatment of choice is coil embolization or stent-graft placement across the lesion when the anatomy allows (11). Endovascular procedures have less severe complications such as splenic infarction or postembolization syndrome (12). If surgical intervention and arterial embolization are not possible or not feasible, percutaneous US or CT-guided application of thrombin can be performed for the first-line treatment (8).

Conclusion

SAP is a potentially life-threatening condition that can be difficult to diagnose. It is important to make the distinction between visceral aneurysm and

pseudoaneurysm for further treatment and prognostic opportunities. SAP can be diagnosed by clinical approach, US with CDS examination, CT angiography, MRI angiography and DSA. The CT is proven to be quite valuable method, but DSA is considered to be the gold standard due to better spatial resolution and potentially successful treatment method.

Death rate in untreated pseudoaneurysms is not neglectable, so that, radiologists, who identify these vascular pathologies, have to recognize the clinical significance and understand the management because prompt and well-timed treatment depends directly on fast and accurate radiological diagnosis.

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MOGUĆNOSTI RADIOLOŠKE DIJAGNOSTIKE PSEUDOANEURIZMI LIJENALNE ARTERIJE – PRIKAZ SLUČAJA I PREGLED LITERATURE

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Pseudoaneurizme lijenalne arterije predstavljaju ekstremno retko, ali potencijalno fatalno medicinsko stanje. U literaturi je do sada opisano ukupno manje od 250 slučajeva. Najčešći uzročnik ovog retkog stanja je pankreatitis. Bolesnici sa pseudoaneurizmama lijenalne arterije skoro uvek imaju ozbiljne kliničke simptome. Ruptura pseudoaneurizme može izazvati komplikacije sa fatalnim posledicama. Rad ima za cilj da prikaže mogućnosti radiološke dijagnostike pseudoaneurizme lijenalne arterije kod bolesnika sa hroničnim pankreatitisom. Bolesniku su inicijalno urađene ultrazvučna i kolor dopler dijagnostika, pomoću kojih je otkrivena promena suspektna na pseudoaneurizmu lijenalne arterije. Nakon ultrazvučnog pregleda sa kolor doplerom, urađene su CT angiografija i digitalna subtrakciona angiografija, kojima je potvrđena inicijalna dijagnoza. Bolesnik je lečen hirurški, a histopatološkim nalazom definitivno je postavljena dijagnoza pseudoaneurizme lijenalne arterije.

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Ključne reči: *pseudoaneurizma lijenalne arterije, radiološka dijagnostika, ultrazvuk, CT, DSA*