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## Ultrasound imaging of splenic artery aneurysms

### Diagnostyka ultrasonograficzna tętniaków tętnicy śledzionowej

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#### Keywords

splenic artery, splanchnic aneurysm,  
ultrasound imaging

#### Słowa kluczowe

tętnica śledzionowa, tętniaki  
tętnic trzewnych, diagnostyka  
ultrasonograficzna

#### Conflict of interest

#### Konflikt interesów

None

Brak konfliktu interesów

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#### Summary

**Introduction.** Splenic artery aneurysms are uncommon but more are being diagnosed in asymptomatic patients because of the widespread of high-resolution imaging techniques. SAA is the third most common site of intraabdominal aneurysms, following aortic and iliac arteries aneurysms.

**Aim.** The aim of our research was to assess the value of ultrasound imaging in detection of splenic artery aneurysms.

**Material and methods.** In period of 8 years, 7650 patients were referred to Department of Interventional Radiology and Neuroradiology, Medical University in Lublin for ultrasound diagnosis of abdominal vessels. The group consist of 4135 male and 3515 female, in age between 16 and 82 years old. B-mode, color and pulsed Doppler options were used. Additionally power Doppler and B-flow presentations were done.

**Results.** In the group of 7650 patients, 42 of them were diagnosed with aneurysms. 23 cases in the group of 42 were splenic artery aneurysms.

**Conclusions.** Splenic artery aneurysms are rare, but mortality rate in case of rupture is high. Aneurysms > 2 cm in diameter should be treated surgically or using endovascular procedure.

#### Streszczenie

**Wstęp.** Tętniaki tętnicy śledzionowej należą do rzadkości, lecz wraz z rozwojem wysokorozdzielczych technik obrazowania, wzrasta częstość ich wykrywania. Stoją na trzecim miejscu co do częstości występowania tętniaków wewnątrzbrzusznych, zaraz po tętniakach aorty i tętnic biodrowych.

**Cel pracy.** Celem naszej pracy było ukazanie przydatności badania ultrasonograficznego w wykrywaniu tętniaków tętnic śledzionowych.

**Materiał i metody.** W okresie 8 lat, 7650 pacjentów zostało skierowanych do Zakładu Radiologii Zabiegowej i Neuroradiologii Uniwersytetu Medycznego w Lublinie, w celu diagnostyki ultrasonograficznej naczyń brzusznych. Grupę badanych osób stanowiło 4135 mężczyzn i 3515 kobiet, w wieku 16-82 lata. Wszystkie badania przeprowadzono z użyciem opcji B-mode, kolorowego Dopplera oraz pulsacyjnego Dopplera. Dodatkowo, zastosowano opcję Dopplera mocy i B-flow.

**Wyniki.** Pośród 7650 przebadanych pacjentów u 42 stwierdzono tętniaki tętnic trzewnych. Wśród nich zostały zdiagnozowane 23 przypadki tętniaków tętnicy śledzionowej. W żadnym przypadku nie wykryto mnogich tętniaków.

**Wnioski.** Tętniaki tętnic śledzionowych występują rzadko, lecz wskaźnik śmiertelności w przypadku pęknięcia tętniaka jest wysoki. Zwykle są bezobjawowe. Tętniaki o średnicy > 2 cm wymagają leczenia chirurgicznego lub wewnątrznaczyniowego.

#### INTRODUCTION

Splenic artery aneurysms (SAA) are uncommon but more are being diagnosed in asymptomatic patients

because of the widespread of high-resolution imaging techniques (1). They represent 58% of all splanchnic aneurysms (2-4). SAA is the third most common site of

intraabdominal aneurysms, following aortic and iliac arteries aneurysms (5). Patients are mostly asymptomatic and the diagnosis is often incidental. If symptoms occur, they are unspecific. Women are affected four times often as males, but the risk of rupture is three times higher in male (1). The risk of developing is in those patients with multiparity, portal hypertension, liver transplantation, systemic hypertension, medial fibroplasia and  $\alpha$ -1 antitrypsin deficiency (3). Liver transplantation, portal hypertension, liver cirrhosis and pregnancy are factors which increase frequency of rupture (1). Splenic artery aneurysms are small, saccular and usually located in the mid or distal portion of the artery (5). Usually, its diameter is < 2 cm (2). Aneurysms greater than 2 cm in diameter should be treated immediately. Other prompt indications for treatment are: childbearing age for women, pregnancy, systemic hypertension or growing aneurysms (6).

### AIM

The aim of our research was to assess the value of ultrasound imaging in detection of splenic artery aneurysms.

### MATERIAL AND METHODS

In period of 8 years, 7650 patients were referred to Department of Interventional Radiology and Neuro-radiology, Medical University in Lublin for ultrasound diagnosis of abdominal vessels. The group consist of 4135 male and 3515 female, in age between 16 and 82 years old. Indication for the examination were:

- renal arteries in 34% (clinical symptoms: arterial hypertension),
- portal system in 16% (portal hypertension, portal vein thrombosis, suspicion of revascularisation),
- abdominal aorta and iliac arteries in 26% (aneurysms, stenosis, occlusion were suspected),
- inferior vena cava and iliac veins in 4% (suspicion of thrombosis, revascularisation),
- inferior vena cava and renal veins in 3% (suspicion of Nutcracker syndrome, thrombosis, revascularisation, cancer materials),
- visceral arteries in 2% (occlusion or stenosis were suspected),
- 10% of patients were referred for control examinations after surgical or endovascular procedure of abdominal aorta, iliac arteries, renal arteries, IVC,
- tumor vasculature of liver, renis in 5%.

All of the patients were diagnosed with use of LOGIQ 9, LOGIQ 7 equipments. B-mode, color and pulsed Doppler options were used. Additionally power Doppler and B-flow presentations were done.

### RESULTS

In a group of 7650 patients, 42 aneurysms of splanchnic artery were diagnosed. There were 23 cases of splenic artery aneurysms between them, which represents 54.7% of all diagnosed aneurysms. 7 of

them were larger than 2 cm (5 female, 2 male). 4 SAA were located in the mid portion of the artery, the rest were located in the distal part (fig. 1, 2). Most of aneurysms were saccular (33 of 42). Mural thrombus was found in 5 of all 42 cases of SAA. 4 cases of peripheral calcification were found.



Fig. 1. B-mode presentation of splenic artery aneurysm in the hilum



Fig. 2. Power Doppler option. Splenic artery aneurysm

Patients with aneurysm > 2 cm in diameter were referred to CT examination, which confirmed presence of lesion and then scheduled for embolisation. In group of patients with aneurysm < 2 cm in diameter, 2 female patients with aneurysms (diameter 1.7 and 1.8 cm) underwent CT procedure and then were referred to embolisation due to child-bearing period and will of pregnancy in future. No case of multiple aneurysm was diagnosed. All treated SAA were located in the distal part of the artery.

### DISCUSSION

In the past, patients with suspicion of aneurysm were referred to conventional angiography (7). It allows us to reveal high-resolution image of small arteries and at the same time it enables treatment (1). On the other hand, arterial puncture, which carries a risk of complications, is needed. Furthermore, it can fail to demonstrate aneurysms in the injected areas (8). Other disadvantage is use of iodinated contrast substances (2). Nowadays, conventional angiography is being used for therapeutic procedures (8).

Today, CT can be used initially as a primary vascular imaging technique (7). Multi-slice computed tomography can accurately and clearly reveal the location of aneurysm, its shape, extend, wall, course of the artery and relationship with other vessels (5). In comparison with DSA it allows us to visualize from various angles and plans after only one scan, it has less invasive character and lower cost (2). Relative contraindications to CT angiography include renal failure, poor IV access and allergy to contrast material (1).

In comparison with CT, nuclear magnetic resonance (MRI) has more advantages, such as use of less nephrotoxic contrast and no ionizing radiation (3). Use of gadolin contrast and 3D reconstruction enables to obtain high quality angiograms in a very short time (2). 3D contrast-enhanced magnetic resonance angiography can depict the location and morphology of an aneurysms and its relationship with the feeding artery – information needed for planning surgery or endovascular treatment (9). MRI cannot be used on patients with pace-makers, aneurysm clips, suffering from claustrofobia or patients unable to hold their breath (8).

Ultrasound is non-invasive method in detection of aneurysms (10). This technique allows to detect splanchnic artery aneurysms with the same accuracy as seen in aortic aneurysms (8). Ultrasound provides visualization of both vascular size and blood flow at the same time (3). Diagnosis with use of US is limited

by bowel gas, which can make impossible to visualize retroperitoneal and mesenteric vessels (5). But in all these cases repeated ultrasound examination 2-3 days later should be done after optimal preparation patients for ultrasound. All patients with SAA < 2 cm diagnosed during ultrasound are referred for control ultrasound examination every 6 months. CT or MRI examinations are indicated only in the group of patients with SAA > 2 cm, diagnosed during ultrasound, for treatment planning.

In routine autopsies, SAA were found in 0.01-0.2% of cadavers (8). According to Moura et al. (11) only 0.1-2% of general population is affected with splenic artery aneurysm. In our research 0.5% of patients, diagnosed with use of ultrasound, were diagnosed with SAA. Comparing our results to results quoted above ultrasound examination can be very useful and effective search method for this kind of lesions.

## CONCLUSIONS

Splenic artery aneurysms are uncommon, but mortality rate in case of rupture is high. Mostly patients are asymptomatic and the diagnosis of aneurysm is often incidental during ultrasound examination. Treatment should be done in all cases then the diameter of aneurysm is > 2 cm. Before treatment CT examination for confirming is indicated. When the diameter of aneurysm is < 2 cm follow-up ultrasound examinations are needed.

## BIBLIOGRAPHY

1. Agrawal GA, Johnson PT, Fishman EK: Splenic artery aneurysms and pseudoaneurysms: clinical distinctions and CT appearances. *AJR Am J Roentgenol* 2007; 188: 992-998.
2. Badea R: Splanchnic Artery Aneurysms: the Diagnostic Contribution of Ultrasonography in Correlation with other Imaging Methods. *J Gastrointestin Liver Dis* 2008; 17: 101-105.
3. Jesinger R, Thoreson A, Lamba R: Abdominal and Pelvic Aneurysms and Pseudaneurysms: Imaging Review with Clinical, Radiologic, and Treatment Correlation. *Radio Graphics* 2013; 33: 71-96.
4. Madoff DC, Denys A, Wallace MJ et al.: Splenic Arterial Interventions: Anatomy, Indications, Technical Considerations, and Potential Complications. *Radio Graphics* 2005; 25: 191-211.
5. Sułkowski L, Szura M, Pasternak A et al.: Pathogenesis, Diagnosis and Treatment of Splenic Artery Aneurysms. *Austin J Vasc Med* 2016; 3: 1-3.
6. Guillaumoni AT, Chaim EA: Splenic artery aneurysm associated with anatomic variations in origin. *J Vasc Bras* 2009; 8: 177-181.
7. Horton KM, Smith C, Fishman EK: MDCT and 3D CT Angiography of Splanchnic Artery Aneurysms. *AJR* 2007; 189: 641-647.
8. Pilleul F, Beuf O: Diagnosis of Splanchnic Artery Aneurysms and Pseudoaneurysms, with Special Reference to Contrast Enhanced 3D Magnetic Resonance Angiography: a Review. *Acta Radiol* 2004; 7: 702-708.
9. Liu O, Lu JP, Wang F et al.: Visceral Artery Aneurysms: Evaluation Using 3D Contrast-Enhanced MR Angiography. *AJR* 2008; 191: 826-832.
10. Darchi L, Biggi E, Cicio G et al.: Aneurysms of the Splenic Artery: Noninvasive Diagnosis by Pulsed Doppler Sonography. *J Ultrasound Med* 1984; 3: 41-44.
11. Moura R, Sobreira ML, Jaldin LG et al.: Splenic artery saccular aneurysm: endovascular approach or open surgery? *J Vasc Bras* 2013; 12(3): 230-233.

received/otrzymano: 02.03.2017  
accepted/zaakceptowano: 24.03.2017