

Otrzymano: 2007.05.15
Zaakceptowano: 2007.11.30

Collateral abdominal circulation in patient with Leriche's syndrome diagnosed with 64-row multislice computed tomography (MSCT)

Grzegorz Staśkiewicz^{1,2}, Elżbieta Czekajaska-Chehab², Janusz Rybak³, Kamil Torres¹, Anna Torres¹, Andrzej Kępa², Ryszard Maciejewski^{1,4,5}, Andrzej Drop²

¹ Human Anatomy Department, Medical University of Lublin, Poland

² 1st Radiology Department, Medical University of Lublin, Poland

³ Vascular Surgery Department, Medical University of Lublin, Poland

⁴ 2nd Surgical Department, Medical University of Lublin, Poland

⁵ Medical Emergency Department, UITEM Rzeszów, Poland

Author's address: Grzegorz Staśkiewicz, 1st Radiology Department, Medical University of Lublin, Poland, Jaczewskiego 8, 20-094 Lublin, e-mail: grzegorz.staskiewicz@am.lublin.pl

Summary

Background:	Leriche's syndrome results from slowly developing occlusion of the abdominal aorta. It affects mainly middle-aged males. The blood flow distal to the occlusion site is secured by collateral circulation. Signs of Leriche's syndrome include claudication, gluteal pain and impotence.
Case report:	The paper presents a patient with Leriche's syndrome, in whom a detailed visualization of collateral circulation was obtained with multislice computed tomography angiography. Patient underwent surgical recanalization of the aorta with an excellent result.
Conclusions:	To our knowledge, the presented case is the first description of collateral circulation in Leriche's syndrome obtained with 64-row computed tomography.
Key words:	Arterial occlusive diseases • Leriche's syndrome • computed tomography • angiography • collateral circulation
PDF file:	http://www.polradiol.com/fulltxt.php?ICID=677356

Background

Leriche's syndrome, first described by Robert Graham in 1814 [1], named after Rene Leriche, a French surgeon who reported on a successful operation of this condition in 1940 [2], was originally defined as a disease of young men with claudication and impotence.

Currently, the name is used in patients with complete occlusion of the distal abdominal aorta, with clinical signs of claudication, gluteal pain, impotence and lack of femoral pulse. It is a rare condition, affecting typically young males.

Multislice computed tomography angiography (MSCTA), which is becoming a widely accepted modality of imaging in vascular disorders [3], was used in the patient to visualize and evaluate normal and pathological circulation related to the primary disease.

Case Report

A 47-year-old male was referred to the Department of Radiology to have MSCTA performed. He complained of advanced symptoms of chronic ischemia of the lower limbs.

MSCTA was performed with 64-row CT Lightspeed VCT scanner (GE Medical Systems) with collimation of 0.6 mm, 120 kV, 200-280 mAs, contrast medium – Ultravist 370, bolus 4 ml/s, with scannig delay assessed with SmartPrep application. Raw examination images were evaluated with Advantage Widows workstation, and postprocessed with multiplanar reformations (MPR), maximum intensity projections (MIP) and Volume Rendering (VR). The salient abnormality found in the examination was obliteration of the abdominal aorta distally to the superior mesenteric artery (Fig. 1). Restoration of patency of the abdominal aorta was performed surgically with an excellent effect.

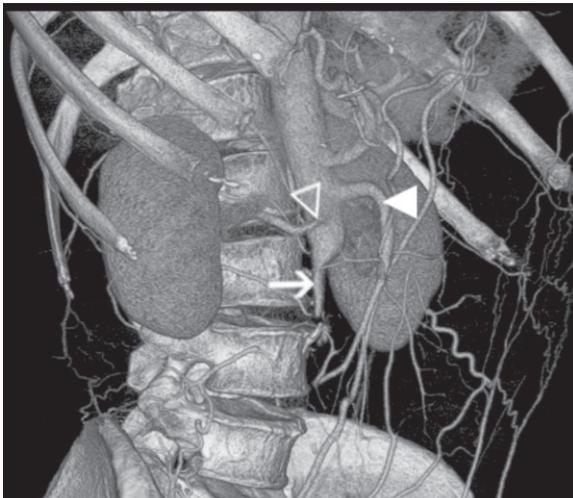


Figure 1. Volume rendering of abdominal aorta, right oblique view. Arrow indicates obliteration of abdominal aorta (arrow), distally to origin of superior mesenteric artery (arrowhead) and renal arteries (right renal artery, blank arrowhead).

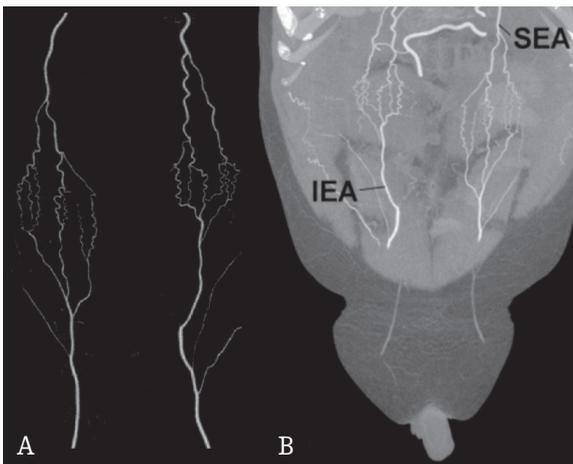


Figure 3. Volume rendering (A) and MIP view (B) of anterior abdominal wall arteries: superior (SEA) and inferior (IEA) epigastric arteries.

Discussion

MSCTA is becoming a widely accepted modality of imaging in vascular disorders, because it is less invasive and provides images of quality comparable to digital subtraction angiography (DSA). Spatial resolution of MSCTA is still much lower than that of DSA, however, as presented in the figures, images from a 64-row scanner allow visualization of even very small vessels. Major advances of MSCTA as compared with DSA include its noninvasive character and availability of three-dimensional reconstructions of structures.

In the patient, MSCTA allowed visualization of multiple regions of collateral circulation, developed as a result of complete obstruction of the abdominal aorta distal to the superior mesenteric artery (SMA) (Fig. 2). In the examination, abnormal collateral circulation was visualized in both visceral and superficial arteries. Among the visceral arteries, the most important abnormality is absence of the inferior mesenteric

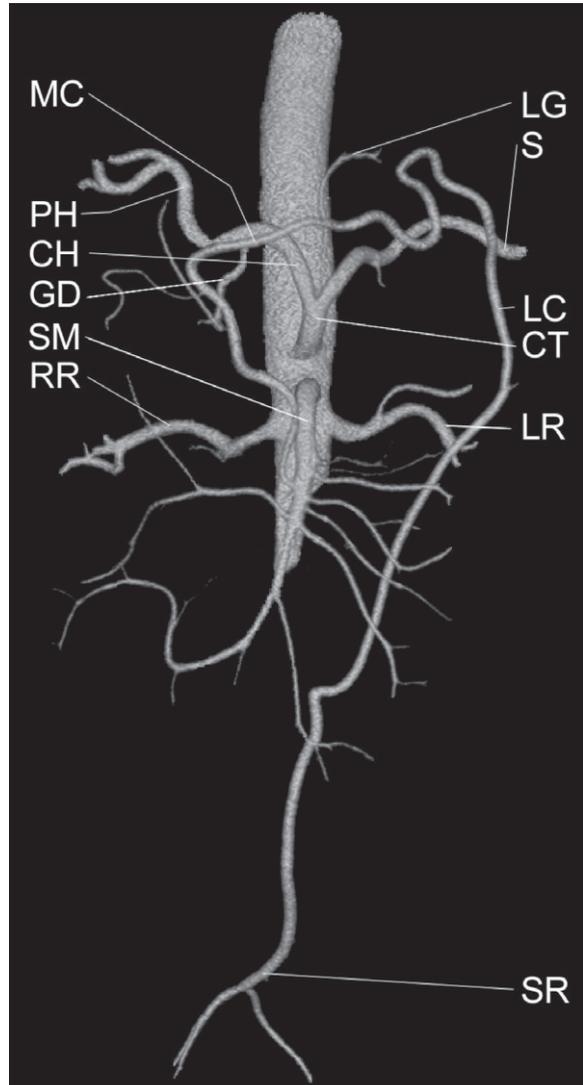


Figure 2. Volume rendering, anterior view. Visceral branches of abdominal aorta: CT – celiac trunk, CH – common hepatic, GD – gastroduodenal, PH – proper hepatic, S – splenic, SM – superior mesenteric, MC – middle colic, LC – left colic, RR – right renal, LR – left renal, SR – superior rectal.

artery (IMA). In normal conditions, both mesenteric arteries anastomose in form of middle colic artery. As visible in Fig. 2, this normal anastomosis allowed SMA to take over the function of IMA and spared vasculature of the distal colon inferior to the superior rectal arteries (Fig. 2).

Rich collaterals were visualized in the arterial system of the abdominal wall. It included anastomoses of the superior and inferior epigastric arteries (SEA & IEA, respectively), lower posterior intercostal (PICa) and subcostal arteries (ScA), ilio-lumbar arteries (ILA) and deep circumflex iliac arteries (DCfIA).

The superior epigastric artery (SEA) is a continuation of the internal thoracic artery, a branch of the subclavian artery. The inferior epigastric artery (IEA) originates from the external iliac artery superior to the inguinal ligament, and normally anastomoses with SEA in the umbilical

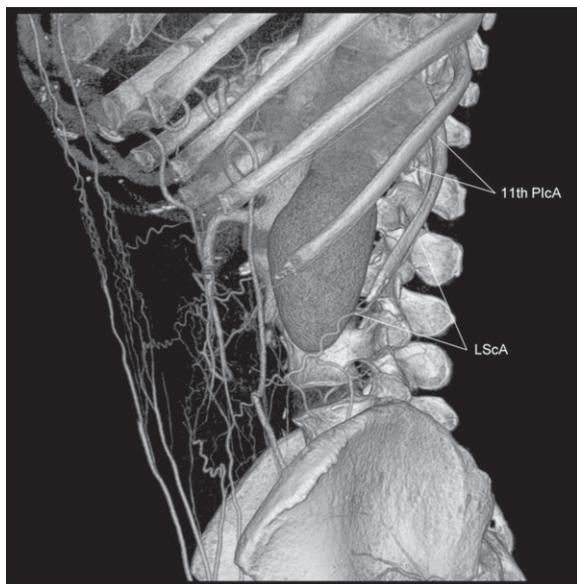


Figure 4. Volume Rendering, left side view. Widened left 11th posterior intercostal artery (PlcA) and left subcostal artery (LScA).

region (Fig. 3), forming the arc of Riolan. Collateral supply of external iliac arteries in patients with occlusion of the abdominal aorta by anastomosing epigastric arteries is referred to as Winslow's pathway [4]. Visualization of this pathway may be of extremely high clinical importance, because of potential use of the internal thoracic arteries for coronary arteries bypass grafting. If used in a patient with aortic occlusive disease, acute ischemia of the ipsilateral lower limb would result [5].

Lower posterior intercostal and subcostal arteries normally anastomose with other arteries of the abdominal wall. They originate from the posterior aspect of thoracic aorta and contribute to intercostal neurovascular bundles. In normal conditions, they anastomose with superior epigastric and iliolumbar arteries, which is visualized in Fig. 4 and Fig. 5.

The iliolumbar artery (ILA) is a branch of posterior division of the internal iliac artery. After short superior course it divides into lumbar (ascending) and iliac (transverse) branches. In both arteries, the branches were visualized in the patient, however, there is a significant difference in the lumen of the right and left iliac and lumbar branches (Fig. 6), suggestive of different collateral circulation between sides.

The deep circumflex iliac artery (DCfIA) originates from the lateral part of external iliac artery, and runs superolaterally, in parallel to the inguinal ligament, normally anastomosing with the subcostal artery, which was visualized in the examination (Fig. 5, Fig. 6).

Conclusions

Multislice computed tomography angiography is a recognized imaging modality, which allows visualization of the smallest arterial branches [6]. In the presented case, MSCTA allowed detailed visualization of abdominal and pelvic vessels, which is essential in patients with Leriche's syndrome

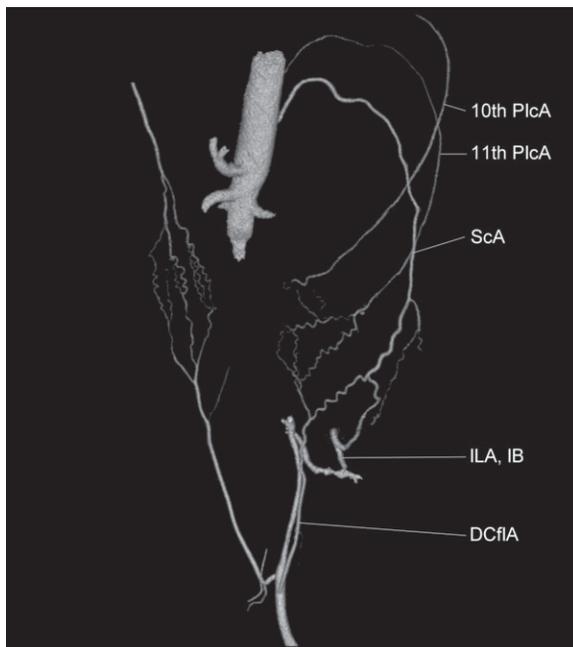


Figure 5. Volume rendering, left oblique view. Anastomoses of left posterior intercostal arteries (PlcA) and subcostal artery (ScA) with iliac branch of iliolumbar artery (ILA, IB). DCfIA deep circumflex iliac artery.

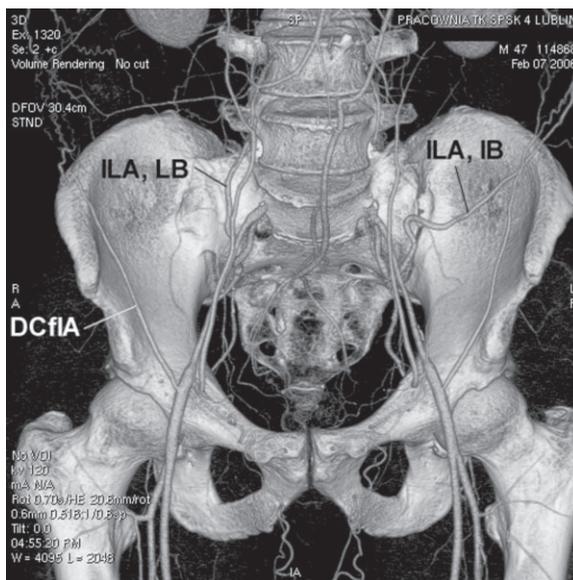


Figure 6. Volume Rendering, anterior view. Iliolumbar arteries (ILA) – widened lumbar branch (LB) on right side and iliac branch (IB) on the left. DCfIA – deep circumflex iliac artery.

to assess the collateral circulation in complete obstruction of the distal abdominal aorta. Proper visualization of collateral pathways is essential in order to recognize vascular relations in the patients. MSCTA is an accepted method of imaging in Leriche's syndrome [7, 8], together with magnetic resonance angiography and digital subtraction angiography [9].

To our knowledge, this is the first report on application of 64-row MSCT in detailed visualization of collateral circulation in a patient with Leriche's syndrome.

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