Case 5

Diabetic Foot Syndrome Complicated by an Arteriovenous Fistula

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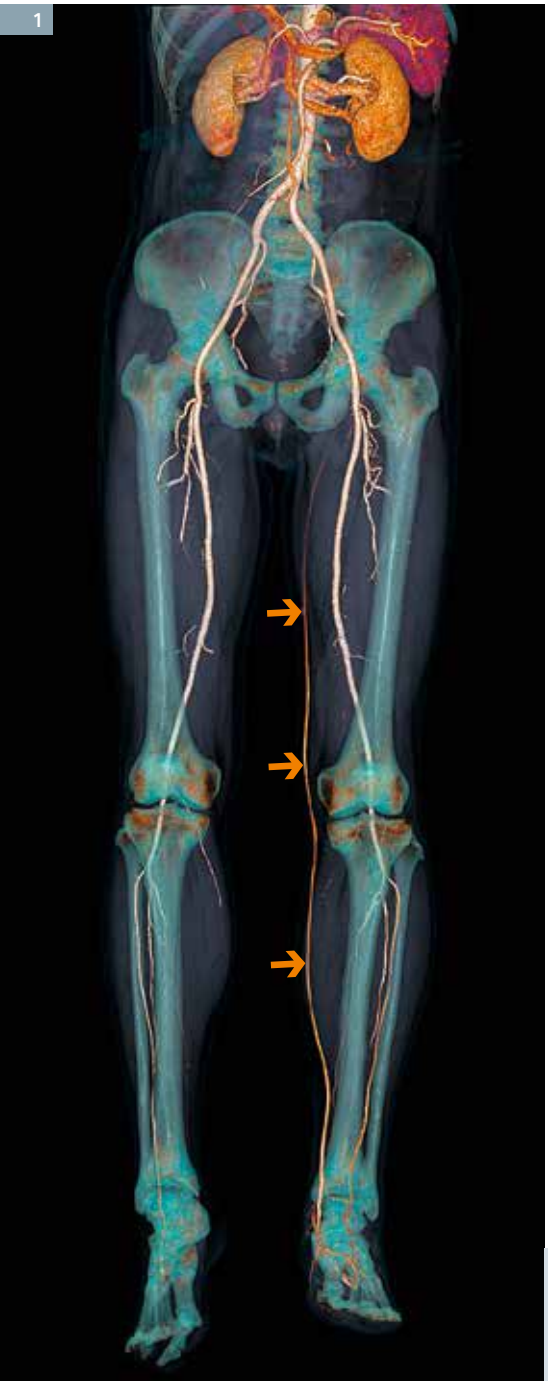


History

A 64-year-old male patient with a known history of diabetes mellitus (DM) was feeling systemically unwell and noted problems with his left foot. He was presented for a CT angiography (CTA) evaluation.

Diagnosis

CTA images showed an early venous return of the left great saphenous vein (Fig. 1) and a fistula between the peripheral anterior tibial artery and the great saphenous vein (Fig. 2). Signs of osteoclasia in the first proximal phalanges, involving interphalangeal joint destruction and osseous fragments, as well as accompanying soft tissue swelling and skin ulcer were observed. No signs of soft tissue gas were noted.The abdominal aortic artery and its other branches were unremarkable.

Comments

DM is mainly a neurovascular disease that particularly affects the musculoskeletal system, especially the foot. The presence of several characteristic diabetic foot pathologies such as infection, diabetic foot ulcer, and neuropathic osteoarthropathy, is called diabetic foot syndrome. An early diagnosis and prompt treatment are essential to avoid amputation. In the imaging of diabetes-related foot complications, CT has certain advantages: generation of images with high tissue contrast, as well as aiding in the identification of cortical erosions, small sequestra, soft tissue gas and calcifications. The three-dimensional nature of CT makes it a useful tool for the analysis of compartmental anatomy. In this case, 70 kV was applied which contributed both to the improvement of contrast enhancement and to the reduction of radiation dose. A runoff CTA showing great peripheral vascular details was completed using only 50 mL of contrast medium. In combination with other advanced dose reduction techniques such as CARE Dose4D (real-time anatomic exposure control) and ADMIRE (sinogram affirmed iterative reconstruction) a total effective dose of 1.58 mSv was achieved. ■

1 A VRT image shows an overview of the runoff CTA and an early venous return of the left great saphenous vein (arrows).

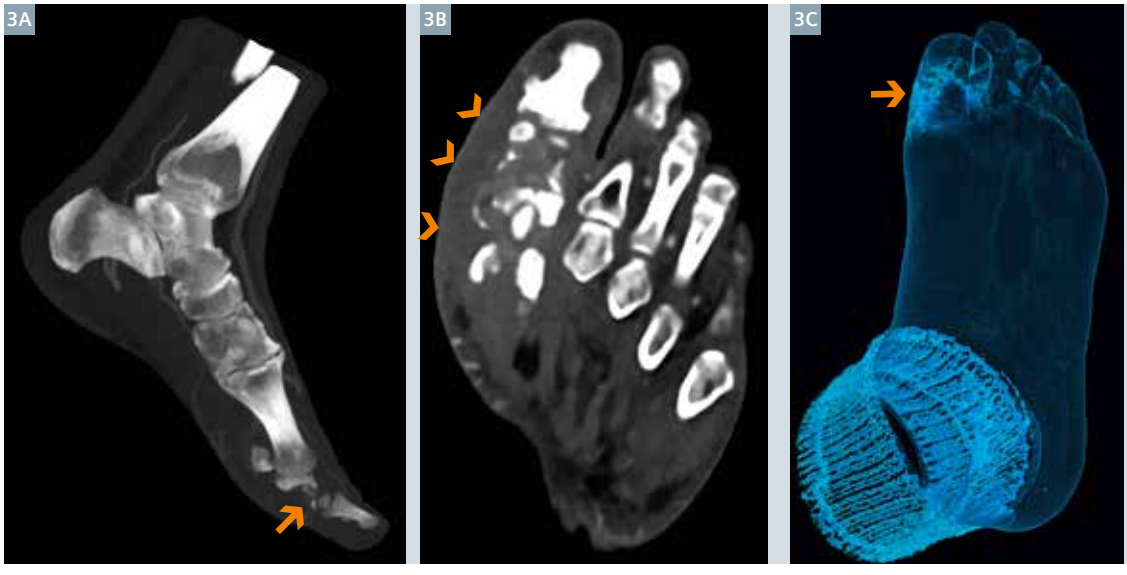
In clinical practice, the use of ADMIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

The outcomes by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.

Examination Protocol

2 VRT images demonstrate a fistula (dashed arrow) between the peripheral anterior tibial artery (arrowheads) and the great saphenous vein (arrows).

Scanner	SOMATOM Force
Scan area	Supra-renal to toes
Scan length	1242.5 mm
Scan direction	Cranio-caudal
Scan time	17.7 s
Tube voltage	70 kV
Tube current	192 mAs
Dose modulation	CARE Dose4D
$CTDI_{vol}$	2.26 mGy
DLP	285.4 mGy cm
Effective dose	1.58 mSv
Rotation time	0.5 s
Pitch	0.6
Slice collimation	192 × 0.6 mm
Slice width	1.0 mm
Reconstruction increment	0.7 mm
Reconstruction kernel	Bv36, ADMIRE 3
Contrast	370 mg/mL
Volume + Flow rate	30 mL at 5 mL/s + 20 mL at 3 mL/s + 30 mL saline at 3 mL/s
Start delay	Bolus tracking in the popliteal artery with a threshold of 100 HU and an additional delay of 7 s



3

MIP (Fig. 3A), MPR (Fig. 3B) and VRT (Fig. 3C) images show signs of osteoclasia in the first proximal phalanges (3A, arrow) involving inter-phalangeal joint destruction, osseous fragments, soft tissue swelling (3B, arrow-heads) and skin ulcer (3C, arrow).