# Aortoiliac Occlusion and Axillobifemoral Bypass Graft

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## History

An 80-year-old male patient with an axillobifemoral bypass graft presented for follow up. The graft had been necessary due to an occluded right common iliac artery and bilateral external iliac arteries 7 years ago. The disabling claudication and rest pain in both lower limbs improved after the operation. However, intermittent claudication in the right lower limb began again 3 years ago and has progressed ever since. A Dual Energy CT (DECT) was requested for further evaluation.

## Diagnosis

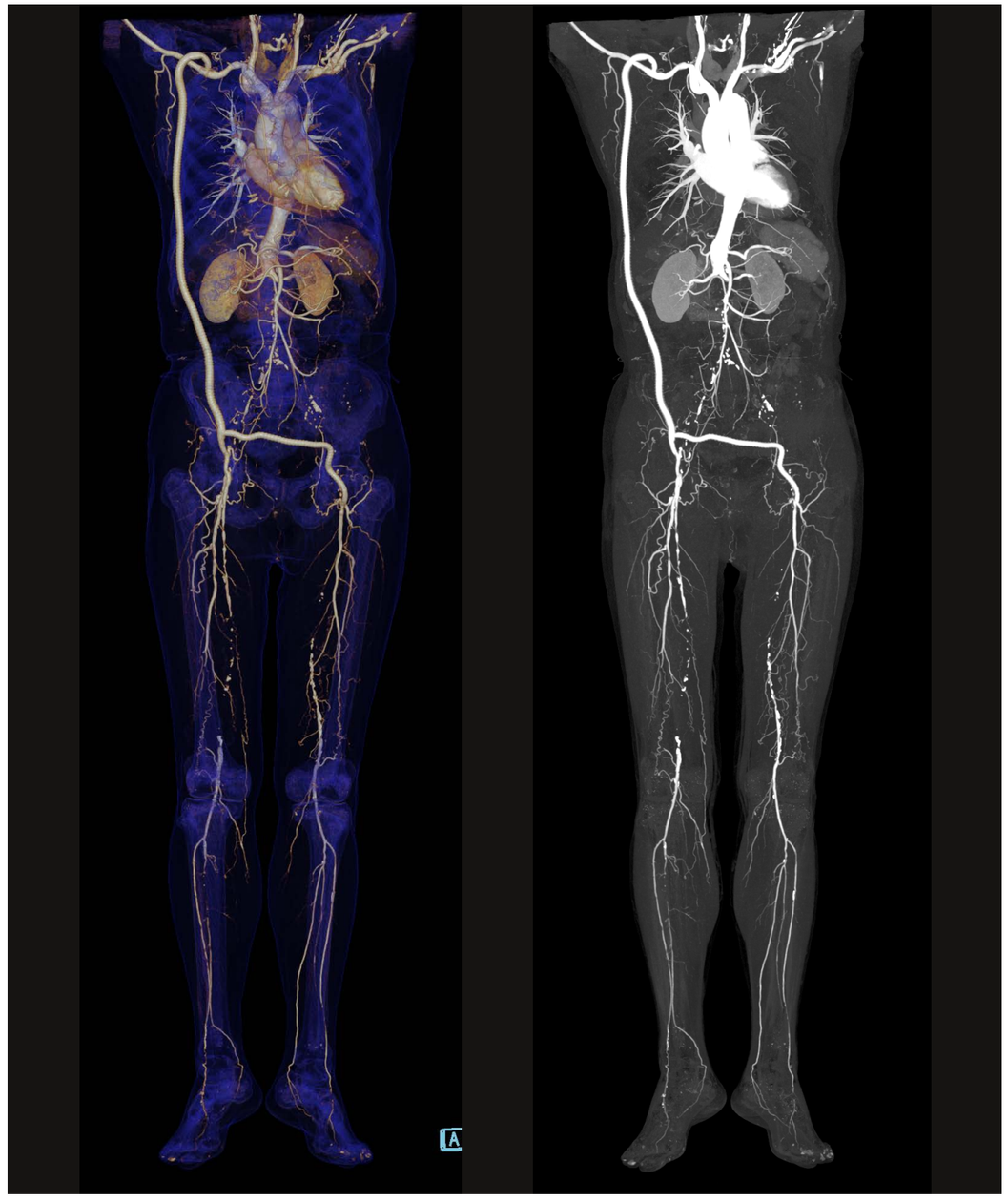
DECT images showed a patent bypass graft originating from the right axillary artery, extending inferiorly and subcutaneously to join the bilateral common femoral arteries. The aortic arch, ascending aorta, and thoracic descending aorta were well enhanced and the perfused blood volume (PBV) of the lungs were normal. Heavy calcification and extensive occlusion of the infrarenal aortoiliac segment were seen. The celiac artery (CA), superior mesenteric artery (SMA) and the right renal artery (RAA) were patent. A severe stenosis of the proximal left renal artery (LRA) was noticed. No opacification of the inferior mesenteric artery (IMA) was seen. Two small enhanced lesions were seen in the prostate. Bilateral femoral arteries, right proximal posterior tibial artery, and right fibular artery were occluded. Bilateral popliteal arteries and the right distal posterior tibial artery were reconstituted through collateral arteries. Bilateral dorsalis pedis arteries and medial plantar arteries were small in caliber but visible. Diffuse calcifications were seen in the native arteries of both lower limbs. No signs of contrast extravasation or evidence for anastomotic stenosis were demonstrated.

The patient refused the options of surgical operation or intervention. After one week of treatment with medication, his intermittent claudication in the right lower limb had improved, and he was discharged.

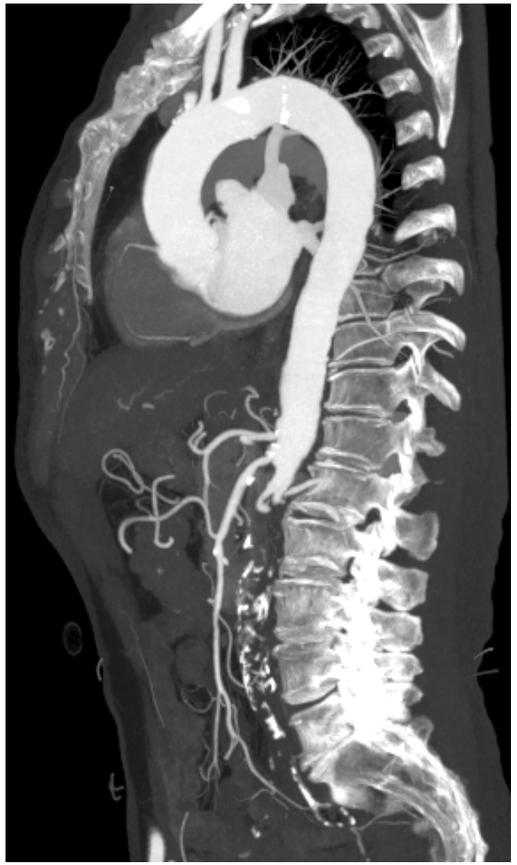
## Comments

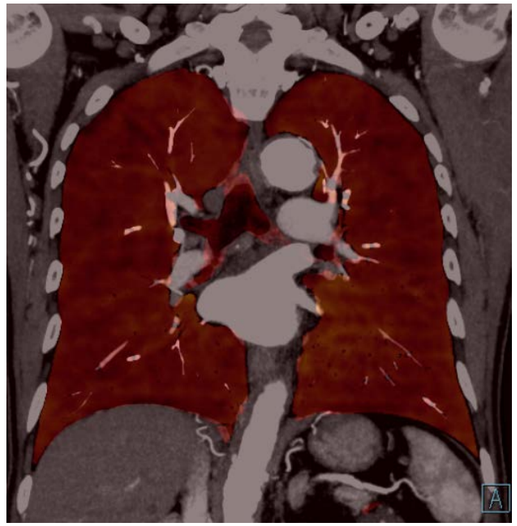
An axillofemoral bypass is a surgical method used in patients with symptomatic aortoiliac occlusive disease. Known as an extra-anatomic procedure, a graft connecting the axillary and bilateral femoral arteries is placed subcutaneously to restore the blood flow to the lower limbs. It is most frequently performed when endovascular options are unsuitable. Postsurgical complications such as thrombosis or infection may occur and require a proper follow up. CT angiography (CTA) is an estabilished imaging method to evaluate the patency of such a graft, as well as the native arteries. In this case, CTA was acquired using Dual Energy, which eases bone subtraction and is faster when using "*syngo*.CT DE Direct Angio". In addition to the graft and arterial evaluations, the same dataset can also be used for soft tissue enhancement evaluation. For example, PBV of the lungs can be evaluated using "*syngo*.CT DE Lung Analysis", enhancement of two small incidental findings in the prostate can be evaluated using "*syngo*.CT DE Monoenergetic Plus" and differentiated from calcification using "*syngo*.CT DE

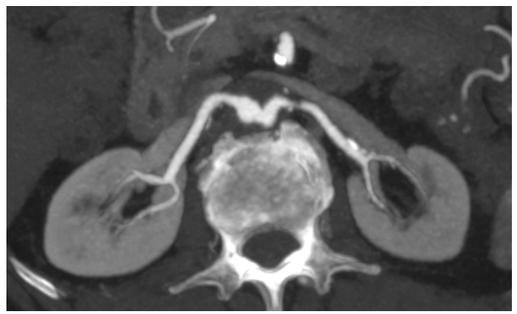





1 A VRT image (Fig. 1a) and an MIP (Fig. 1b) image show a patent bypass graft originating from the right axillary artery, extending inferiorly and subcutaneously to join the bilateral common femoral arteries. No evidence of anastomotic stenosis. Heavy calcification and extensive occlusion of the infrarenal aortoiliac segment are noticed, with patent CA, SMA, and the RAA. A severe stenosis of the proximal LRA is seen. The IMA is not opacified. Bilateral femoral arteries, right proximal posterior tibial artery, and right fibular artery are occluded. Bilateral popliteal arteries and the right distal posterior tibial artery are reconstituted through collateral arteries. Bilateral dorsalis pedis arteries and medial plantar arteries are small in caliber but visible. Diffuse calcifications are seen in the native arteries of both lower limbs.




2 MIP images (Fig. 2a and Fig. 2c) reveal an occluded infrarenal aorta (Fig. 2a) and a severe stenosis of the proximal left renal artery (Fig. 2c). The aortic arch, ascending aorta, and thoracic descending aorta are well enhanced, and the PBV of the lungs (Fig. 2b) are normal.

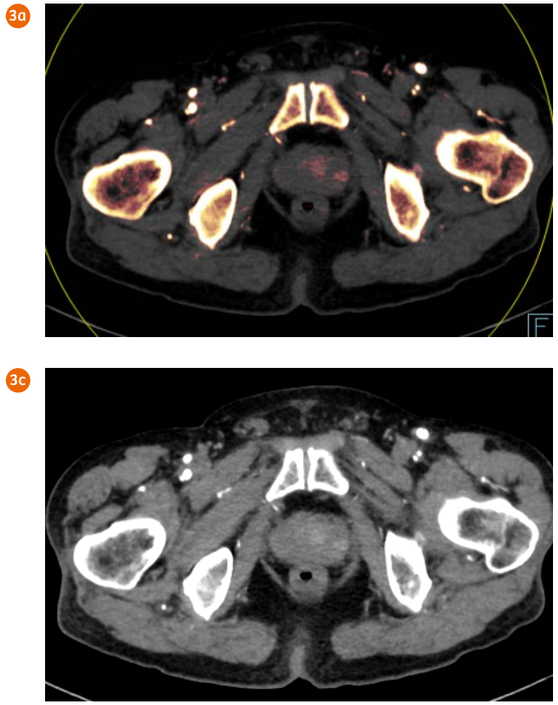
Virtual Unenhanced". All these applications are performed in an automated workflow. The energy spectra at 70 and 150 kV settings can be significantly separated by applying a special filter technique, the Selective Photon Shield (SPS II), to ensure excellent image quality and appropriate quantification. Other advanced techniques such as CARE Dose4D™ (real-time automated exposure control) and ADMIRE (advanced modeled iterative reconstruction) are also available to help achieve a dose-neutral DECT examination. Our experience leads us to the conclusion that DE CTA can be routinely applied for this type of clinical evaluation rather than the traditional CTA.

The outcomes by Siemens Healthineers 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.

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.








3 The two small hyperdense lesions (arrows) in the prostate shown in the mixed / iodine fused image (Fig. 3a) and not shown in the virtual noncontrast (VNC) image (Fig. 3b) are characterized as contrast enhancement and differentiated from calcification using DE Virtual Unenhanced. The enhancement is more significant in the image displayed at 40 keV (Fig. 3d) than that at 70 keV (Fig. 3c, equivalent to 120 kV acquisition) using *syngo*.CT DE Monoenergetic Plus. Both images (Figs. 3c und 3d) are displayed at the same window settings.

## Examination Protocol

| Scanner | SOMATOM Force | | |
|---|---|---|---|
| **Scan area** | Whole body | **Rotation time** | 0.28 s |
| **Scan mode** | Dual Energy | **Pitch** | 0.4 |
| **Scan length** | 1456.7 mm | **Slice collimation** | 128 × 0.6 mm |
| **Scan direction** | Cranio-caudal | **Slice width** | 1.0 mm |
| **Scan time** | 27 s | **Reconstruction increment** | 0.7 mm |
| **Tube voltage** | 70 / Sn 150 kV | **Reconstruction kernel** | Qr40 |
| **Effective mAs** | 149 / 49 mAs | **Contrast** | 300 mg/mL |
| **Dose modulation** | CARE Dose4D™ | **Volume** | 100 mL |
| **CTDIvol** | 3.4 mGy | **Flow rate** | 5 mL/s |
| **DLP** | 502 mGy cm | **Start delay** | Bolus tracking at 100 HU at Thoracic aorta + 7s |