Giant Cell Tumor in Tendon Sheath of the Right Ankle

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History

A 56-year-old female patient presented with a swollen and painful right ankle. She reported a trauma to this ankle 20 years ago. She had noticed a growing soft-tissue mass on the right ankle for the past four years. The mass was associated with swelling and pain that became aggravated while walking. In the past two years, surgical excision had been performed twice to remove the mass due to its recurrence and accompanying severe pain. The histological result was not available at admission. A Dual Energy CT (DECT) examination was requested for further evaluation.

Diagnosis

CT images showed a well-defined, unevenly enhanced soft-tissue mass enveloping the right ankle. The largest portion of the mass was over the anterolateral aspect, measuring 4.5 × 5.8 cm in size. The mass was wrapped with medial and lateral malleolus branches as well as the arteria dorsalis pedis involving the right peroneal artery, and the posterior and anterior tibial arteries. The perforating veins between the deep and superficial veins were noticeably enlarged (Figs. 1 and 2). Pronounced cortical destructions of the talus, the navicular, and the upper calcaneus were also seen (Fig. 3). The patient underwent subsequent ultrasound-guided percutaneous biopsy. The histopathological result revealed a giant cell tumor of the tendon sheath (GCTTS). A surgical excision of the mass was accordingly planned.

Examination Protocol

Scanner	SOMATOM Force		
Scan area	Lower extremities	**Rotation time**	0.5 s
Scan mode	Dual Energy	**Pitch**	0.7
Scan length	691 mm	**Slice collimation**	128 × 0.6 mm
Scan direction	Caudo-cranial	**Slice width**	1.0 mm
Scan time	12.9 s	**Reconstruction increment**	0.7 mm
Tube voltage	80 / Sn150 kV	**Reconstruction kernel**	Qr40, ADMIRE 3
Effective mAs	62 / 37 mAs	**Contrast**	370 mg/mL
Dose modulation	CARE Dose4D™	**Volume**	60 mL at 70% + 38 mL + 30 mL saline
CTDIvol	2.44 mGy	**Flow rate**	5 mL/s + 5 mL/s + 4.5 mL/s
DLP	177.2 mGy cm	**Start delay**	Bolus tracking in the popliteal artery at 100 HU and an additional delay of 8 s

1 Cinematic rendering images show the soft tissue mass enveloping the right ankle and the relevant vasculature of the right lower extremity. The blood supply of the mass involves multiple branches of the right peroneal artery, and the posterior and anterior tibial arteries. The enlarged perforating veins between the deep and superficial veins are also clearly shown. The original CT images were displayed at 40 keV.

Comments

GCTTS is a benign lesion of uncertain etiology. However, it does have a high incidence of recurrence after excision. [1,2] The foot and ankle are rare sites of involvement. One of the most important clinical features is that the symptoms of GCTTS are non-specific, making the diagnosis difficult. Treatments consist of careful local excision, particularly microscopic excision, and postoperative radiotherapy.[2] It is imperative to know the anatomy of the tumor, so that the surgical incision can be planned accordingly, allowing the surgeons to reach its extensions.[3] Although MRI has been helpful in the anatomical assessment of soft-tissue tumors and may be incorporated into the preoperative workup,[4] there are patients who have contraindications to MRI or for whom MRI is not available. Our experience with DECT in the evaluation of this case has been promising. DECT applies a special filter technique, Selective Photon Shield (SPS II), which enables significant separation of energy spectra at 80 and 150 kV settings. The attenuation measurements acquired at these two kV settings are used to display images at different keV levels using "*syngo*.CT DE Monoenergetic Plus". Compared with conventional CT images acquired at 120 kV, image contrast at 40 keV is significantly enhanced, allowing a clearer and easier visualization of the mass extension (Fig. 5). The same image data can also be used to generate iodine/VNC-fused images using "*syngo*. CT DE Virtual Unenhanced" for better differentiation of enhanced mass tissue and the non-invaded tendons (Fig. 4). The bone structures can be removed using "*syngo*.CT DE Direct Angio" to show non-obscured vasculature. All these applications are performed in an automated workflow.
To achieve a dose-neutral DECT examination, other advanced techniques such as CARE Dose4D™ (real-time anatomic exposure control) and ADMIRE (advanced modeled iterative reconstruction) are also available. In this case, an effective dose of only 0.14 mSv was applied to the patient.

2a 2b 2c

2 Cinematic rendering images (Figs. 2a and 2b), using different presets, demonstrate different anatomical views of the right lower extremity. An MIP image (Fig. 2c) generated by using DE Direct Angio shows the vasculature not obscured by bones. The original CT images were displayed at 40 keV.

References

[1] Findlin J. Lascola NK, Grone TW. Giant cell tumor of the flexor hallucis longus tendon sheath: a case study. J Am Podiatr Med Assoc. 2011; 101(2):187-189.

[2] Sun C, Sheng W, Yu H, et al. Giant cell tumor of the tendon sheath: A rare case in the left knee of a 15-year-old boy. Oncology Letters. 2012;(3):718-720.

[3] Vargaonkar G, et al. Giant Cell Tumor of the Tendon Sheath around the Foot and Ankle, a Report of Three Cases and a Literature Review. J Am Podiatr Med Assoc. 2015;105(3):249-254.

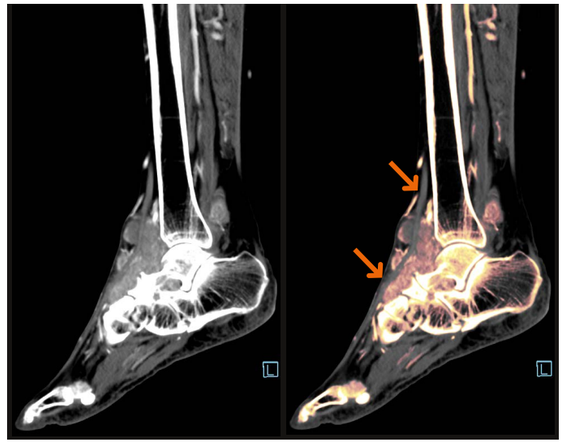
[4] Demouy EH, Kaneko K, Bear HM, et al.: Giant cell tumor of the plantar tendon sheath: role of MR imaging in diagnosis. Case report. Clin Imaging. 1993;17(2):153-155.

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.

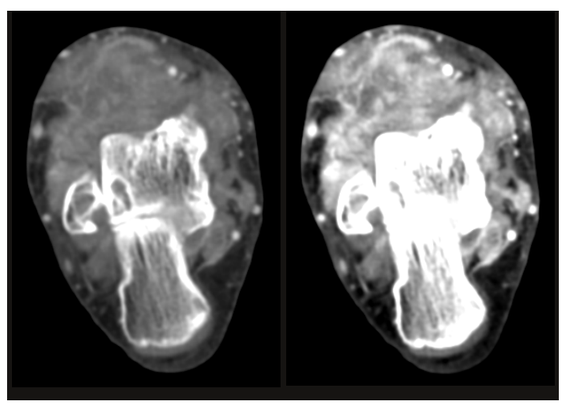
The outcomes by Siemens Healthineers customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers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

3a 3b 3c

4a 4b



5a 5b



3 Sagittal (Fig. 3a), oblique (Fig. 3b), and axial (Fig. 3c) MPR images show cortical destructions of the talus, the navicular, and the upper calcaneus.

4 Sagittal view of an iodine/VNC-fused image (Fig. 4b) shows better differentiation of the enhanced mass tissue from the extensor digitorum longus tendon (arrows) compared to a standard CT image (Fig. 4a).

5 An axial image displayed at 40 keV (Fig. 5b) shows much better contrast and clearer mass extension compared to a standard CT image (Fig. 5a).