Case 7

Identification of Posterior Cruciate Ligament Avulsion using Dual Energy CT

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History

A 41-year-old male patient was transported by emergency services to a level one trauma center, after a high speed, head on, motor vehicle collision. The patient was a passenger and, despite being restrained at the time of collision, suffered significant dashboard contact. Clinical examination revealed increased anterior translation of the left knee.

Diagnosis

The CT examination discovered an acute avulsion fracture at the posterior cruciate ligament insertion.

Comments

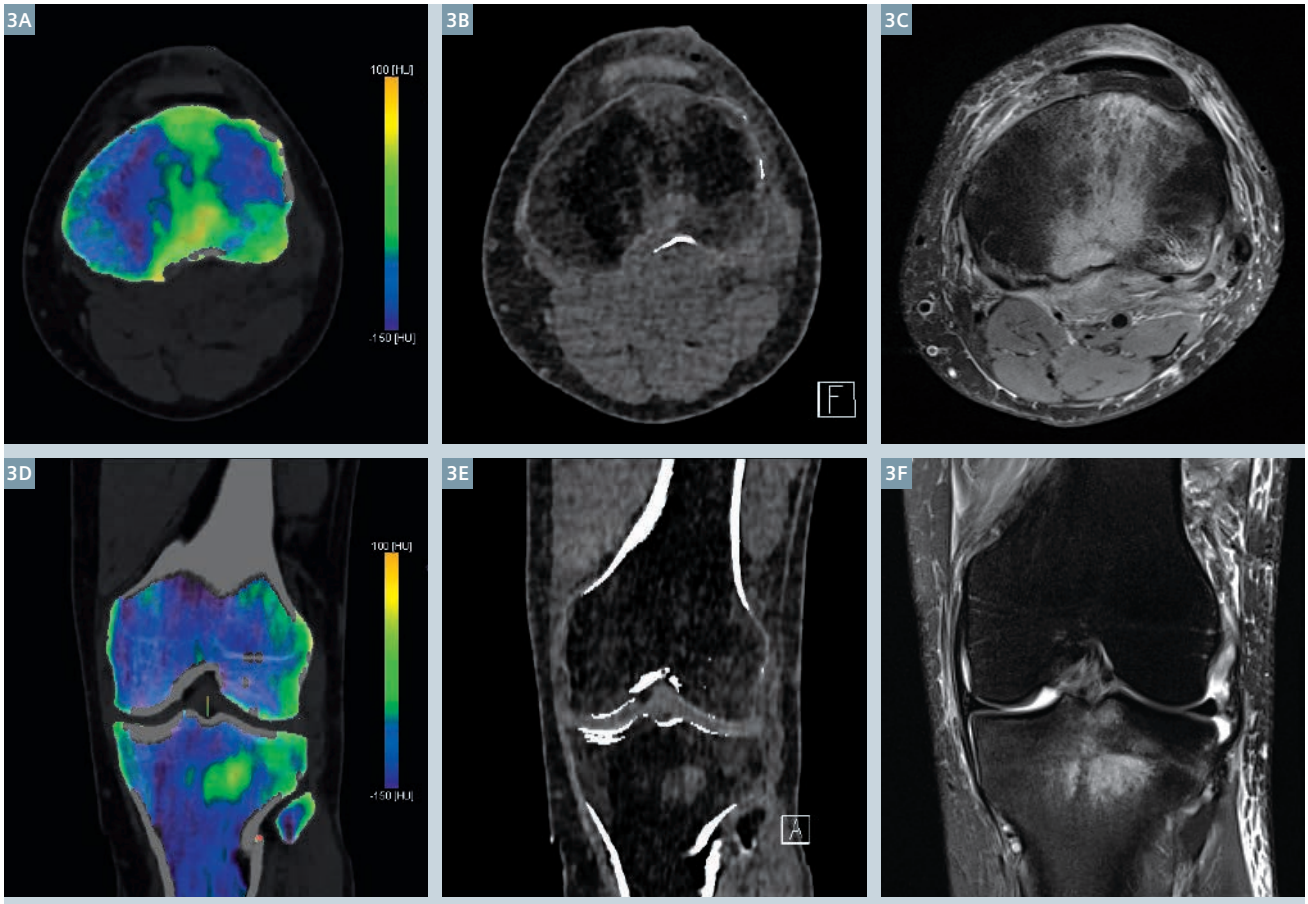
Mixed CT images (Fig. 2), reconstructed using a 0.5 blend of Sn 140 kV and 80 kV data and a high spatial frequency deconvolution kernel (B75), provided excellent depiction of fine bony detail and allowed best depiction of the fracture line as it extended into the weight bearing surface of the posterior tibial plateau (not shown). Virtual non-calcium reconstructed Dual Energy (DE) CT images (Q34, strength 3) confirmed the presence of extensive bone marrow edema in the proximal left tibia which correlated well with the fat suppressed T2 weighted MRI (Fig. 3). DE CT images, reconstructed using the collagen application, showed that the posterior cruciate ligament was buckled but intact (Fig. 4). There also was a moderate acute lipohemarthrosis. ■

Examination Protocol

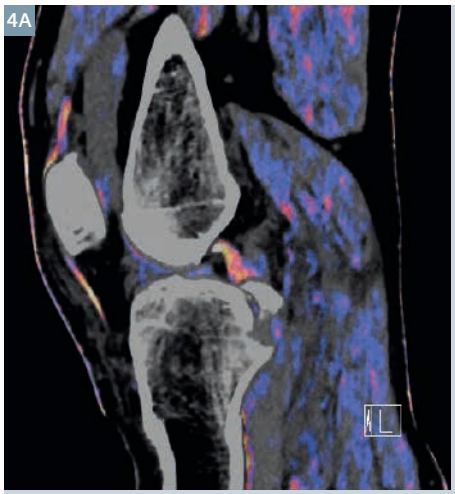
Scanner	SOMATOM Definition Flash		
Scan area	Left knee	Pitch	0.7
Scan length	168 mm	Slice collimation	40 x 0.6 mm
Scan direction	Cranio-caudal	Slice width	0.75 mm
Scan time	10 s	Reconstruction increment	0.7 mm
Tube voltage	80 kV / Sn140 kV	Reconstruction kernel	B75, Q34f (SAFIRE 3)
Tube current	163 – 82mAs	**Contrast**	–
Dose modulation	CARE Dose4D	Volume	–
$CTDI_{vol}$	7.59 mGy	Flow rate	–
DLP	141 mGy cm	Start delay	–
Rotation time	0.5 s		

1 Plain radiograph, lateral projection, of the left knee showed a small fracture fragment arising from the posterior aspect of the proximal left tibia and a moderate sized effusion collecting in the suprapatellar bursa.

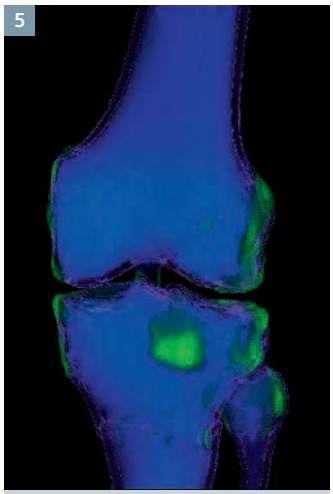
2 Sagittal CT image demonstrated a small avulsion fracture at the expected insertion site of the posterior cruciate ligament.



3 Axial and coronal virtual non-calcium reconstructed DE CT images (Figs. 3A, 3B, 3D, 3E) displayed extensive bone marrow edema in the proximal left tibia which correlated almost identically with high T2 signal areas on the fat suppressed T2 weighted MRI images (Figs. 3C and 3F).



4 Sagittal DE CT image, reconstructed using the collagen application (Fig. 4A), confirmed that the posterior cruciate ligament was intact but had an irregular buckled contour. This finding correlates well with the sagittal proton density image from the subsequently performed MRI (Fig. 4B).



5 VRT DE CT image showed the three dimensional view of the extensive bone marrow edema in the proximal left tibia.