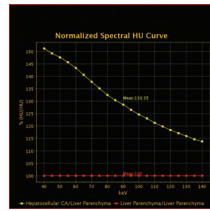
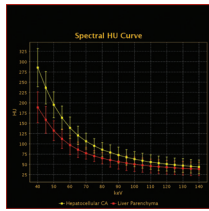
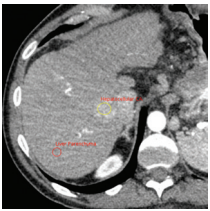


Gemstone Spectral Imaging quantifies lesion characteristics for a confident diagnosis

CT clinical case study – lesion characterization



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Case study

Spectral curves aid physicians in seeing, characterizing, and quantifying material characteristics of small lesions.

Abstract

According to the American Journal of Radiology, more than half of small lesions—particularly those found in the abdomen region that includes the kidney, liver, and lung—are indeterminate by conventional CT exams. As a result, additional testing, such as a PET or MR scan, may be required to make a definitive diagnosis, possibly resulting in unnecessary healthcare costs and patient anxiety. It's this major shortcoming that led to one of the clinical advantages of the Discovery* CT750 HD: the ability to characterize lesions.

Using Spectral HU curves, radiologists are able to see the attenuation characteristics within ROIs, receive clearer characterizations, and quantify characteristics across all energy levels for a confident diagnosis. With the ability to quantify and separate materials such as calcium, iodine, and water, clinicians are better able to determine whether lesions are enhancing or non-enhancing.

Patient histories

Patient One is a 67-year-old woman who had an incidental pancreatic head cystic mass discovered during a routine CT to evaluate left lower quadrant pain. She was referred for multiphase pancreatic CT to further characterize.

Patient Two is a 63-year-old man with hepatitis C cirrhosis undergoing surveillance CT for HCC.

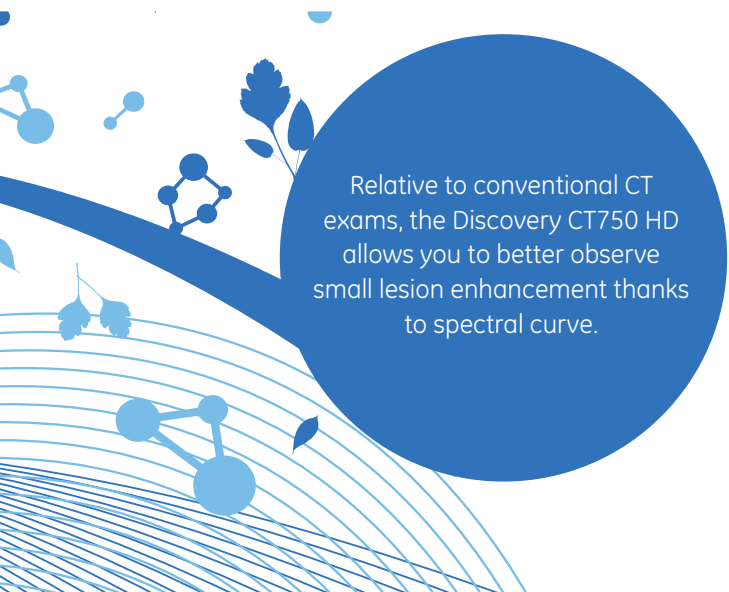
Exam protocol

GSI Acquisition

GSI Viewer Spectral HU Curves & Lower Monochromatic (keV) Images

Acquisition protocols

Scanner:	Discovery CT750 HD
Scan type:	GSI—Helical
GSI preset:	GSI-10
Rotation speed:	0.8 seconds
Detector configuration:	64 x 0.625
Slice thickness:	0.625 mm
Pitch:	1.375:1
SFOV:	50 cm
kVp:	Low/High (80/140 kVp)



Relative to conventional CT exams, the Discovery CT750 HD allows you to better observe small lesion enhancement thanks to spectral curve.

Patient One discussion and results

CT images through the abdomen reveal a 2.9 x 4.0 cm cystic lesion in the head of the pancreas. The lesion communicates with the main pancreatic duct through a side branch, and contains a 14 mm mural nodule. The main pancreatic duct is prominent in the head, but normal in caliber within the body and tail. The cystic component of the lesion abuts branches of the SMA and SMV immediately below their bifurcations, however, there was no definite invasion of the portal vein or the SMA. Using GSI and viewing images at lower spectral energy, the nodule is more conspicuous, and the differentiation of the nodule and mucin cystic components is well depicted on the spectral curves, normalized to pancreatic parenchyma, compared to water in the stomach. Endoscopic ultrasound confirmed both the mural nodule and the communication of the cystic lesion with the pancreatic duct. The patient underwent Whipple resection for suspected high risk intraductal papillary mucinous neoplasm. Surgical path and pathological analysis revealed metaplasia but no malignancy.

Patient Two discussion and results

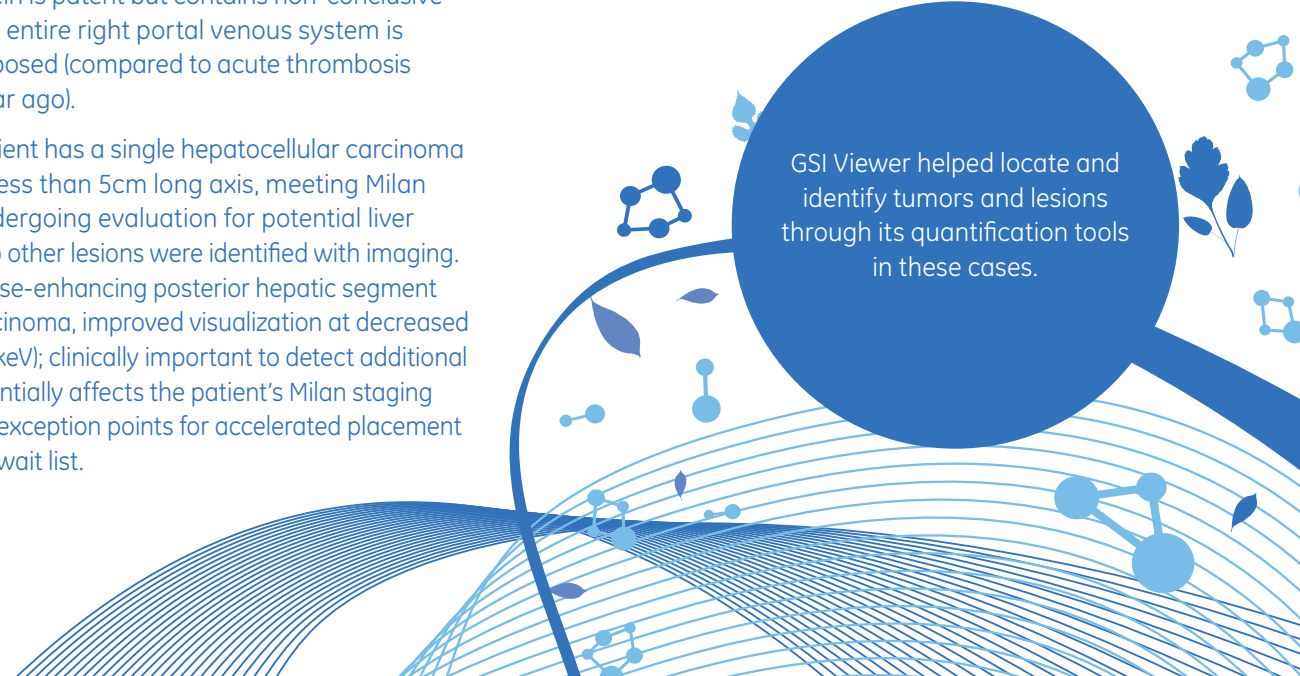
On arterial phase, there is a 3.3 x 2.8 cm hyperenhancing lesion in caudate/posterior hepatic segment, abutting the right lateral wall of the intrahepatic IVC with slight flattening. The main portal vein is patent but contains non-conclusive thrombus and the entire right portal venous system is chronically thrombosed (compared to acute thrombosis on earlier CT a year ago).

Follow up: The patient has a single hepatocellular carcinoma (HCC) measuring less than 5cm long axis, meeting Milan criteria, and is undergoing evaluation for potential liver transplant since no other lesions were identified with imaging. Subtle, arterial phase-enhancing posterior hepatic segment hepatocellular carcinoma, improved visualization at decreased keVs (Range 50-65keV); clinically important to detect additional lesions as this potentially affects the patient's Milan staging and potential HCC exception points for accelerated placement on liver transplant wait list.

Conclusion

Patient One: Spectral analysis provided improved conspicuity of the nodule at lower energies compared to the cystic (mucin) component of the lesion and the surrounding parenchyma.

Patient Two: Gemstone Spectral Imaging Viewer spectral information at lower keV for both axial and coronal planes revealed no additional lesions. Better demarcation of the relationship to the IVC and preservation of the pericaval fat was depicted on coronals.



GSI Viewer helped locate and identify tumors and lesions through its quantification tools in these cases.

Case study

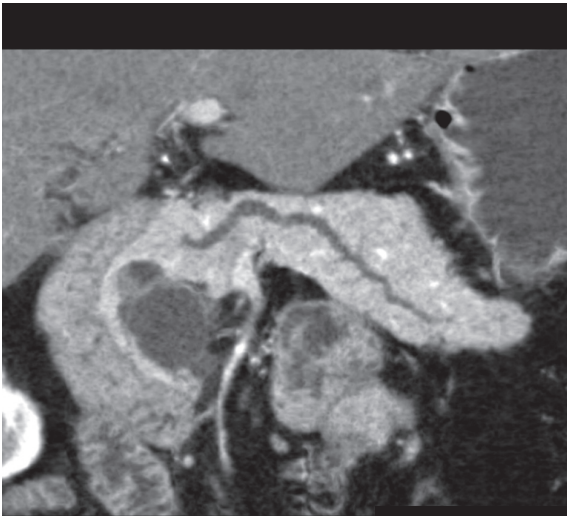


Figure 1 Patient 1.
65 keV MinIP Curved

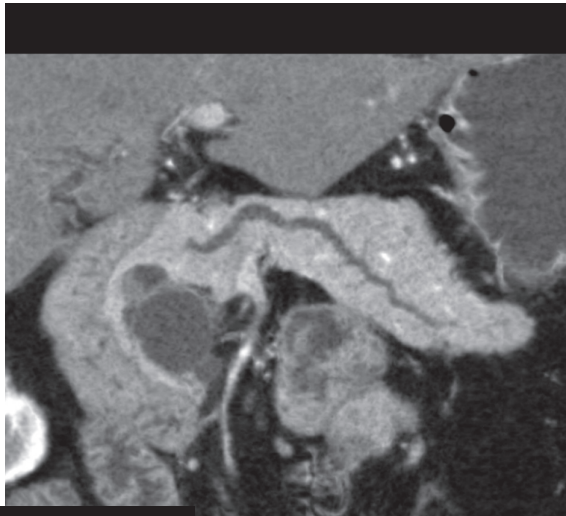


Figure 2 Patient 1.
70 keV MinIP Curved

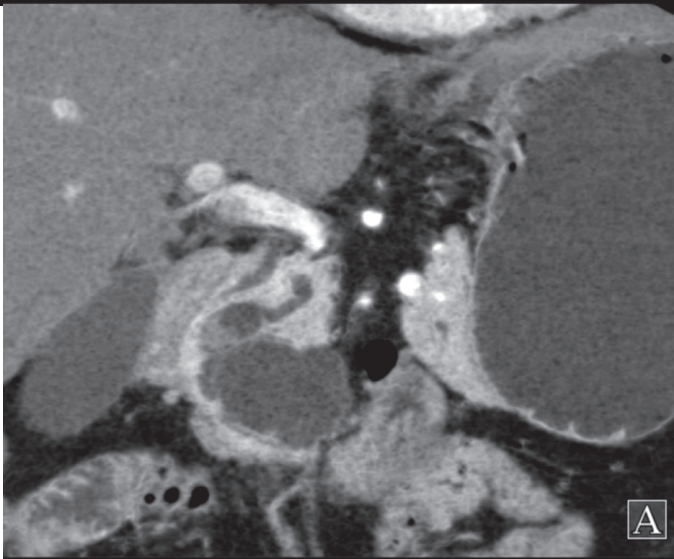


Figure 3 Patient 1.
65 keV MinIP coronal

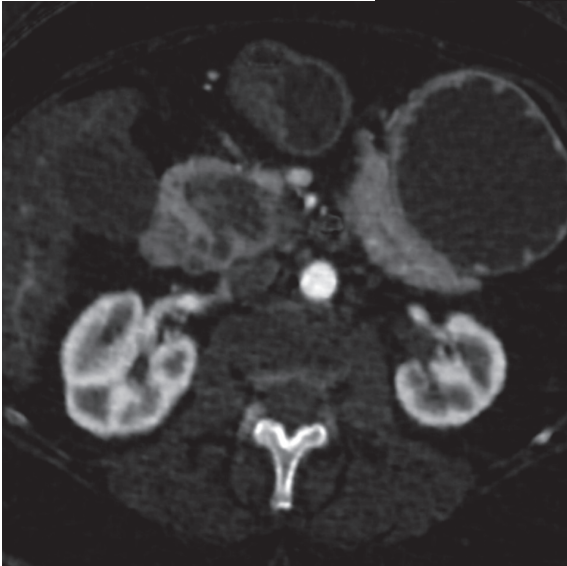


Figure 4 Patient 1.
Iodine (water)

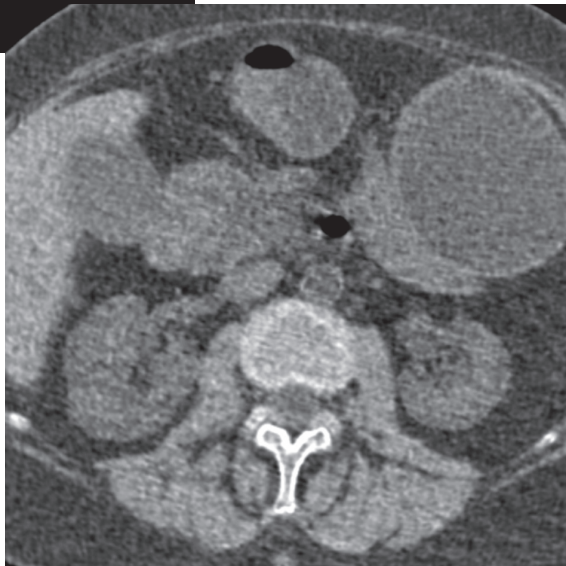


Figure 5 Patient 1.
Water (iodine)

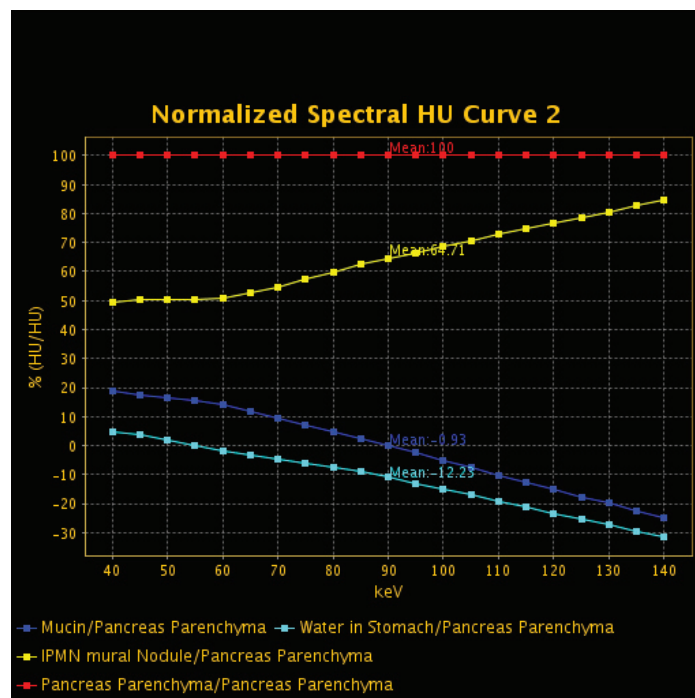
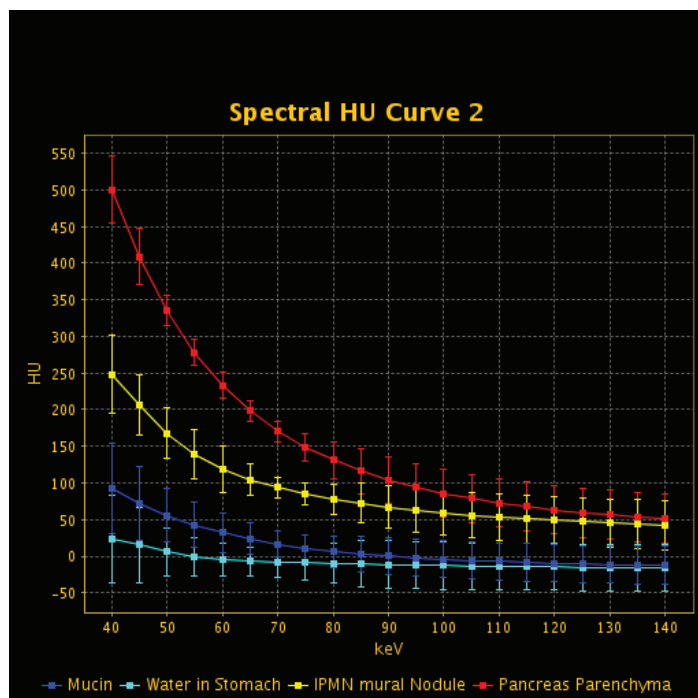
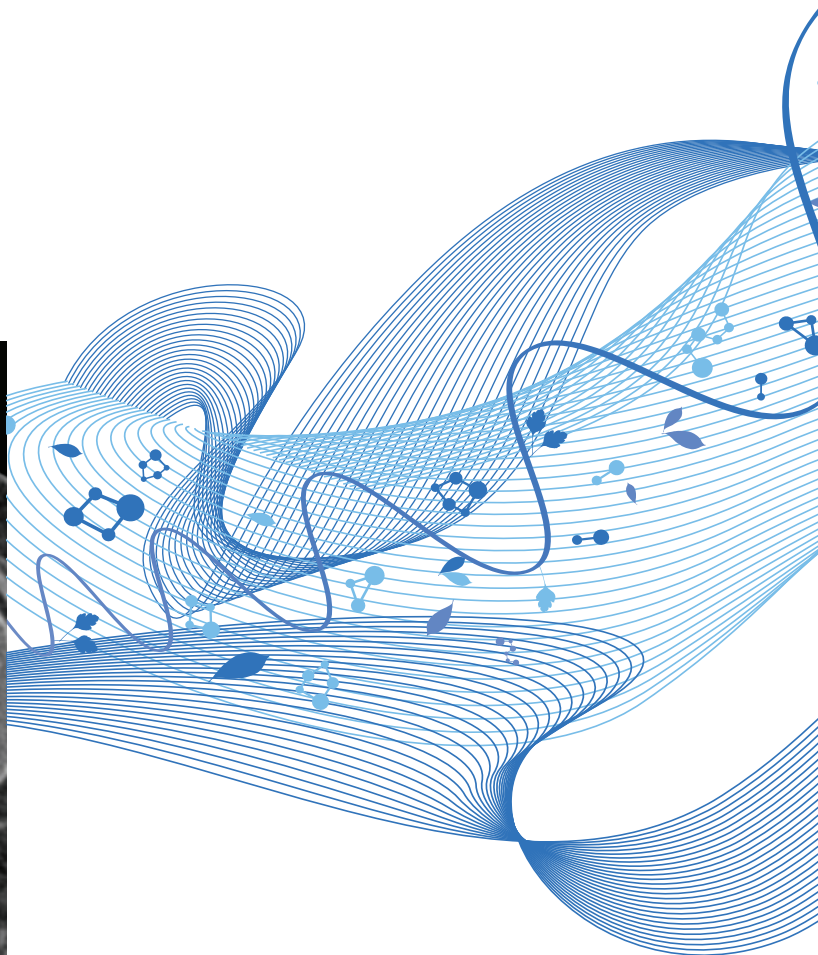
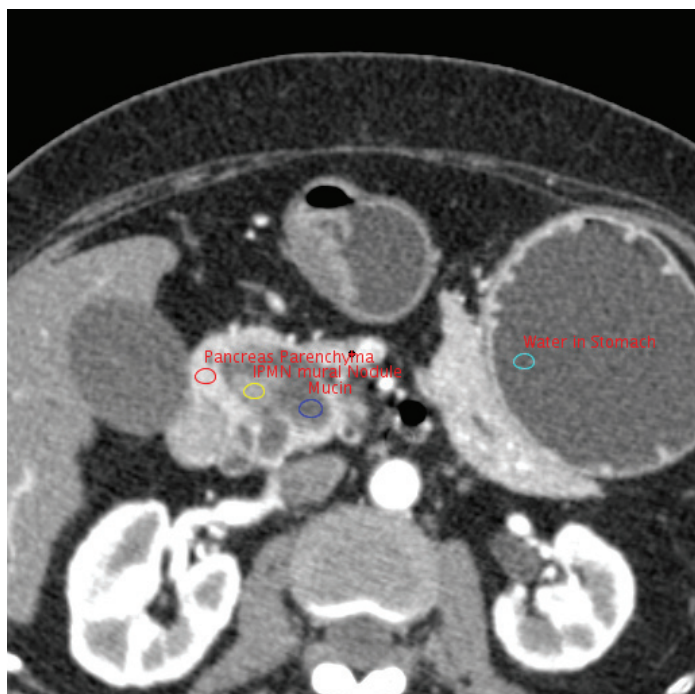


Figure 6 Patient 1.

65 keV ROIs and Spectral HU Curves with and without normalization

Case study

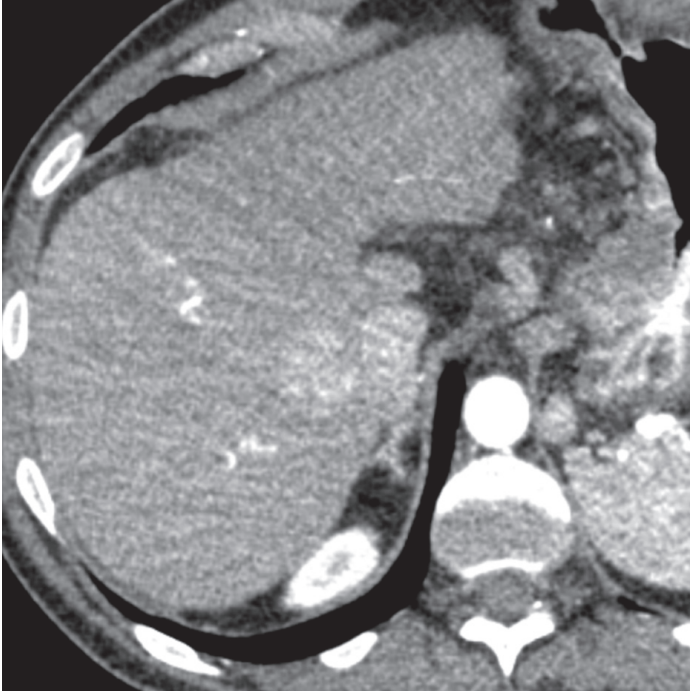


Figure 7 Patient 2.

60 keV hepatic segment hepatocellular carcinoma

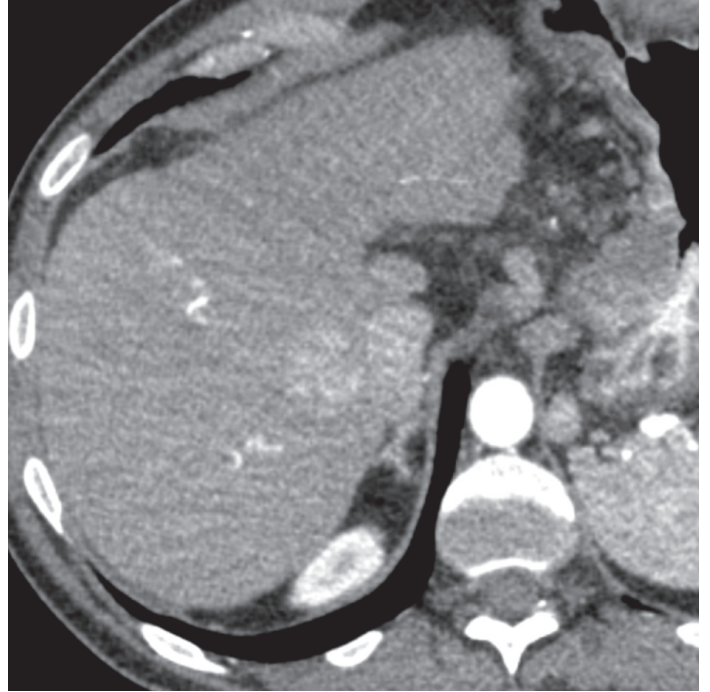


Figure 8 Patient 2.

65 keV hepatic segment hepatocellular carcinoma

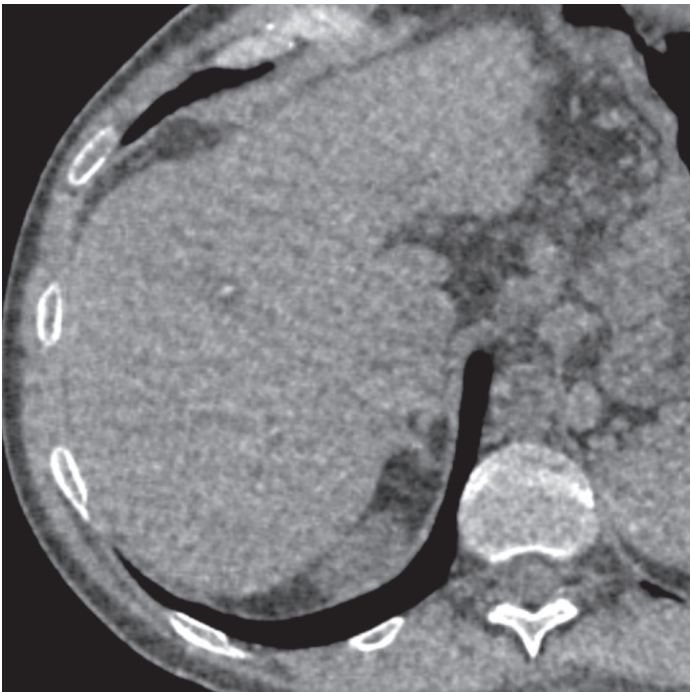


Figure 9 Patient 2.

Water (iodine) hepatic segment hepatocellular carcinoma

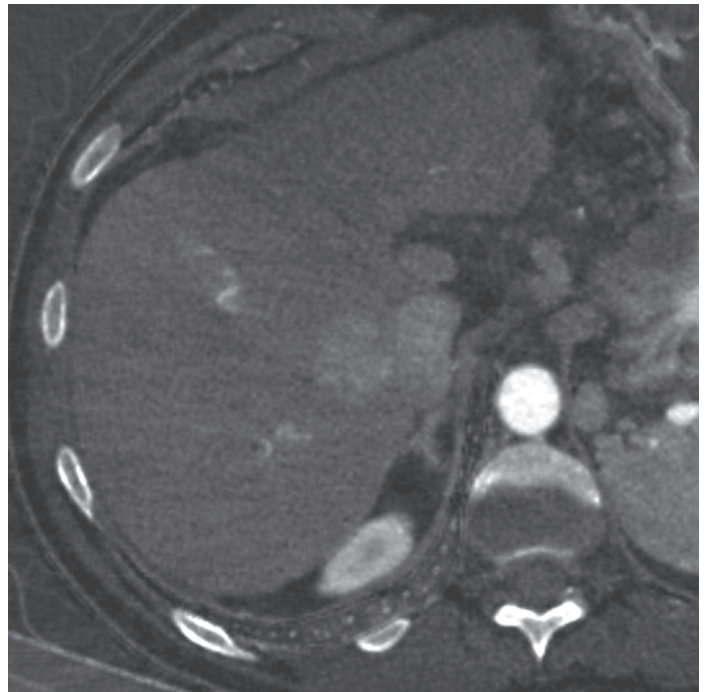


Figure 10 Patient 2.

Iodine (water) hepatic segment hepatocellular carcinoma

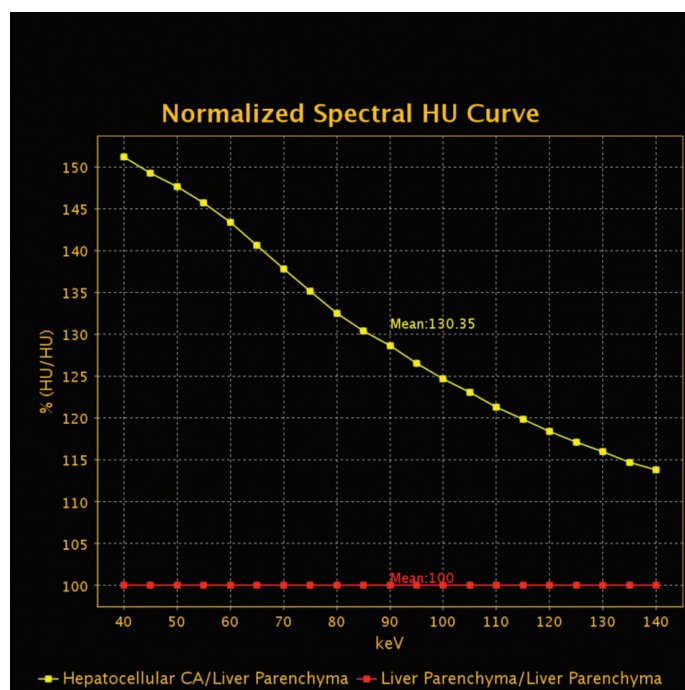
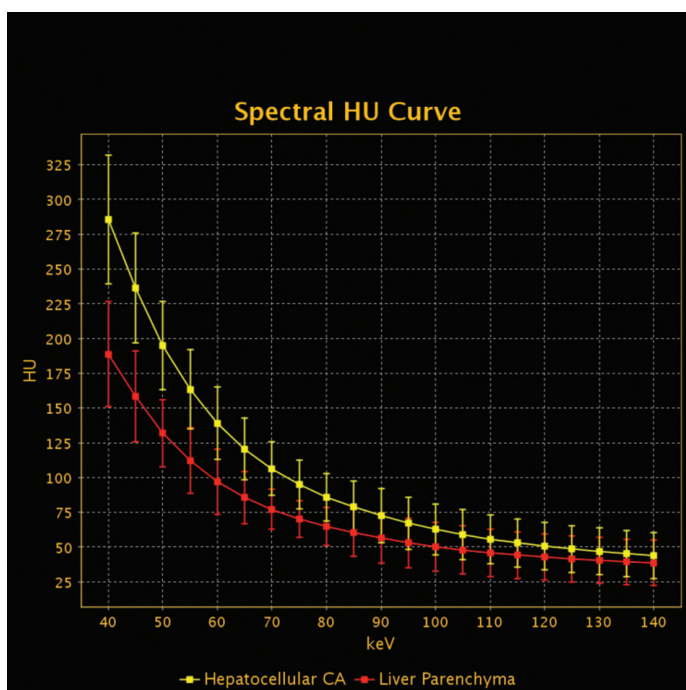
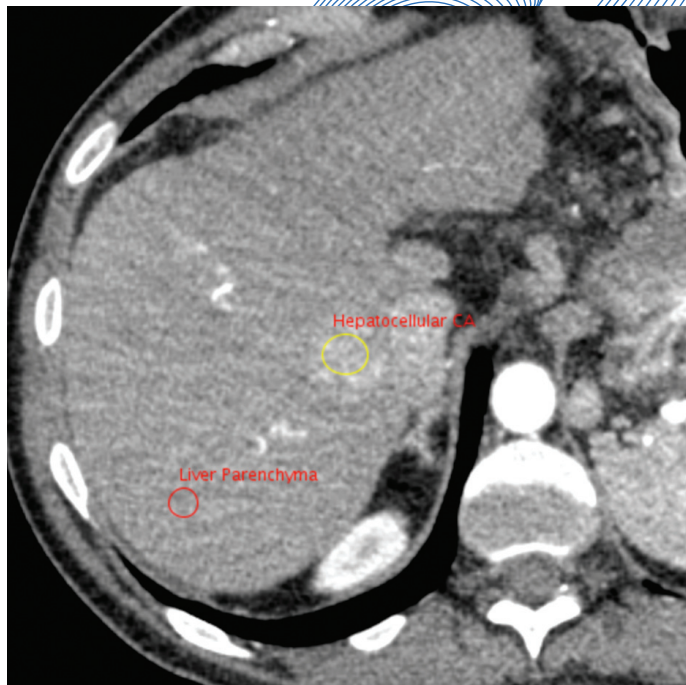


Figure 11 Patient 2.

65 keV ROI's and Spectral HU Curves with and without normalization

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imagination at work