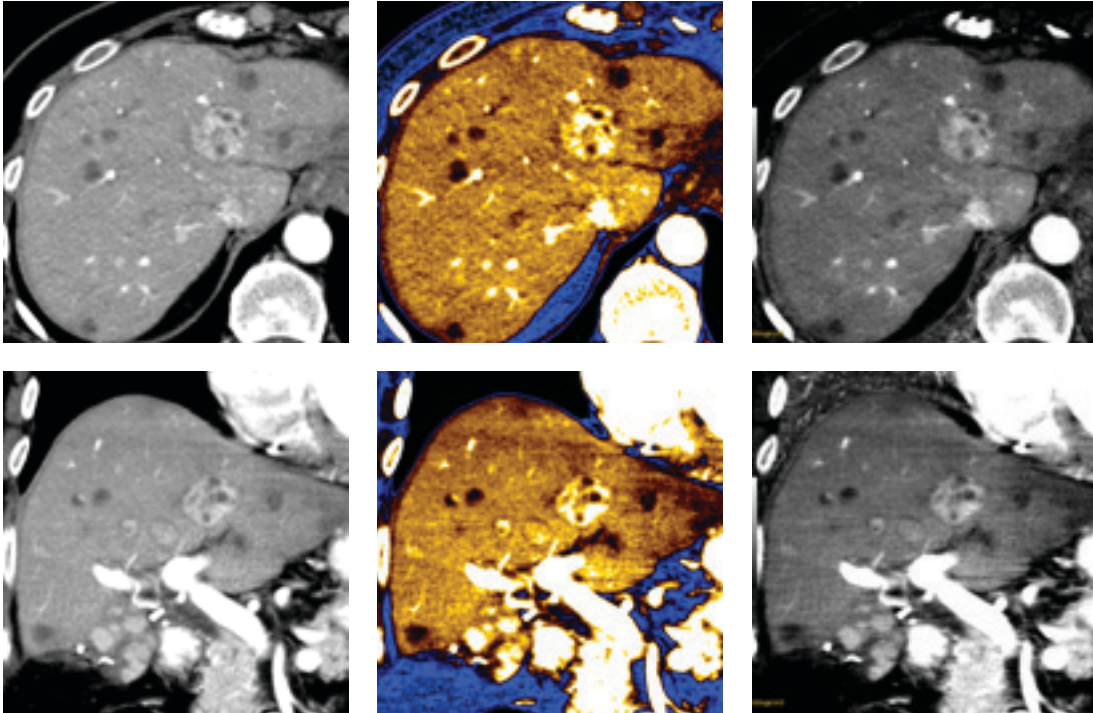


# GSI now routine at the University of Alabama at Birmingham



**Desiree Morgan, MD**

Vice Chair of Clinical Research

Professor of Radiology

Abdominal Imaging Section

Medical Director MRI, Chief Body MRI

University of Alabama, Birmingham, AL





# Introduction

The University of Alabama at Birmingham (UAB), an institution at the forefront of clinical care, is now routinely using Gemstone Spectral Imaging (GSI) to make clinical decisions. Patients are scanned with GSI protocols and post-processing is done with GSI Viewer on a regular basis to follow hepatocellular lesions.

This case study highlights one such day of routine GSI scanning at UAB. Seven patients (four male, three female), with histories of hepatocellular lesions, were scanned using the GSI scan mode. The clinical goal was to monitor the extent of disease progression and/or treatment response within identified lesions.

“At UAB we are now routinely using GSI to help our patients by incorporating dual energy CT details along with conventional anatomic CT measures to aid us in our assessment of disease progression and treatment response.”

—Dr. Desiree Morgan



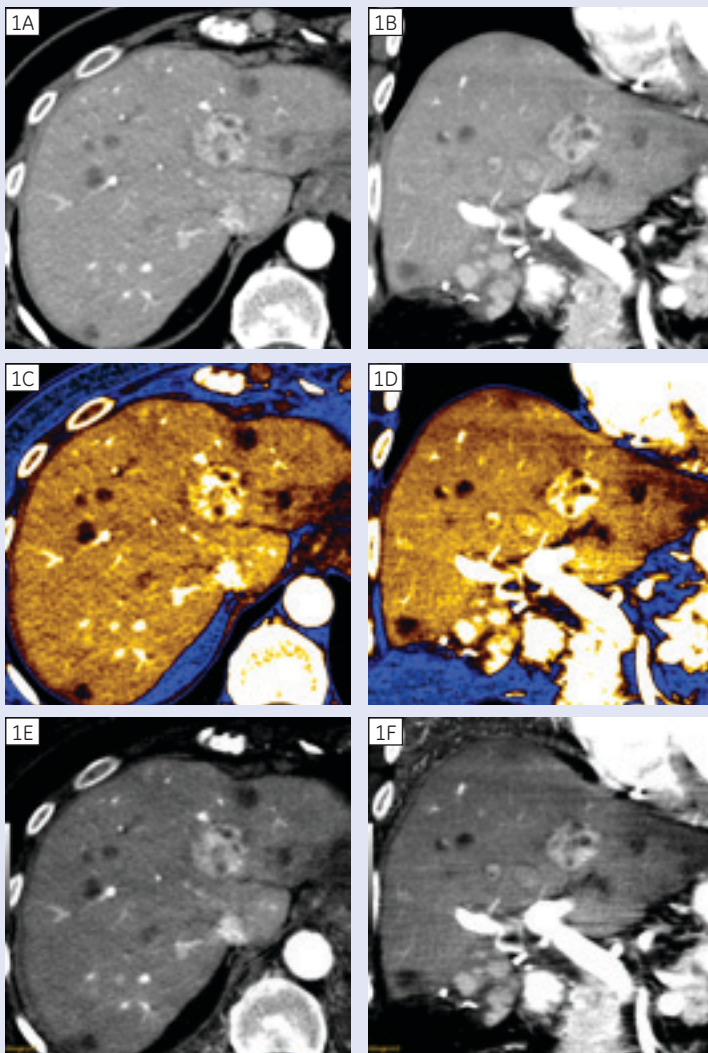
# GSI now routine at UAB

## Detailed Case Study

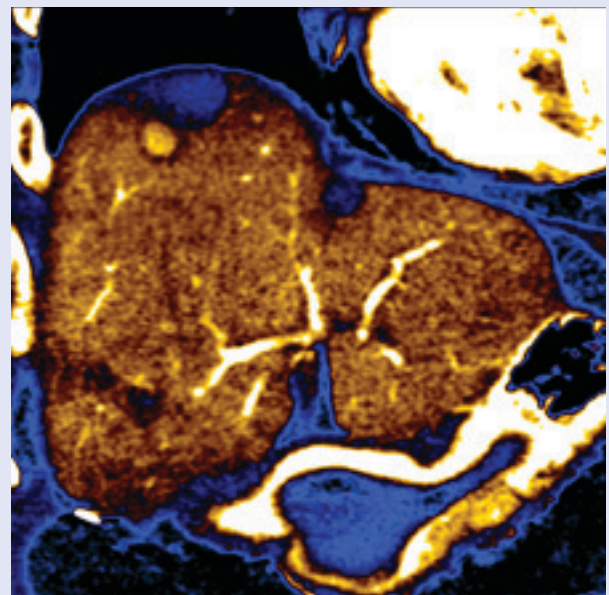
### 1 Patient history

An 81-year-old female with a history of ruptured hepatocellular carcinoma and recurrence of multifocal hepatocellular carcinoma. The patient was treated with transarterial chemoembolization (TACE) and a multiphase hepatic CT exam using GSI was performed to assess treatment response and extent of residual tumor post TACE.

### Advantage of application



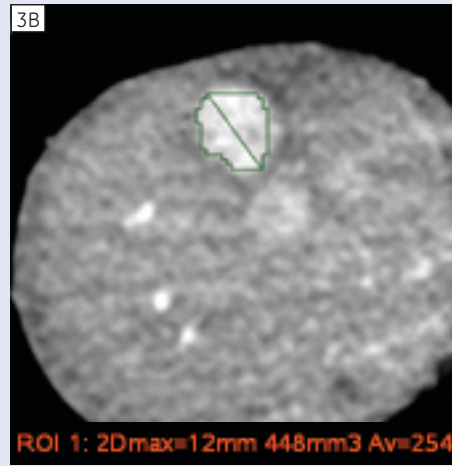
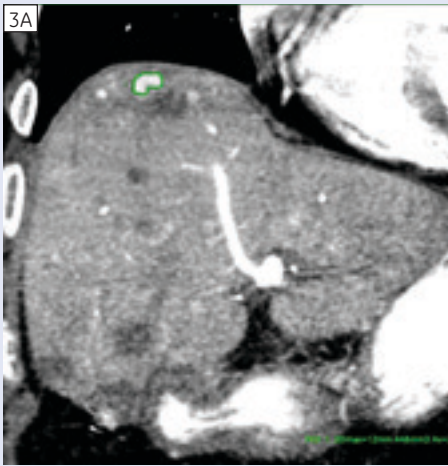
**Figure 1.** (A) Axial and (B) Coronal 70 keV monochromatic images. (C) Axial and (D) Coronal 55 keV monochromatic images displayed with perfusion color ramp. (E) Axial and (F) Coronal material density iodine images.



**Figure 2:** Coronal 55 keV monochromatic image displayed with Perfusion color ramp highlighting the enhancing residual lesion next to the treated (blue) lesion.

Selecting the appropriate keV level, in this case 55 keV, from the 101 available monochromatic levels (ranging from 40–140 keV) is important for optimizing lesion conspicuity and for aiding in our assessment of the extent of residual disease. Additionally, having the ability to dial down energy levels that maximize contrast is a useful tool especially if we encounter an exam with a low level of contrast enhancement.

With the introduction of GSI Viewer 3D, intuitive one-click lesion segmentation on a lower keV monochromatic image (55 keV image in this case) is possible. The selected volumetric ROI can be interrogated easily for material quantification, iodine content, and/or spectral curve analysis, in addition to conventional CT measures, volume, axis, and HU measures.



**Figure 3.** (A) Coronal 55 keV monochromatic image with volume ROI segmented using the Autocontour tool. (B) Axial 55 keV monochromatic image with volume ROI segmented using the Auto contour tool.

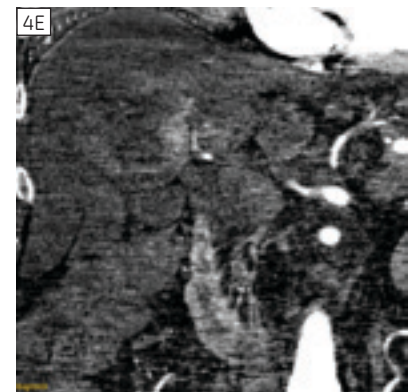
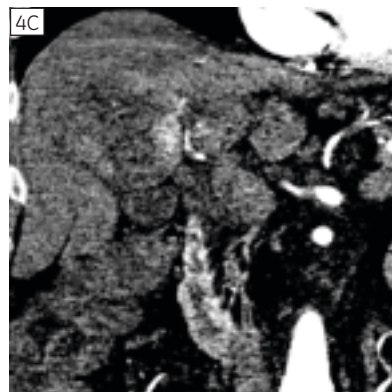
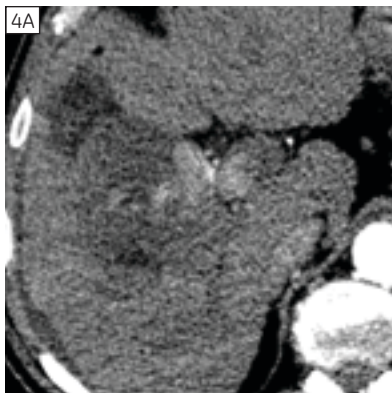
### Discussion and conclusion

We use GSI on a regular basis to provide us additional information for assessment, detection, and therapy response. GSI provides the benefit of spectral information and material quantification in addition to improved contrast visualization aiding in our diagnostic confidence. With the introduction of the new GSI Viewer 3D, we benefit from workflow improvements.

GSI Viewer 3D displays information for confident diagnosis with user-centric workflow.

Follow the link below to watch a video walkthrough of this case using the new GSI Viewer 3D application.

<http://www.youtube.com/watch?v=VxfLVhKs6M4&feature=youtu.be>



**Figure 4.** (A) Axial 70 keV monochromatic image, (B) Axial and (C) Coronal 52 keV monochromatic images, (D) Axial and (E) Coronal material density iodine images.

## 2 Patient history

A 60-year-old male with hepatocellular carcinoma.

### Clinical indication

Multi-phasic CT was performed to assess treatment response post TACE.

### Discussion

Using GSI Viewer, the lesion conspicuity was improved at 52 keV and helped to demonstrate tumor thrombus in the anterior segmental branch of the right portal vein.

### 3 Patient history

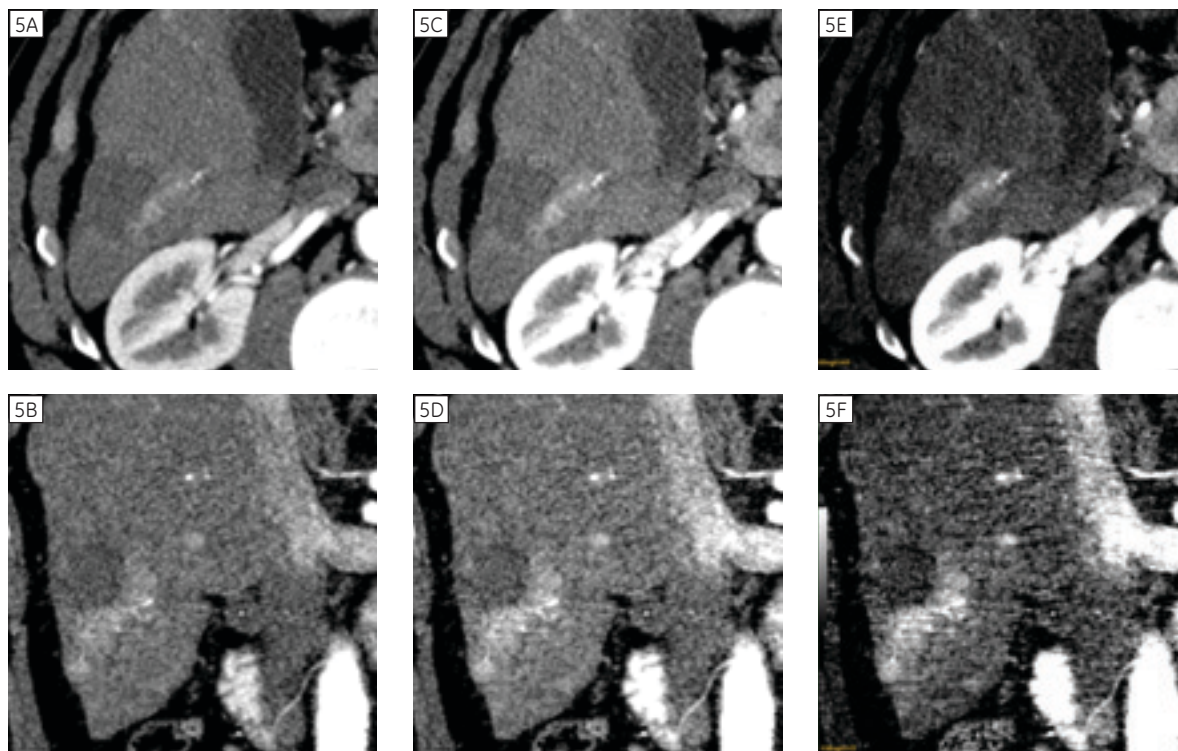
A 63-year-old male with hepatocellular carcinoma

#### Clinical indication

Multi-phasic CT was performed to assess treatment response post TACE

#### Discussion

Using GSI Viewer, the image conspicuity was improved at 52 keV and the iodine image aided in the assessment of the extent of residual disease around the treated lesion in segment 6, as well as other sites in the liver.



**Figure 5.** (A) Axial and (B) Coronal 70 keV monochromatic images. (C) Axial and (D) Coronal 52 keV monochromatic images. (E) Axial and (F) Coronal material density iodine images.

### 4 Patient history

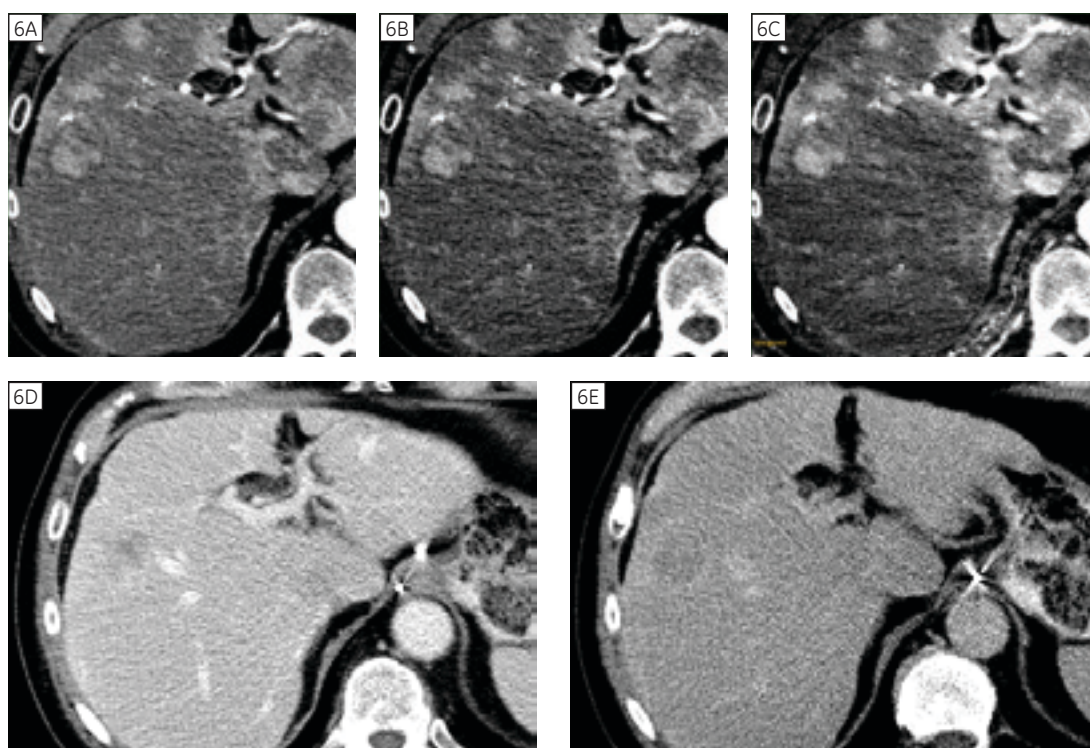
A 66-year-old male with cirrhosis

#### Clinical indication

Multi-phasic CT was performed to assess disease progression.

#### Discussion:

Using GSI Viewer, the image conspicuity was improved at 52 keV and aided in the assessment of the extent of hepatocellular carcinoma.



**Figure 6.** (A) Axial 70 keV monochromatic image. (B) Axial 52keV monochromatic image. (C) Axial material density iodine image. (D) Axial portal venous phase (non-GSI). (E) Axial delayed image (non-GSI).

## 5 Patient history

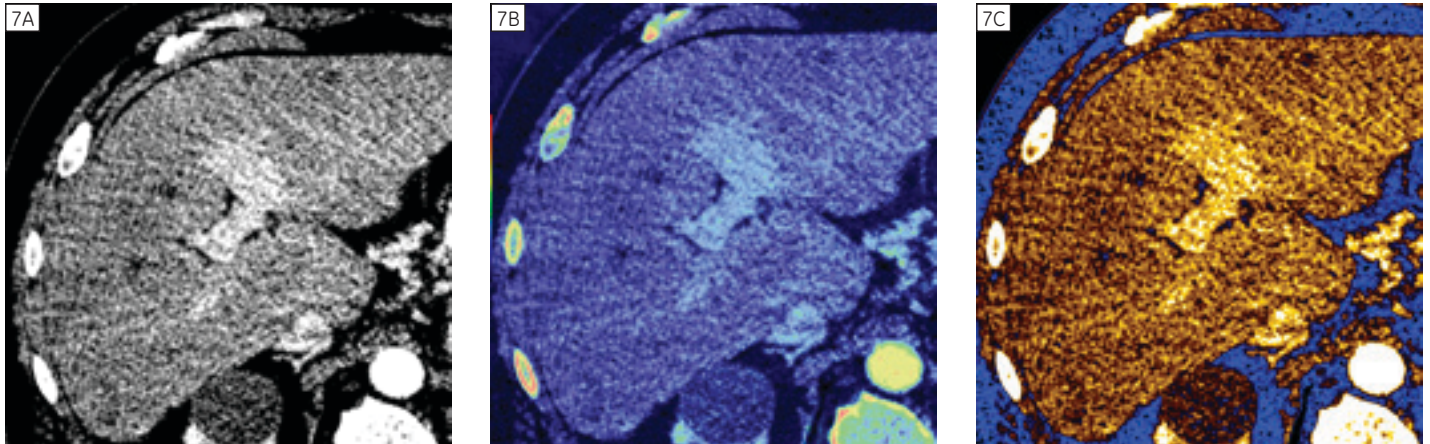
A 61-year-old male with cirrhosis.

### Clinical indication

Multi-phasic CT was performed to assess disease progression.

### Discussion

The material density iodine image on the GSI viewer helped us confirm the absence of enhancement; the non-enhancing lesions are thought to represent benign von Meyenberg complexes. In this case, GSI was especially useful to evaluate small lesions that may be difficult to characterize as often seen incidentally on CT.



**Figure 7.** (A) Axial 52 keV monochromatic image. (B) Axial 52 keV monochromatic image with material density iodine overlay (C) Axial 52keV monochromatic image with Perfusion color ramp.

## 6 Patient history

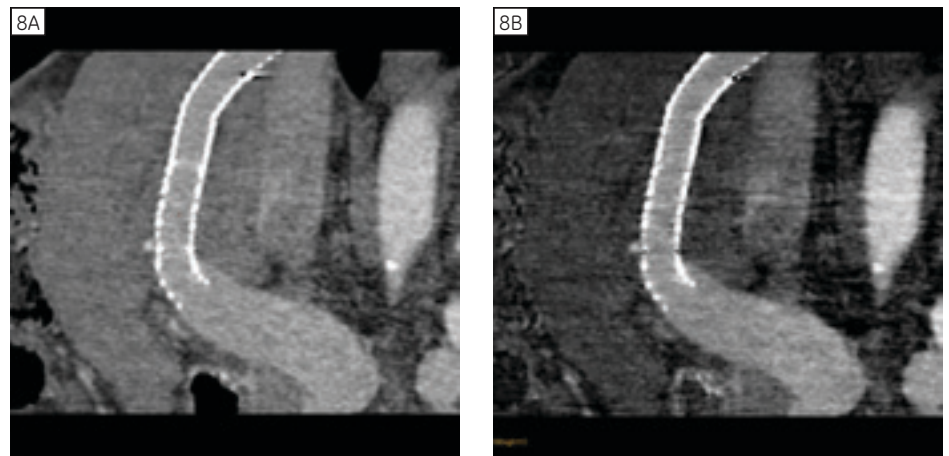
A 59-year-old female with cirrhosis

### Clinical indication

Multi-phasic CT was performed to assess disease progression in presence of TIPS. GSI images were used to analyze TIPS patency.

### Discussion

As part of GSI Viewer 3D, a two-click AVA, a Volume Viewer tool, was used for vessel tracking. In this case, the material density iodine image of the tracked vessel shows enhancement within the vessel proving TIPS patency.



**Figure 8.** (A) Curved reformat 70 keV monochromatic image, (B) Curved reformat material density iodine image.

## 7 Patient history

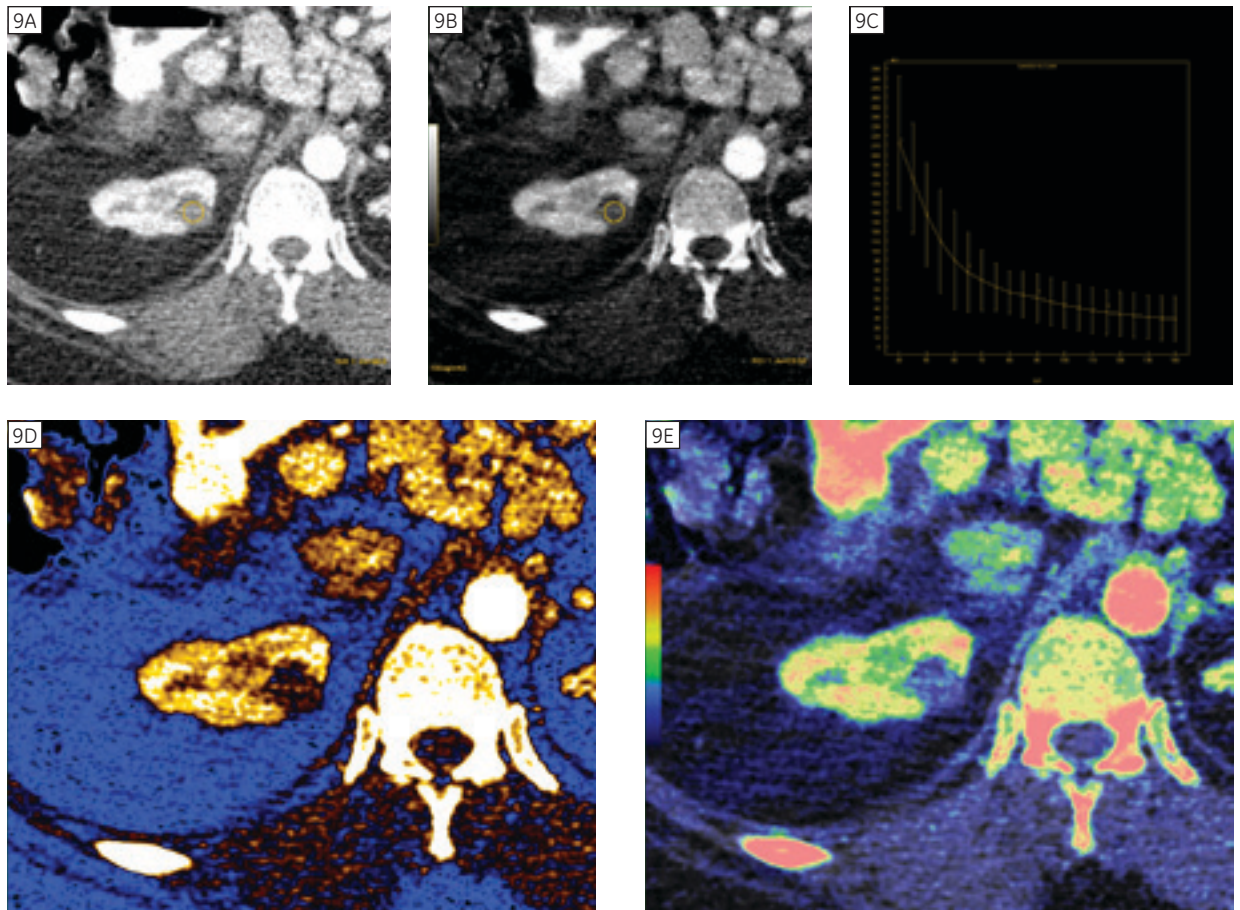
A 54-year-old female with cirrhosis

### Clinical indication

Multi-phasic CT was performed to assess disease progression.

## Discussion

GSI Viewer was used to help us analyze a hypodense lesion in the right kidney that had minimal interval growth but both spectral images and material density iodine image confirmed enhancement.



**Figure 9.** (A) Axial 70 keV monochromatic image. (B) Axial material density iodine image. (C) Spectral HU curve for the ROI selected on figures A and B. (D) Axial 70 keV monochromatic image with Perfusion color ramp. (E) Axial 70 keV monochromatic image with material density iodine overlay.

GE Healthcare  
3000 N. Grandview Blvd.  
Waukesha, WI 53188  
U.S.A.

[www.gehealthcare.com](http://www.gehealthcare.com)

©2012 General Electric Company – All rights reserved.

General Electric Company reserves the right to make changes in specifications and features shown herein, or discontinue the product described at any time without notice or obligation.

GE and GE Monogram are trademarks of General Electric Company.

GE Healthcare, a division of General Electric Company.

