State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry

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(2) Department of Diagnostic Radiology, Singapore General Hospital
(3) Department of General Surgery, Singapore General Hospital
(4) Duke-NUS Graduate Medical School, Singapore

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MBBS, MRCP(UK), FAMS(Nuclear Medicine)
yung.h.kao@gmail.com

Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories
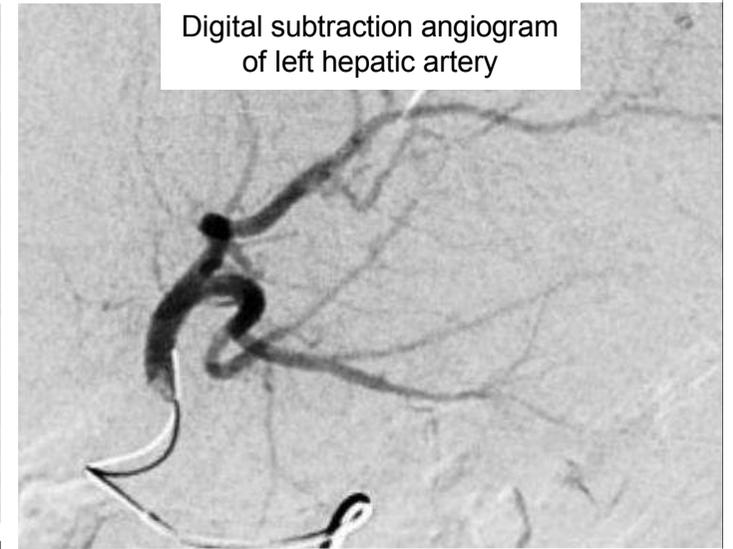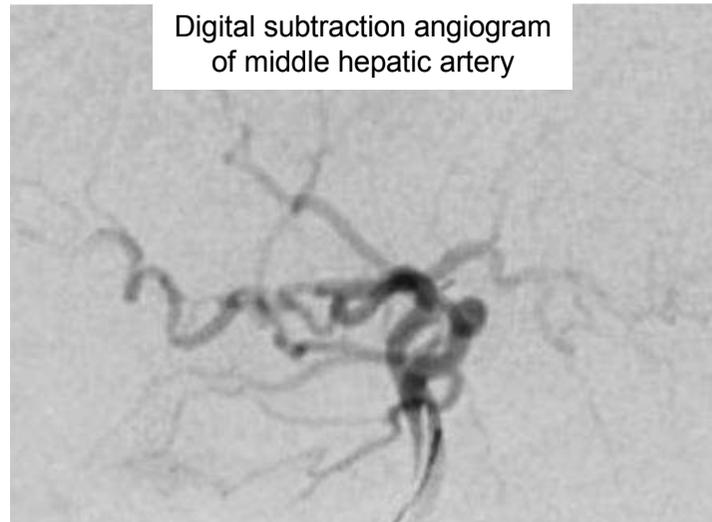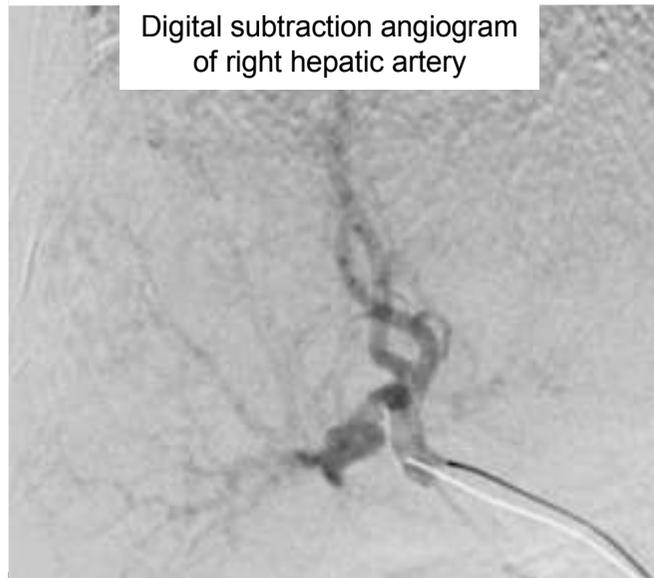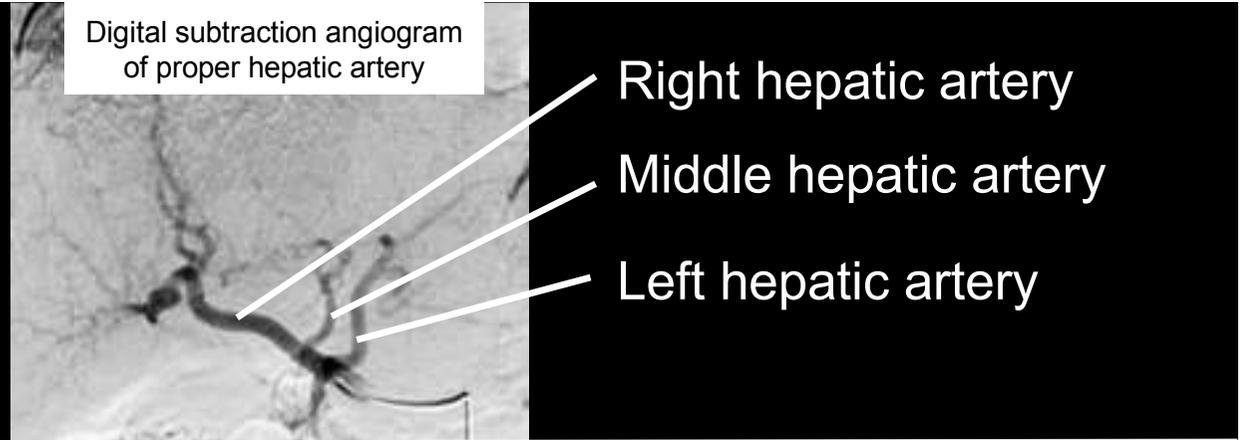
November 2011

State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry

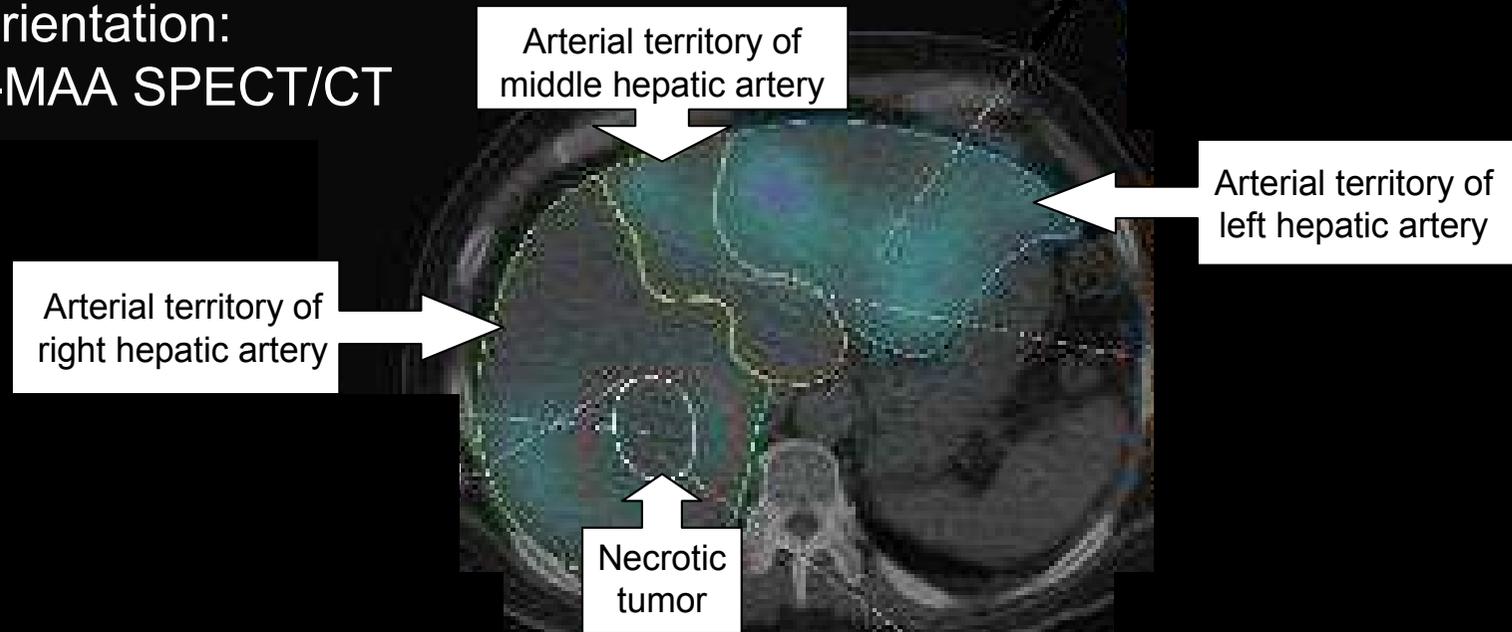Note: This PDF file is best viewed in 'full screen' mode i.e. 'Ctrl+L'.

Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084

Figure orientation: Angiography

Digital subtraction angiogram of proper hepatic artery

Right hepatic artery

Middle hepatic artery

Left hepatic artery

Digital subtraction angiogram of right hepatic artery

Digital subtraction angiogram of middle hepatic artery

Digital subtraction angiogram of left hepatic artery

Catheter-directed CT hepatic angiogram of right hepatic artery

Catheter-directed CT hepatic angiogram of middle hepatic artery

Catheter-directed CT hepatic angiogram of left hepatic artery

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Figure orientation:
Tc-99m-MAA SPECT/CT

Arterial territory of middle hepatic artery

Arterial territory of left hepatic artery

Arterial territory of right hepatic artery

Necrotic tumor

Supplemental Figure 2:

Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Tc-99-MAA SPECT/CT

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Supplemental Figure 2:
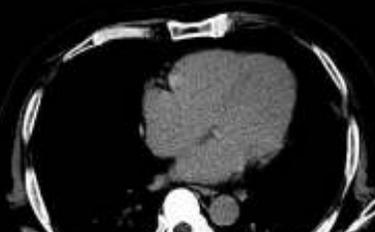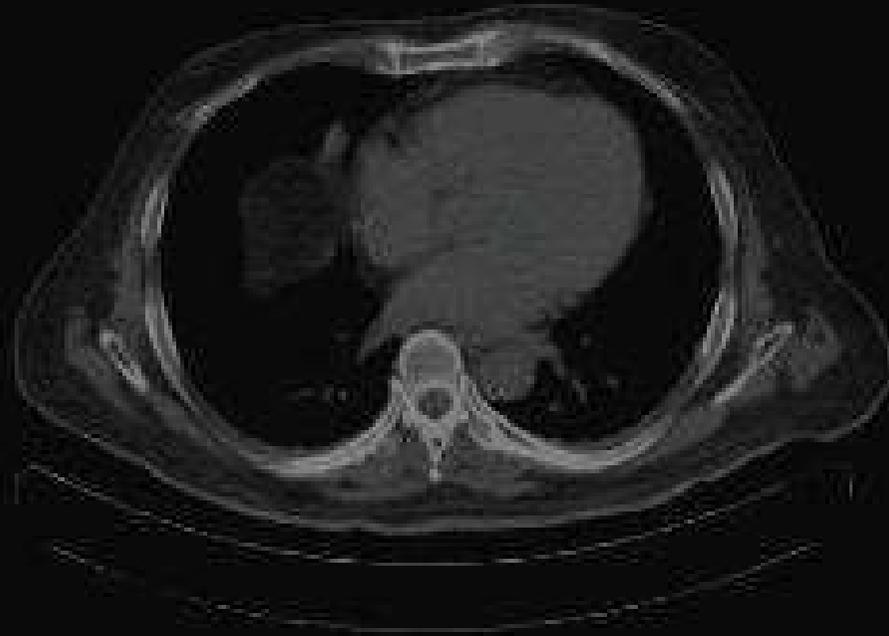Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Tc-99-MAA SPECT/CT

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.

Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Catheter-directed CTHA of right hepatic artery

Min: 191
Max: 1105
Mean: 667.8
StdDev: 224.3
Sum: 133,552
Number of Voxels: 200
Volume: 20,291.1 mm³

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Catheter-directed CTHA of middle hepatic artery

Min: 27
Max: 1974
Mean: 398.7
StdDev: 397.1
Sum: 1,396,887
Number of Voxels: 3504
Volume: 355,500.1 mm³

Min: 19
Max 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

Catheter-directed CTHA of left hepatic artery

Supplemental Figure 2:
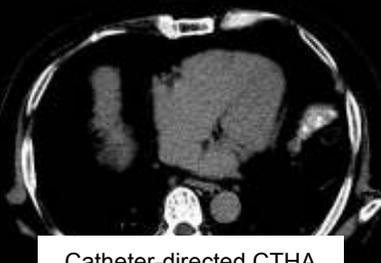Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.
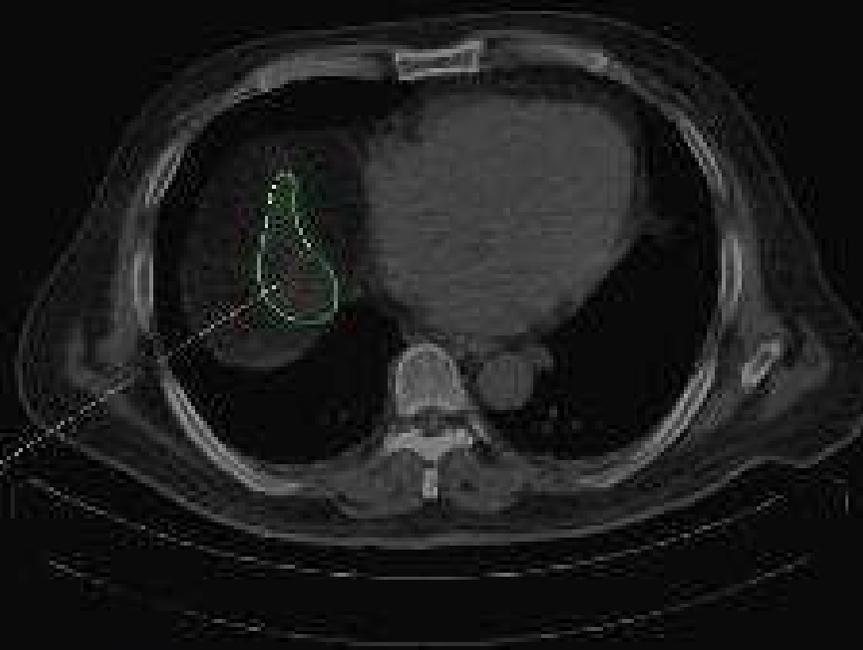
Catheter-directed CTHA of right hepatic artery

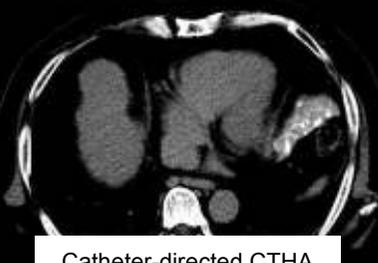Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 191
Max: 1105
Mean: 667.8
StdDev: 224.3
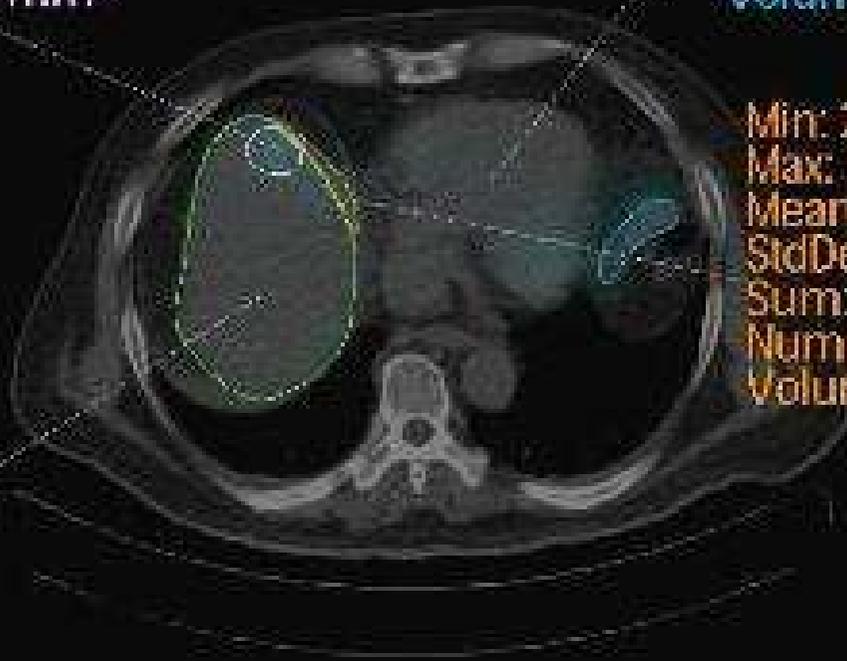Sum: 133,552
Number of Voxels: 200
Volume: 20,291.1 mm³

Min: 250
Max: 6022
Mean: 3238.8
StdDev: 1428.1
Sum: 722,256
Number of Voxels: 223
Volume: 22,624.6 mm³

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Min: 27
Max: 1974
Mean: 398.7
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Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

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Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

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Catheter-directed CTHA of right hepatic artery

Min: 191
Max: 1105
Mean: 667.8
StdDev: 224.3
Sum: 133,552
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Volume: 20,291.1 mm³

Min: 250
Max: 6022
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Sum: 722,256
Number of Voxels: 223
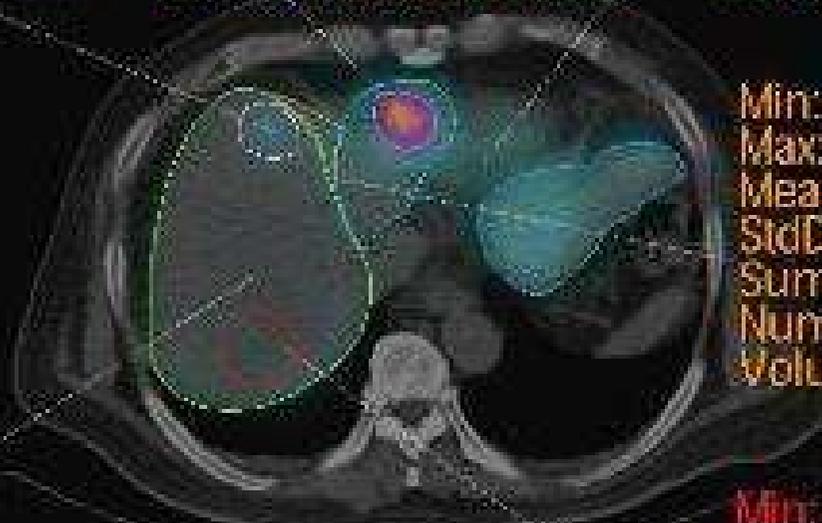Volume: 22,624.6 mm³

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Catheter-directed CTHA of middle hepatic artery

Min: 103
Max: 510
Mean: 281.1
StdDev: 96.8
Sum: 158,554
Number of Voxels: 564
Volume: 57,220.9 mm³

Min: 27
Max: 1974
Mean: 398.7
StdDev: 397.1
Sum: 1,396,887
Number of Voxels: 3504
Volume: 355,500.1 mm³

Catheter-directed CTHA of left hepatic artery

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

Min: 103
Max: 1122
Mean: 536.5
StdDev: 244.6
Sum: 1,403,946
Number of Voxels: 2617
Volume: 265,509 mm³

Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.

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Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 191
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Volume: 1,035,962.1 mm³

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Sum: 158,554
Number of Voxels: 564
Volume: 57,220.9 mm³

Min: 27
Max: 1974
Mean: 398.7
StdDev: 397.1
Sum: 1,396,887
Number of Voxels: 3504
Volume: 355,500.1 mm³

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

Min: 790
Max: 1390
Mean: 1049.1
StdDev: 139
Sum: 150,018
Number of Voxels: 143
Volume: 14,508.1 mm³

Min: 103
Max: 1122
Mean: 536.5
StdDev: 244.6
Sum: 1,403,946
Number of Voxels: 2617
Volume: 265,509 mm³

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Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 250
Max: 6022
Mean: 3238.8
StdDev: 1428.1
Sum: 722,256
Number of Voxels: 223
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Mean: 812.2
StdDev: 1138.8
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Sum: 158,554
Number of Voxels: 564
Volume: 57,220.9 mm³

Min: 27
Max: 1974
Mean: 398.7
StdDev: 397.1
Sum: 1,396,887
Number of Voxels: 3504
Volume: 355,500.1 mm³

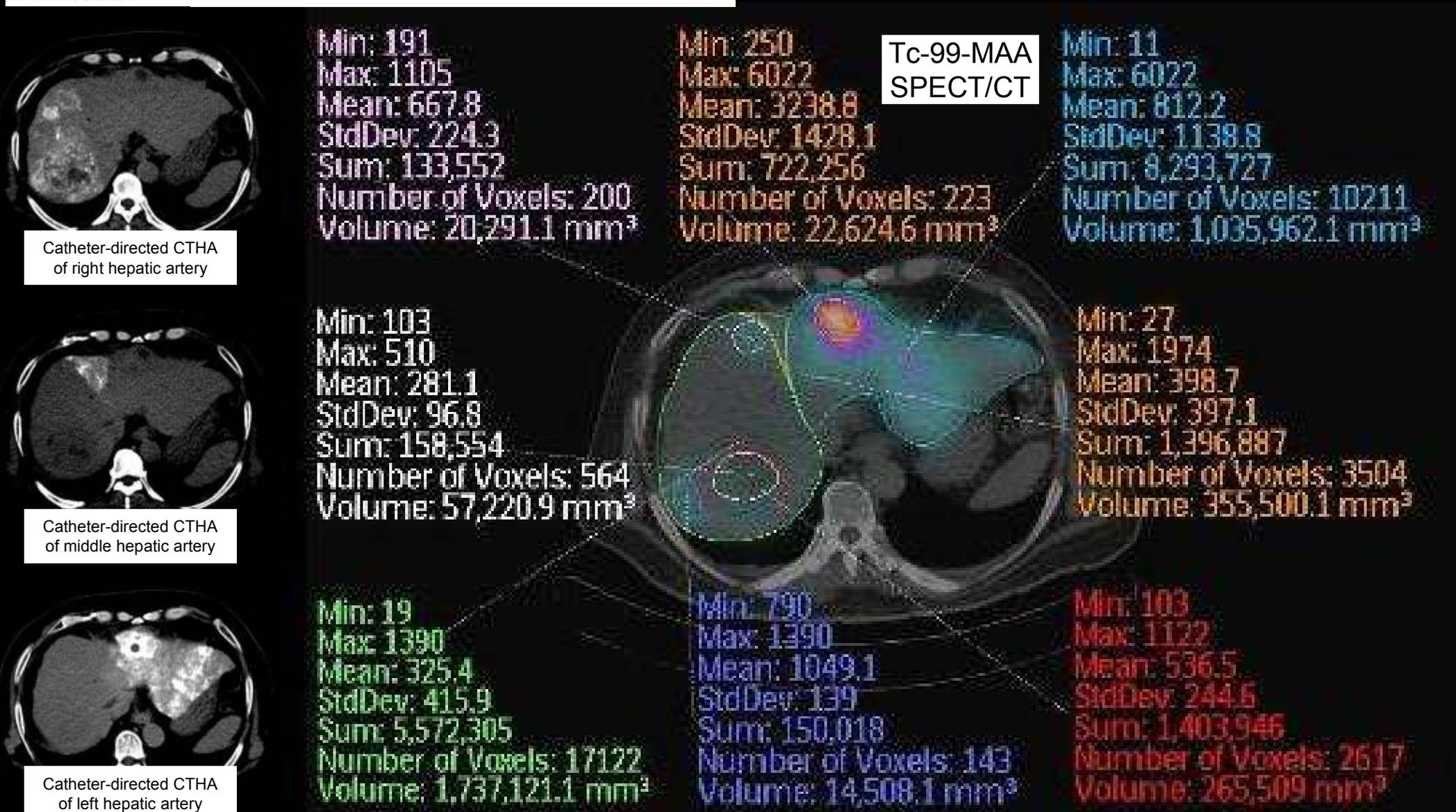Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

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Max: 1122
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Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

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Max: 6022
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Sum: 722,256
Number of Voxels: 223
Volume: 22,624.6 mm³

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Max: 6022
Mean: 812.2
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Sum: 8,293,727
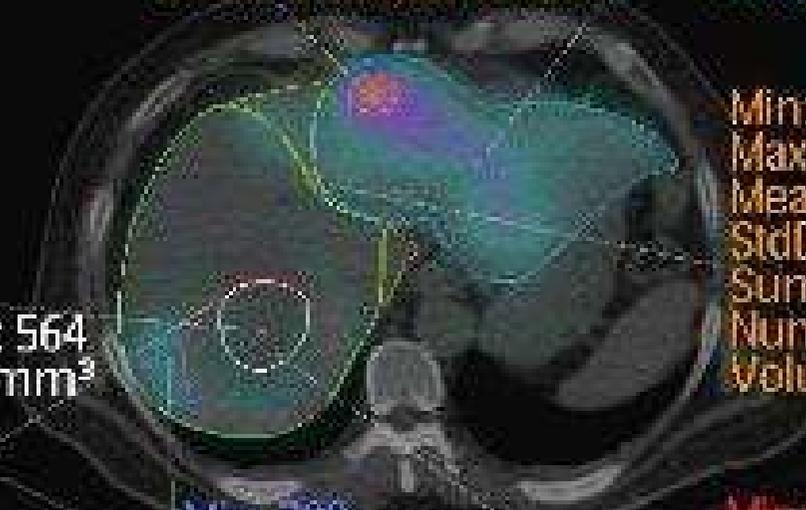Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Min: 103
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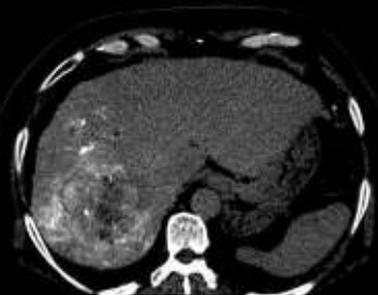
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Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
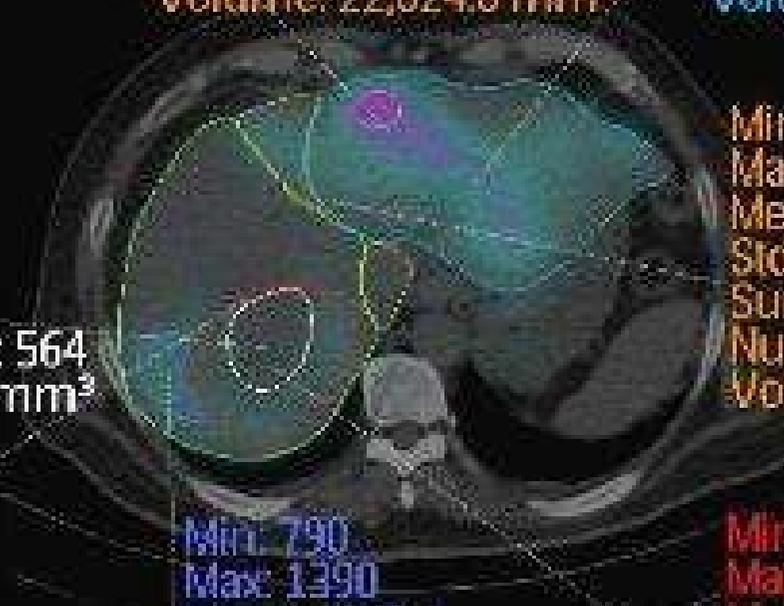Number of Voxels: 10211
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Min: 103
Max: 510
Mean: 281.1
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Sum: 158,554
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Min: 27
Max: 1974
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Min: 19
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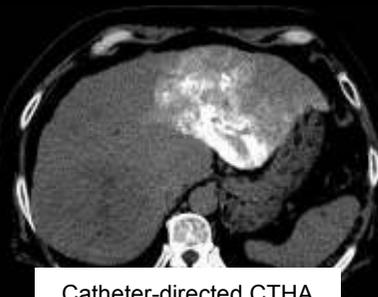Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

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Tc-99-MAA SPECT/CT

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Max: 6022
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StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

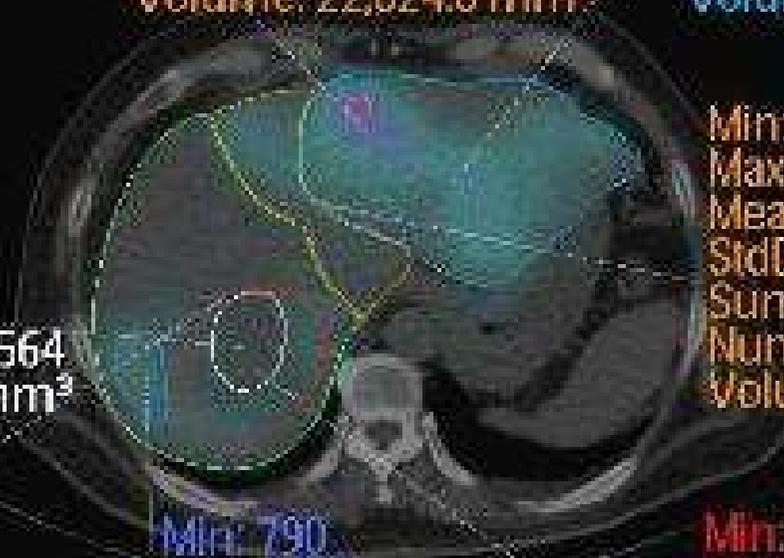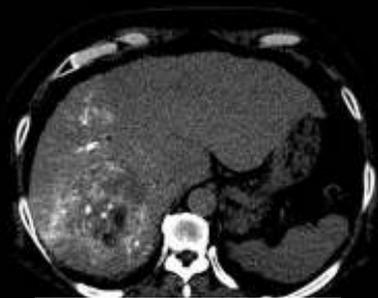Catheter-directed CTHA of right hepatic artery

Min: 103
Max: 510
Mean: 281.1
StdDev: 96.8
Sum: 158,554
Number of Voxels: 564
Volume: 57,220.9 mm³

Min: 27
Max: 1974
Mean: 398.7
StdDev: 397.1
Sum: 1,396,887
Number of Voxels: 3504
Volume: 355,500.1 mm³

Catheter-directed CTHA of middle hepatic artery

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

Min: 103
Max: 1122
Mean: 536.5
StdDev: 244.6
Sum: 1,403,946
Number of Voxels: 2617
Volume: 265,509 mm³

Catheter-directed CTHA of left hepatic artery

Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Catheter-directed CTHA of right hepatic artery
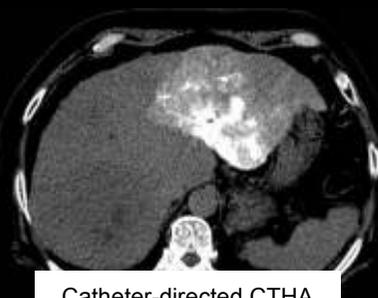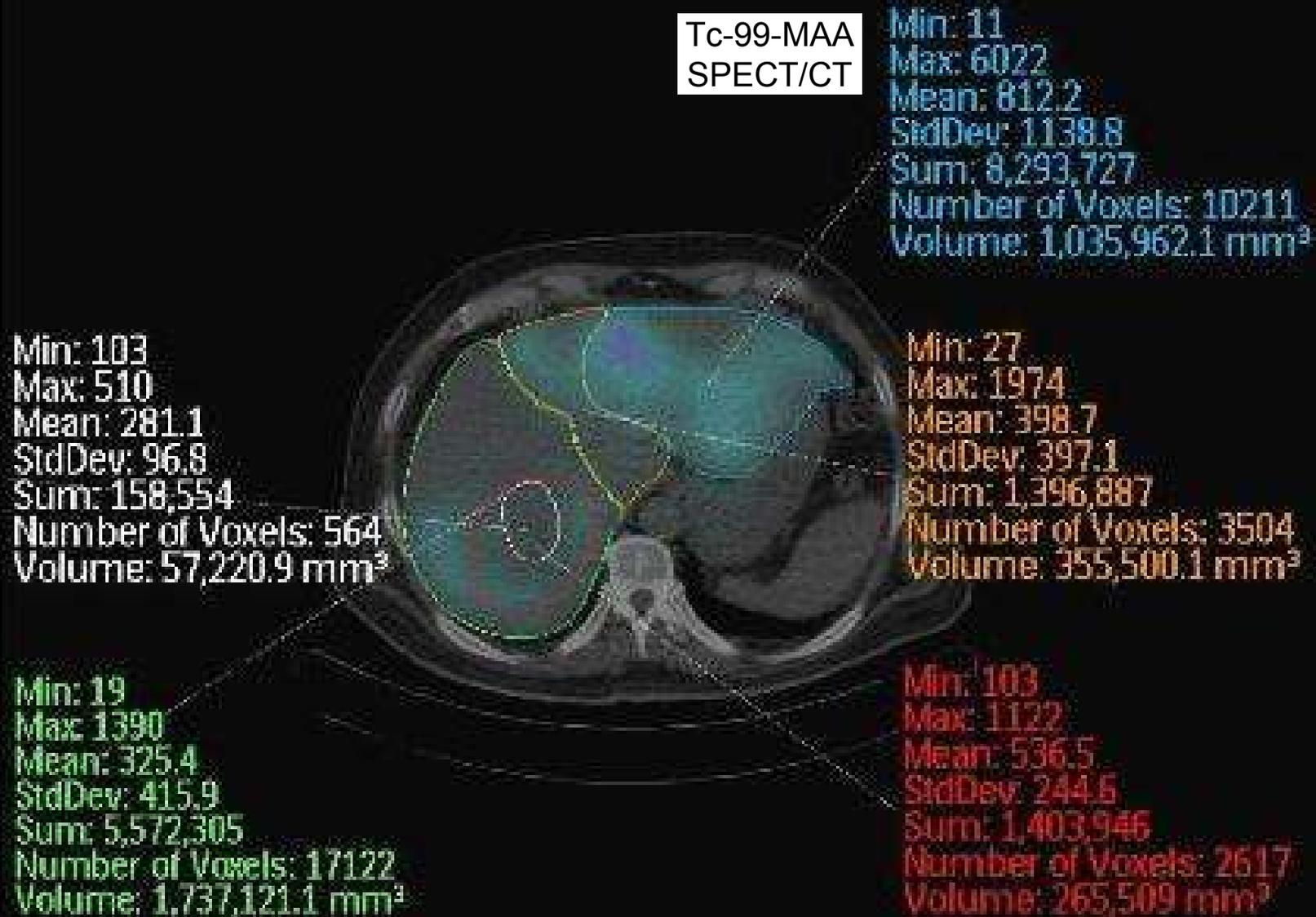
Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
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Min: 103
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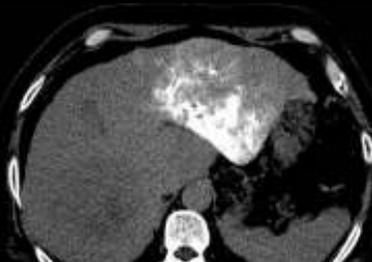Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

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Min: 27
Max: 1974
Mean: 398.7
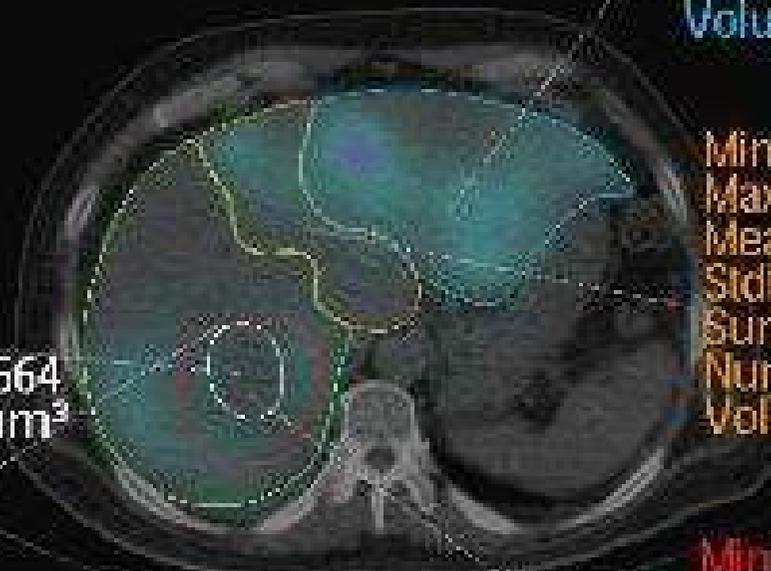StdDev: 397.1
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Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Min: 795
Max: 1974
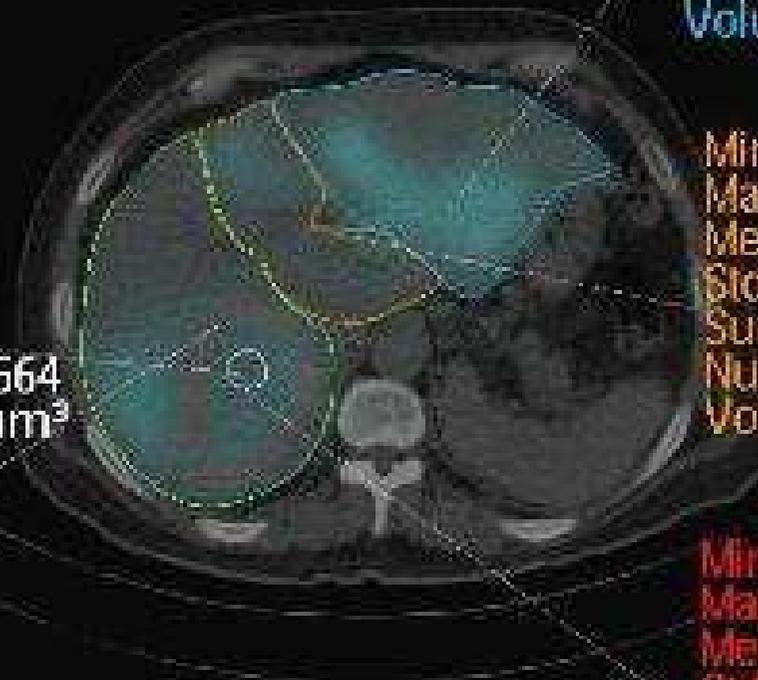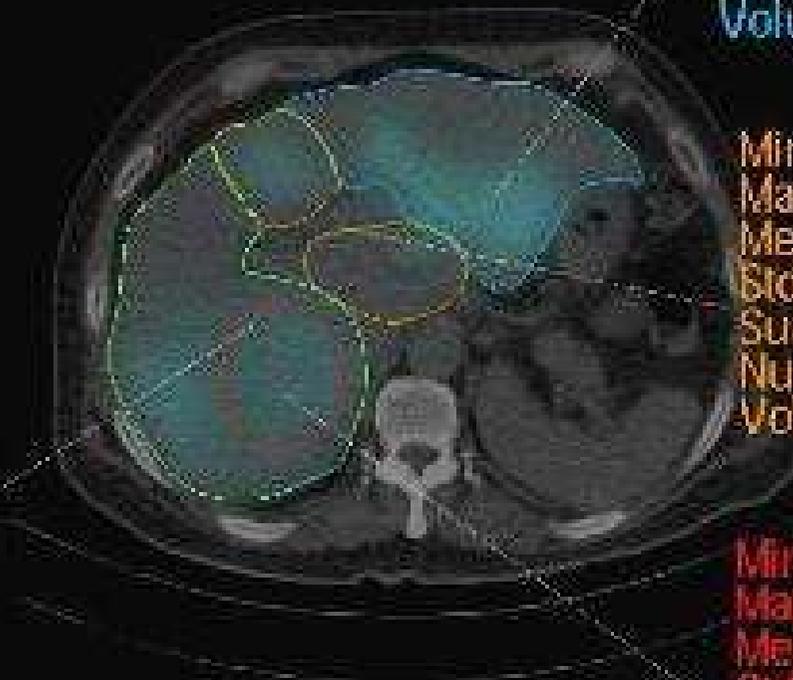Mean: 1186.5
StdDev: 261.9
Sum: 113,908
Number of Voxels: 96
Volume: 9,739.7 mm³

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Min: 647
Max: 931
Mean: 761.1
StdDev: 73.7
Sum: 31,206
Number of Voxels: 41
Volume: 4,159.7 mm³

Min: 27
Max: 1974
Mean: 398.7
StdDev: 397.1
Sum: 1,396,887
Number of Voxels: 3504
Volume: 355,500.1 mm³

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
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Number of Voxels: 2617
Volume: 265,509 mm³

Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.
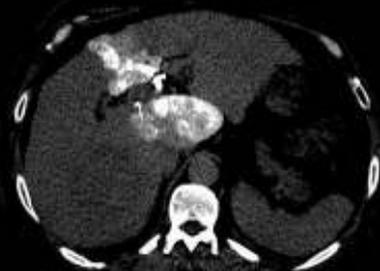
Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

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Catheter-directed CTHA of right hepatic artery
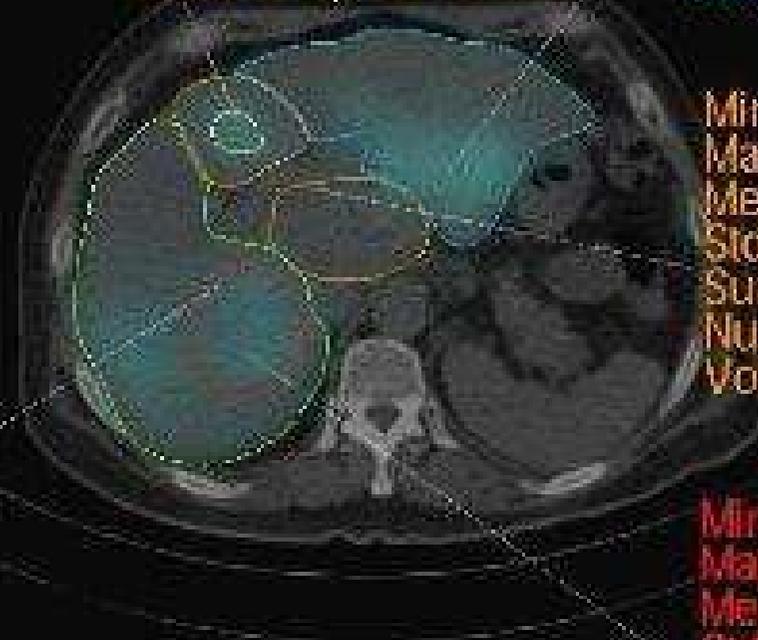
Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 795
Max: 1974
Mean: 1186.5
StdDev: 261.9
Sum: 113,908
Number of Voxels: 96
Volume: 9,739.7 mm³

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Min: 647
Max: 931
Mean: 761.1
StdDev: 73.7
Sum: 31,206
Number of Voxels: 41
Volume: 4,159.7 mm³

Min: 27
Max: 1974
Mean: 398.7
StdDev: 397.1
Sum: 1,396,887
Number of Voxels: 3504
Volume: 355,500.1 mm³

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

Min: 103
Max: 1122
Mean: 536.5
StdDev: 244.6
Sum: 1,403,946
Number of Voxels: 2617
Volume: 265,509 mm³
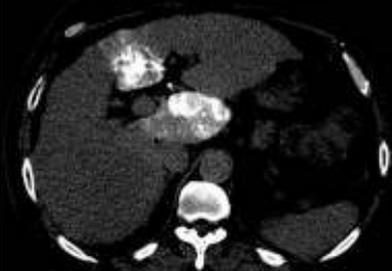
Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 795
Max: 1974
Mean: 1186.5
StdDev: 261.9
Sum: 113,908
Number of Voxels: 96
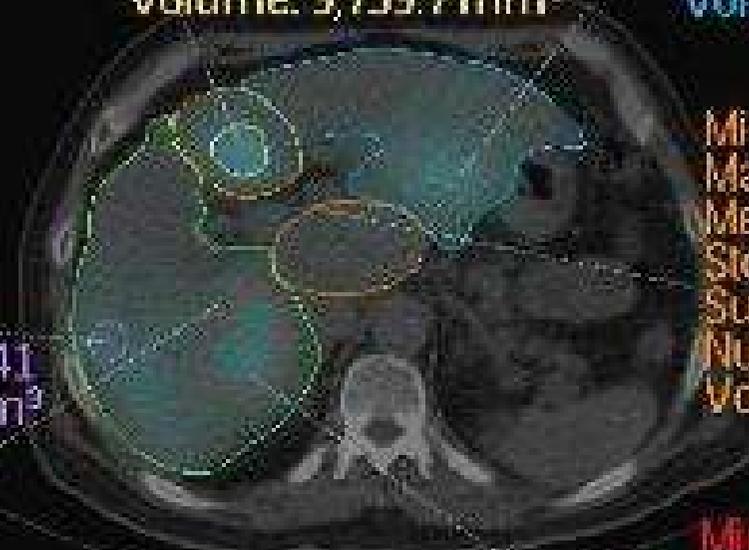Volume: 9,739.7 mm³

Min: 11
Max: 6022
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Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.

Supplemental Figure 2:
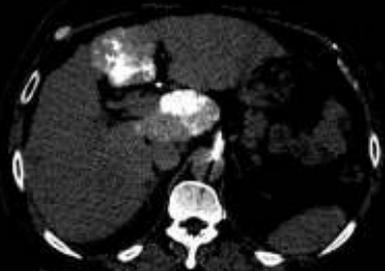Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

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Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 795
Max: 1974
Mean: 1186.5
StdDev: 261.9
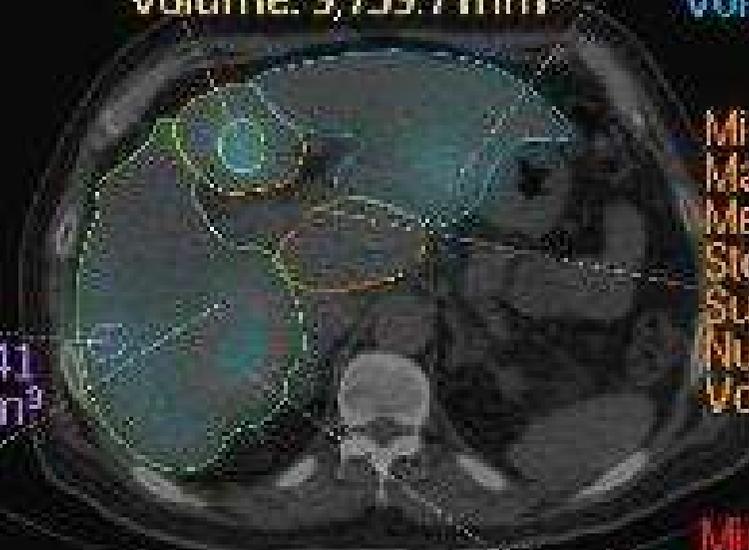Sum: 113,908
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Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

Min: 648
Max: 881
Mean: 751
StdDev: 60.6
Sum: 78,852
Number of Voxels: 105
Volume: 10,652.8 mm³

Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.

<u>Supplemental Figure 2</u>:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
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Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Min: 27
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Number of Voxels: 3504
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Supplemental Figure 2:
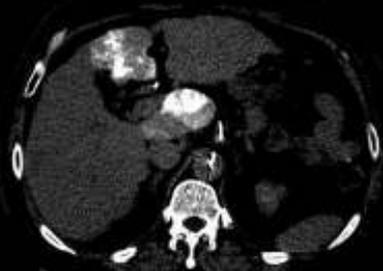Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

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Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

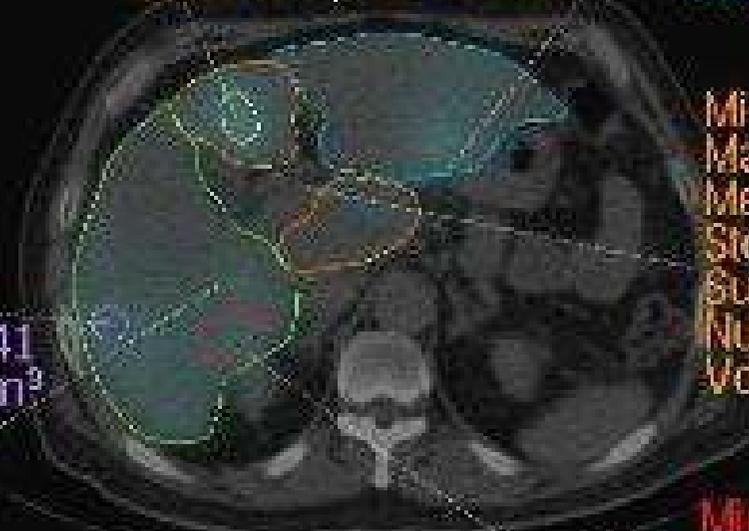Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

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Mean: 751
StdDev: 60.6
Sum: 78,852
Number of Voxels: 105
Volume: 10,652.8 mm³

Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.
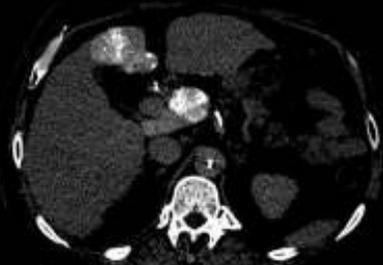
Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

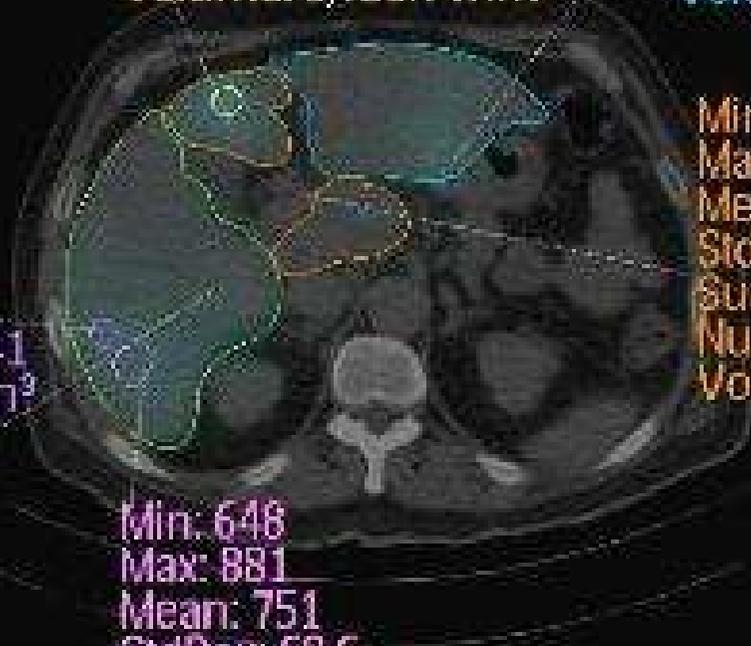Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
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Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.

Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Tc-99-MAA SPECT/CT

Min: 11
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Mean: 812.2
StdDev: 1138.8
Sum: 8,293,727
Number of Voxels: 10211
Volume: 1,035,962.1 mm³

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Min: 19
Max 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
Number of Voxels: 17122
Volume: 1,737,121.1 mm³

Supplemental Figure 2:
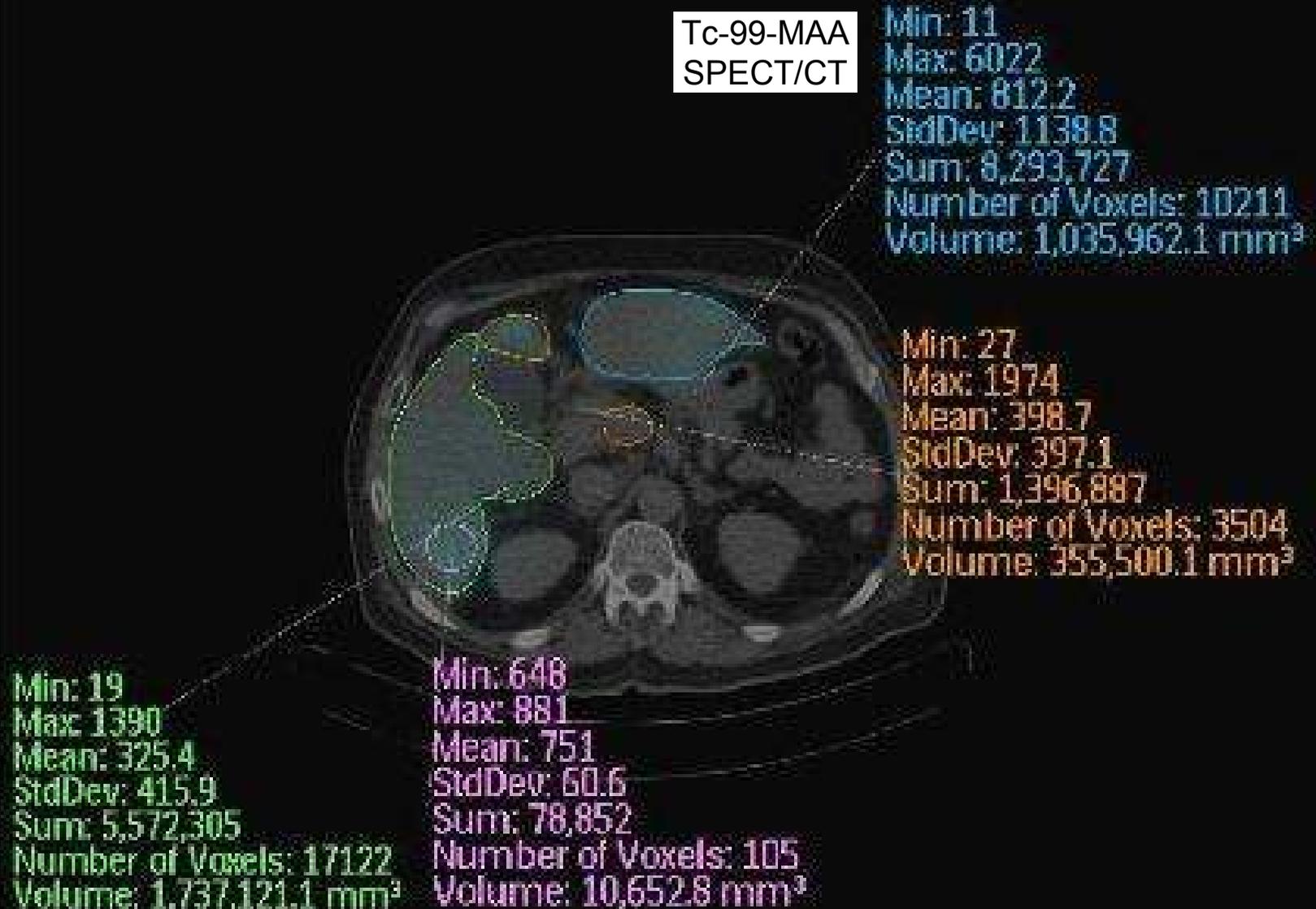Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Tc-99-MAA SPECT/CT

Min: 11
Max: 6022
Mean: 812.2
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Number of Voxels: 10211
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Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

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Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.

Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

Tc-99-MAA SPECT/CT

Catheter-directed CTHA of right hepatic artery

Catheter-directed CTHA of middle hepatic artery

Catheter-directed CTHA of left hepatic artery

Min: 19
Max: 1390
Mean: 325.4
StdDev: 415.9
Sum: 5,572,305
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Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.

Supplemental Figure 2:
Worked example of artery-specific SPECT/CT partition modeling of three arterial territories.

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Tc-99-MAA
SPECT/CT

Catheter-directed CTHA
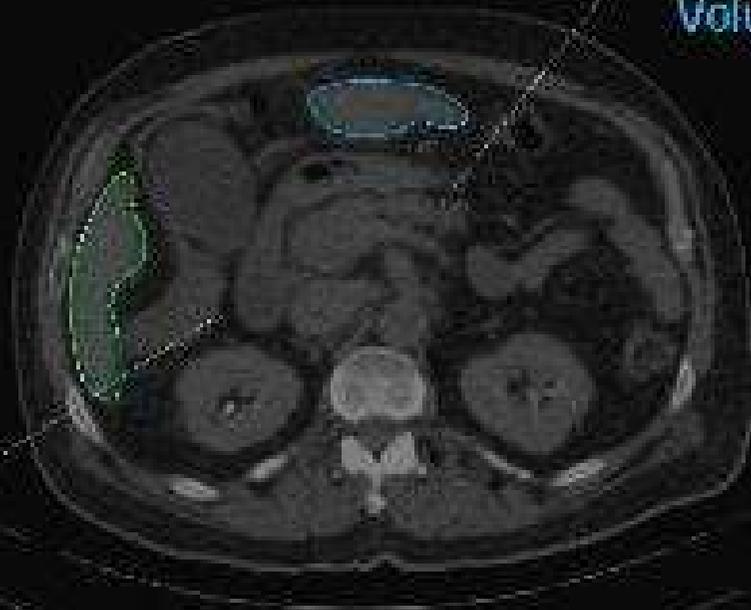of right hepatic artery

Catheter-directed CTHA
of middle hepatic artery

Catheter-directed CTHA
of left hepatic artery

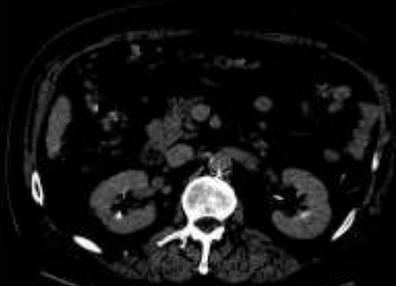Min: 19
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Volume: 1,737,121.1 mm³

Singapore General Hospital
SingHealth

DEPARTMENT OF NUCLEAR MEDICINE & PET
Image-Guided Personalized Predictive Dosimetry
For Yttrium-90 Radioembolization (SIR-Spheres®)

Worked example of artery-specific SPECT/CT partition modeling of three arterial territories

ARTERY-SPECIFIC SPECT/CT COMPARTMENTAL PERSONALIZED PREDICTIVE MIRD MACRODOSIMETRY

Total Mass of Targeted, Implanted, Non-Tumorous Liver	2,892	gm
Total Mass of Targeted, Implanted Tumor	302	gm
Total Mass of Targeted, Implanted (Non-Tumorous Liver + Tumor)	3,194	gm
Mean Liver-to-Lung Shunt Percentage	6.1	%
Total Lung Mass (Assumed Standard Man)	1,000	gm
Predicted Mean Radiation Dose to Lungs	8.5	Gy
PLANNING TARGET VOLUME 1 (TRI-COMPARTMENTAL MIRD)	Left Hepatic	Artery
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	24.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	103.3	Gy
PLANNING TARGET VOLUME 2 (TRI-COMPARTMENTAL MIRD)	Middle Hepatic	Artery
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	32.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	100.9	Gy
PLANNING TARGET VOLUME 3 (TRI-COMPARTMENTAL MIRD)	Right Hepatic	Artery
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	42.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	100.6	Gy

Total Desired Yttrium-90 Activity by Predictive MIRD Macrodosimetry   2.77   GBq

ARTERY-SPECIFIC SPECT/CT TRI-COMPARTMENTAL PREDICTIVE MIRD MACRODOSIMETRY

PLANNING TARGET VOLUME 1 (TRI-COMPARTMENTAL MIRD)	Left Hepatic	Artery
Mass of Targeted, Implanted, Non-Tumorous Liver	1,054	gm
Mass of Targeted, Implanted Tumor	24	gm
Mean Tumor-to-Normal Liver Ratio by Mean SPECT/CT Count Density	4.30	
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	24.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	103.3	Gy
Predicted Mean Radiation Dose to Lungs	1.8	Gy
Desired Artery-Specific Yttrium-90 Activity	0.59	GBq

PLANNING TARGET VOLUME 2 (TRI-COMPARTMENTAL MIRD)	Middle Hepatic	Artery
Mass of Targeted, Implanted, Non-Tumorous Liver	360	gm
Mass of Targeted, Implanted Tumor	10	gm
Mean Tumor-to-Normal Liver Ratio by Mean SPECT/CT Count Density	3.15	
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	32.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	100.9	Gy
Predicted Mean Radiation Dose to Lungs	0.8	Gy
Desired Artery-Specific Yttrium-90 Activity	0.27	GBq

PLANNING TARGET VOLUME 3 (TRI-COMPARTMENTAL MIRD)	Right Hepatic	Artery
Mass of Targeted, Implanted, Non-Tumorous Liver	1,479	gm
Mass of Targeted, Implanted Tumor	268	gm
Mean Tumor-to-Normal Liver Ratio by Mean SPECT/CT Count Density	2.39	
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	42.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	100.6	Gy
Predicted Mean Radiation Dose to Lungs	5.8	Gy
Desired Artery-Specific Yttrium-90 Activity	1.91	GBq

ARTERY-SPECIFIC SPECT/CT COUNTS & VOLUMES-OF-INTEREST (VOI)

ARTERIAL TERRITORY SUPPLIED BY: (i.e. PLANNING TARGET VOLUME 1)	Left Hepatic (i.e. Artery1)	Artery
Perfused Territory (Liver + Tumor) SPECT/CT Counts	8,239,727	counts
Perfused Territory (Liver + Tumor) SPECT/CT VOI	1,035,962.1	mm3
Tumor 1 (Implanted + Necrotic) SPECT/CT Counts	722,256	counts
Tumor 1 (Implanted + Necrotic) SPECT/CT VOI	22,624.6	mm3
Tumor 2 (Implanted + Necrotic) SPECT/CT Counts		counts
Tumor 2 (Implanted + Necrotic) SPECT/CT VOI		mm3
Tumor 3 (Implanted + Necrotic) SPECT/CT Counts		counts
Tumor 3 (Implanted + Necrotic) SPECT/CT VOI		mm3
Tumor 4 (Implanted + Necrotic) SPECT/CT Counts		counts
Tumor 4 (Implanted + Necrotic) SPECT/CT VOI		mm3
Tumor 5 (Implanted + Necrotic) SPECT/CT Counts		counts
Tumor 5 (Implanted + Necrotic) SPECT/CT VOI		mm3

ARTERY-SPECIFIC SPECT/CT MEAN TUMOR-TO-NORMAL LIVER RATIO CALCULATION

ARTERIAL TERRITORY SUPPLIED BY: (i.e. PLANNING TARGET VOLUME 1)	Left Hepatic (i.e. Artery1)	Artery
Sum of (Implanted + Necrotic) Tumor SPECT/CT Counts	722,256	counts
Sum of (Implanted + Necrotic) Tumor SPECT/CT VOI	22,624.6	mm3
Sum of Non-Implanted, Non-Tumorous Liver SPECT/CT Counts	0	counts
Sum of Non-Implanted, Non-Tumorous Liver SPECT/CT VOI	0.0	mm3
Sum of Necrotic Tumor SPECT/CT Counts	0	counts
Sum of Necrotic Tumor SPECT/CT VOI	0.0	mm3
Net Implanted, Non-Tumorous Liver SPECT/CT Counts	7,517,471	counts
Net Implanted, Non-Tumorous Liver SPECT/CT VOI	1,013,337.5	mm3
Net Implanted, Non-Tumorous Liver Mass	1,053.87	gm
Net Implanted Tumor SPECT/CT Counts	722,256	counts
Net Implanted Tumor SPECT/CT VOI	22,624.6	mm3
Net Implanted Tumor Mass	23.53	gm
Implanted, Non-Tumorous Liver Mean SPECT/CT Count Density	7.42	counts/mm3
Implanted, Tumor Mean SPECT/CT Count Density	31.92	counts/mm3
Artery-Specific Mean Tumor-to-Normal Liver Ratio	4.30	
by Mean SPECT/CT Count Density, specific to territory supplied by:	Left Hepatic	Artery

ARTERY-SPECIFIC SPECT/CT COUNTS & VOLUMES-OF-INTEREST FOR TRI-COMPARTMENTAL MIRD

ARTERIAL TERRITORY SUPPLIED BY: (i.e. PLANNING TARGET VOLUME 2)	Middle Hepatic (i.e. Artery2)	Artery
Perfused Territory (Liver + Tumor) SPECT/CT Counts	1,396,887	counts
Perfused Territory (Liver + Tumor) SPECT/CT VOI	355,500.1	mm3
Tumor 1 (Implanted + Necrotic) SPECT/CT Counts	113,908	counts
Tumor 1 (Implanted + Necrotic) SPECT/CT VOI	9,739.7	mm3
Tumor 2 (Implanted + Necrotic) SPECT/CT Counts		counts
Tumor 2 (Implanted + Necrotic) SPECT/CT VOI		mm3
Tumor 3 (Implanted + Necrotic) SPECT/CT Counts		counts
Tumor 3 (Implanted + Necrotic) SPECT/CT VOI		mm3
Tumor 4 (Implanted + Necrotic) SPECT/CT Counts		counts
Tumor 4 (Implanted + Necrotic) SPECT/CT VOI		mm3

ARTERY-SPECIFIC SPECT/CT MEAN TUMOR-TO-NORMAL LIVER RATIO CALCULATION

	Middle Hepatic	Artery
ARTERIAL TERRITORY SUPPLIED BY: (i.e. PLANNING TARGET VOLUME 2)	(i.e. Artery2)	
Sum of (Implanted + Necrotic) Tumor SPECT/CT Counts	113,908	counts
Sum of (Implanted + Necrotic) Tumor SPECT/CT VOI	9,739.7	mm3
Sum of Non-Implanted, Non-Tumorous Liver SPECT/CT Counts	0	counts
Sum of Non-Implanted, Non-Tumorous Liver SPECT/CT VOI	0.0	mm3
Sum of Necrotic Tumor SPECT/CT Counts	0	counts
Sum of Necrotic Tumor SPECT/CT VOI	0.0	mm3
Net Implanted, Non-Tumorous Liver SPECT/CT Counts	1,282,979	counts
Net Implanted, Non-Tumorous Liver SPECT/CT VOI	345,760.4	mm3
Net Implanted, Non-Tumorous Liver Mass	359.59	gm
Net Implanted Tumor SPECT/CT Counts	113,908	counts
Net Implanted Tumor SPECT/CT VOI	9,739.7	mm3
Net Implanted Tumor Mass	10.13	gm
Implanted, Non-Tumorous Liver Mean SPECT/CT Count Density	3.71	counts/mm3
Implanted Tumor Mean SPECT/CT Count Density	11.70	counts/mm3
Artery-Specific Mean Tumor-to-Normal Liver Ratio	3.15	
by Mean SPECT/CT Count Density, specific to territory supplied by:	Middle Hepatic	Artery

ARTERY-SPECIFIC SPECT/CT COUNTS & VOLUMES-OF-INTEREST FOR TRI-COMPARTMENTAL MIRD

ARTERIAL TERRITORY SUPPLIED BY: (i.e. PLANNING TARGET VOLUME 3)	Right Hepatic (i.e. Artery3)	Artery
Perfused Territory (Liver + Tumor) SPECT/CT Counts	5,572,305	counts
Perfused Territory (Liver + Tumor) SPECT/CT VOI	1,737,121.1	mm3
Tumor 1 (Implanted + Necrotic) SPECT/CT Counts	133,552	counts
Tumor 1 (Implanted + Necrotic) SPECT/CT VOI	20,291.1	mm3
Tumor 2 (Implanted + Necrotic) SPECT/CT Counts	1,403,946	counts
Tumor 2 (Implanted + Necrotic) SPECT/CT VOI	265,509.0	mm3
Tumor 3 (Implanted + Necrotic) SPECT/CT Counts	150,018	counts
Tumor 3 (Implanted + Necrotic) SPECT/CT VOI	14,508.1	mm3
Tumor 4 (Implanted + Necrotic) SPECT/CT Counts	31,206	counts
Tumor 4 (Implanted + Necrotic) SPECT/CT VOI	4,159.7	mm3
Tumor 5 (Implanted + Necrotic) SPECT/CT Counts	78,852	counts
Tumor 5 (Implanted + Necrotic) SPECT/CT VOI	10,652.8	mm3
Tumor 6 (Implanted + Necrotic) SPECT/CT Counts		counts
Tumor 6 (Implanted + Necrotic) SPECT/CT VOI		mm3
Necrotic Tumor 1 SPECT/CT Counts	158,554	counts
Necrotic Tumor 1 SPECT/CT VOI	57,220.9	mm3
Necrotic Tumor 2 SPECT/CT Counts		counts
Necrotic Tumor 2 SPECT/CT VOI		mm3

ARTERY-SPECIFIC SPECT/CT MEAN TUMOR-TO-NORMAL LIVER RATIO CALCULATION

ARTERIAL TERRITORY SUPPLIED BY: (i.e. PLANNING TARGET VOLUME 3)	Right Hepatic (i.e. Artery3)	Artery
Sum of (Implanted + Necrotic) Tumor SPECT/CT Counts	1,797,574	counts
Sum of (Implanted + Necrotic) Tumor SPECT/CT VOI	315,120.7	mm3
Sum of Non-Implanted, Non-Tumorous Liver SPECT/CT Counts	0	counts
Sum of Non-Implanted, Non-Tumorous Liver SPECT/CT VOI	0.0	mm3
Sum of Necrotic Tumor SPECT/CT Counts	158,554	counts
Sum of Necrotic Tumor SPECT/CT VOI	57,220.9	mm3
Net Implanted, Non-Tumorous Liver SPECT/CT Counts	3,774,731	counts
Net Implanted, Non-Tumorous Liver SPECT/CT VOI	1,422,000.4	mm3
Net Implanted, Non-Tumorous Liver Mass	1,478.88	gm
Net Implanted Tumor SPECT/CT Counts	1,639,020	counts
Net Implanted Tumor SPECT/CT VOI	257,899.8	mm3
Net Implanted Tumor Mass	268.22	gm
Implanted, Non-Tumorous Liver Mean SPECT/CT Count Density	2.65	counts/mm3
Implanted Tumor Mean SPECT/CT Count Density	6.36	counts/mm3
Artery-Specific Mean Tumor-to-Normal Liver Ratio	2.39	
by Mean SPECT/CT Count Density, specific to territory supplied by:	Right Hepatic	Artery

Kao et al. State-of-the-art yttrium-90 selective internal radiation therapy: Technical aspects of artery-specific SPECT/CT partition model dosimetry. J Nucl Med. 2011; 52 (Supplement 1):1084.

www.facebook.com/radioembolization

SNM 2011 poster exhibit, dosimetric worksheet
and more worked examples are available for download at:
www.sgh.com.sg/Clinical-Departments-Centers/Nuclear-Medicine-PET