

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

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Supplemental Figure 3:

Worked example of sub-lesional dosimetry by artery-specific SPECT/CT partition modeling

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

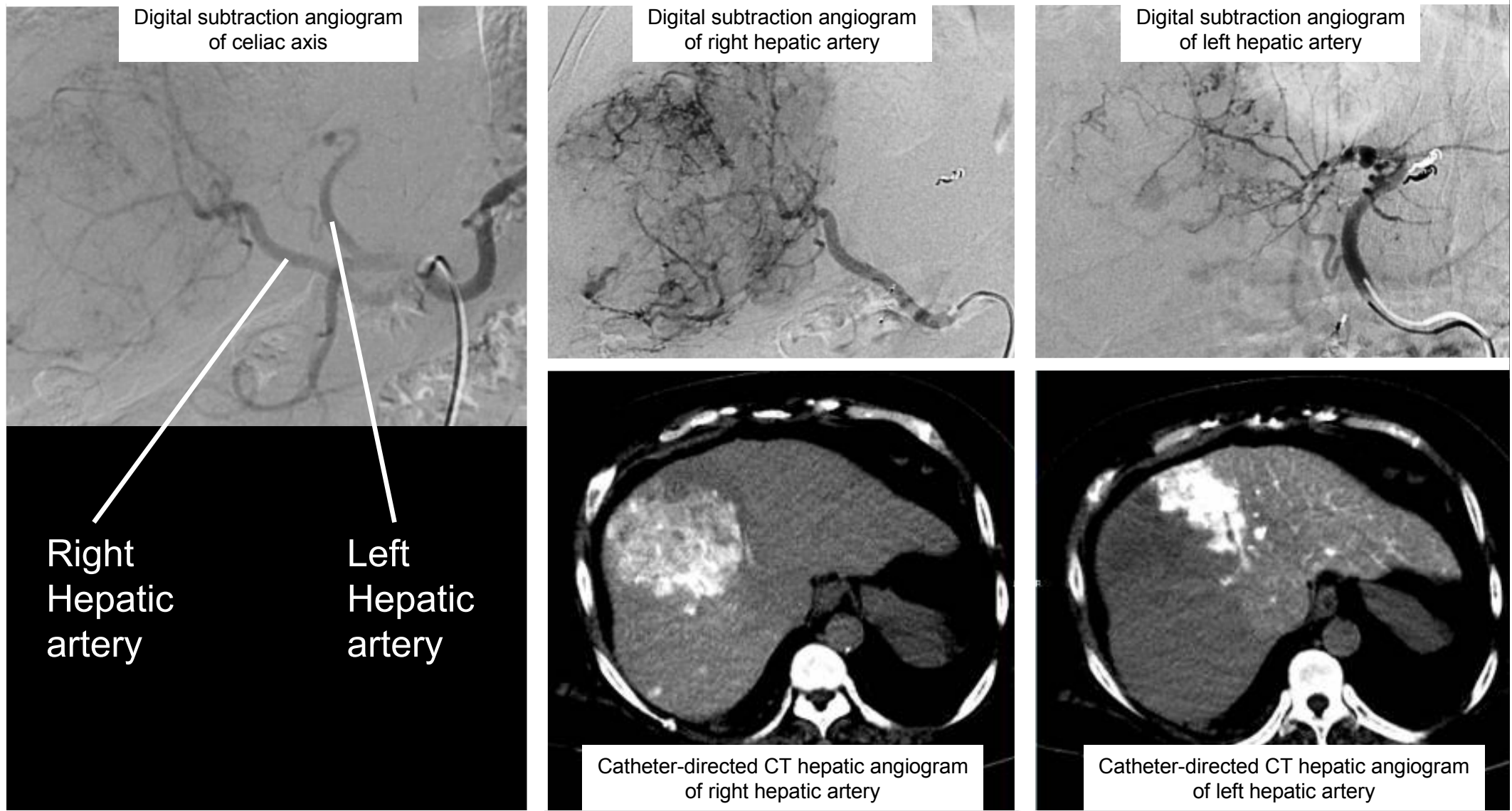
Note: This PDF file is best viewed in 'full screen' mode i.e. 'Ctrl+L'.

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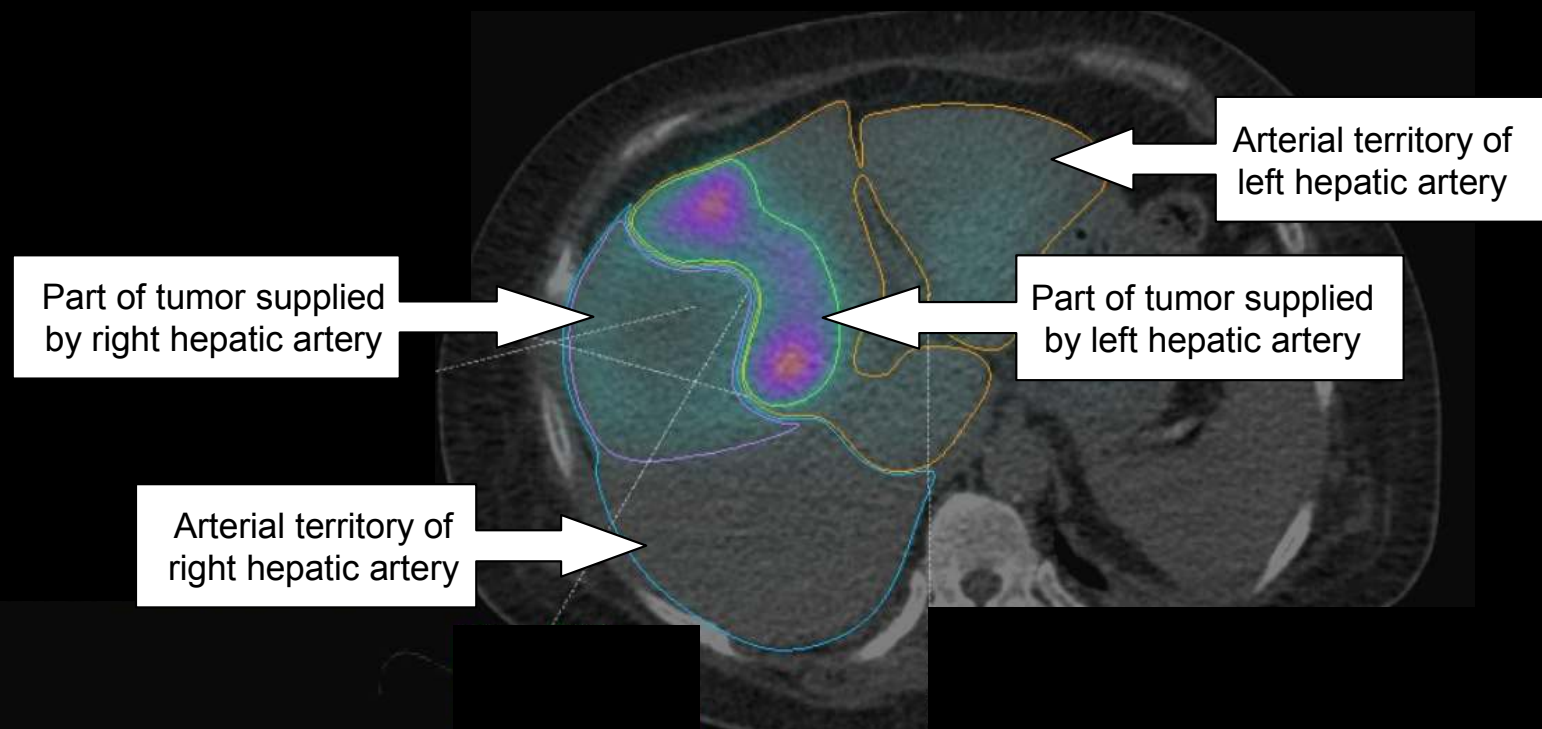
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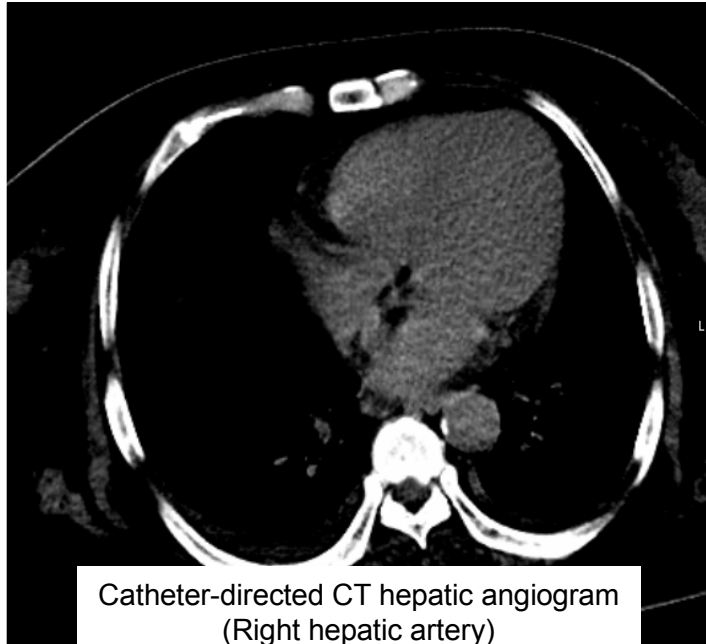
Figure orientation: Hepatic angiography



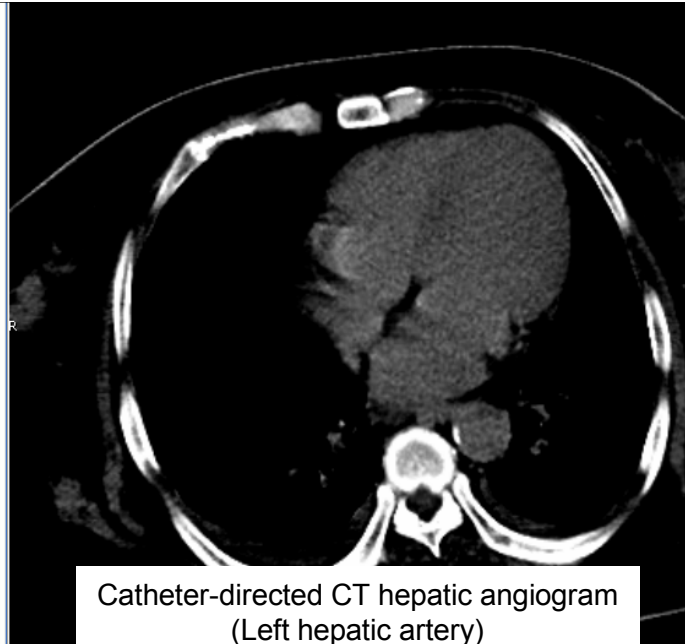
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Figure orientation: Tc-99m-MAA SPECT/CT





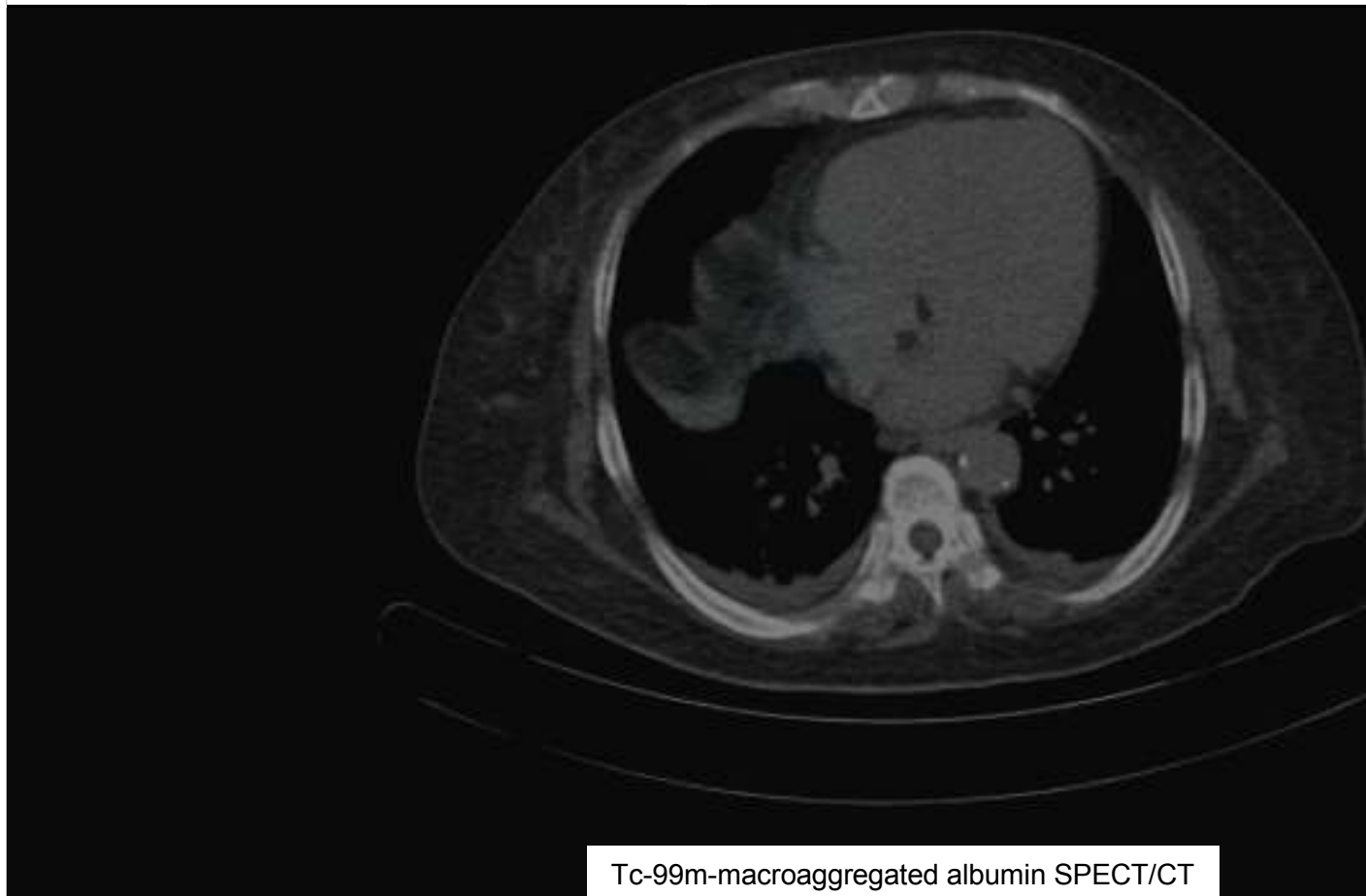
Catheter-directed CT hepatic angiogram
(Right hepatic artery)



Catheter-directed CT hepatic angiogram
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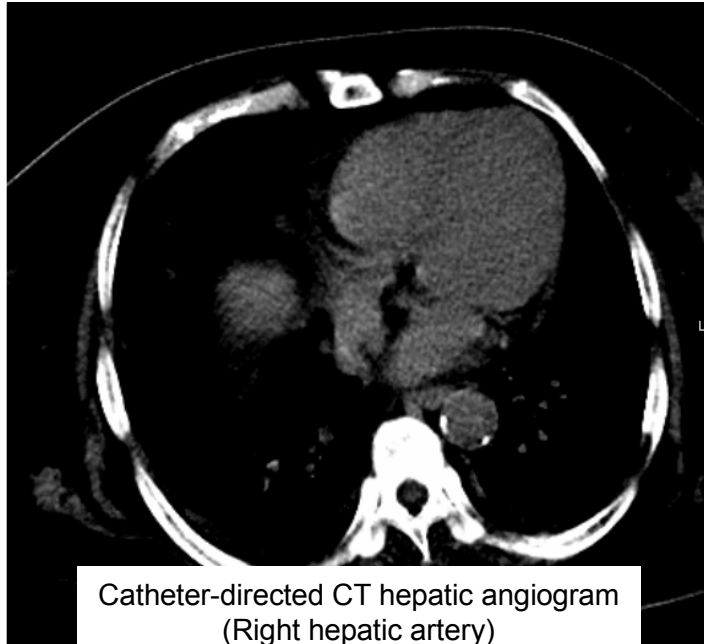
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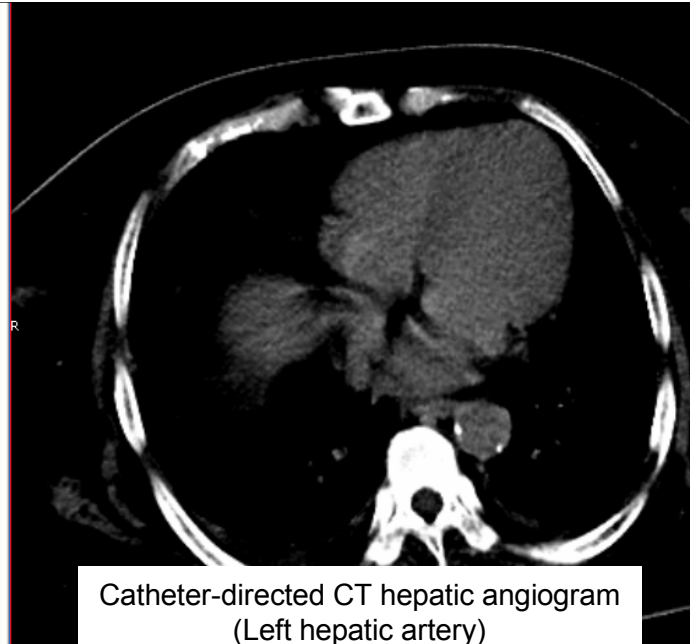
Tc-99m-macroaggregated albumin SPECT/CT



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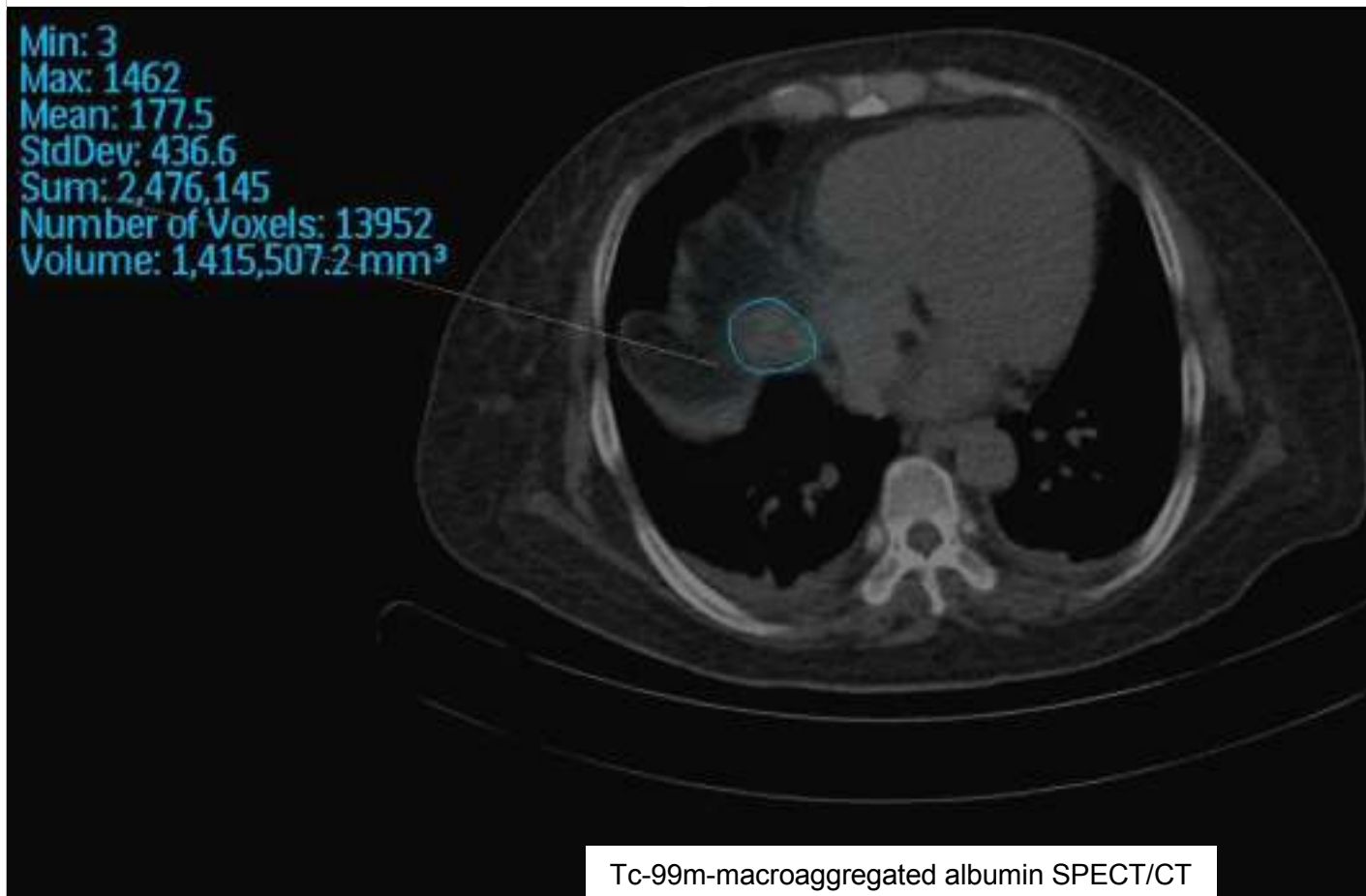
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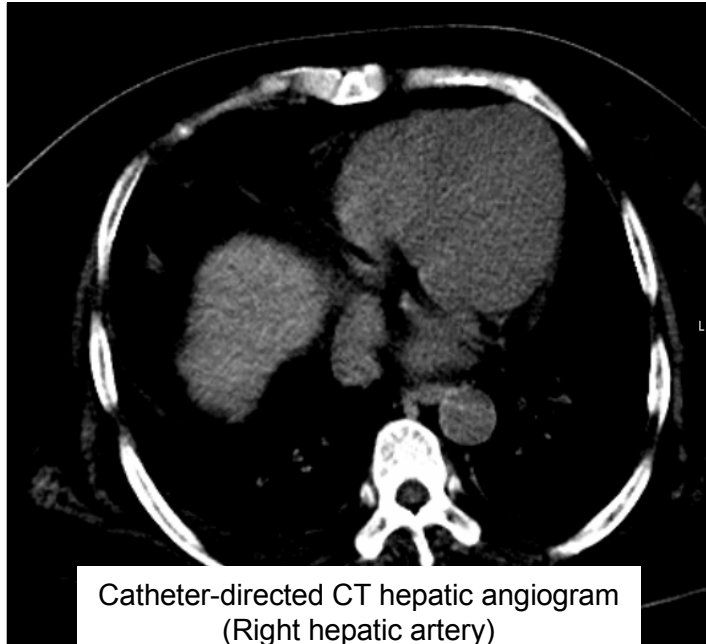
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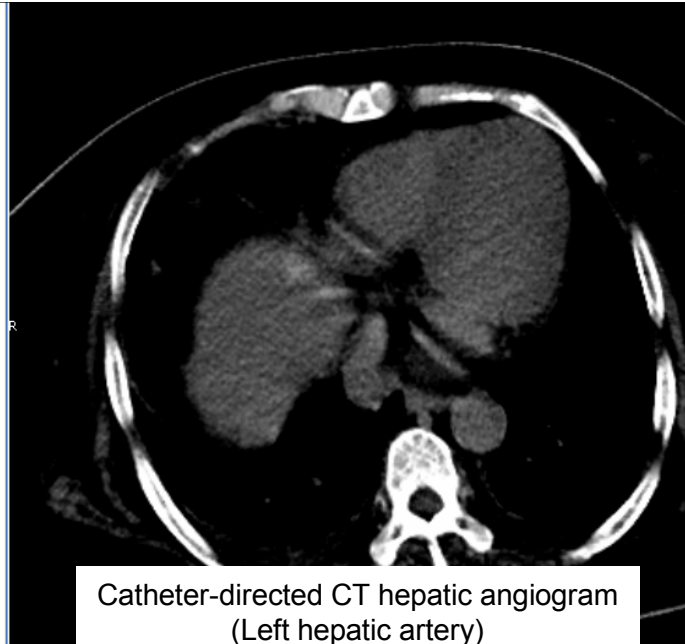
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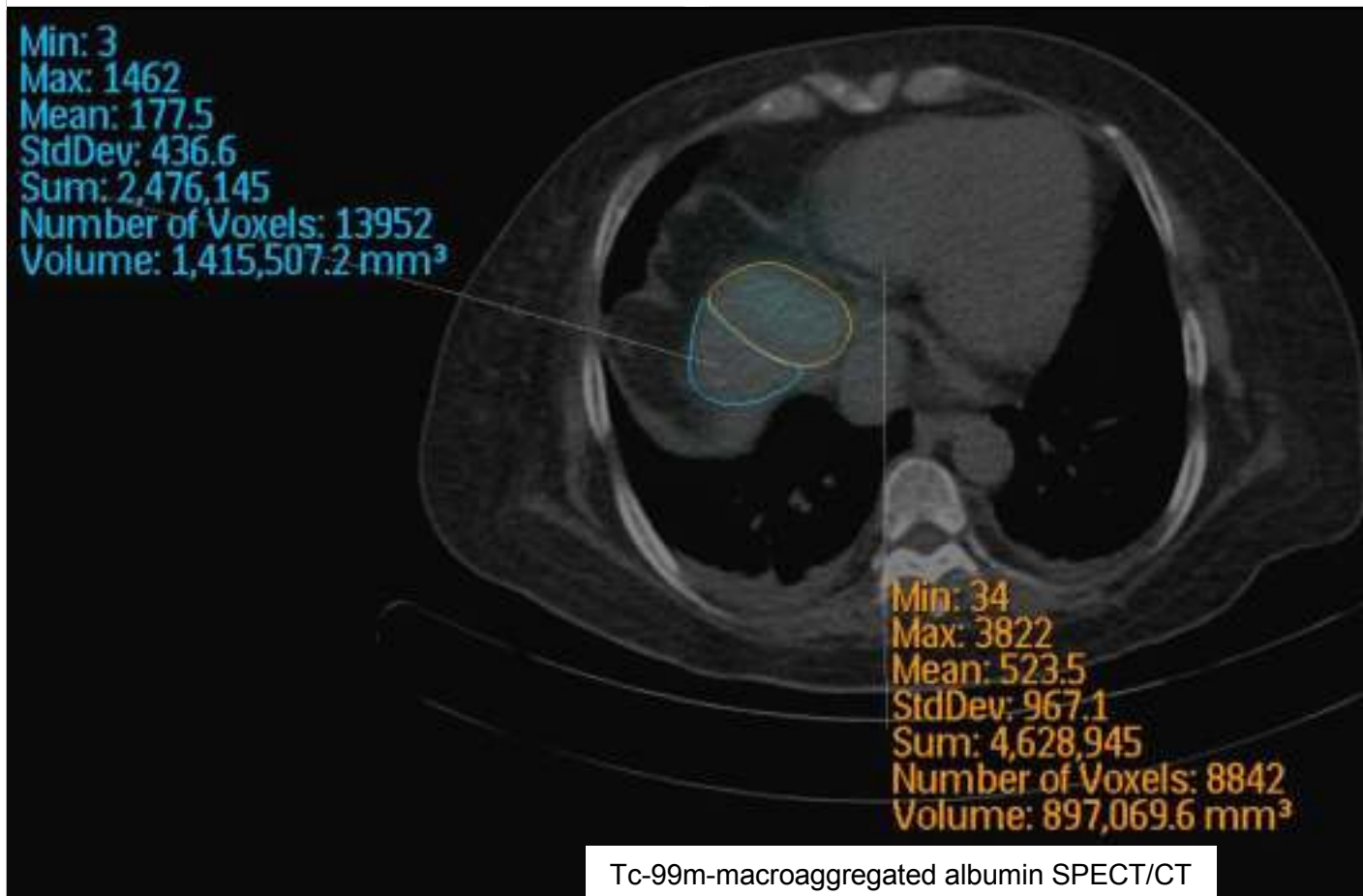
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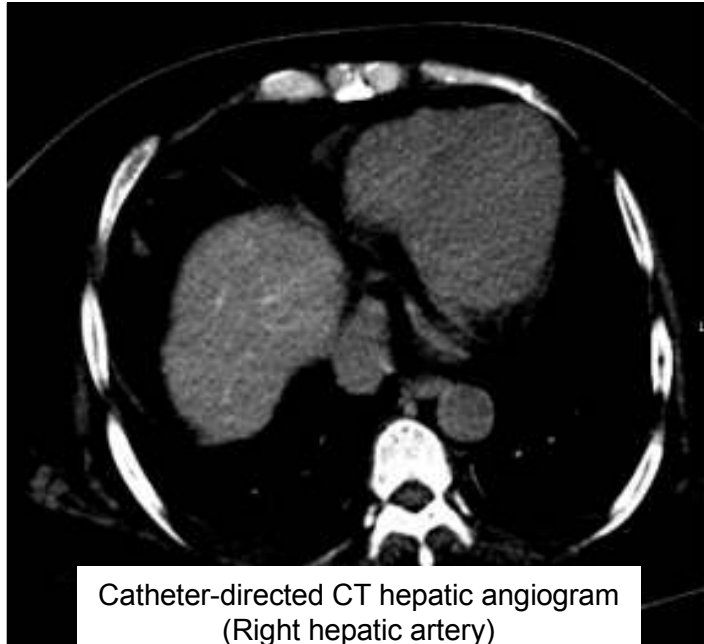
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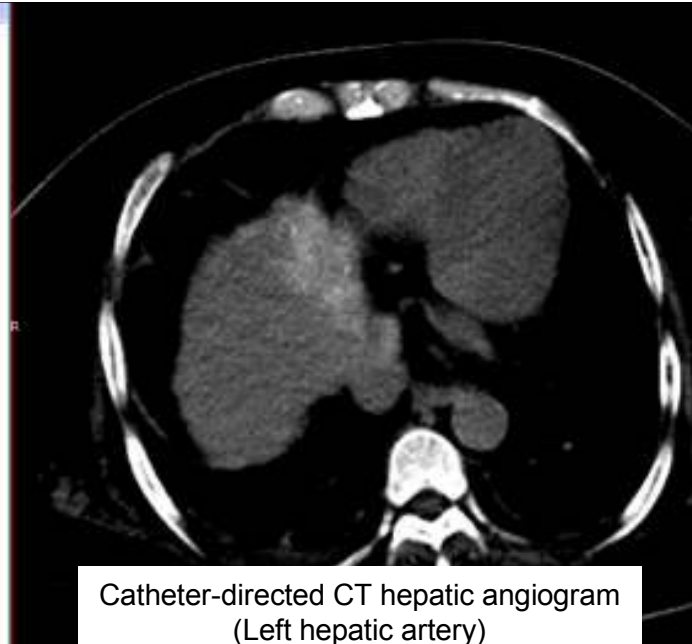
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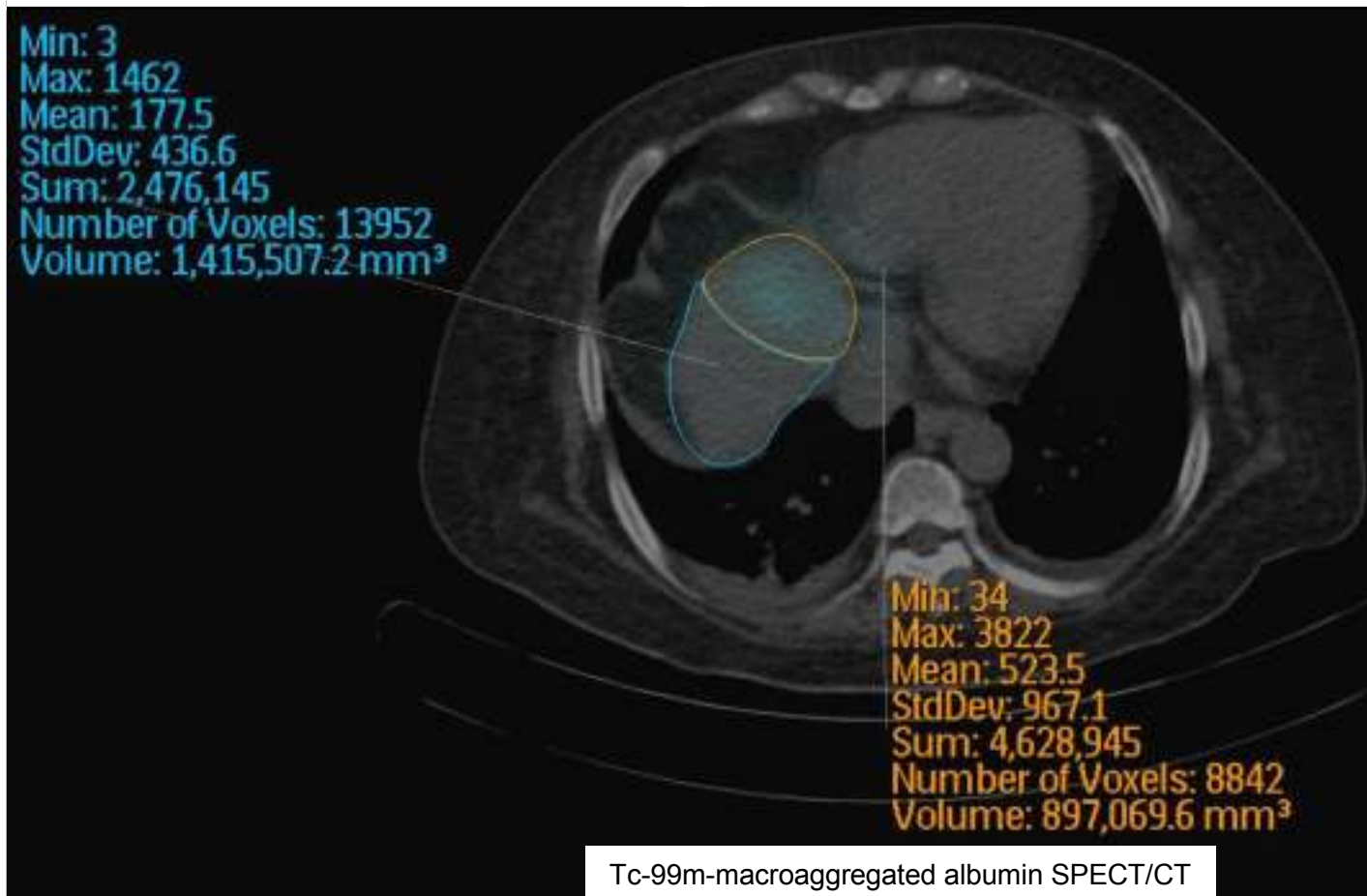
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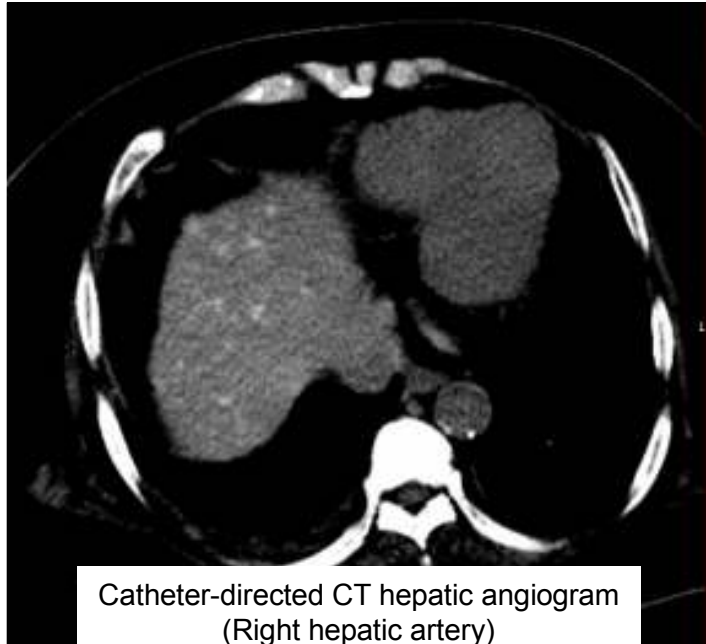
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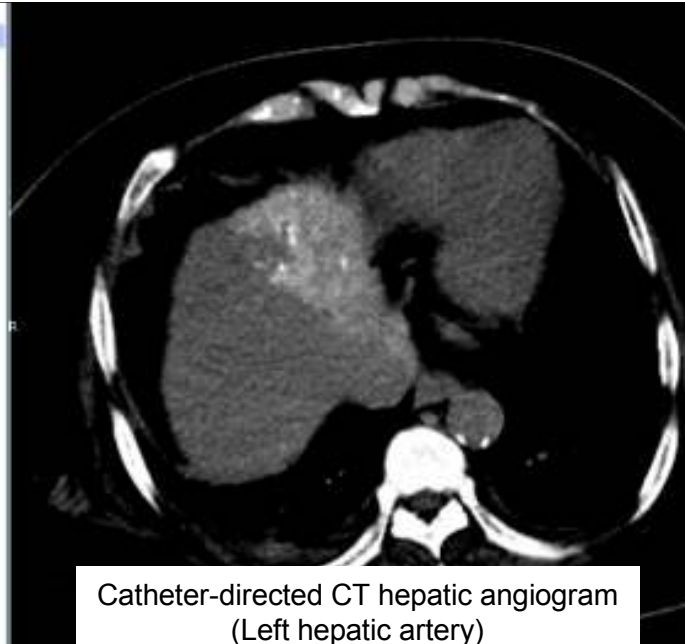
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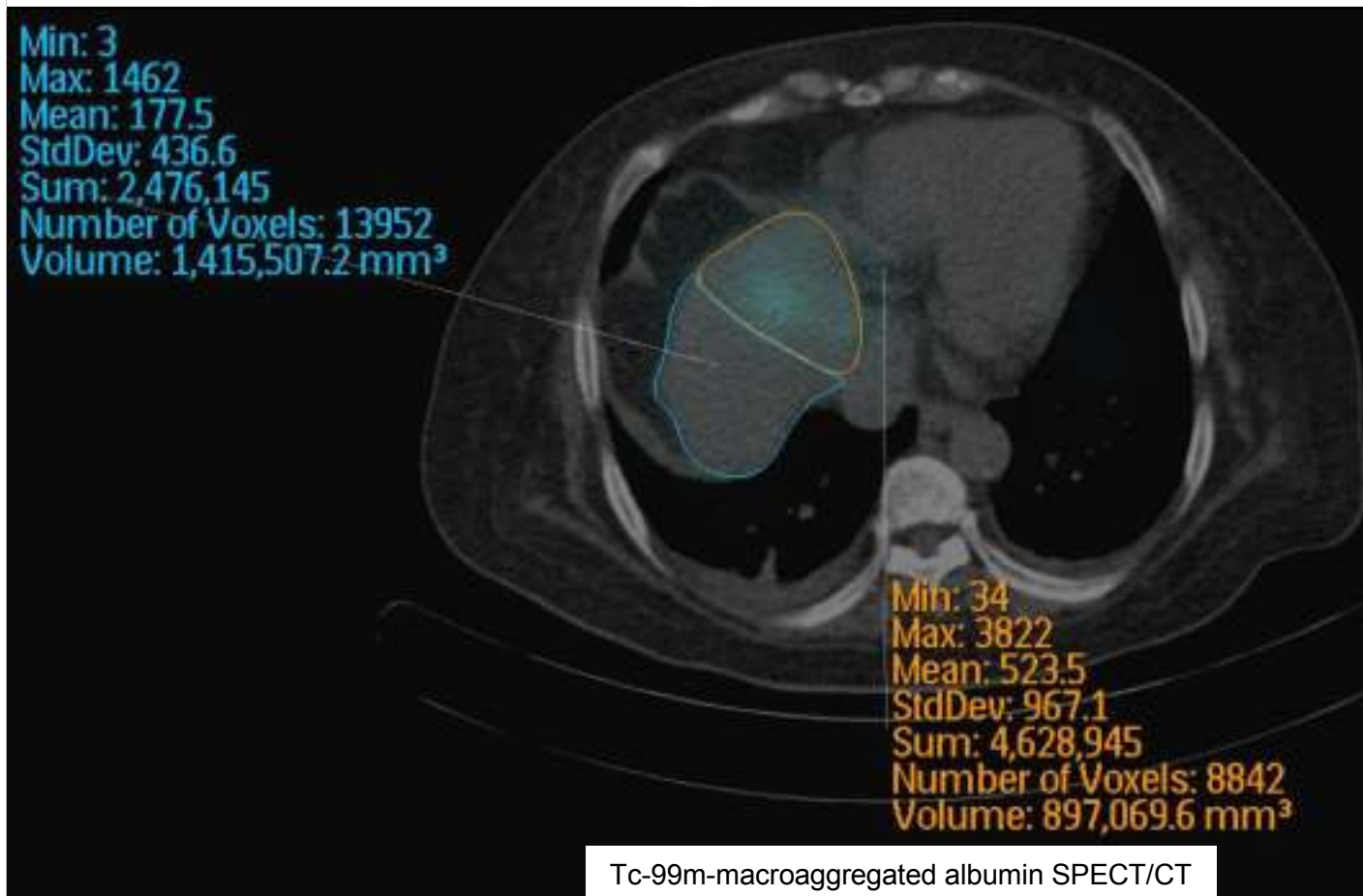
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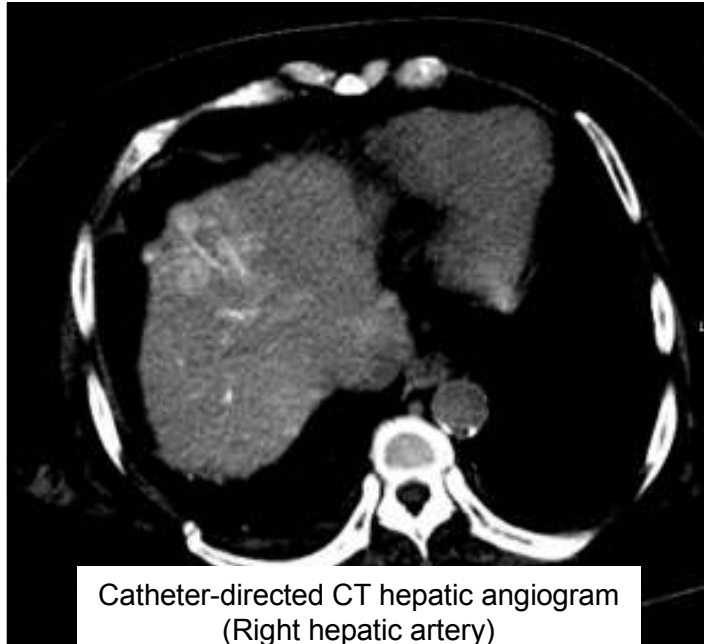
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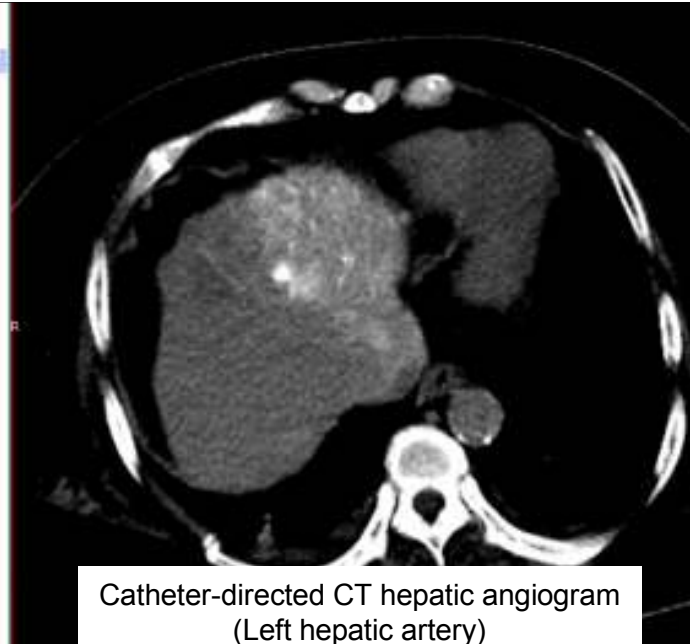
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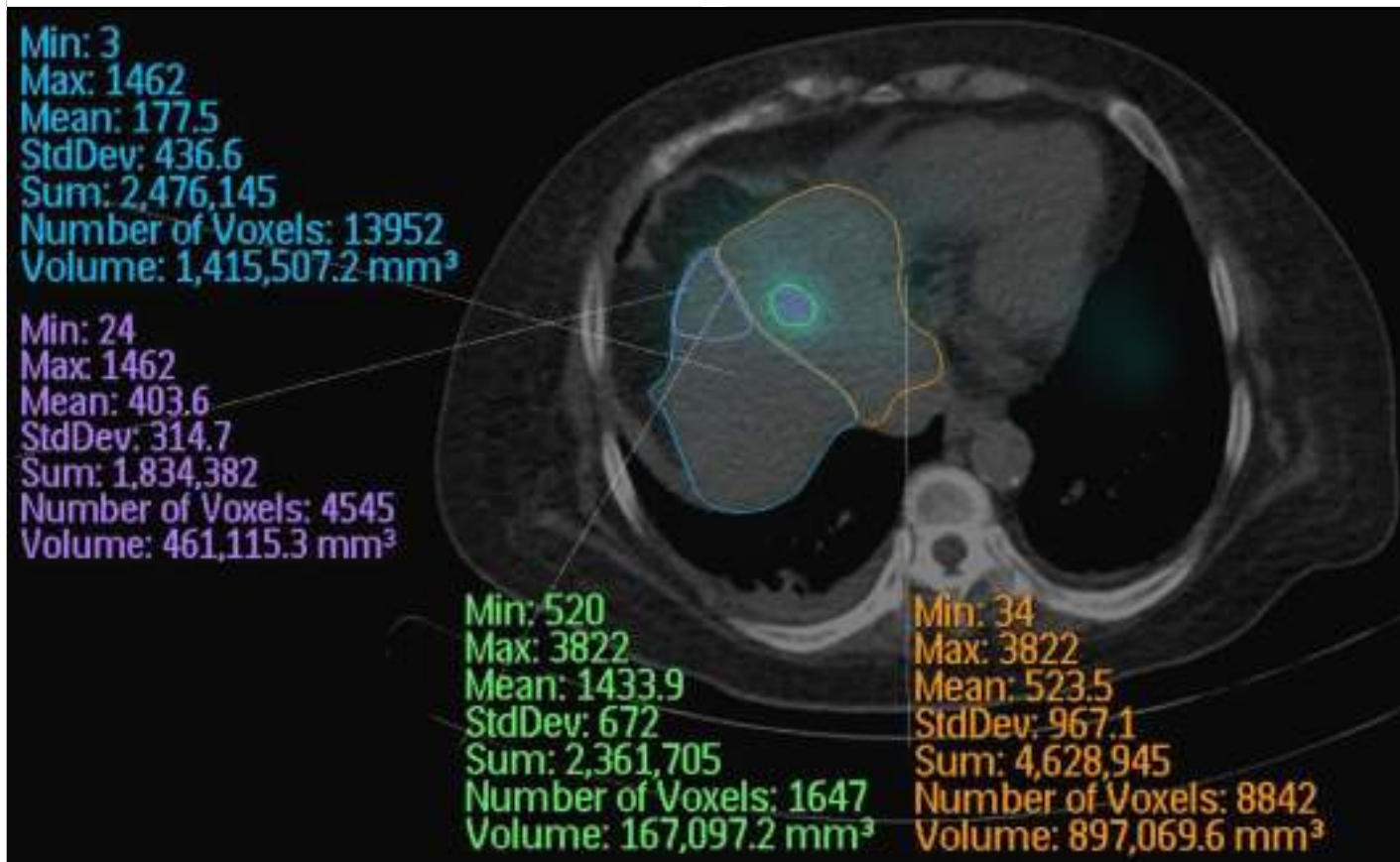
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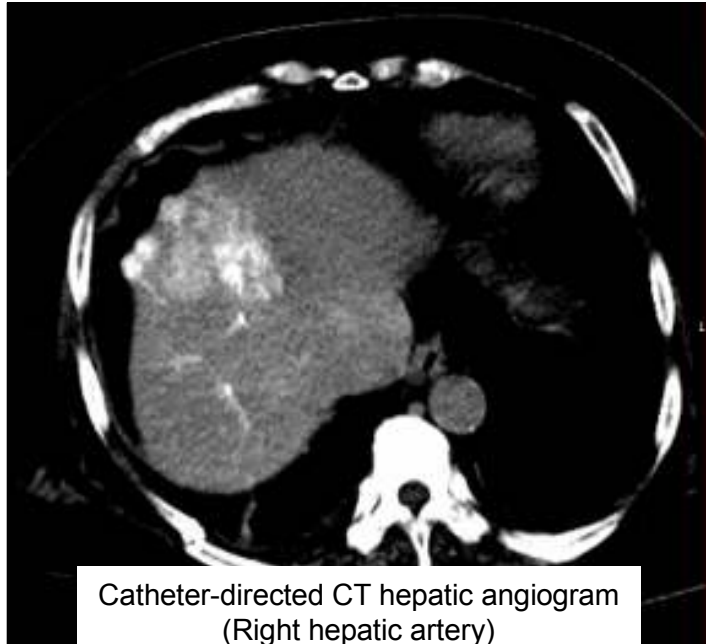
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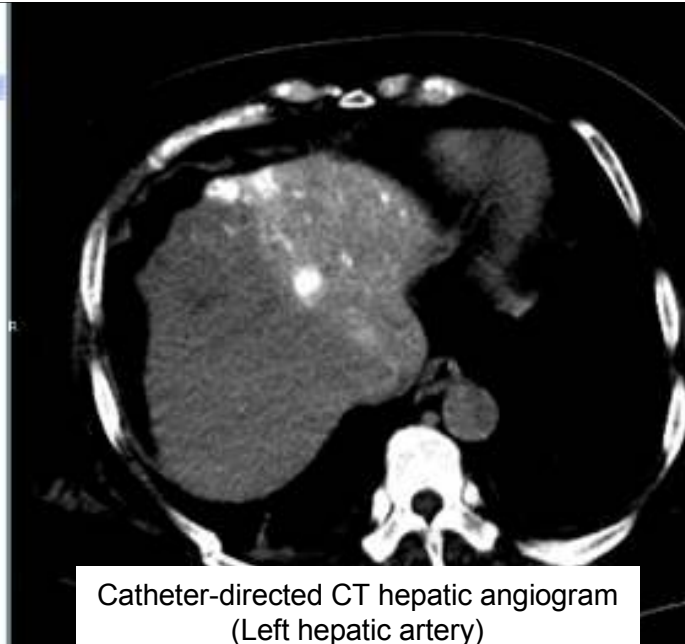
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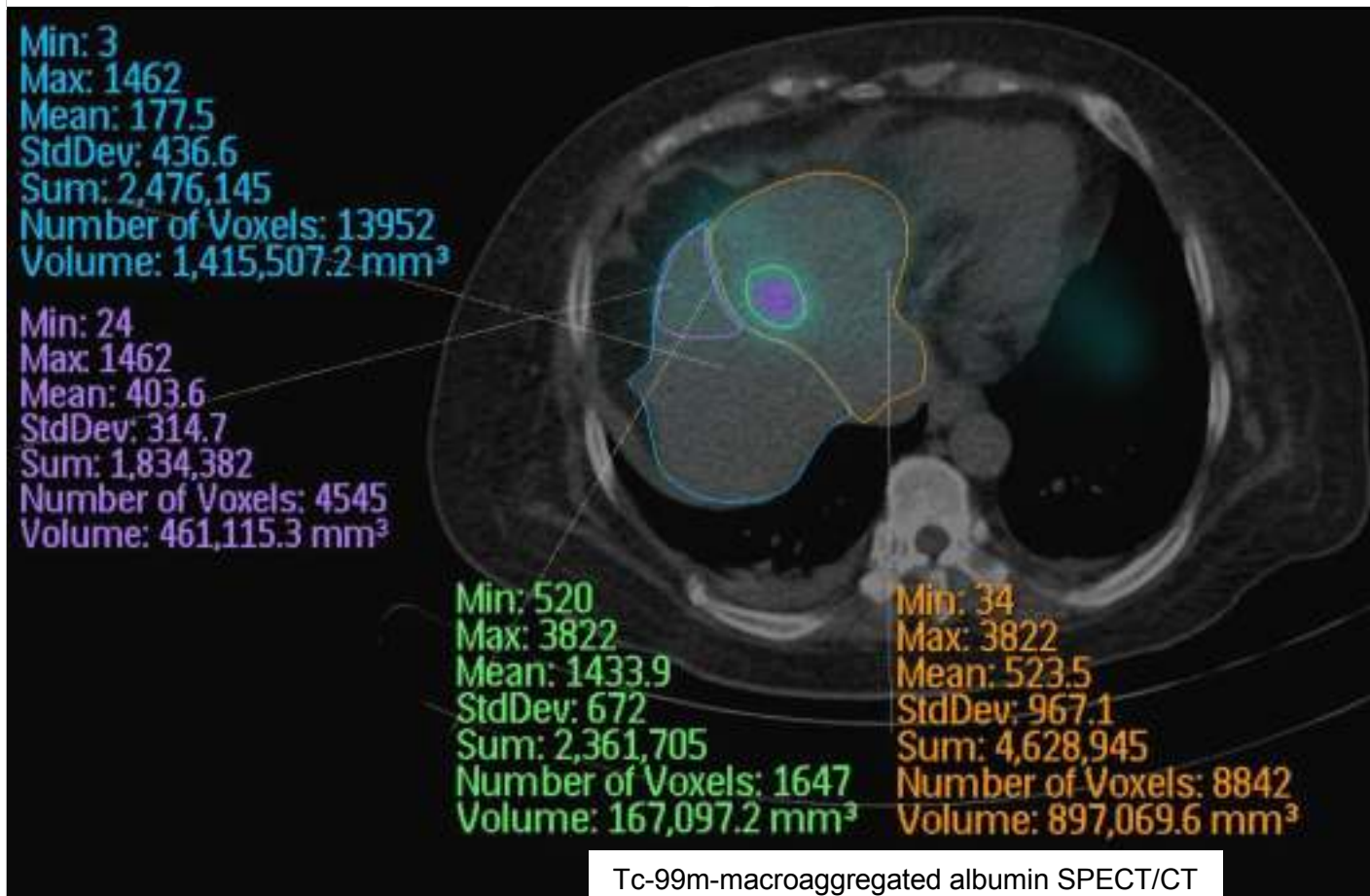
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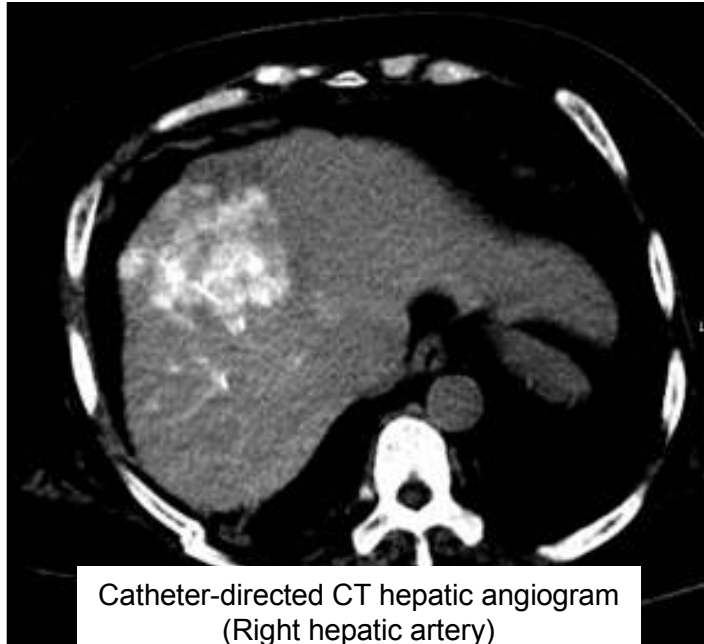
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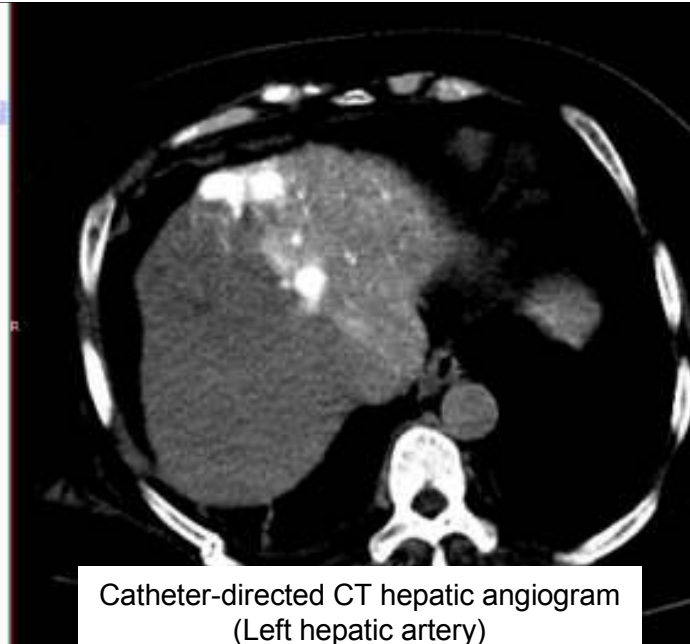
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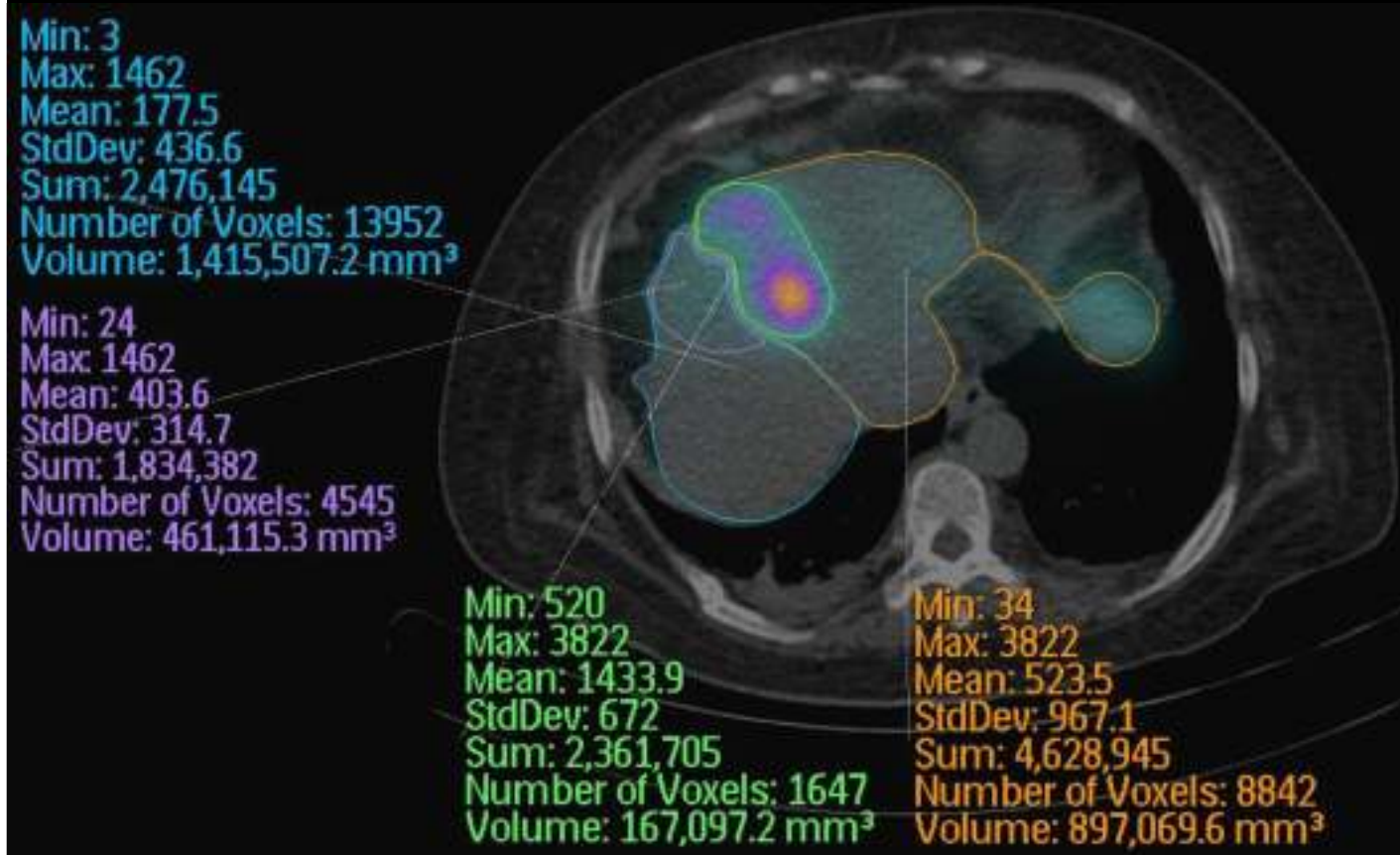
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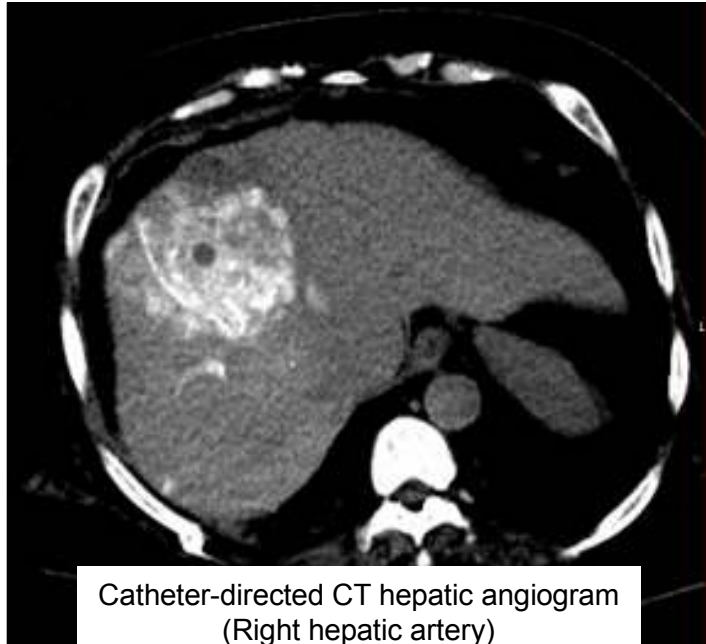
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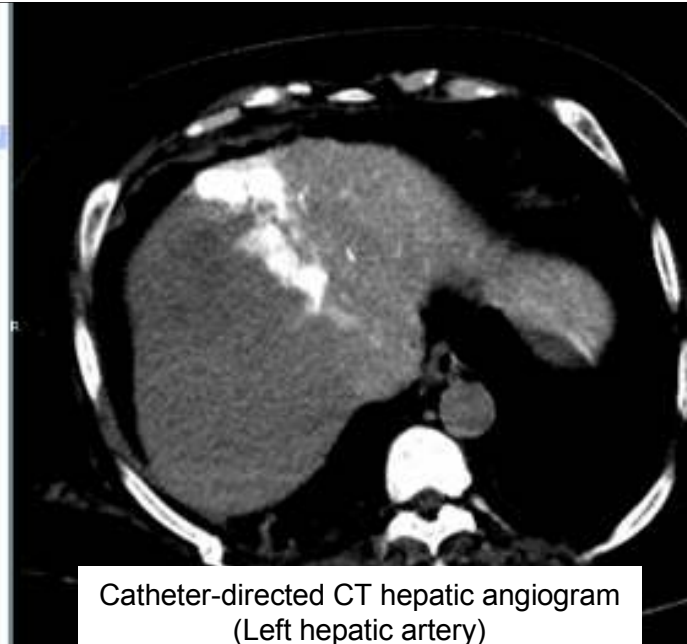
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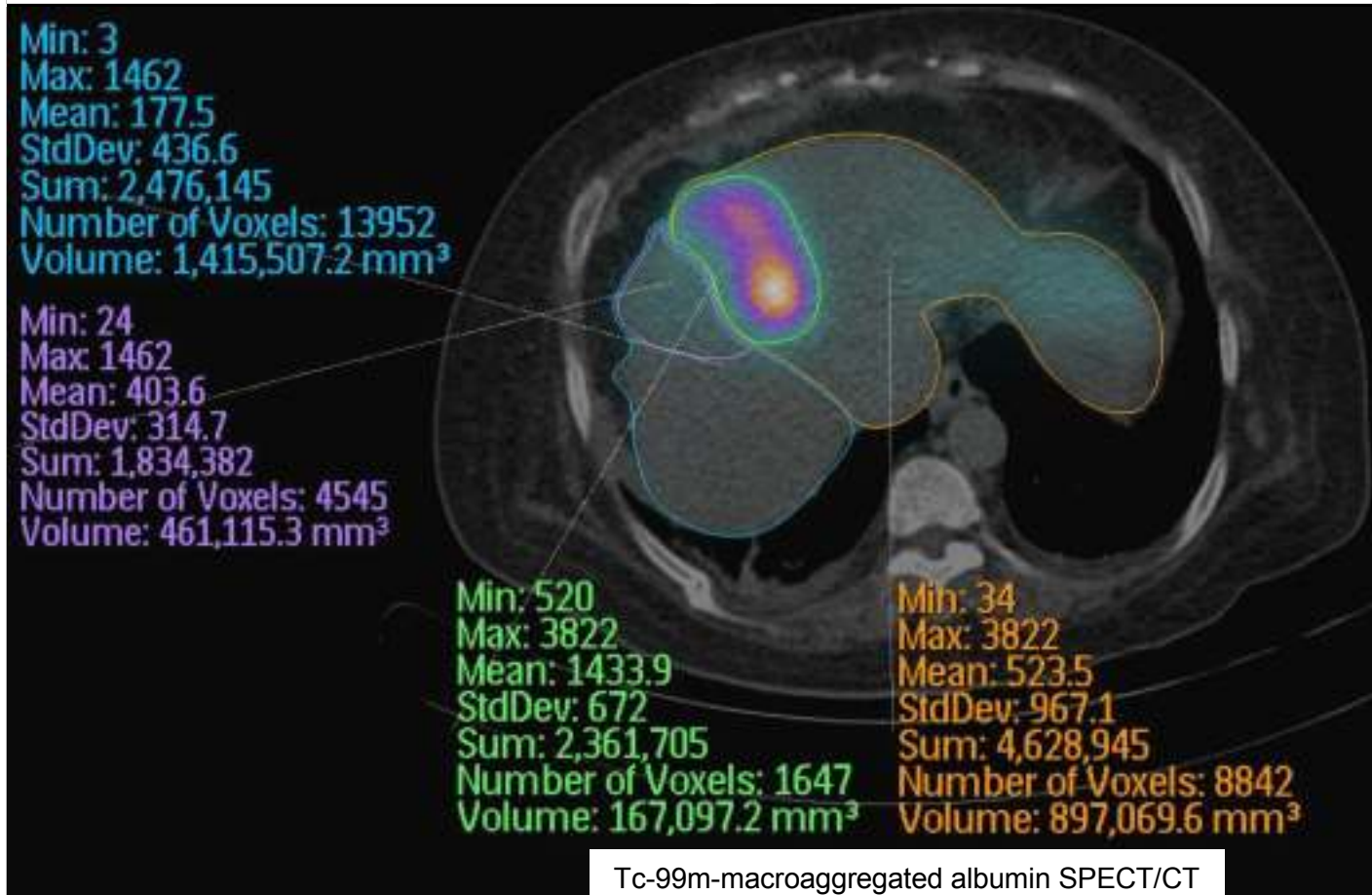
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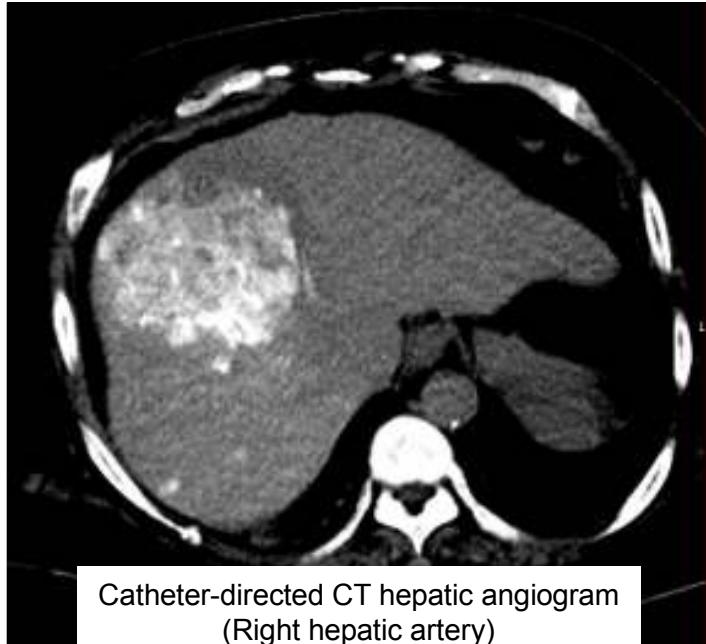
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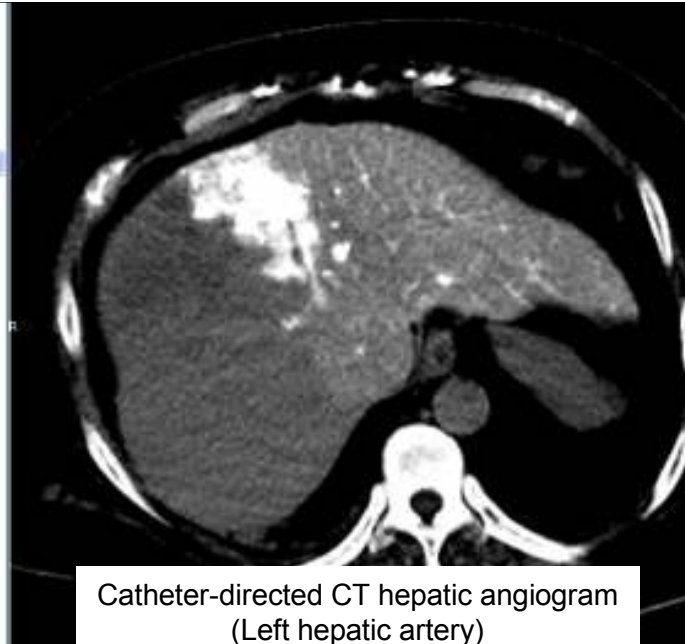
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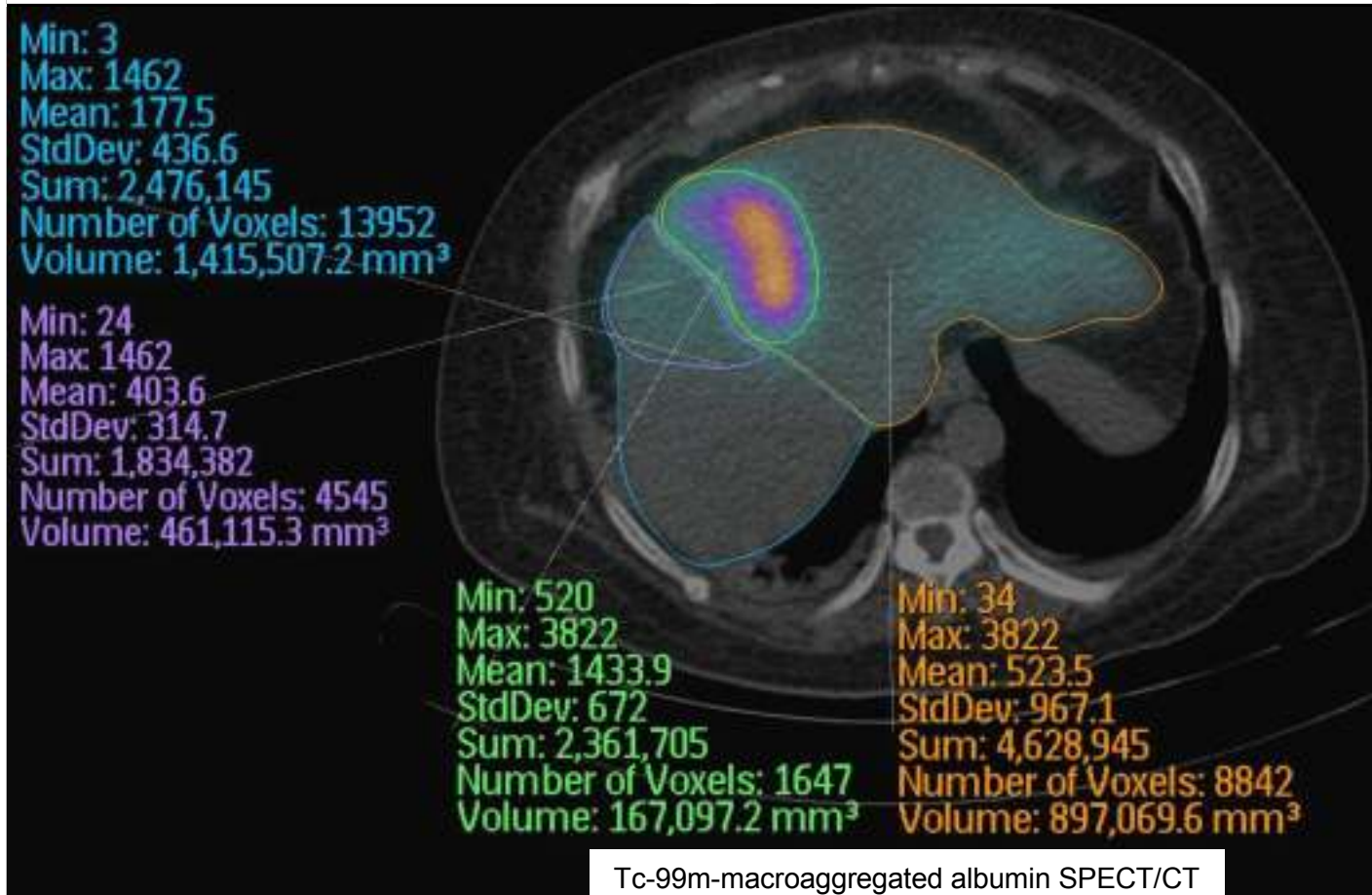
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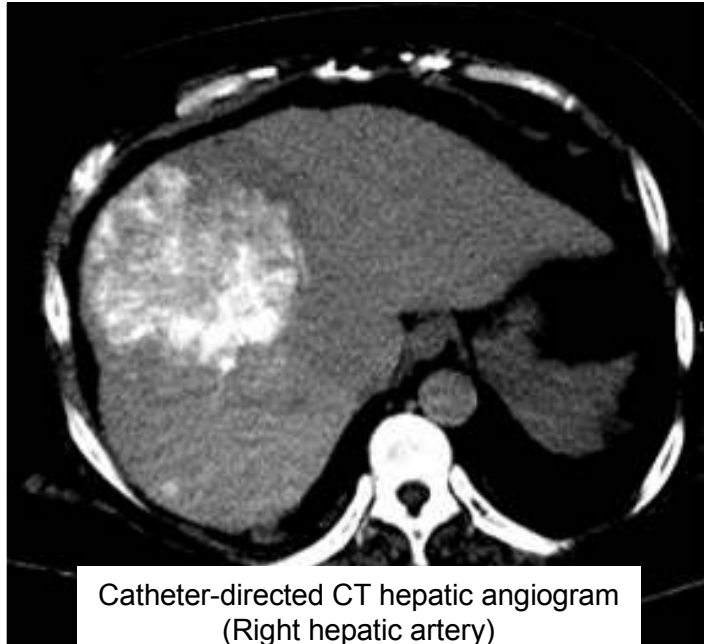
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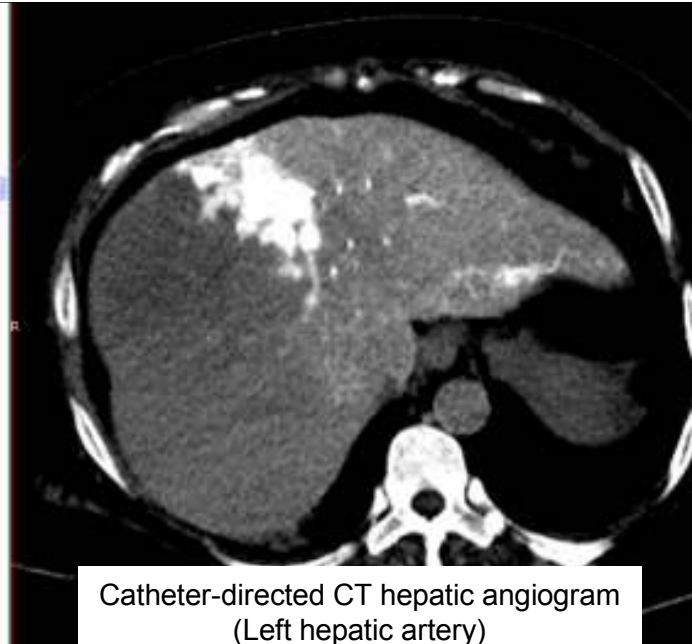
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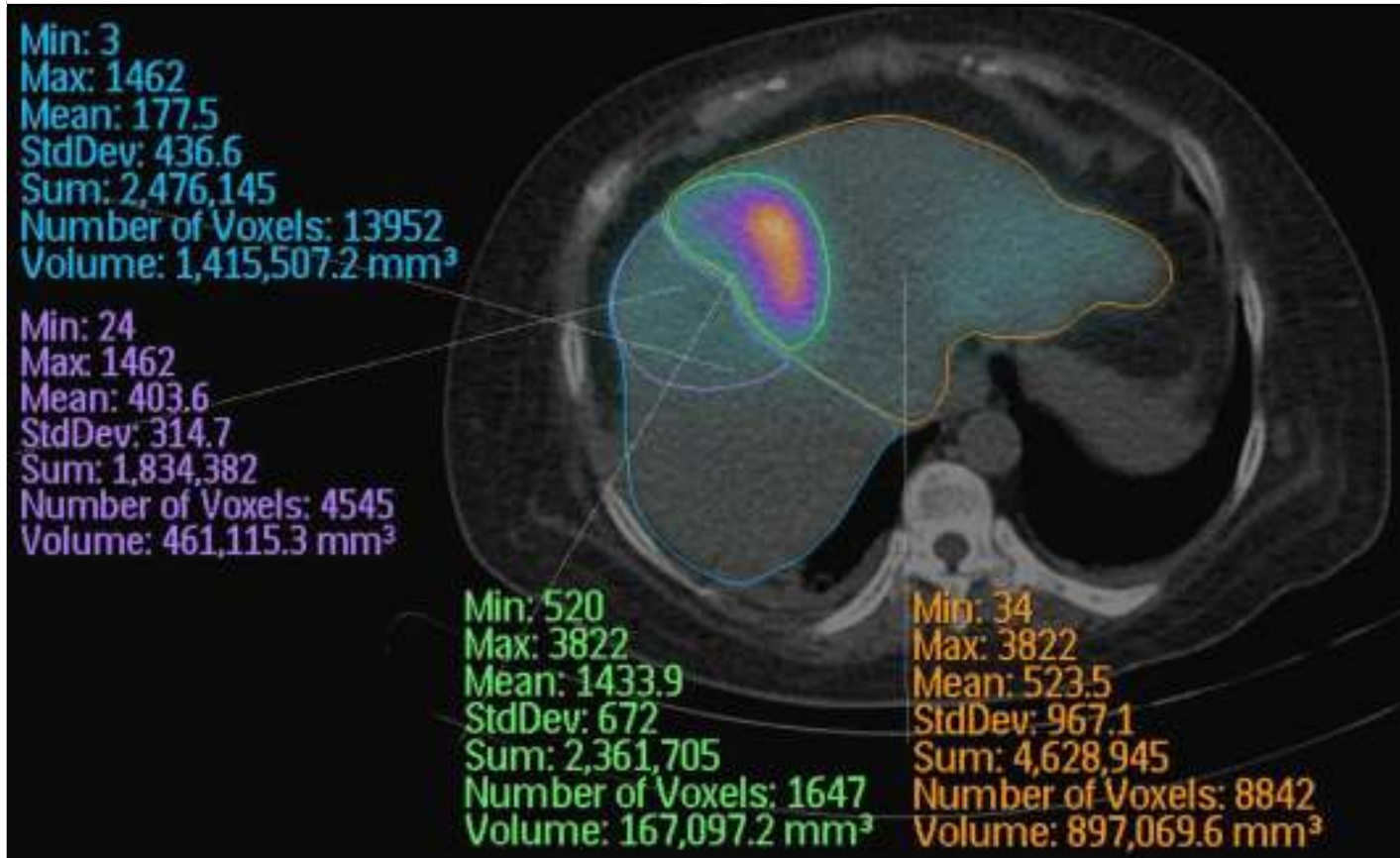
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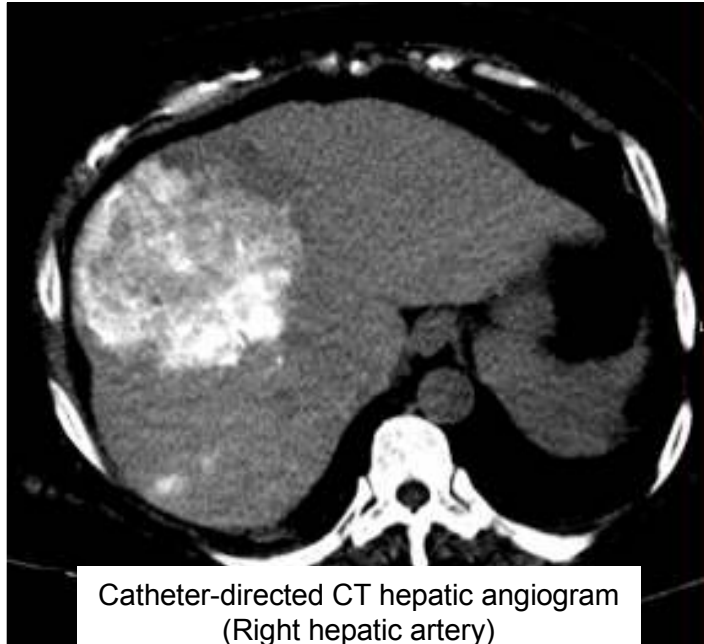
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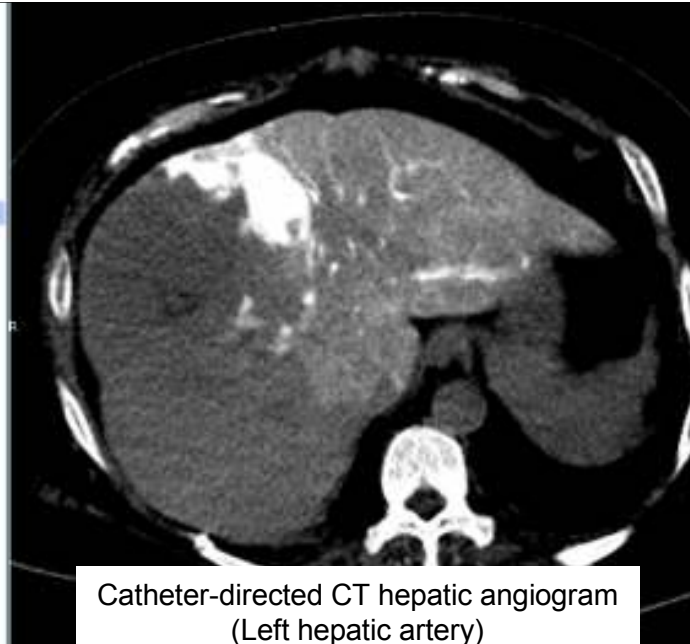
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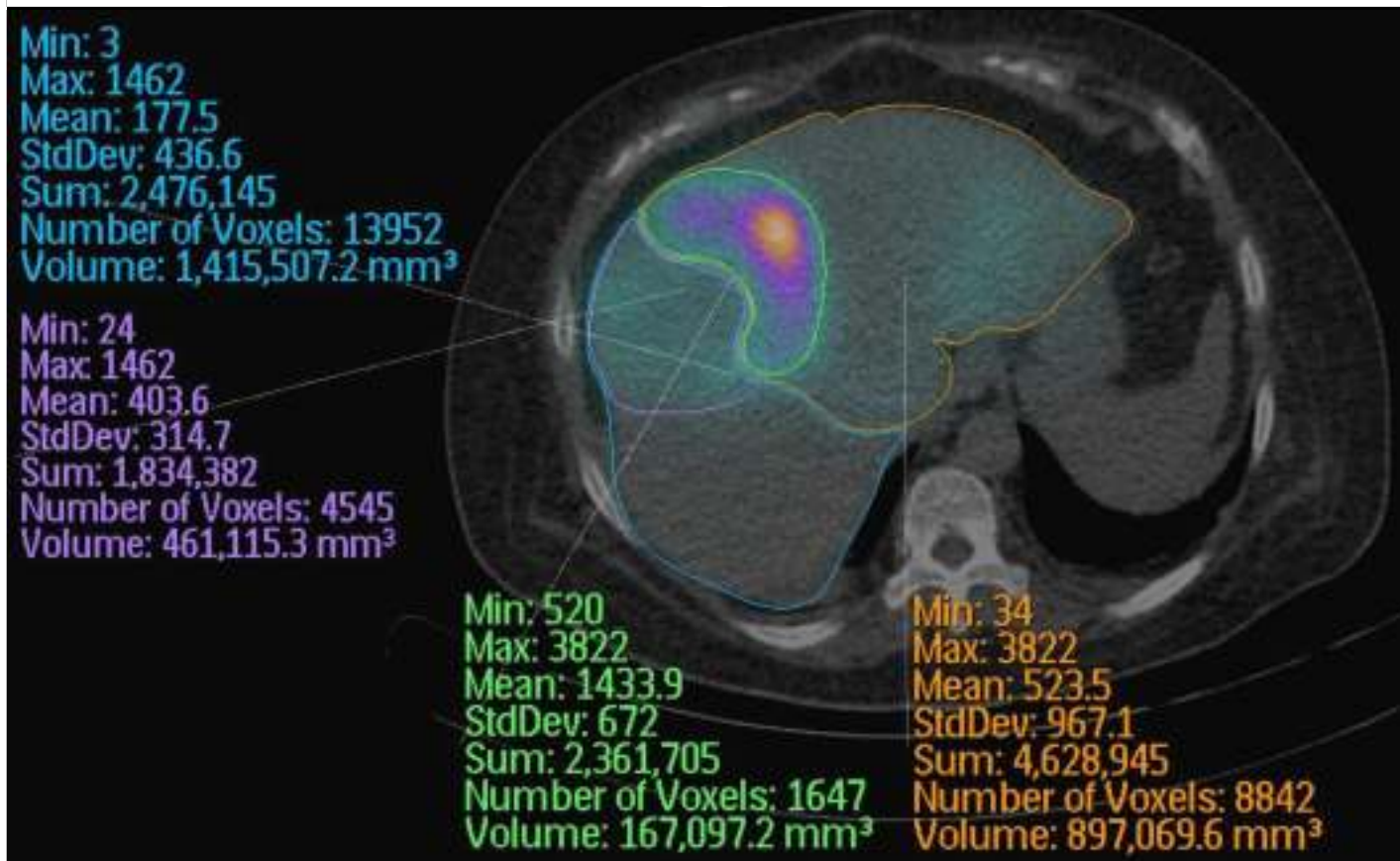
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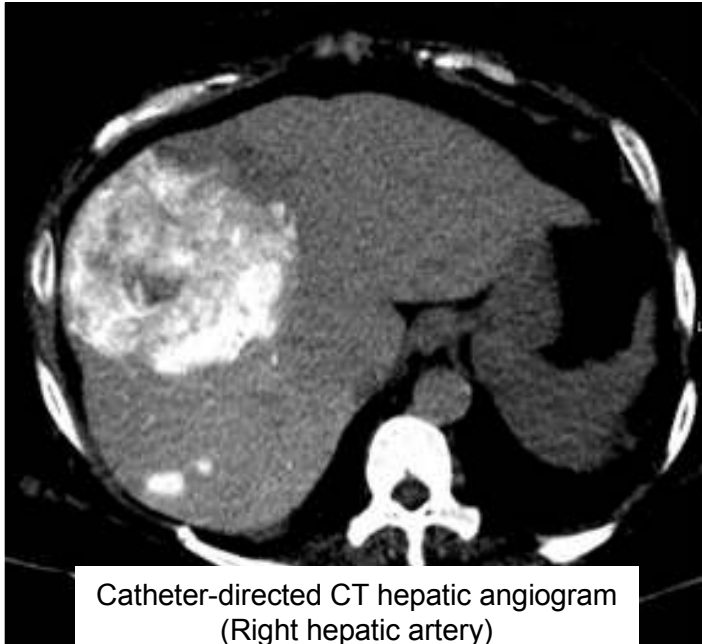
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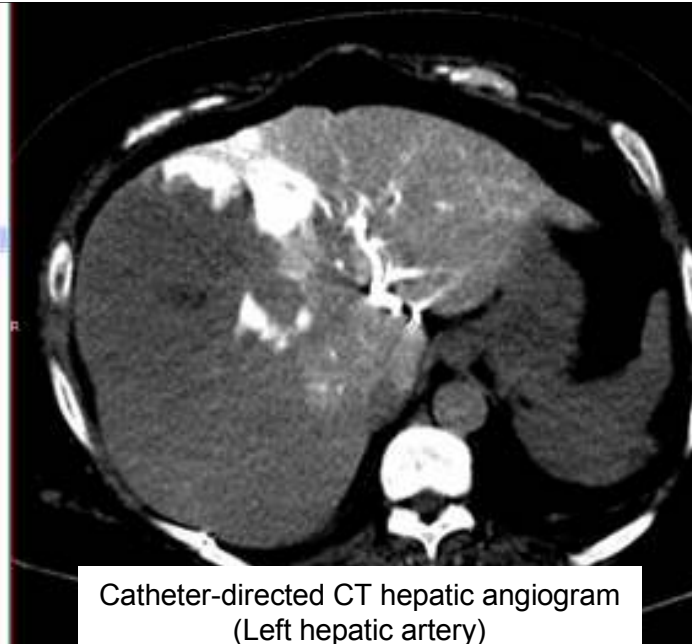
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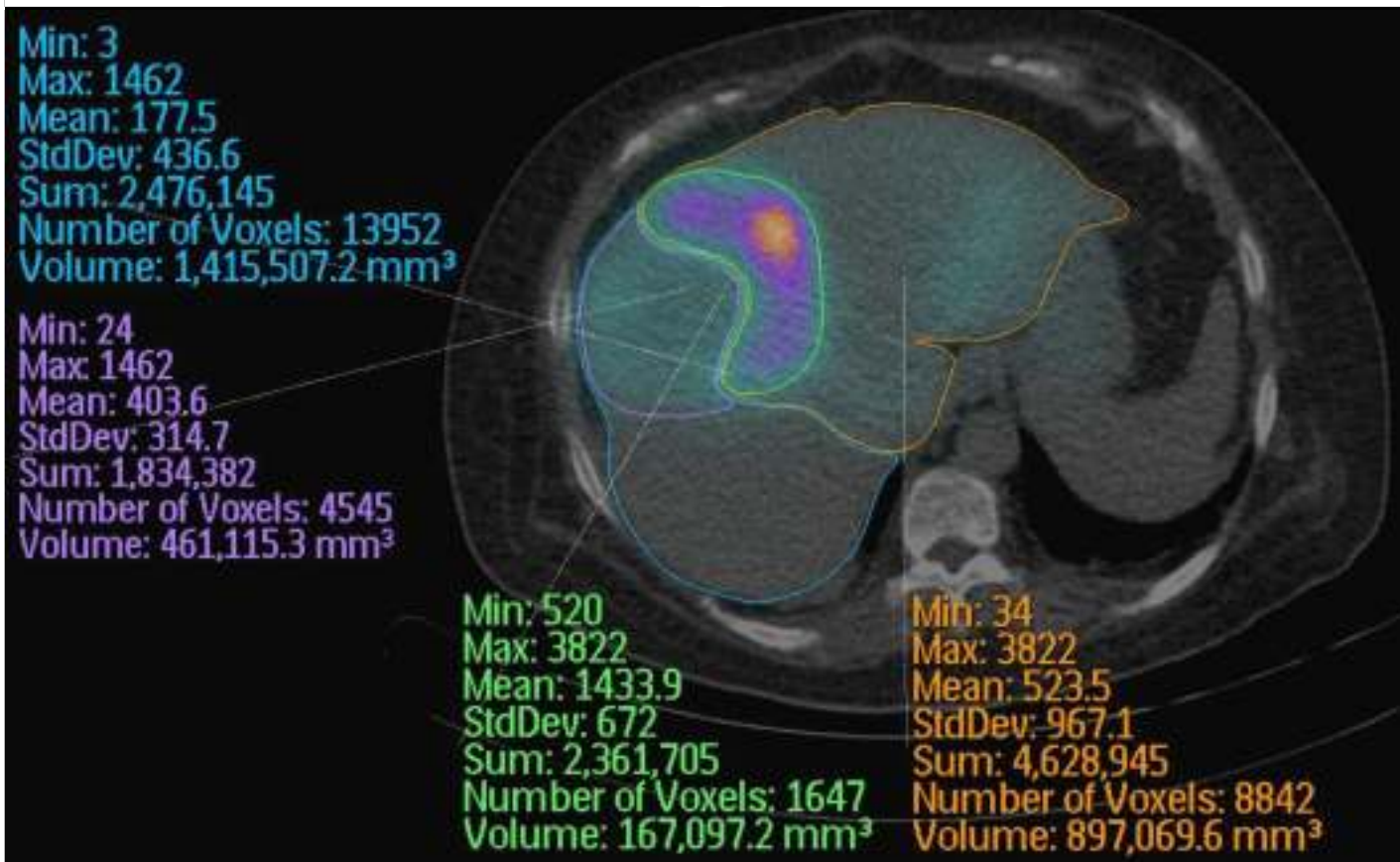
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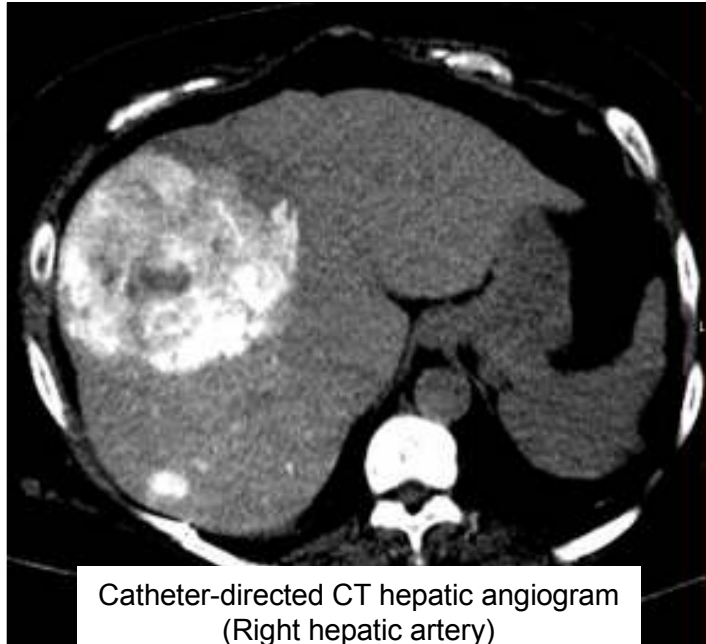
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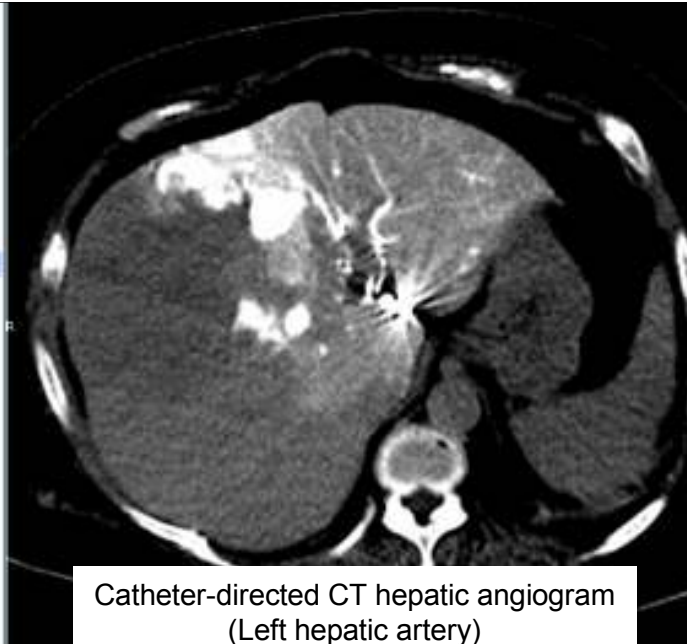
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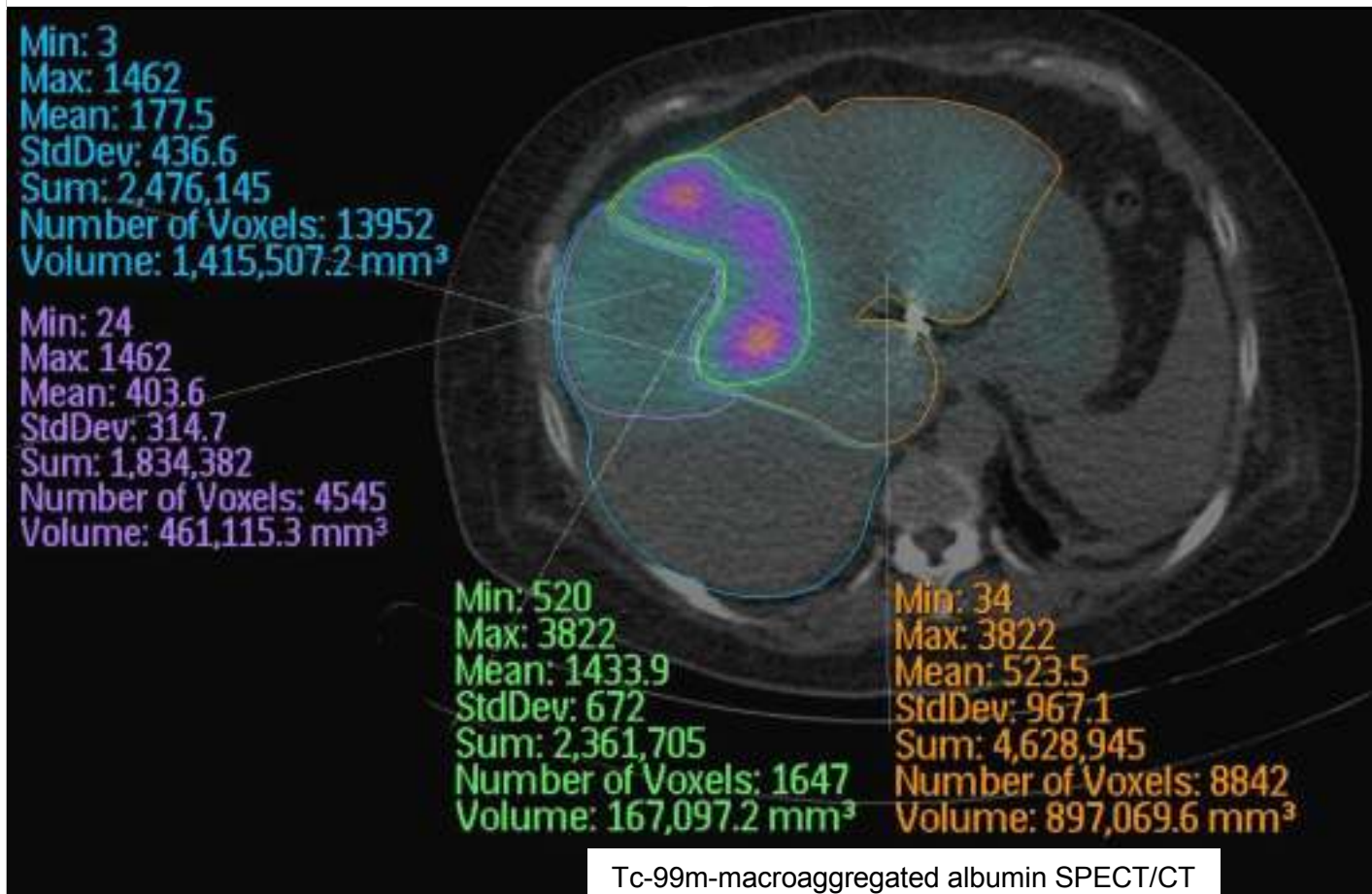
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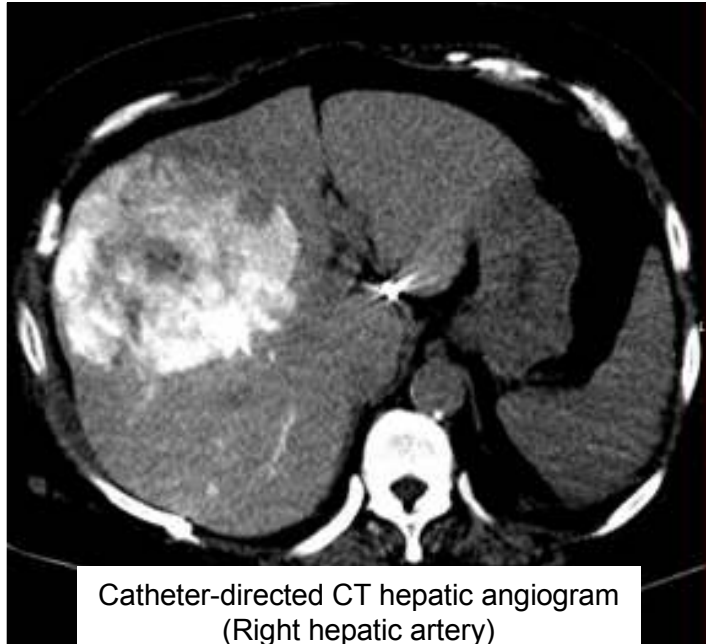
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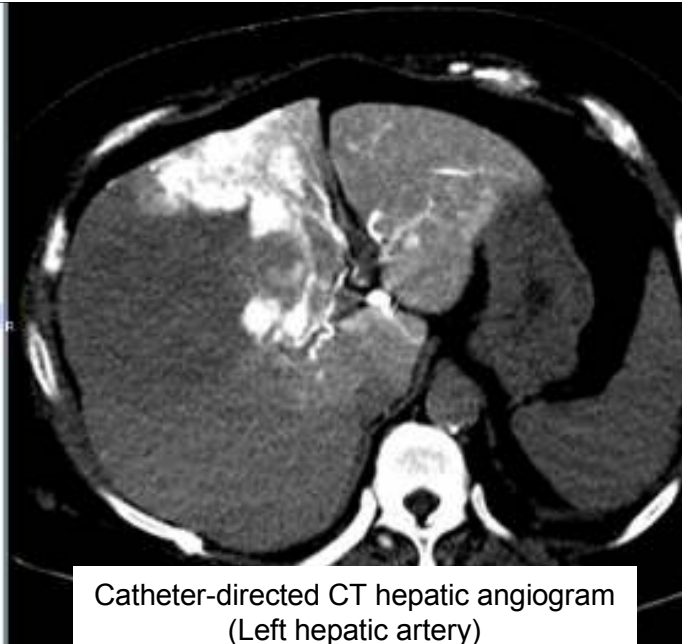
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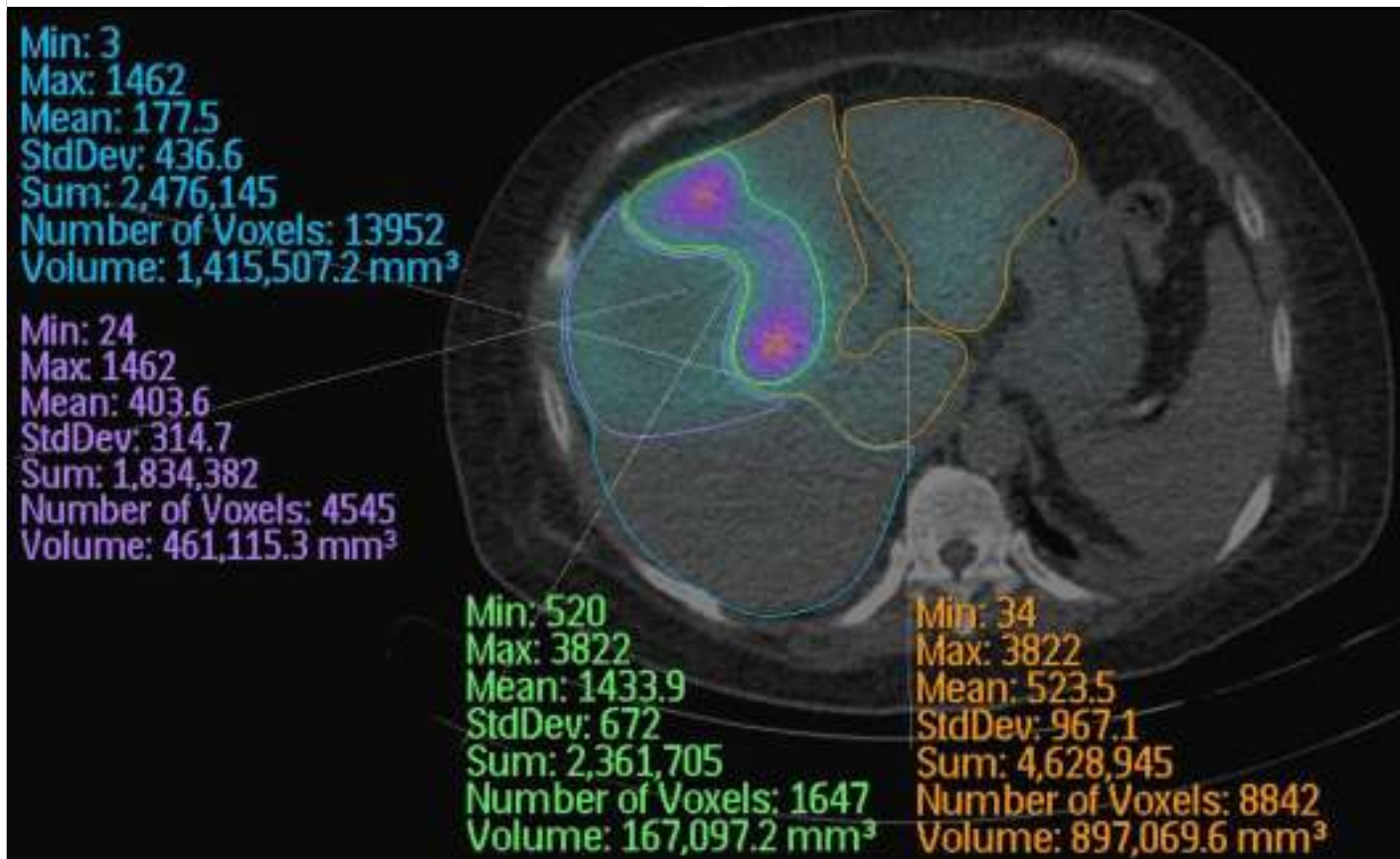
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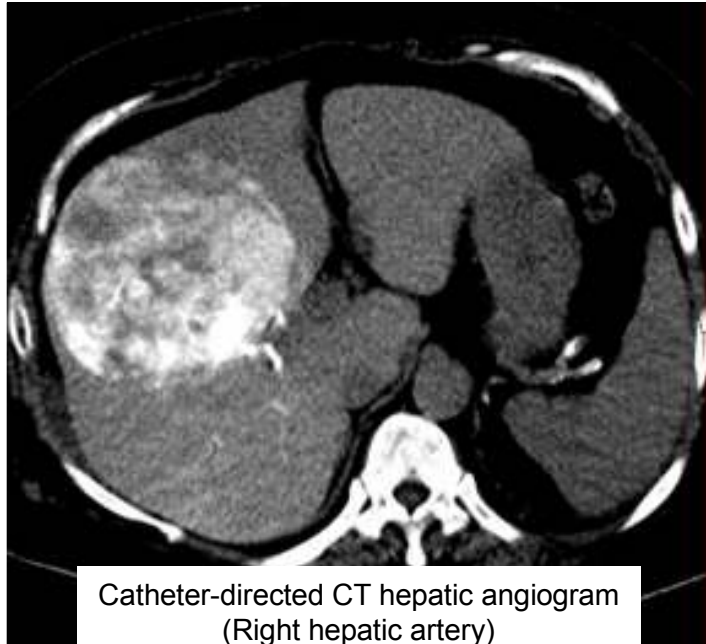
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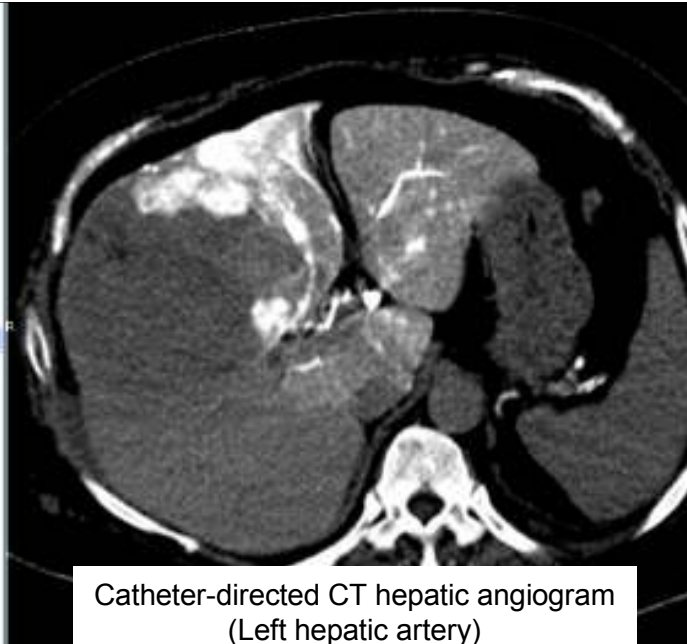
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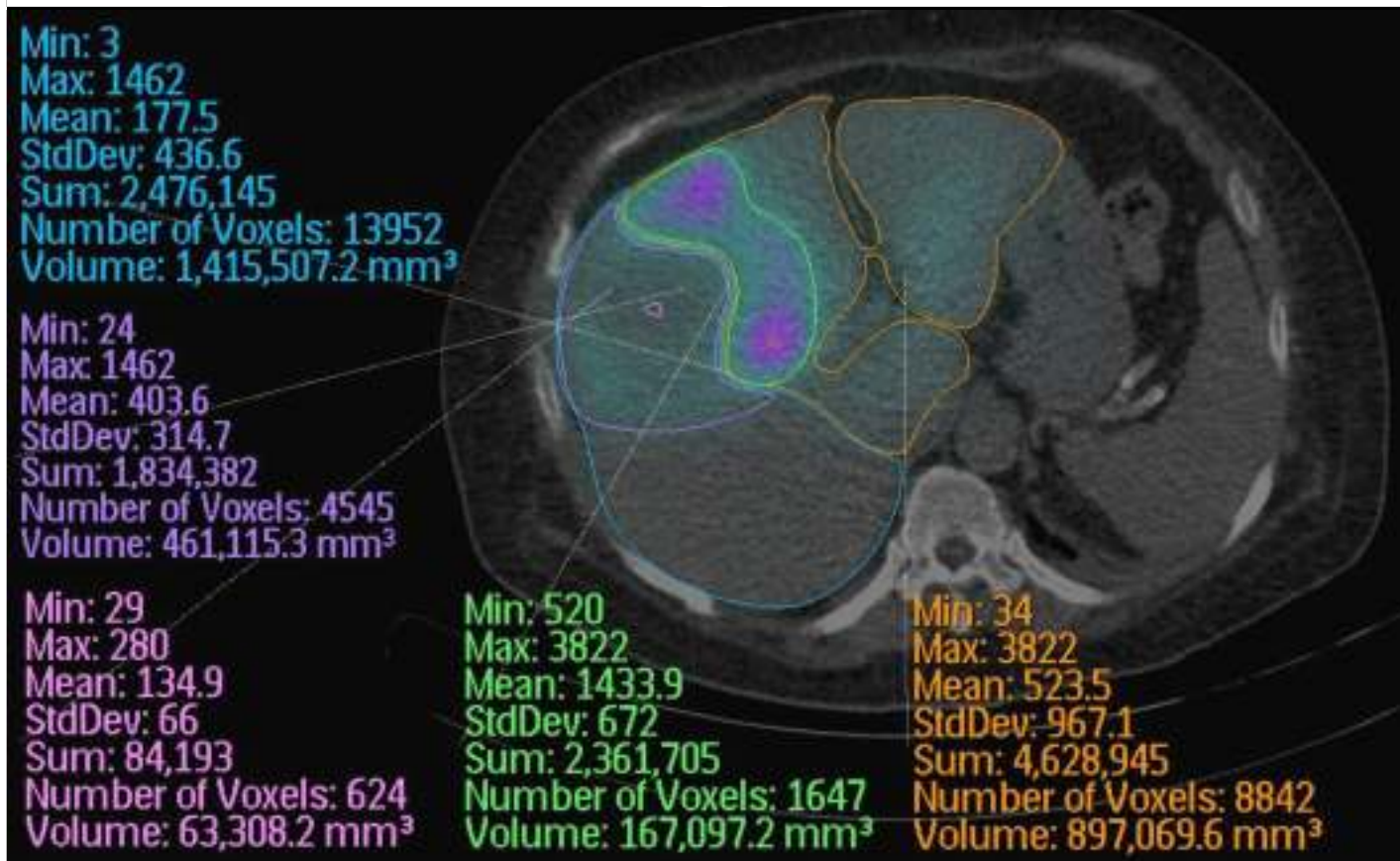
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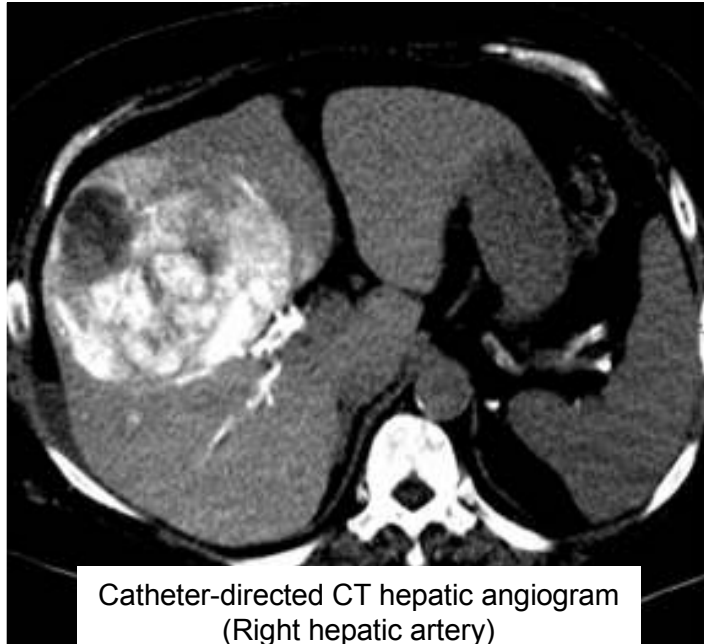
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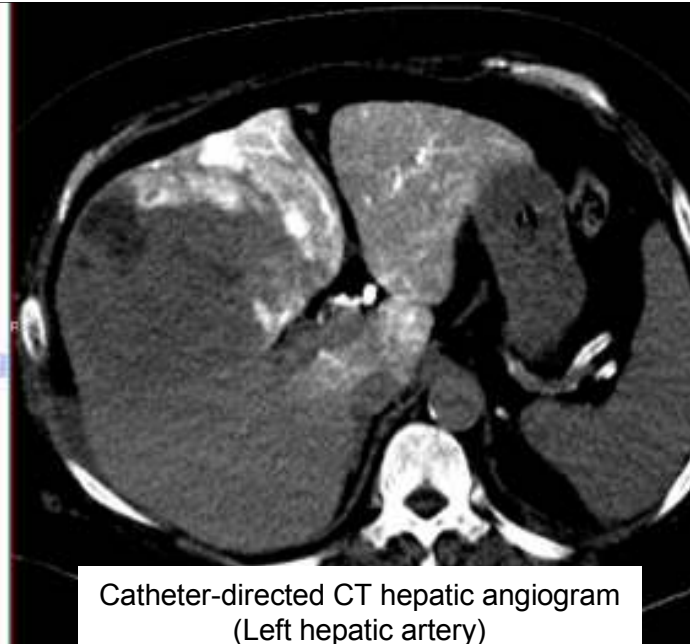
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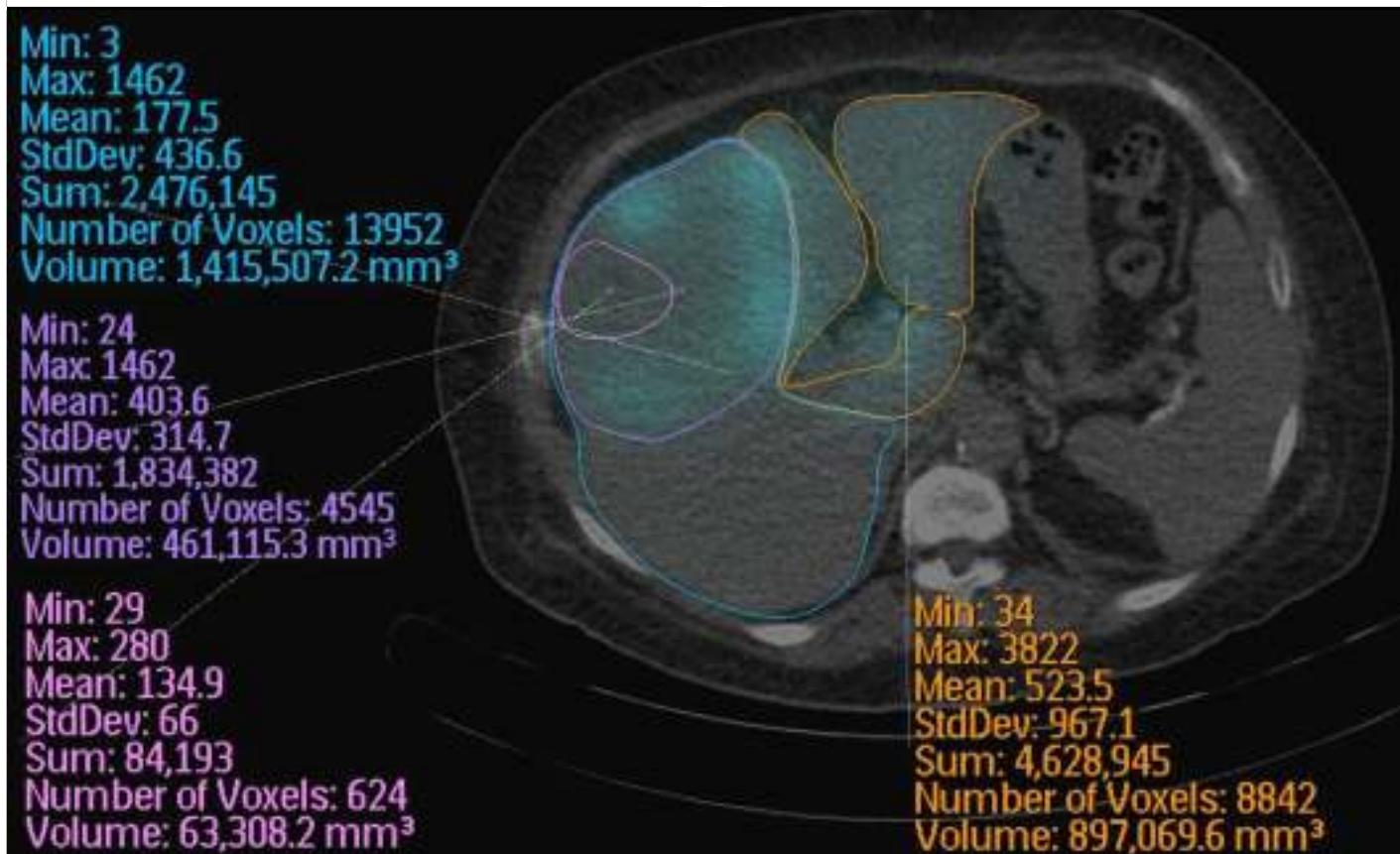
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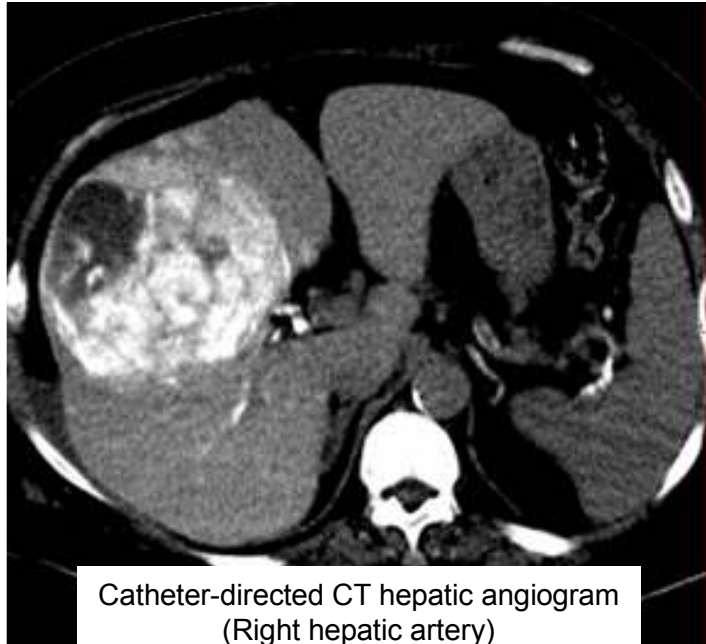
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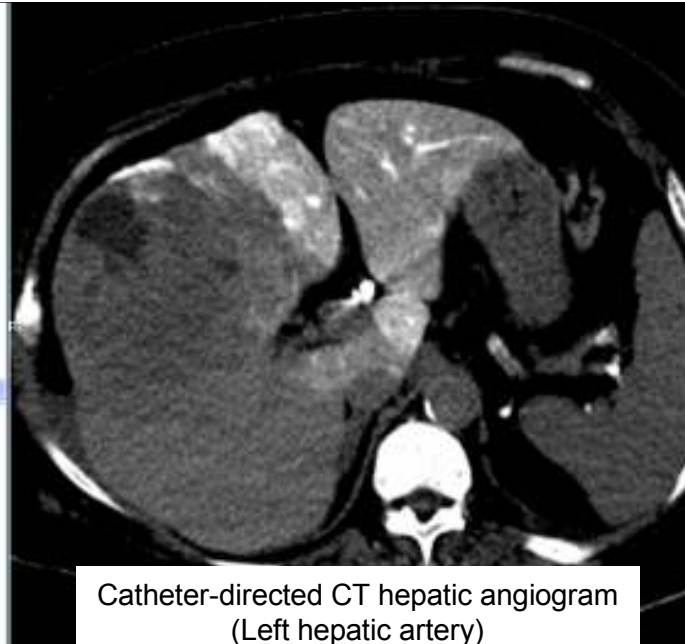
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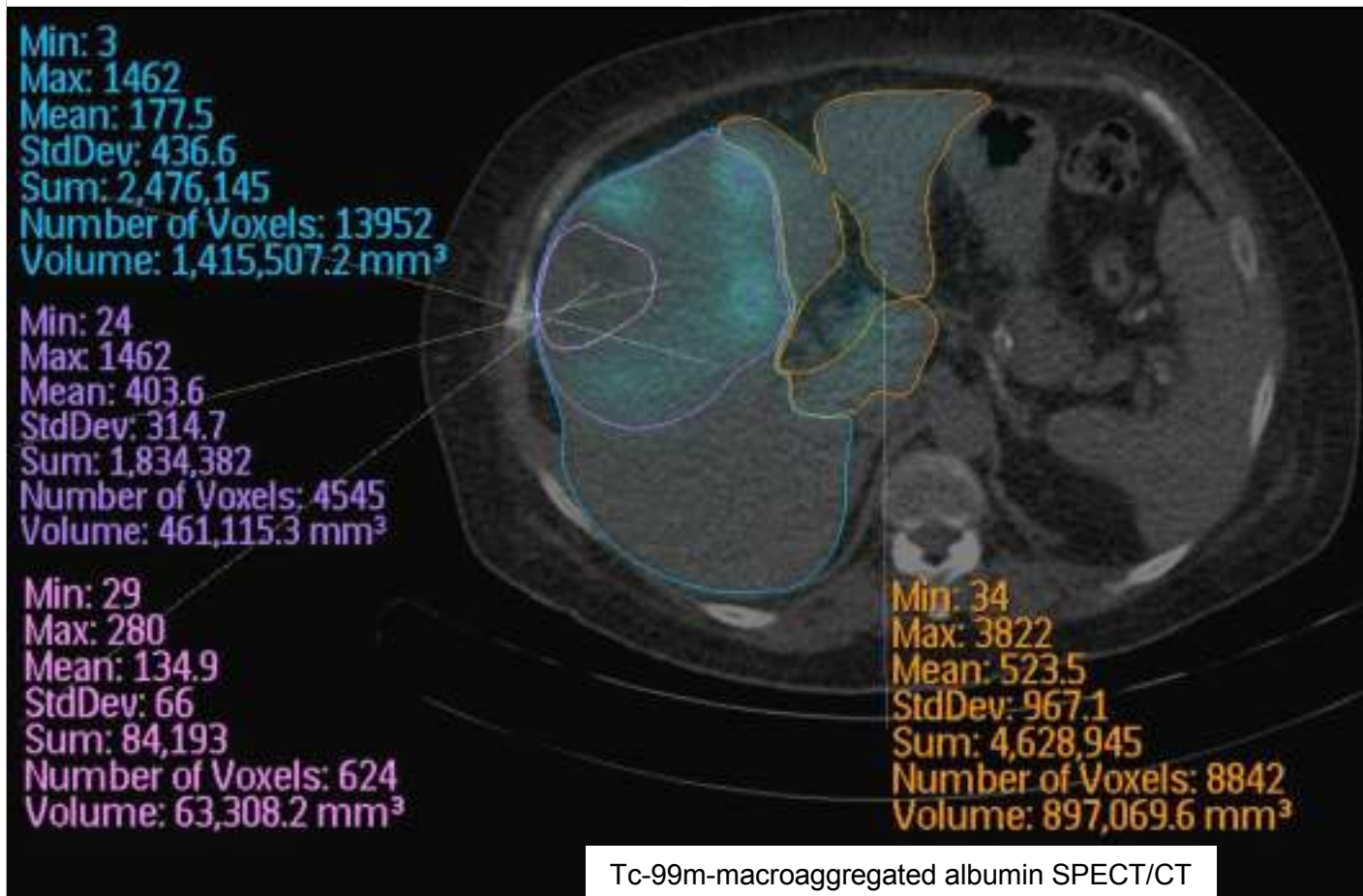
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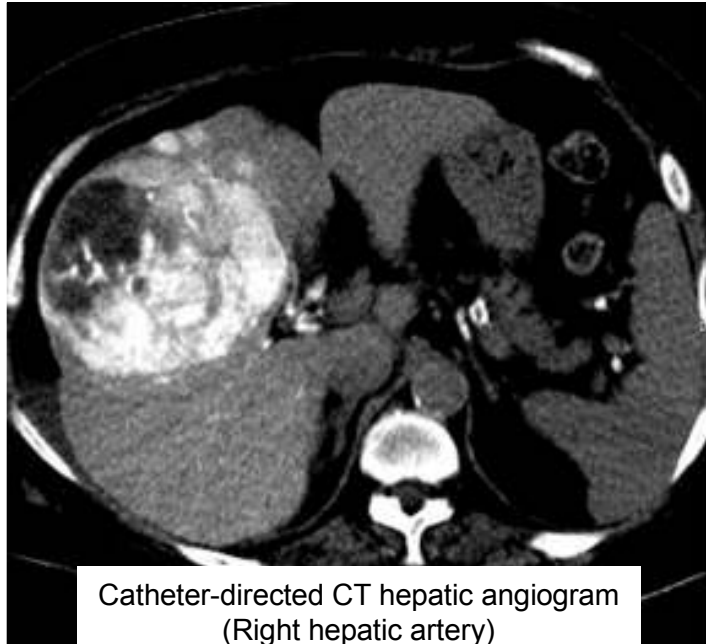
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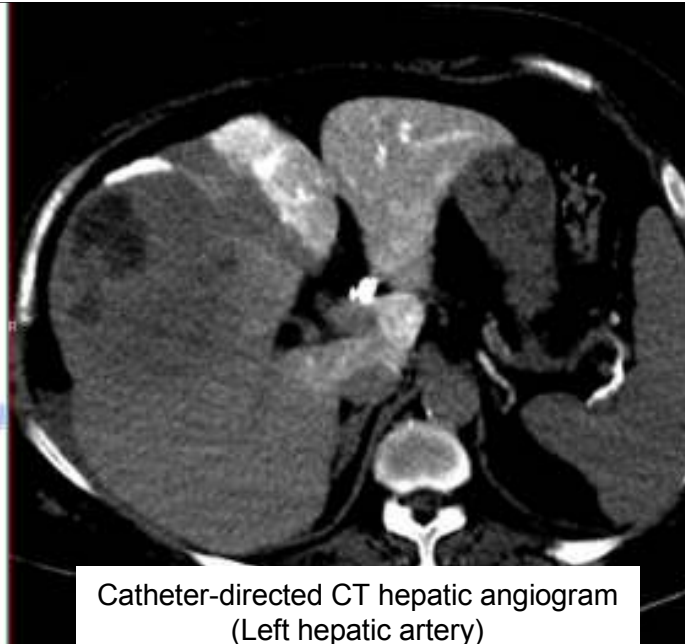
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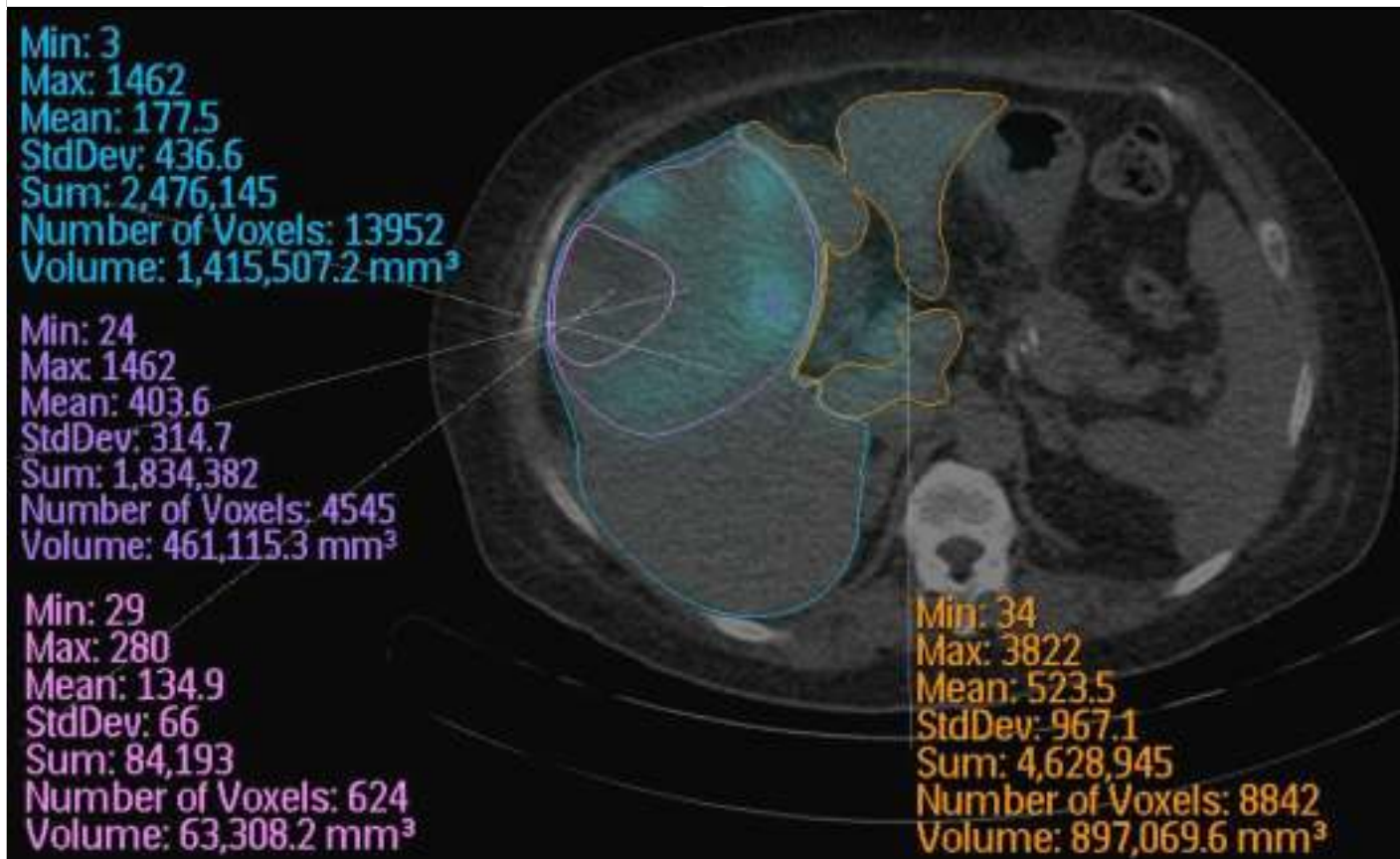
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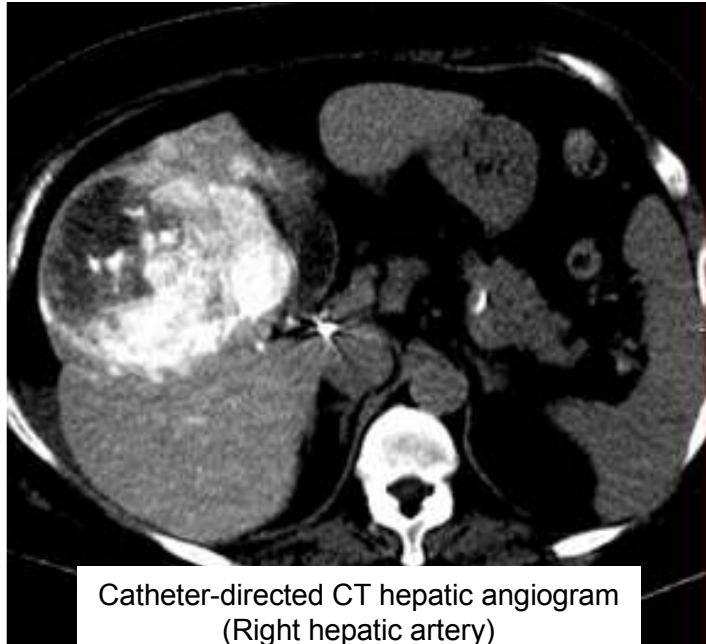
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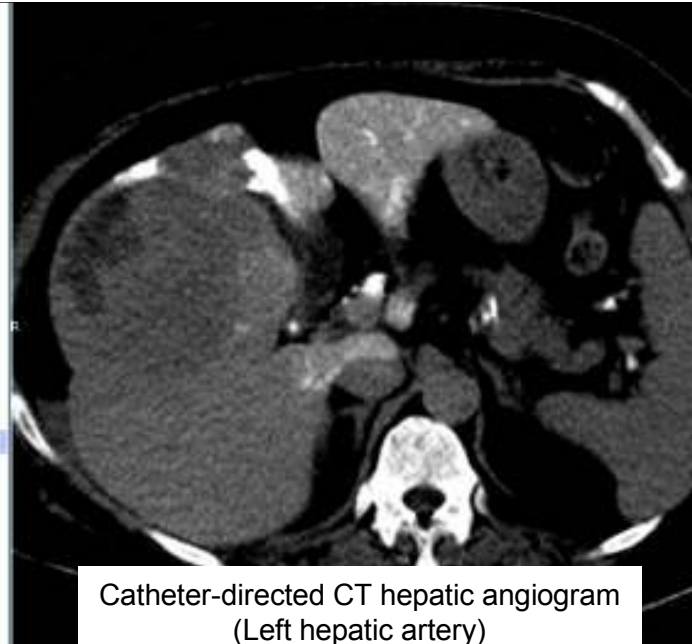
Tc-99m-macroaggregated albumin SPECT/CT



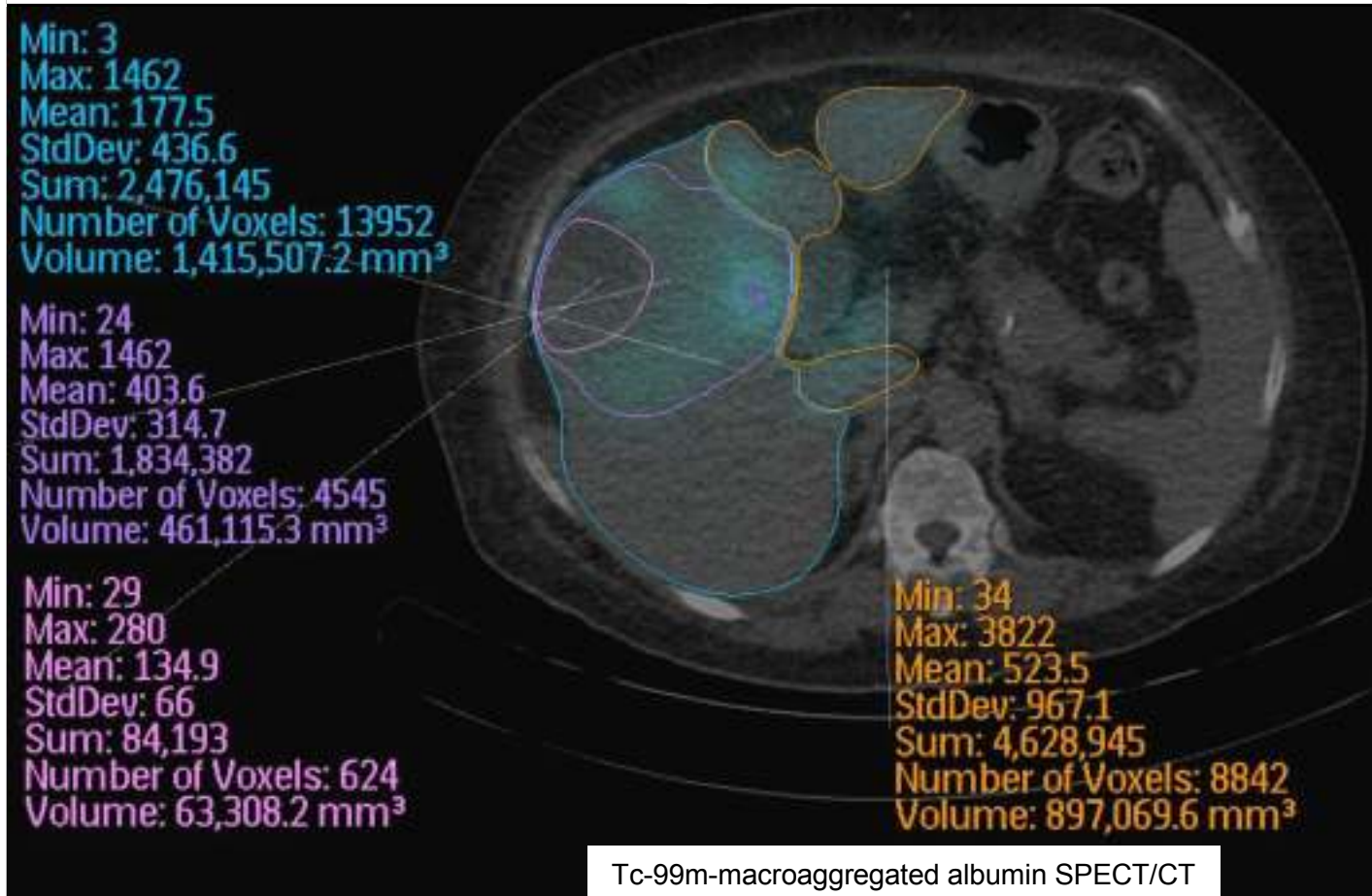
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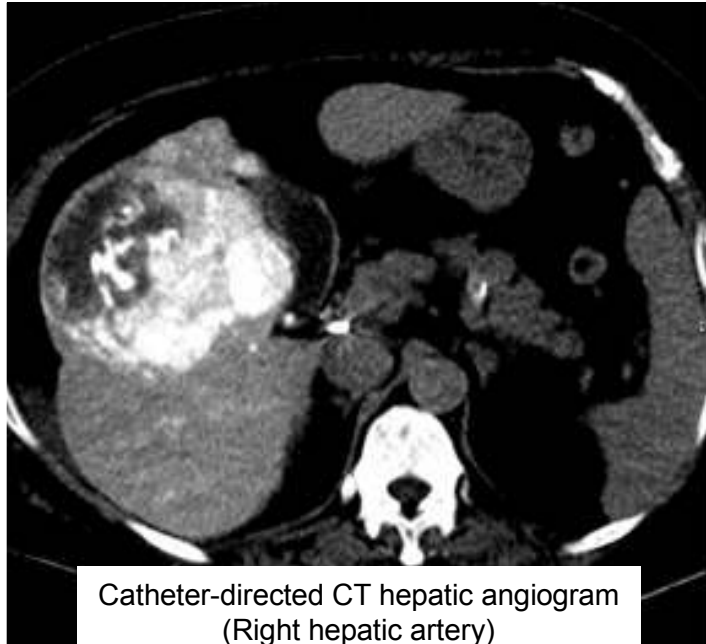
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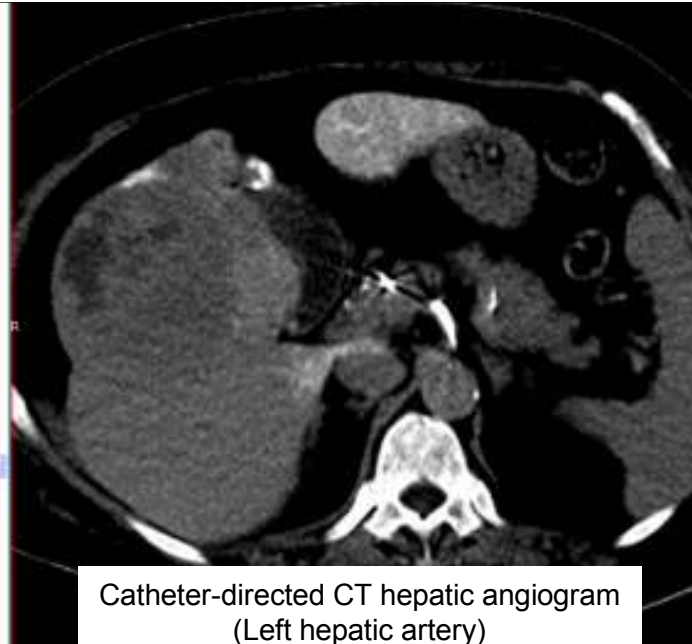
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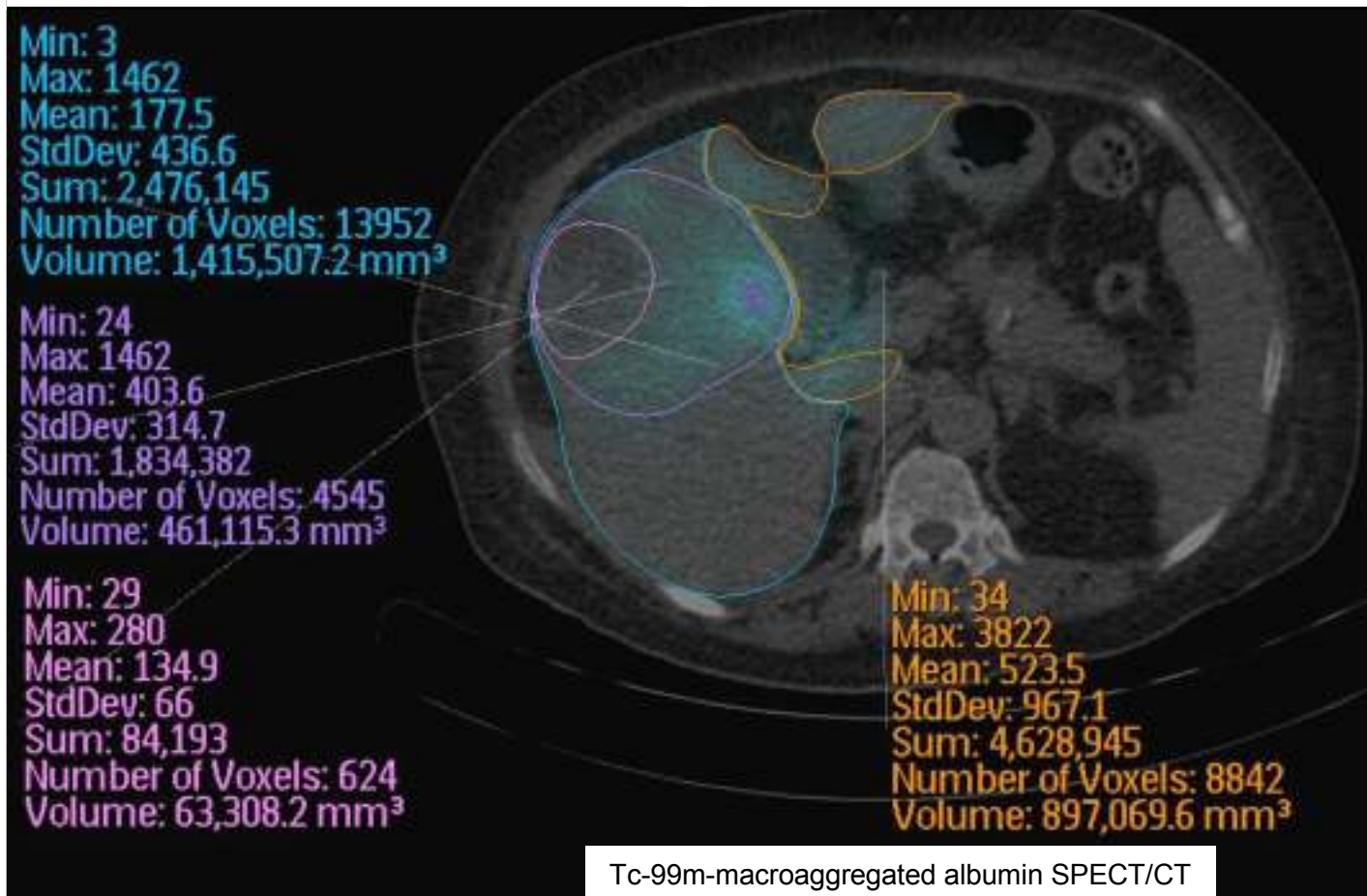
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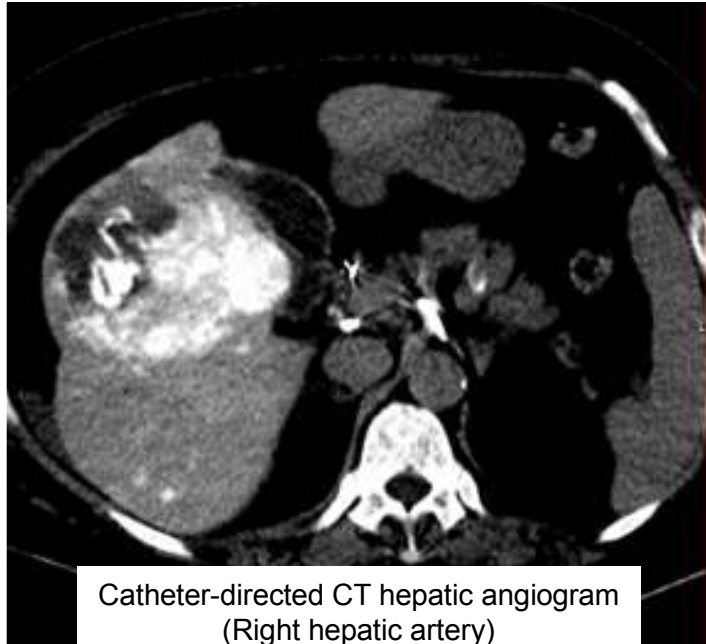
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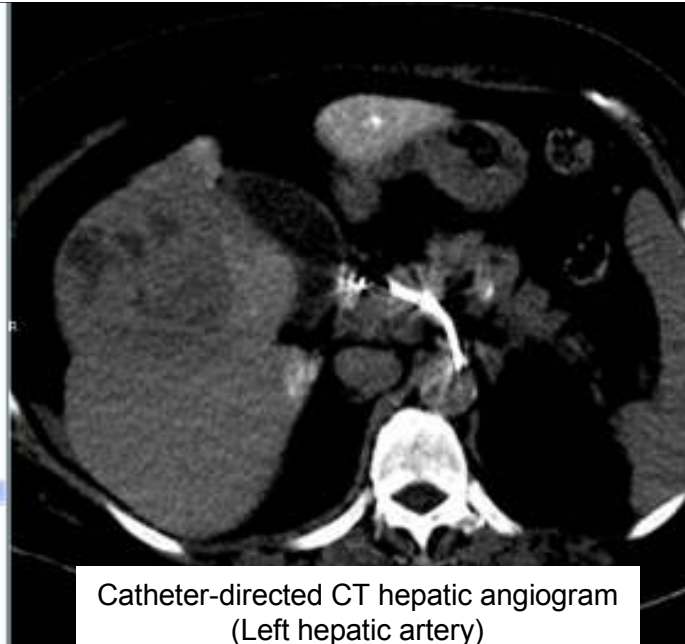
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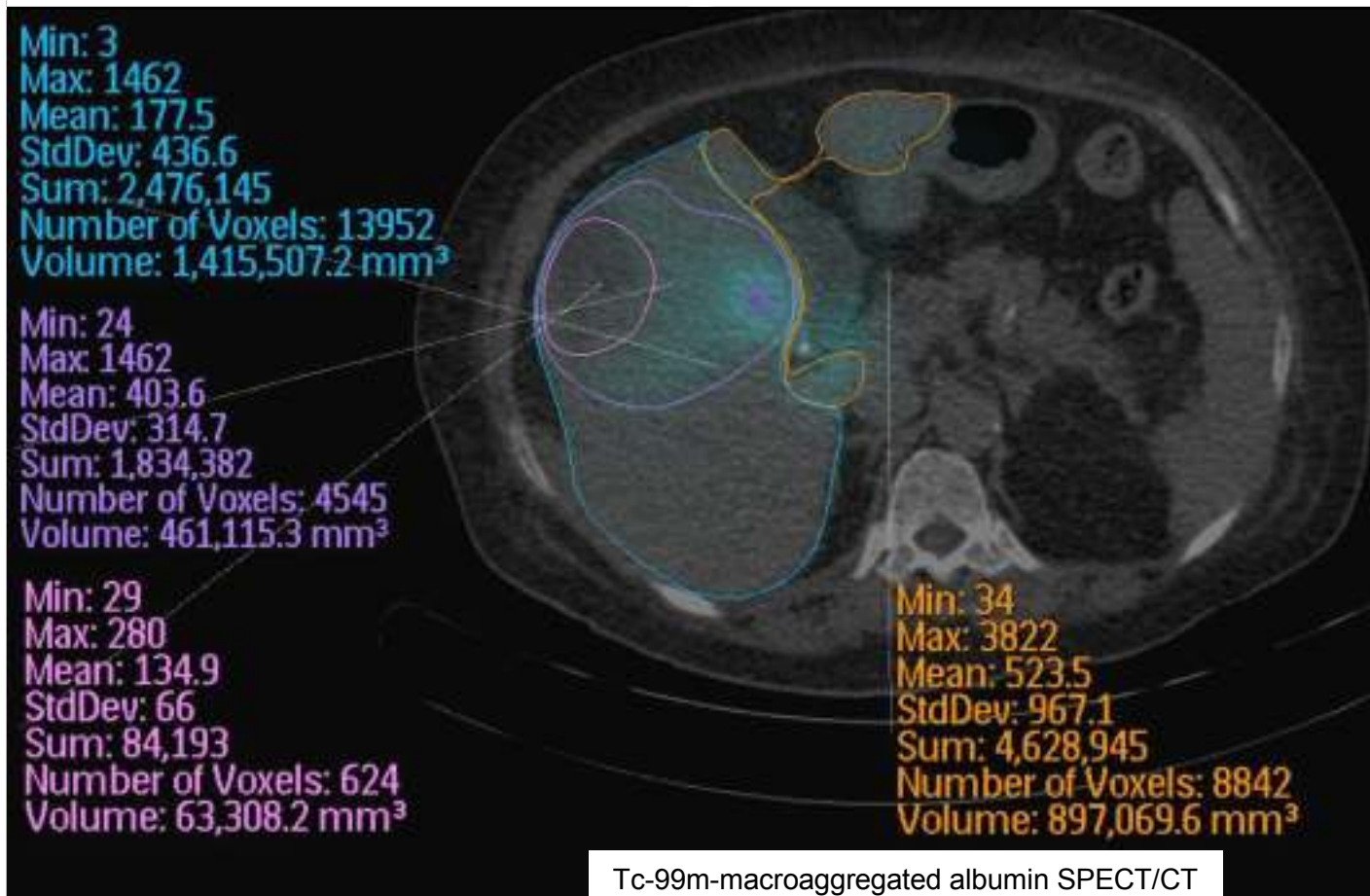
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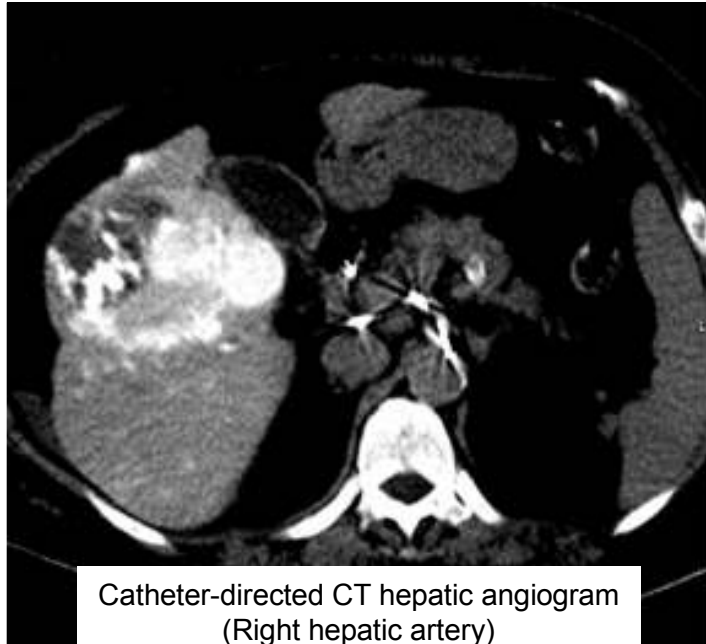
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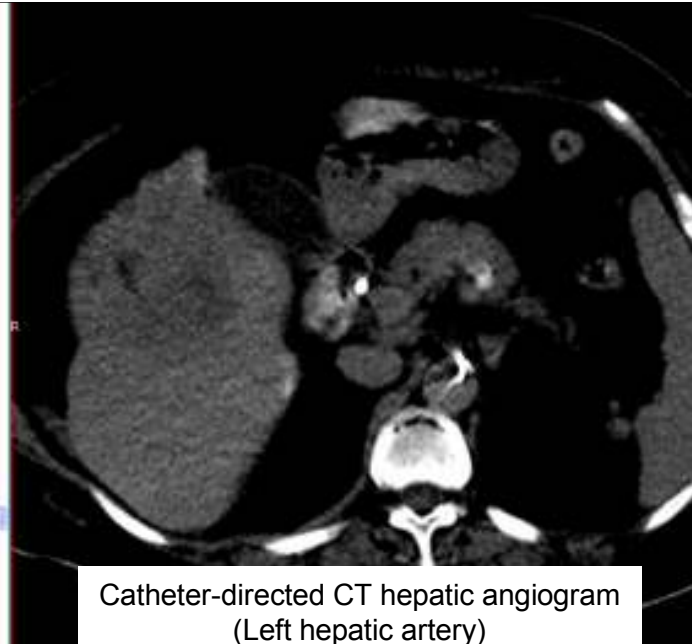
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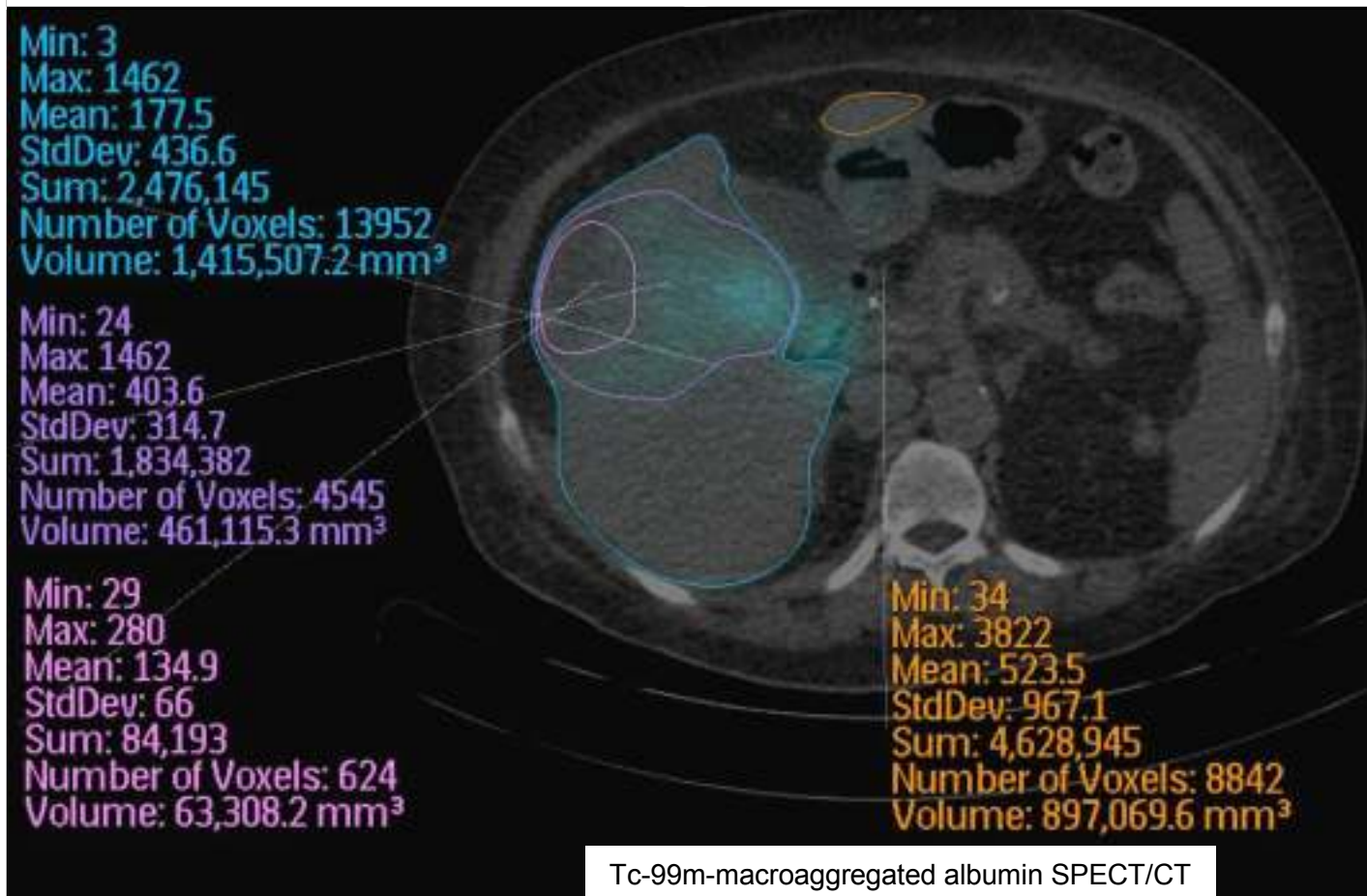
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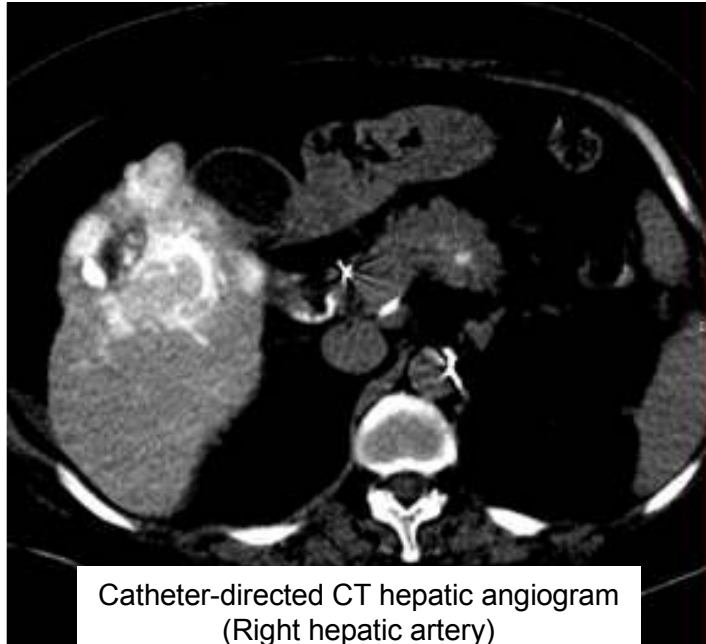
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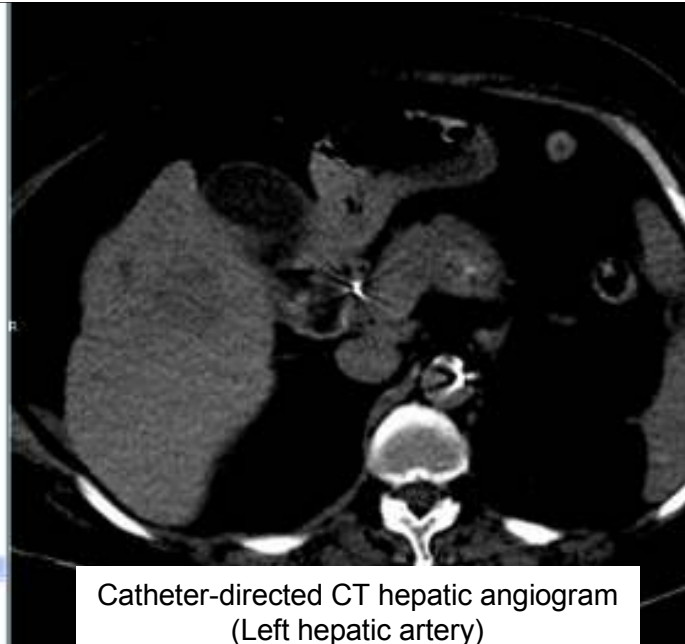
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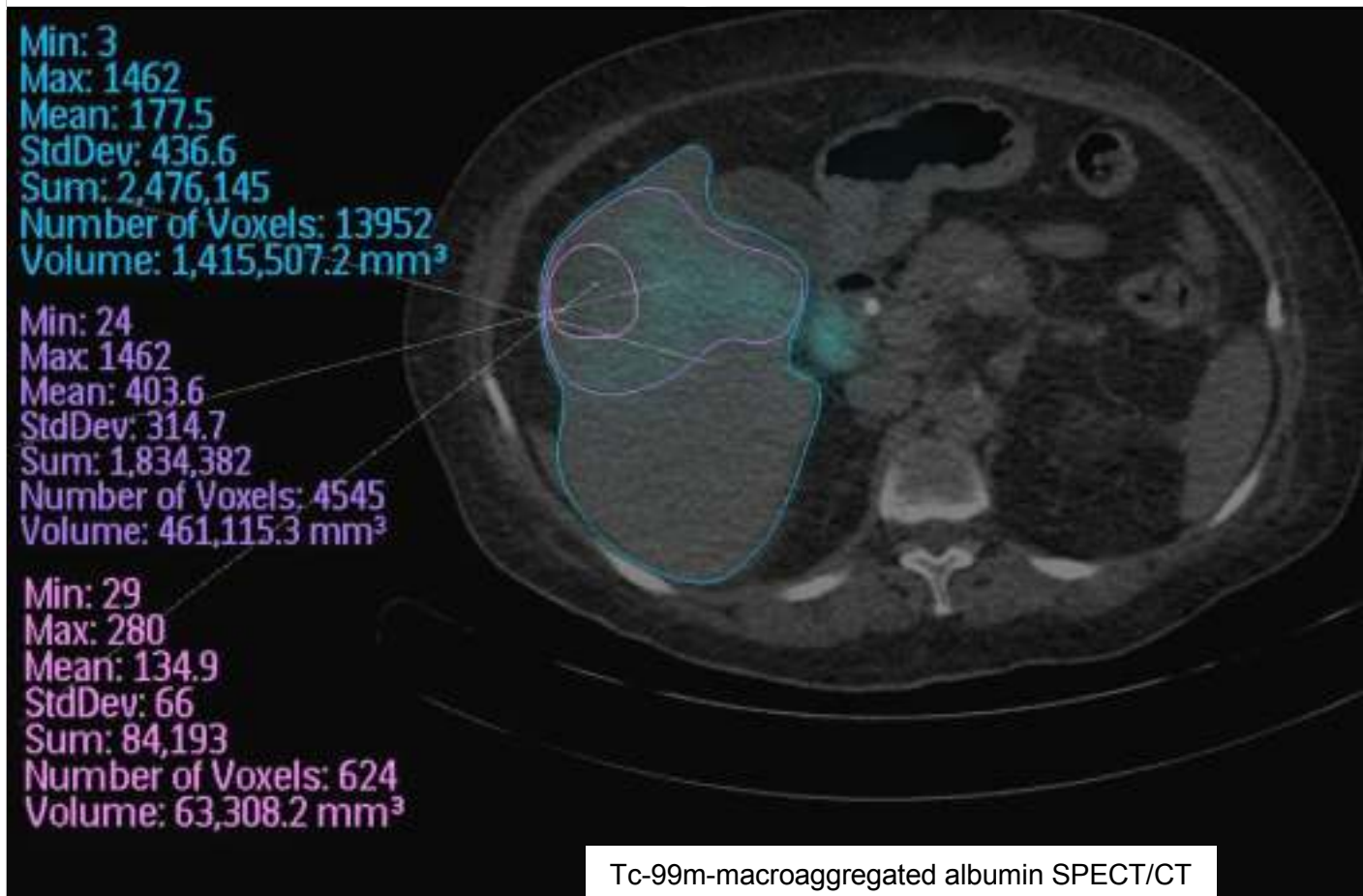
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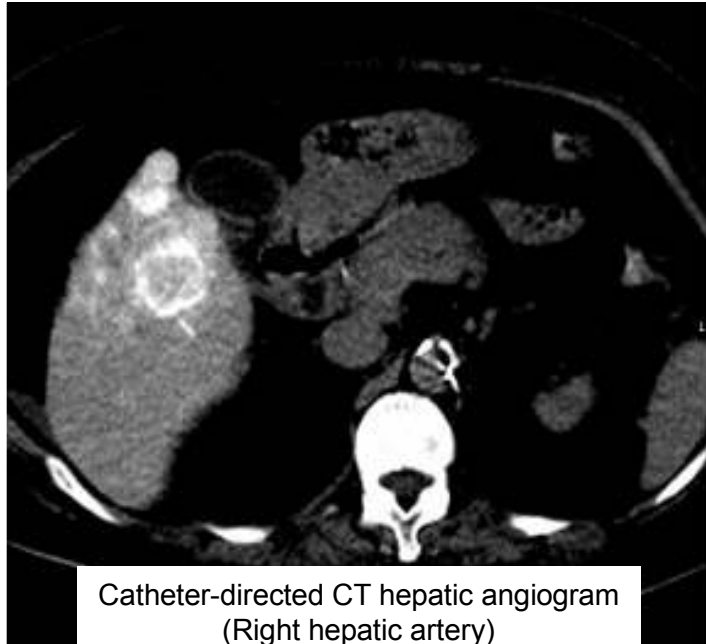
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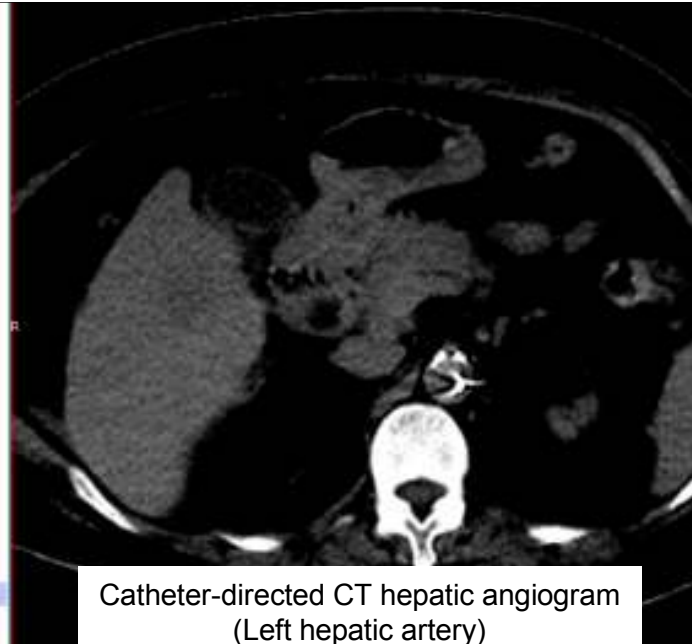
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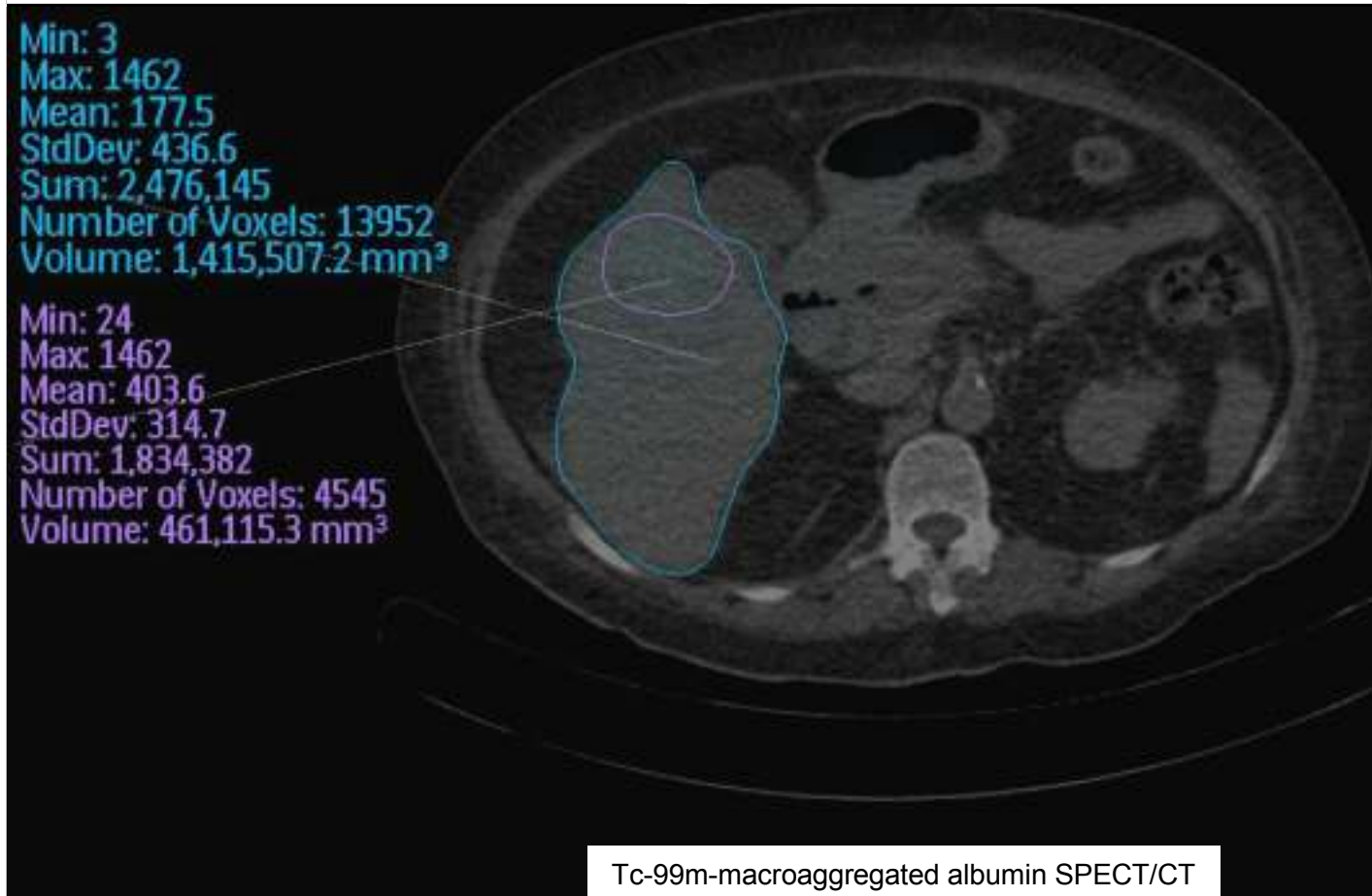
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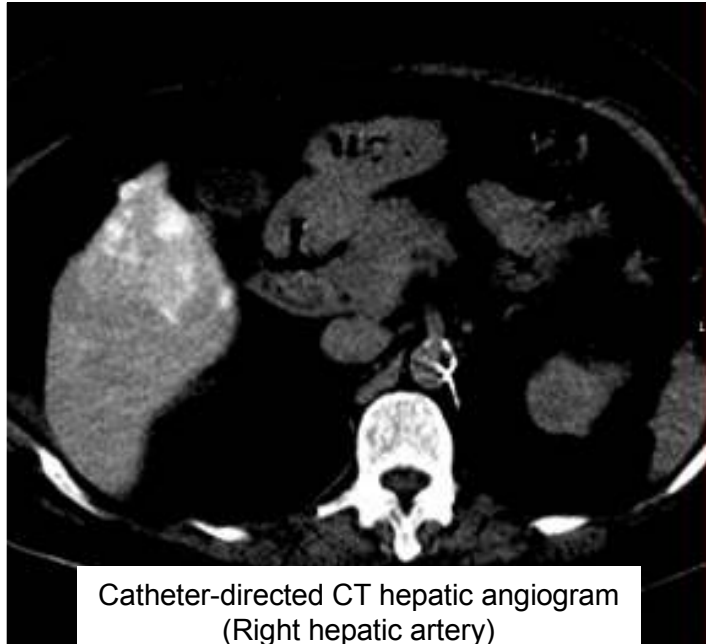
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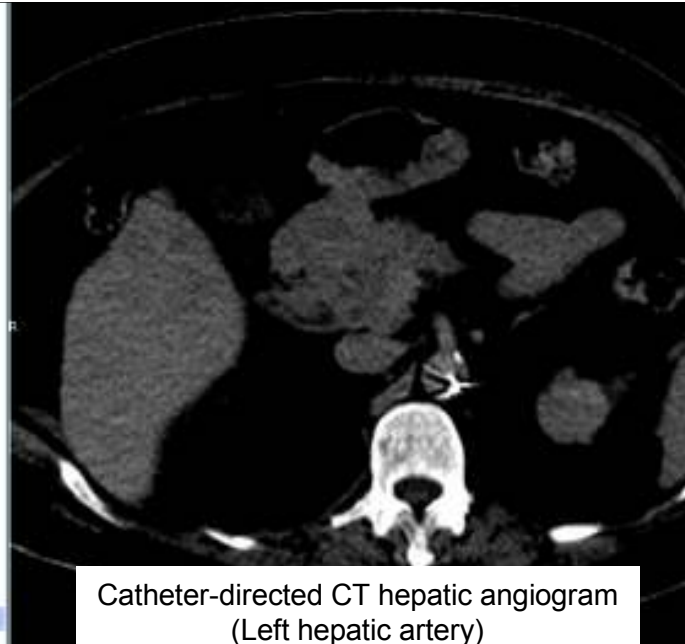
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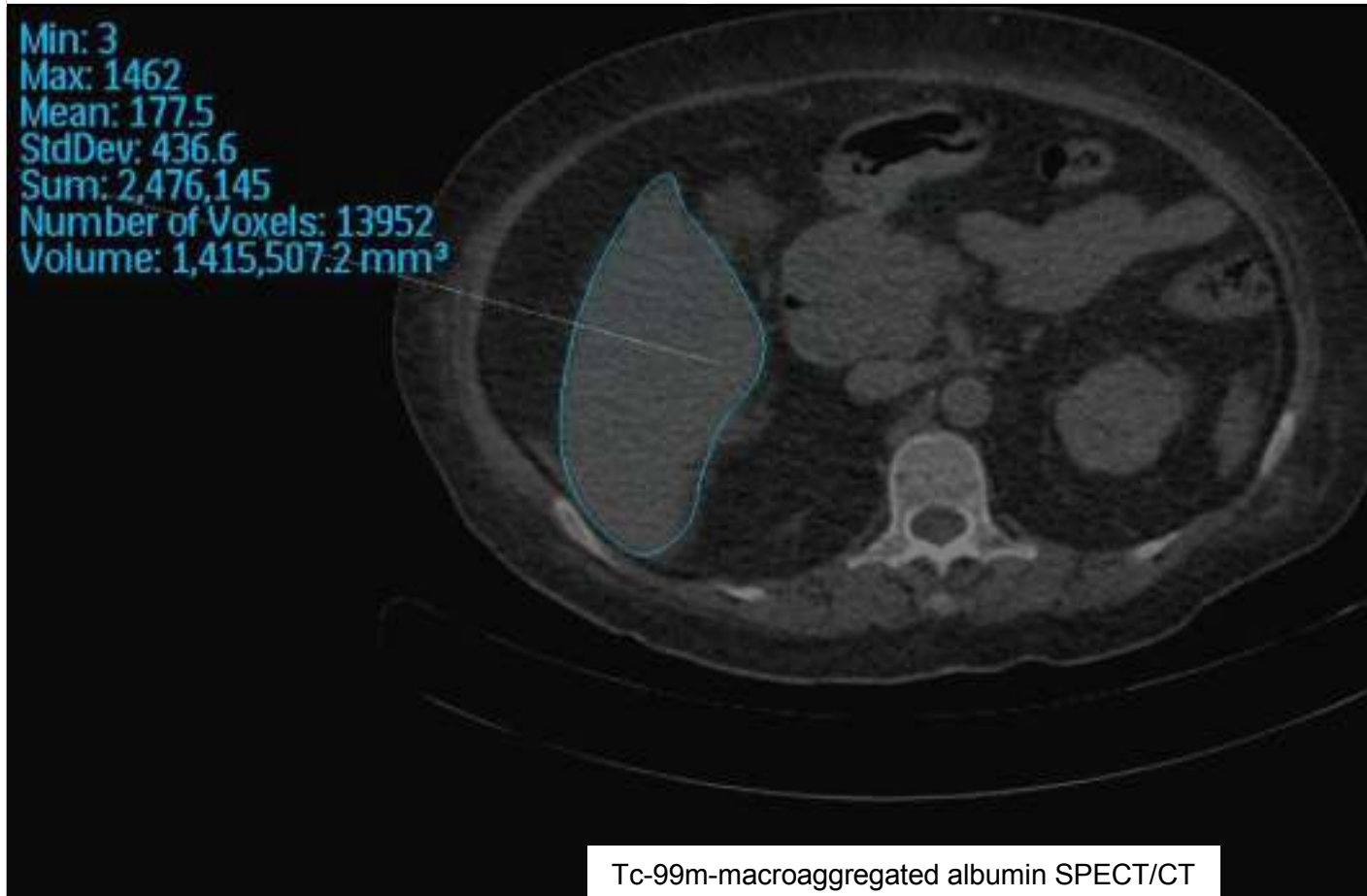
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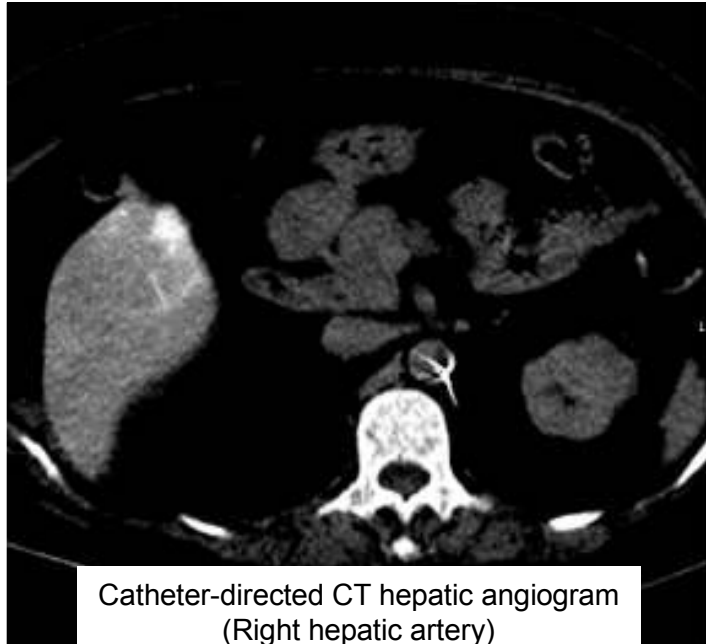
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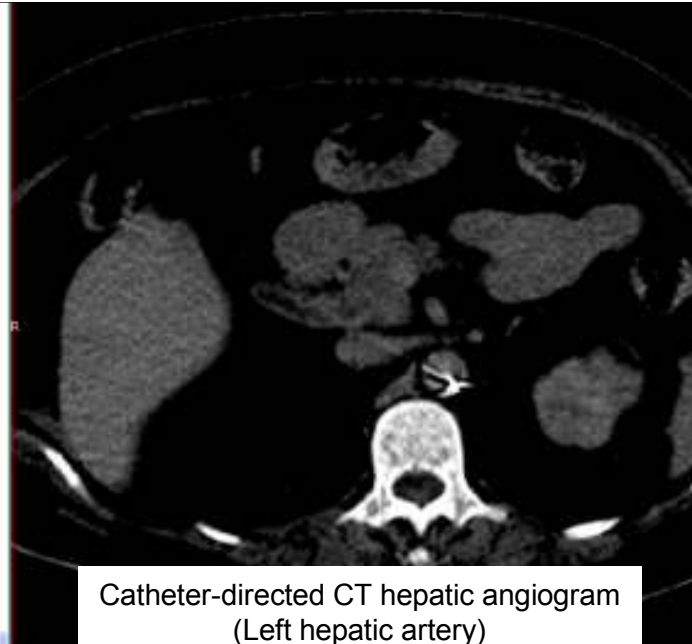
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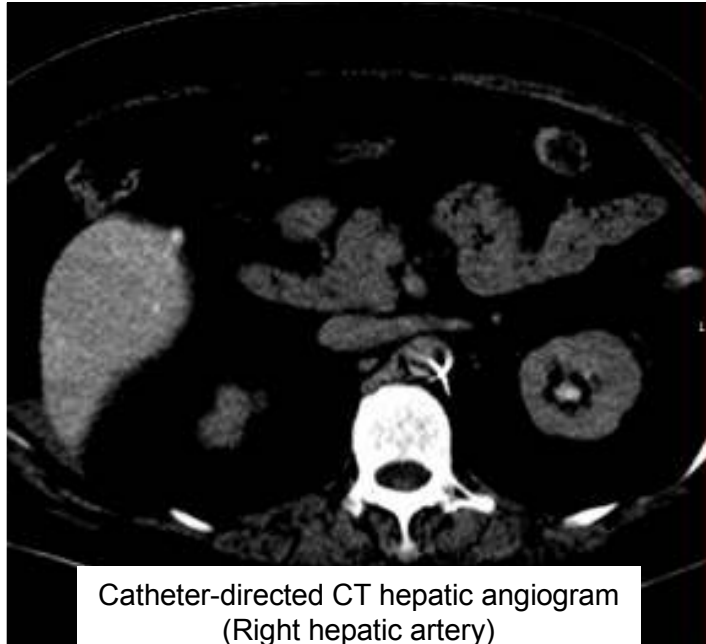
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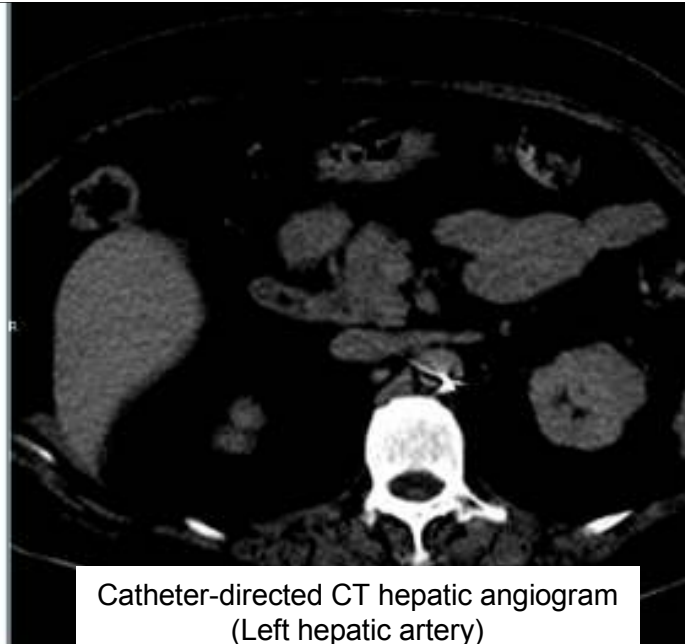
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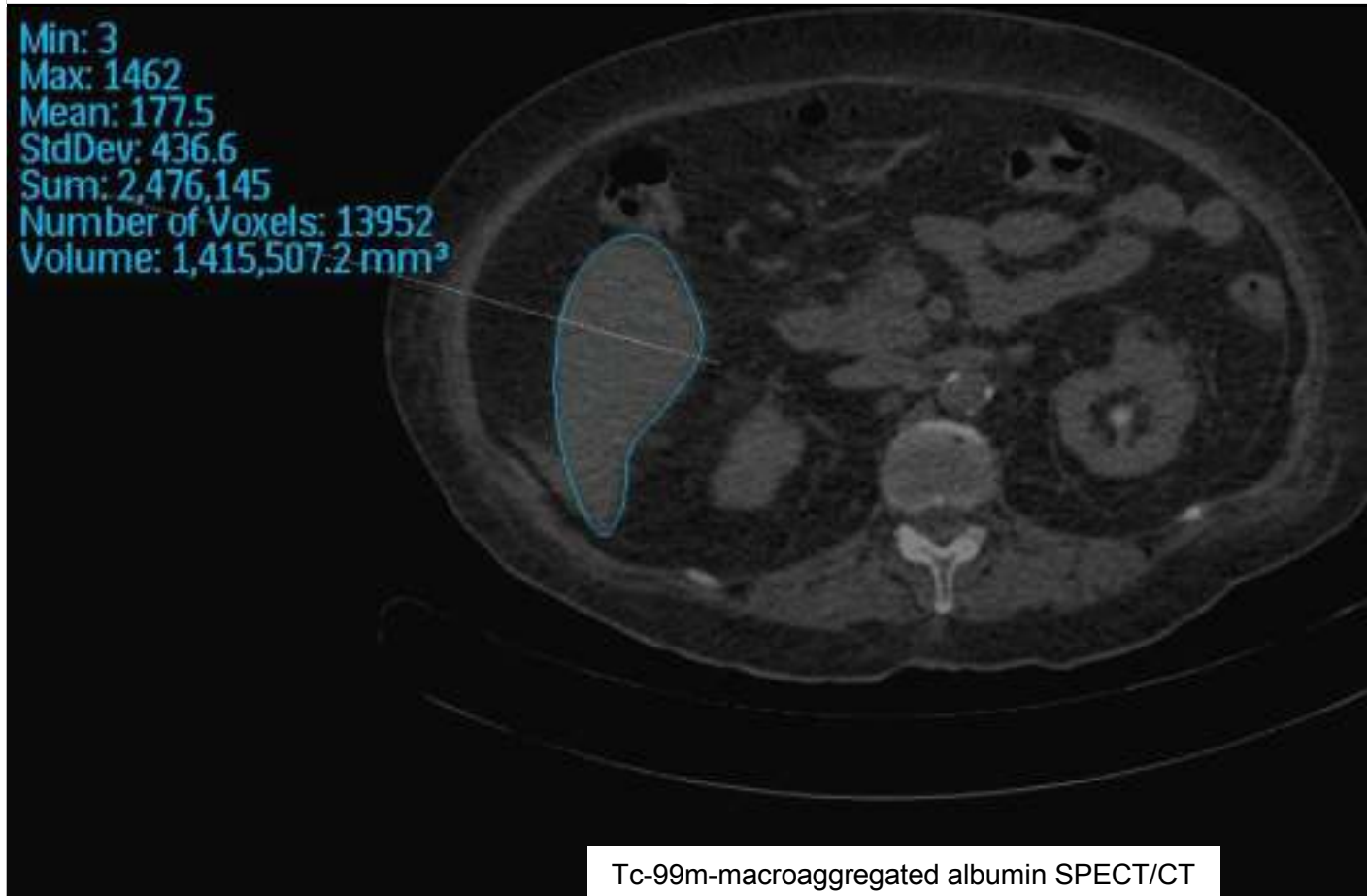
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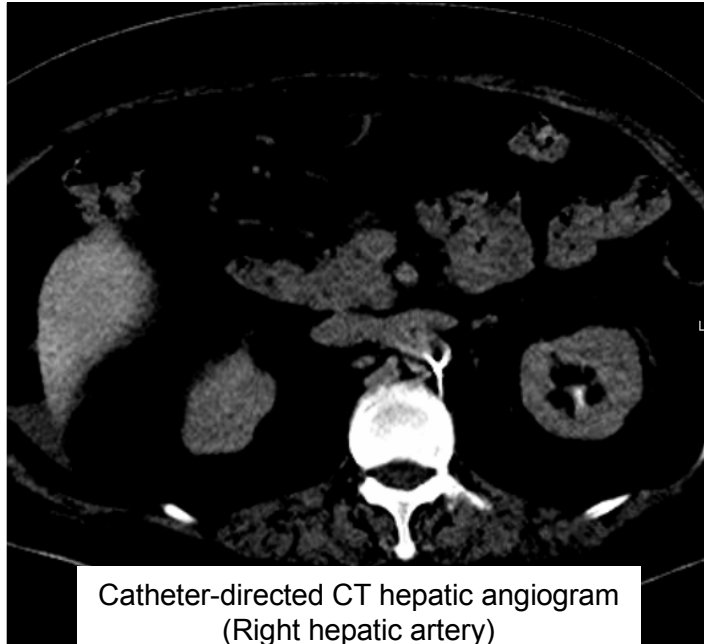
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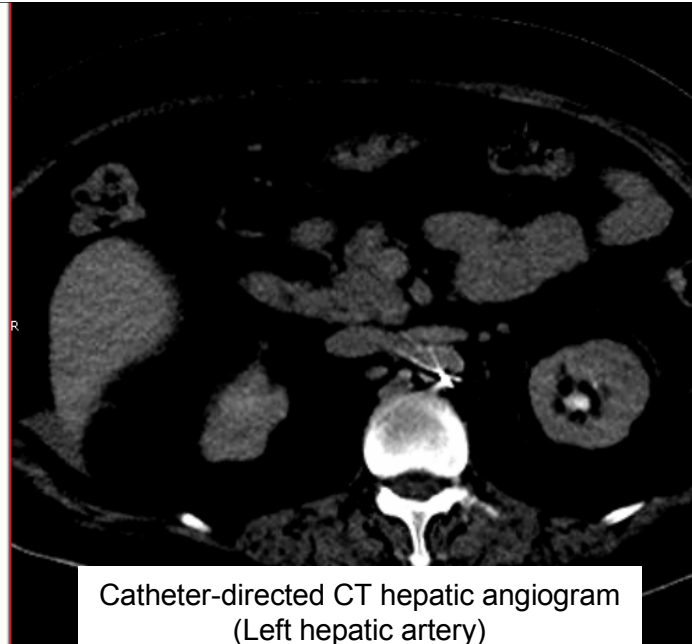
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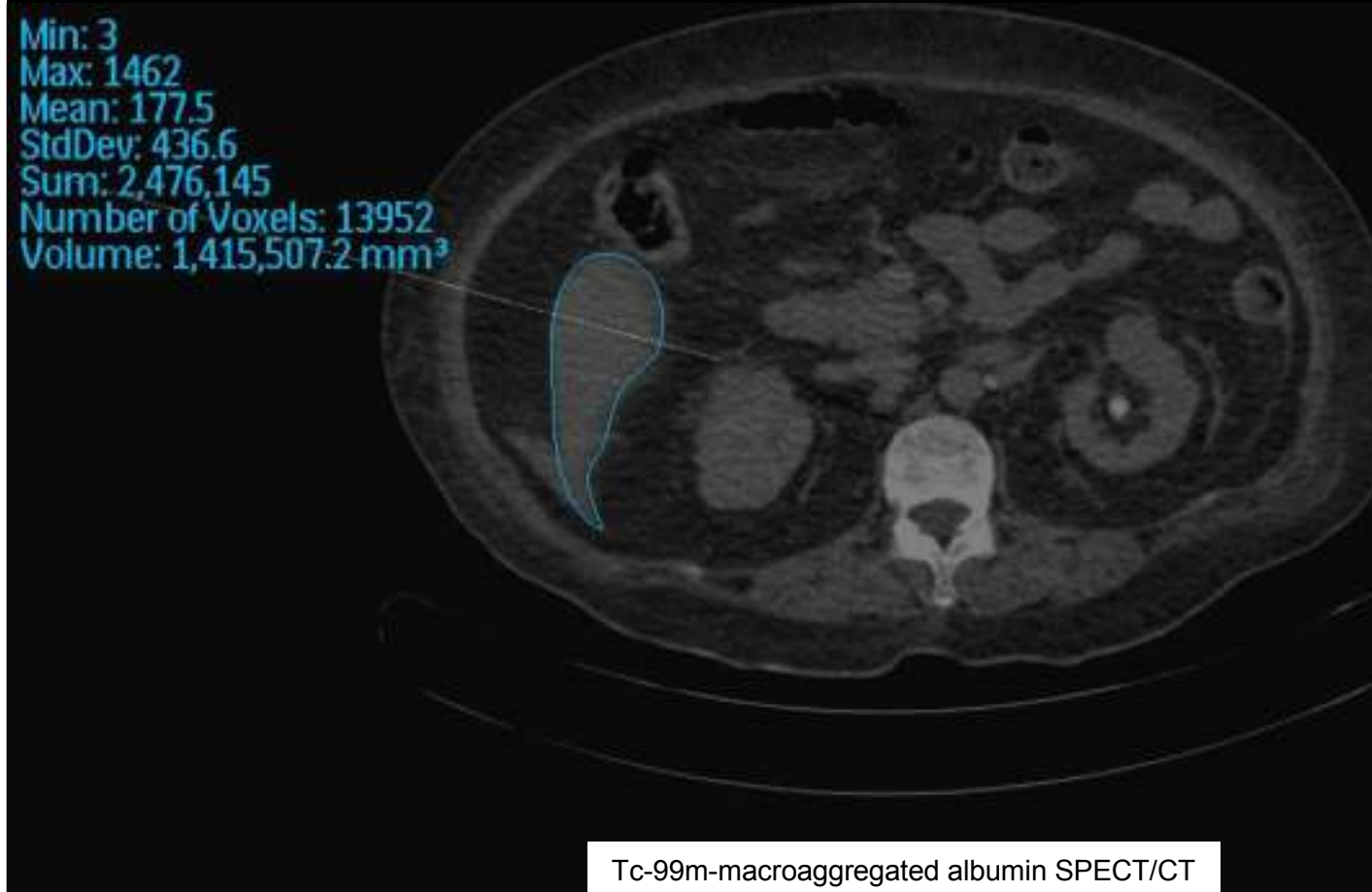
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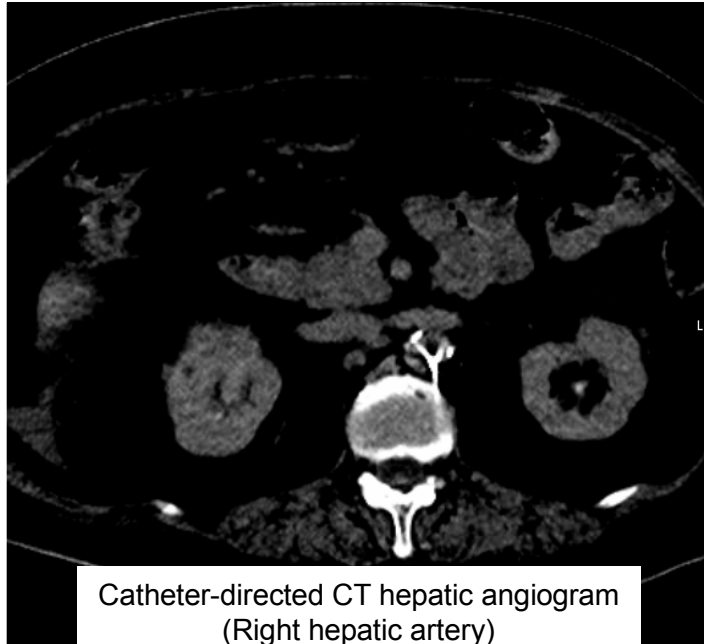
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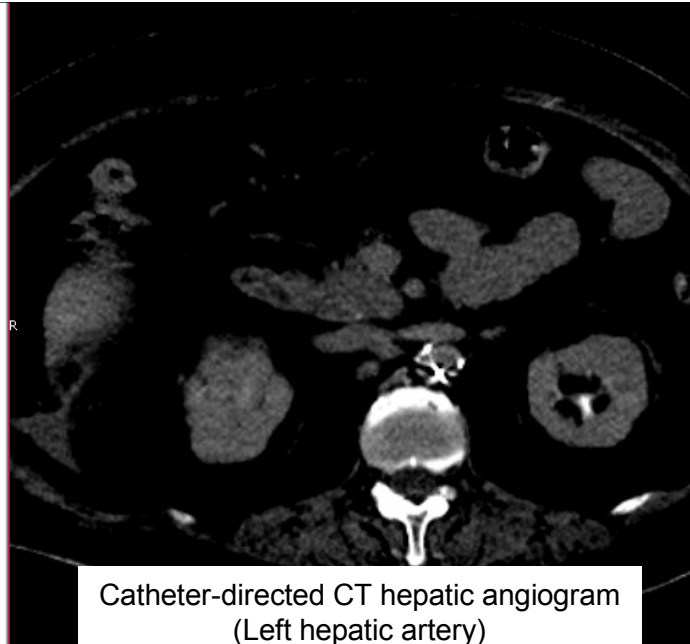
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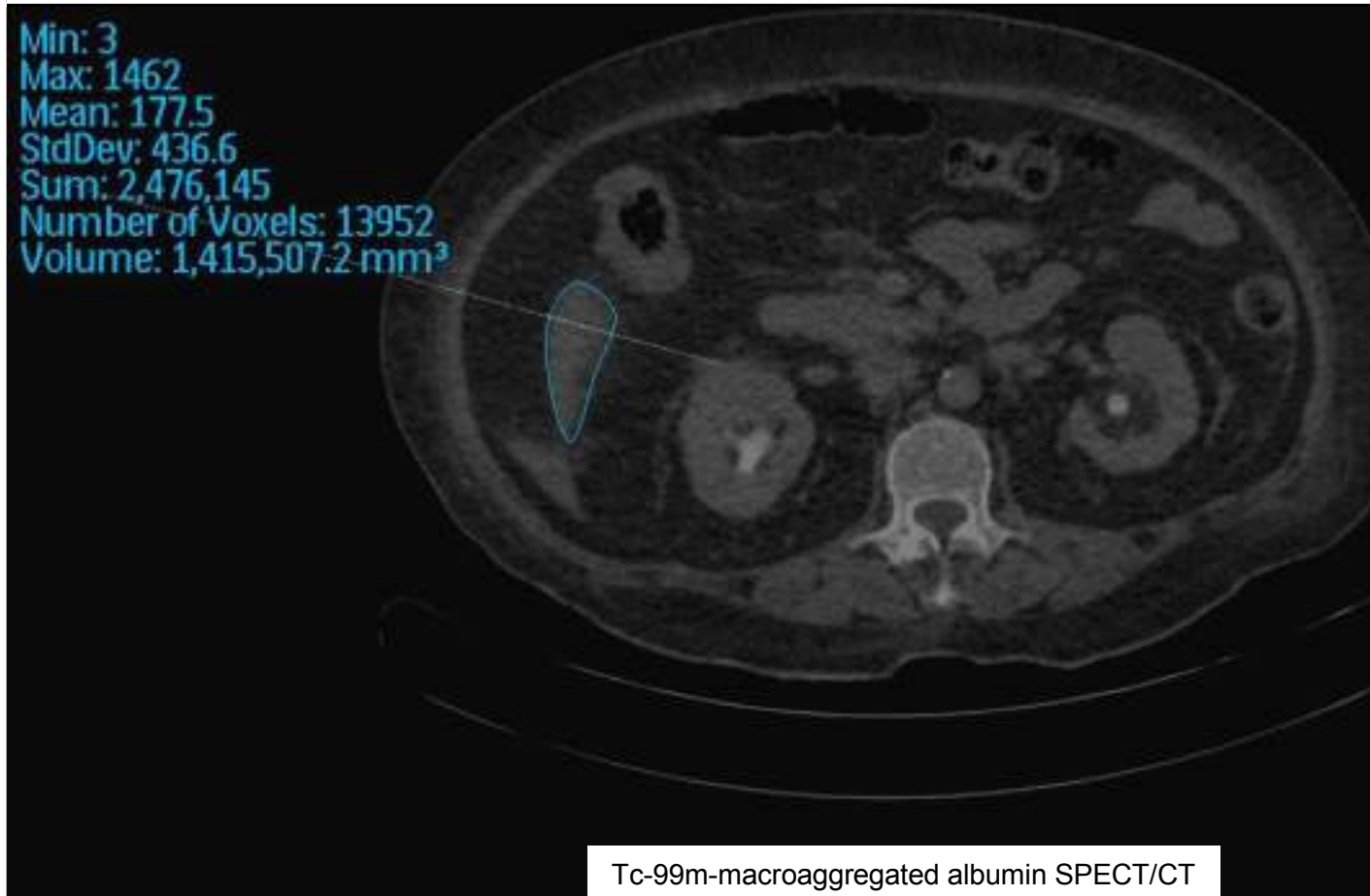
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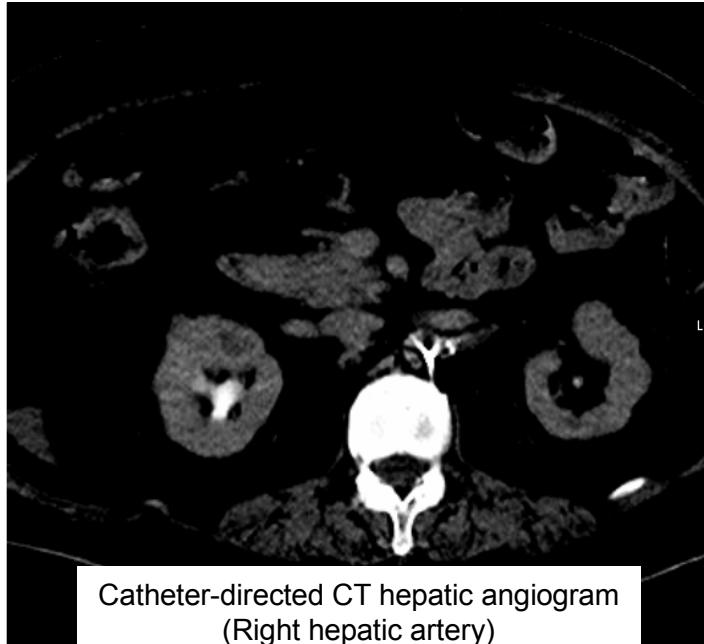
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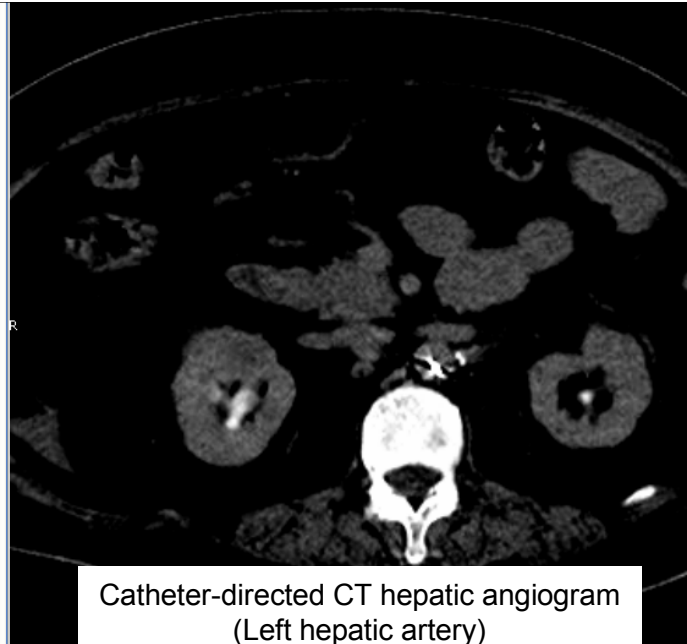
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Reference: J Nucl Med. 2011; 52: 1084
Authors: Yung H KAO, Andrew EH TAN
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ARTERY-SPECIFIC SPECT/CT COMPARTMENTAL PERSONALIZED PREDICTIVE MIRD MACRODOSIMETRY

Total Mass of Targeted, Implanted, Non-Tumorous Liver	1,752	gm
Total Mass of Targeted, Implanted Tumor	588	gm
Total Mass of Targeted, Implanted (Non-Tumorous Liver + Tumor)	2,339	gm
Mean Liver-to-Lung Shunt Percentage	4.6	%
Total Lung Mass (Assumed Standard Man)	1,000	gm
Predicted Mean Radiation Dose to Lungs	5.4	Gy
PLANNING TARGET VOLUME 1 (TRI-COMPARTMENTAL MIRD)	Left Hepatic	Artery
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	27.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	122.9	Gy
PLANNING TARGET VOLUME 2 (TRI-COMPARTMENTAL MIRD)	Right Hepatic	Artery
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	19.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	124.3	Gy
PLANNING TARGET VOLUME 3 (TRI-COMPARTMENTAL MIRD)	Not Targeted	Artery
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	0.0	Gy
Predicted Mean Radiation Dose to Implanted Tumor	0.0	Gv

Total Desired Yttrium-90 Activity by Predictive MIRD Macrodosimetry **2.37** GBq

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

<u>PLANNING TARGET VOLUME 1 (TRI-COMPARTMENTAL MIRD)</u>		
Mass of Targeted, Implanted, Non-Tumorous Liver	Left Hepatic	Artery
Mass of Targeted, Implanted Tumor	759	gm
Mean Tumor-to-Normal Liver Ratio by Mean SPECT/CT Count Density	174	gm
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	4.55	
Predicted Mean Radiation Dose to Implanted Tumor	27.0	Gy
Predicted Mean Radiation Dose to Lungs	122.9	Gy
Desired Artery-Specific Yttrium-90 Activity	2.0	Gy
	0.88	GBq
<u>PLANNING TARGET VOLUME 2 (TRI-COMPARTMENTAL MIRD)</u>		
Mass of Targeted, Implanted, Non-Tumorous Liver	Right Hepatic	Artery
Mass of Targeted, Implanted Tumor	993	gm
Mean Tumor-to-Normal Liver Ratio by Mean SPECT/CT Count Density	414	gm
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	6.54	
Predicted Mean Radiation Dose to Implanted Tumor	19.0	Gy
Predicted Mean Radiation Dose to Lungs	124.3	Gy
Desired Artery-Specific Yttrium-90 Activity	3.4	Gy
	1.48	GBq
<u>PLANNING TARGET VOLUME 3 (TRI-COMPARTMENTAL MIRD)</u>		
Mass of Targeted, Implanted, Non-Tumorous Liver	Not Targeted	Artery
Mass of Targeted, Implanted Tumor	0	gm
Mean Tumor-to-Normal Liver Ratio by Mean SPECT/CT Count Density	0	gm
Desired Mean Radiation Dose to Implanted, Non-Tumorous Liver	0.00	
Predicted Mean Radiation Dose to Implanted Tumor	0.0	Gy
Predicted Mean Radiation Dose to Lungs	0.0	Gy
Desired Artery-Specific Yttrium-90 Activity	0.00	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	4,628,945	counts
Perfused Territory (Liver + Tumor) SPECT/CT VOI	897,069.6	mm3
Tumor 1 (Implanted + Necrotic) SPECT/CT Counts	2,361,705	counts
Tumor 1 (Implanted + Necrotic) SPECT/CT VOI	167,097.2	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	2,361,705	counts
Sum of (Implanted + Necrotic) Tumor SPECT/CT VOI	167,097.2	mm ³
Sum of Non-Implanted, Non-Tumorous Liver SPECT/CT Counts	0	counts
Sum of Non-Implanted, Non-Tumorous Liver SPECT/CT VOI	0.0	mm ³
Sum of Necrotic Tumor SPECT/CT Counts	0	counts
Sum of Necrotic Tumor SPECT/CT VOI	0.0	mm ³
Net Implanted, Non-Tumorous Liver SPECT/CT Counts	2,267,240	counts
Net Implanted, Non-Tumorous Liver SPECT/CT VOI	729,972.4	mm ³
<u>Net Implanted, Non-Tumorous Liver Mass</u>	759.17	gm
Net Implanted Tumor SPECT/CT Counts	2,361,705	counts
Net Implanted Tumor SPECT/CT VOI	167,097.2	mm ³
<u>Net Implanted Tumor Mass</u>	173.78	gm
Implanted, Non-Tumorous Liver Mean SPECT/CT Count Density	3.11	counts/mm ³
Implanted, Tumor Mean SPECT/CT Count Density	14.13	counts/mm ³
<u>Artery-Specific Mean Tumor-to-Normal Liver Ratio</u>	4.55	
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)	Right Hepatic (i.e. Artery2)	Artery
Perfused Territory (Liver + Tumor) SPECT/CT Counts	2,476,145	counts
Perfused Territory (Liver + Tumor) SPECT/CT VOI	1,415,507.2	mm3
Tumor 1 (Implanted + Necrotic) SPECT/CT Counts	1,834,382	counts
Tumor 1 (Implanted + Necrotic) SPECT/CT VOI	461,115.3	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
Necrotic Tumor 1 SPECT/CT Counts	84,193	counts
Necrotic Tumor 1 SPECT/CT VOI	63,308.2	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 2)	Right Hepatic (i.e. Artery2)	Artery
Sum of (Implanted + Necrotic) Tumor SPECT/CT Counts	1,834,382	counts
Sum of (Implanted + Necrotic) Tumor SPECT/CT VOI	461,115.3	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	84,193	counts
Sum of Necrotic Tumor SPECT/CT VOI	63,308.2	mm3
Net Implanted, Non-Tumorous Liver SPECT/CT Counts	641,763	counts
Net Implanted, Non-Tumorous Liver SPECT/CT VOI	954,391.9	mm3
<u>Net Implanted, Non-Tumorous Liver Mass</u>	992.57	gm
Net Implanted Tumor SPECT/CT Counts	1,750,189	counts
Net Implanted Tumor SPECT/CT VOI	397,807.1	mm3
<u>Net Implanted Tumor Mass</u>	413.72	gm
Implanted, Non-Tumorous Liver Mean SPECT/CT Count Density	0.67	counts/mm3
Implanted Tumor Mean SPECT/CT Count Density	4.40	counts/mm3
<u>Artery-Specific Mean Tumor-to-Normal Liver Ratio</u>	6.54	
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.



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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



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