A Case of Hepatocellular Carcinoma Treated with Interventional Radiology

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Agenda

- Our patient
- American College of Radiology guidelines
- Transarterial chemoembolization (TACE)
- Radiofrequency ablation (RFA)
- Efficacy of RFA and TACE

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Our Patient: History

- Senior male with liver cirrhosis due to hemochromatosis and heavy alcohol use
- Hepatocellular carcinoma (HCC) discovered with ultrasound and confirmed with biopsy at outside hospital
- Cirrhosis well compensated—patient active and working

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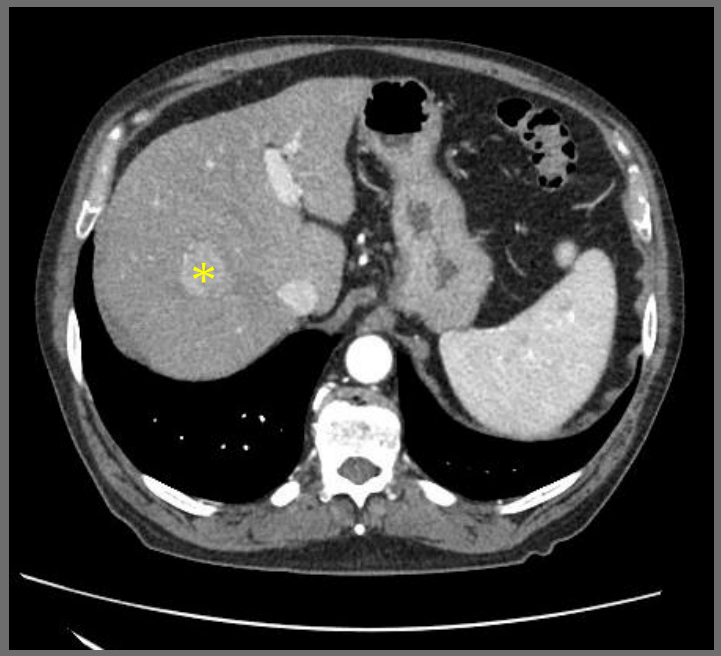
Our Patient: HCC on CT



AXIAL C+ ABDOMINAL CT: ARTERIAL

AXIAL C+ ABDOMINAL CT: PORTAL

HCC enhances in the arterial phase before washing out in the portal phase

Images from BIDMC PACS

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Our Patient: HCC Qualities

- Single tumor
- Measured about 2 cm in diameter at original presentation at outside hospital
- Measures a little over 3 cm in diameter after referral for treatment at our hospital

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Treatment: Solitary Tumor <3 cm

Clinical Condition: **Radiologic Management of Hepatic Malignancy**

Variant 1: **Hepatocellular carcinoma: Solitary tumor <3 cm.**

Treatment/Procedure	Rating	Comments
Systemic chemotherapy	3	
Resection	8	
Transplantation	9	
Chemical ablation	6	
Thermal ablation	8	
Transarterial embolization (TAE)	5	
Transarterial chemoembolization (TACE)	5	
Selective internal radiation therapy (SIRT)	5	

Rating Scale: **1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate**

From American College of Radiology. ACR Appropriateness Criteria®. Available at www.acr.org/ac. Accessed July 18th, 2015.

Liver transplantation is rated highest by ACR, followed by resection and thermal ablation

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Treatment: Solitary Tumor 5 cm

Variant 2: **Hepatocellular carcinoma: Solitary tumor 5 cm.**

Treatment/Procedure	Rating	Comments
Systemic chemotherapy	3	
Resection	8	
Transplantation	9	
Chemical ablation	3	The tumor is too large for chemical ablation. May use it instead of or in addition to thermal ablation depending on tumor location.
Thermal ablation	5	
Transarterial embolization (TAE)	6	
Transarterial chemoembolization (TACE)	7	
Selective internal radiation therapy (SIRT)	7	Especially applicable in portal vein thrombosis or extensive bilobar disease.
Transarterial chemoembolization (TACE) combined with thermal ablation	7	

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

From American College of Radiology. ACR Appropriateness Criteria®. Available at www.acr.org/ac. Accessed July 18th, 2015.

With a larger tumor, TACE with thermal ablation is favored over thermal ablation alone

Our Patient: Treatment

- Transplant possible but patient must abstain from alcohol and wait for available liver—HCC may progress in the meantime
- Resection unsuitable due to cirrhosis and location of tumor deep in right lobe—remaining function would be insufficient
- TACE with RFA (a type of thermal ablation) is chosen by patient and team as bridging therapy to potential transplant

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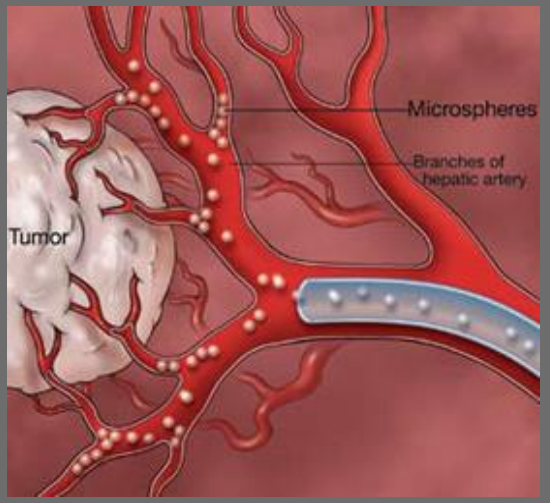
TACE: Overview

- Catheterize branch of hepatic artery feeding tumor via femoral artery
- Deposit drug-eluting microspheres to deliver chemotherapy and embolize



From California Pacific Medical Center, Sutter Health. On http://www.cpmc.org/advanced/liver/patientstopics/MetasticLiver-profile.html.

- Postembolization syndrome seen in ~90%
- Major complications seen in ~5%

Data from Clark TW.

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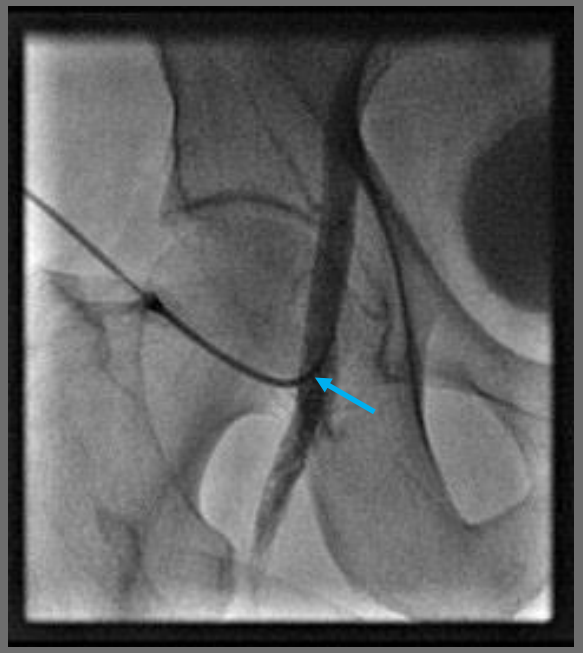
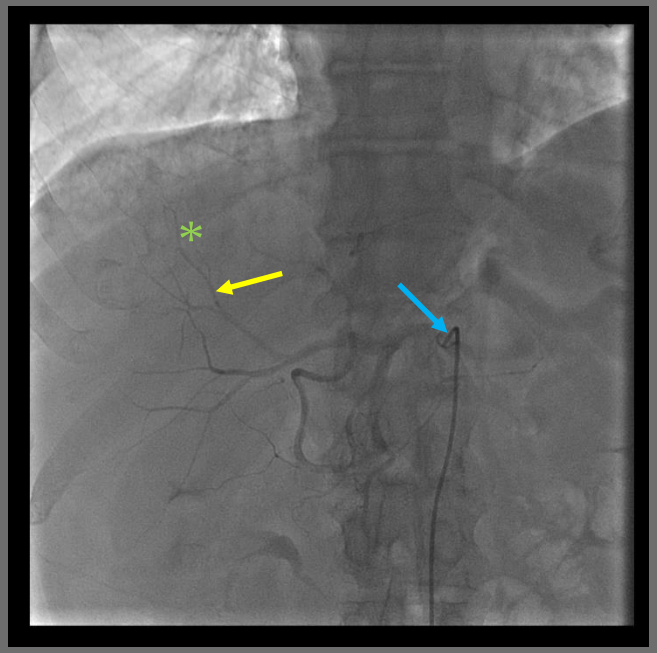
Our Patient: TACE Approach



ANGIOGRAM: FEMORAL ARTERY



ANGIOGRAM: CELIAC TRUNK

Catheter inserted via femoral artery advancing toward branch of hepatic artery feeding tumor

Images from BIDMC PACS

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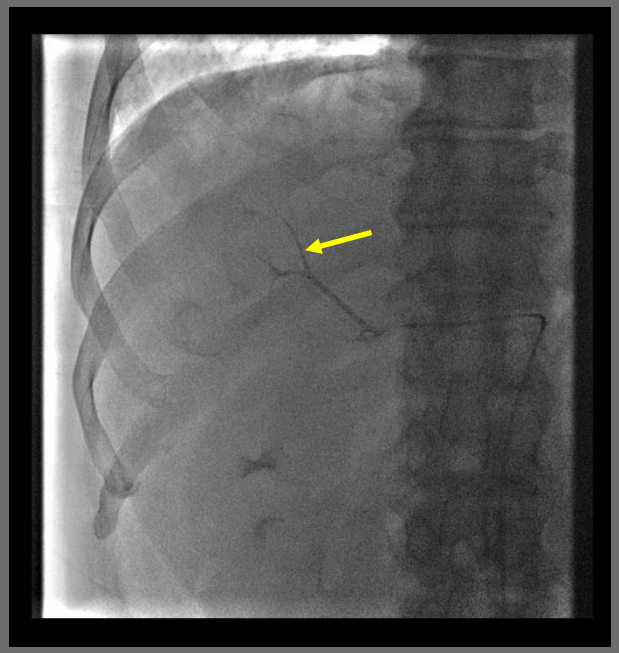
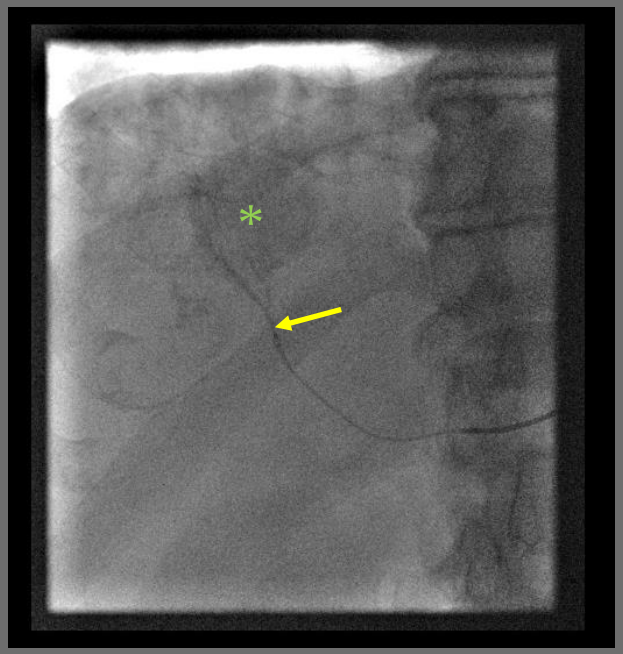
Our Patient: TACE Positioning



ANGIOGRAM: HEPATIC ARTERY



ANGIOGRAM: TUMOR

Catheter advanced into branch of hepatic artery feeding tumor to deposit microspheres

Images from BIDMC PACS

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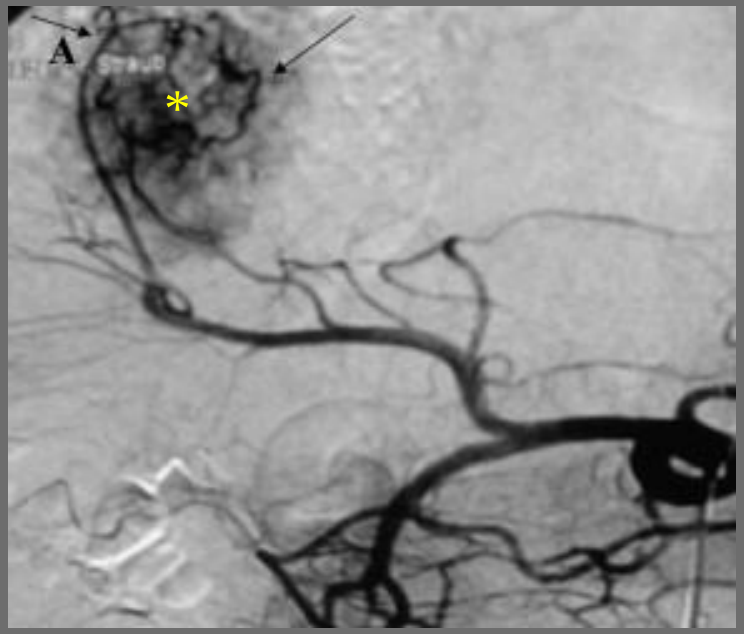
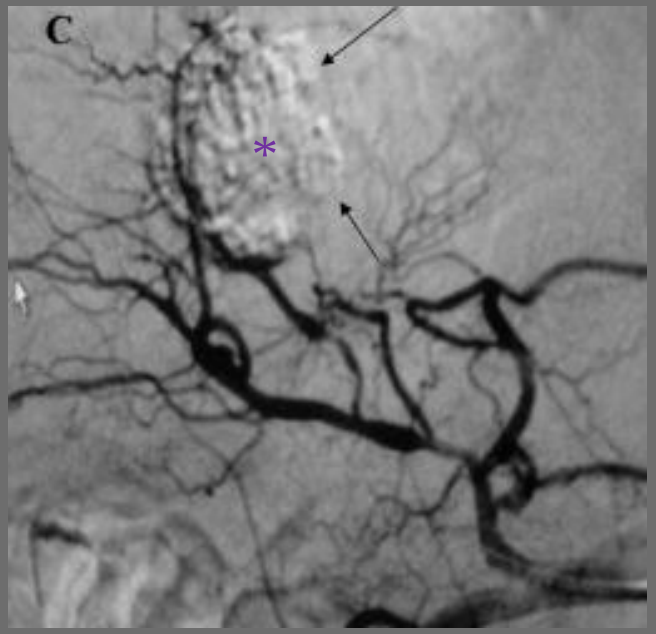
Companion Patient: TACE



ANGIOGRAM: HEPATIC ARTERIES



ANGIOGRAM: HEPATIC ARTERIES

Tumor enhances before but not after successful embolization of feeding arteries

Images from Vogl TJ et al.

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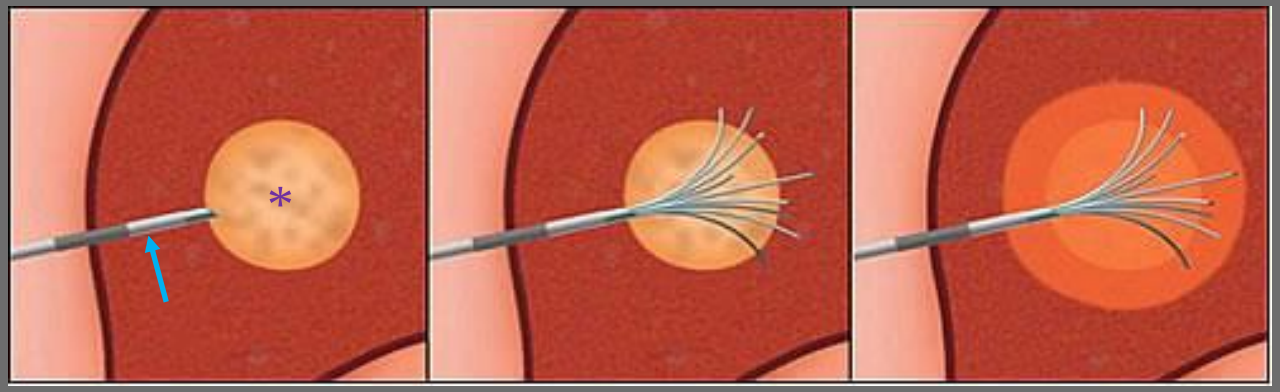
Radiofrequency Ablation: Overview



From Vascular and Interventional Physicians, Spectrum Medical Group. On http://www.mainevascular.com/site/cancer.htm.

- Insert probe into liver percutaneously
- Destroy tumor, margin, and insertion path with heat produced by A/C current
- Major complications seen in ~3%

Data from Rhim H.

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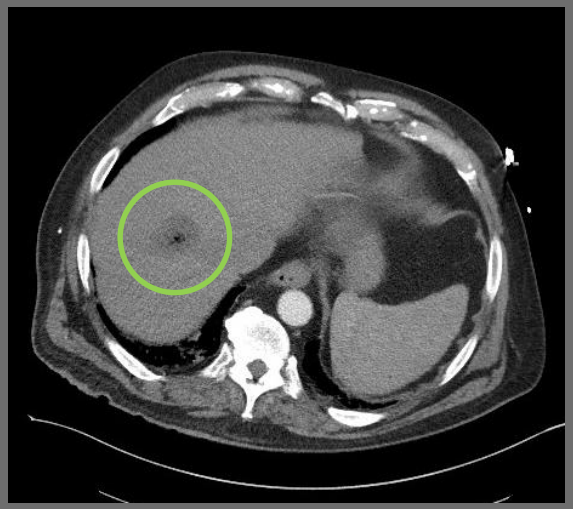
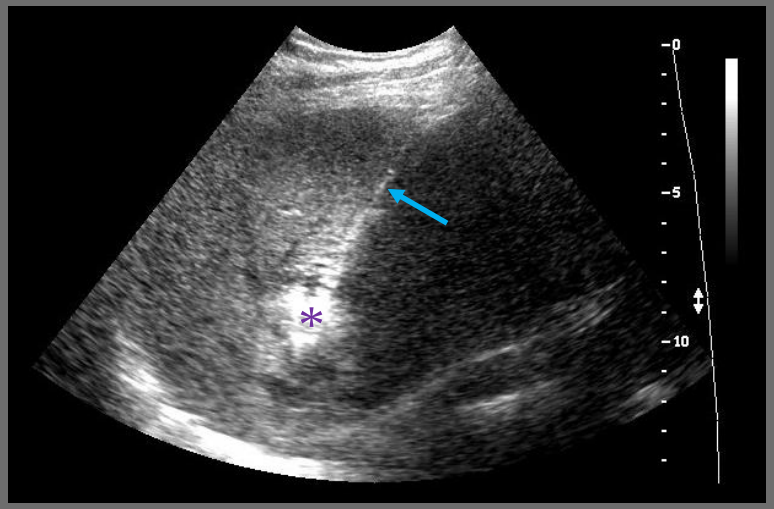
Our Patient: RF Ablation



AXIAL C+ ABDOMINAL CT



ULTRASOUND LIVER

Probe inserted into tumor under ultrasound guidance following preliminary CT showing tumor with central air from successful TACE

Images from BIDMC PACS

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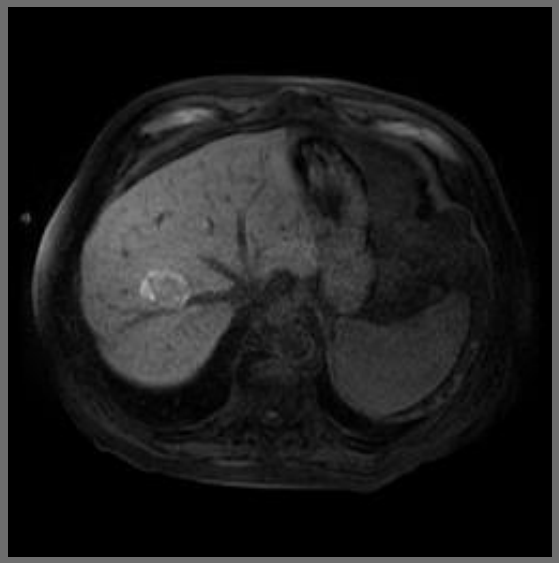
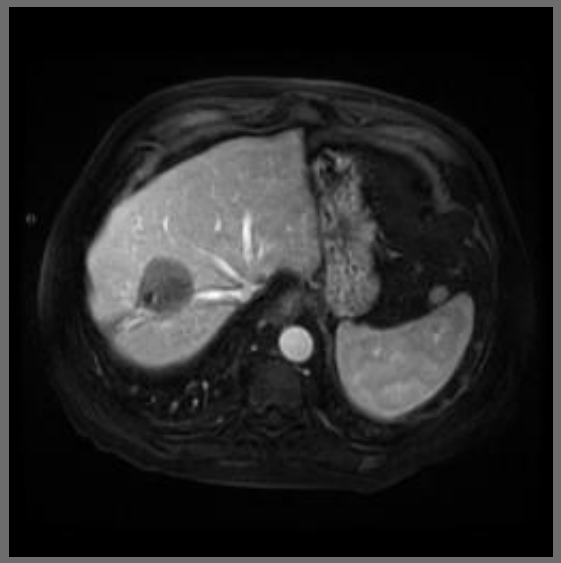
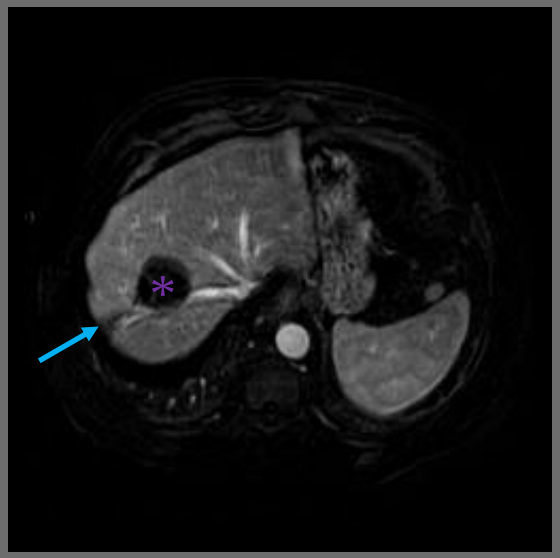
Our Patient: One Month Post



AXIAL MRI PRE-CONTRAST



AXIAL MRI POST-CONTRAST



AXIAL MRI SUBTRACTION

Follow-up MRI shows no contrast enhancement at site of tumor or path of insertion of RFA probe—this indicates successful treatment

Images from BIDMC PACS

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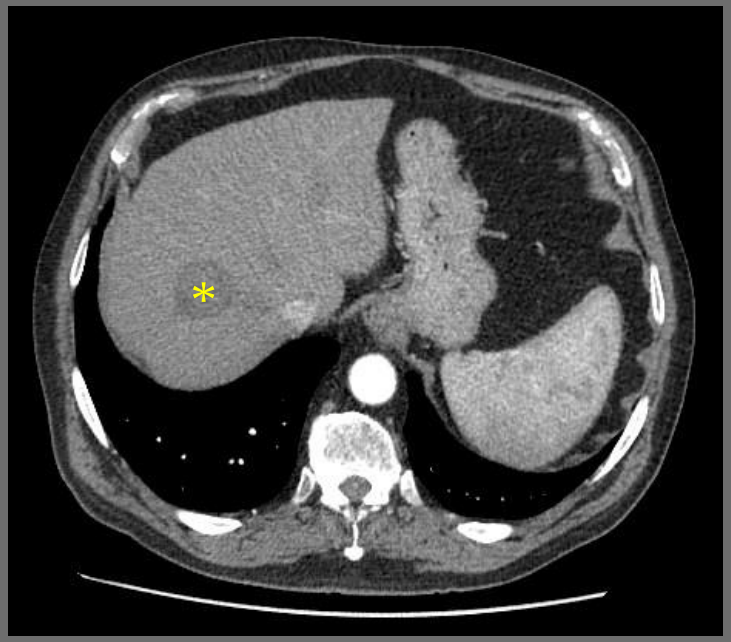
Our Patient: Three Months Post



AXIAL C+ ABDOMINAL CT: ARTERIAL

AXIAL C+ ABDOMINAL CT: PORTAL

No enhancement of treatment site in the arterial phase and no enhancement in the portal phase

Images from BIDMC PACS

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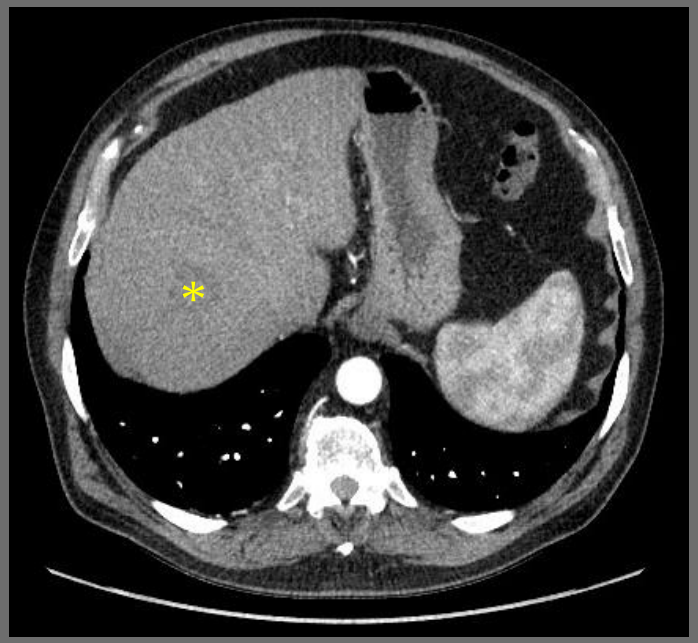
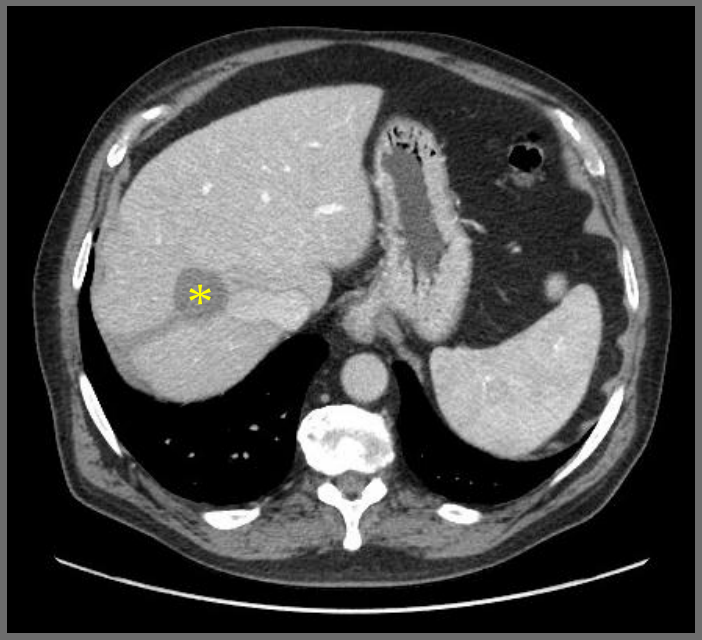
Our Patient: One Year Post



AXIAL C+ ABDOMINAL CT: ARTERIAL



AXIAL C+ ABDOMINAL CT: PORTAL

Site of treatment remains stable with no enhancement and hence no evidence of HCC

Images from BIDMC PACS

Our Patient: Outcome

- Patient tolerated treatment with no side effects or complications
- Imaging shows no evidence of missed, recurrent, or new HCC at one year
- Patient is in good health—status on transplant list consequently made inactive only to be made active if patient falls ill

TACE: Known Efficacy

- Overall survival at 2 years is higher after TACE (63%) than after conservative treatment (27%) for unresectable HCC (N=112)
- Overall survival after TACE is 26% at 5 years (N=8510)
- Transplant dropout rate potentially lower with TACE (3-9%) than without (25-38%)

Data from Llovet JM et al., Vogl TJ et al., Pompili M et al., Lau WY et al.

RFA: Known Efficacy

- Transplant dropout rate is lower with RFA (6-14%) than without (25-38%)
- Overall survival after RFA is statistically equal to overall survival after resection for tumors less than 3 cm (58-74% at 5 years)
- RFA is consequently challenging resection as treatment for tumors less than 3 cm

Data from Lau WY et al.

TACE with RFA: Known Efficacy

- Overall survival at 5 years is higher after TACE with RFA (44%) than after TACE alone (20%) for recurrent HCC (N=103)
- Recurrence rate is lower after TACE with RFA (21%) than after both TACE alone (57%) and RFA alone (43%) (N=103)
- Quality of life scores are higher after TACE with RFA than after TACE alone (N=83)

Data from Yang W et al., Wang YB et al.

Summary

- Our patient has responded well to treatment
- ACR recommends TACE with RFA for solitary HCC tumors of 5 cm if transplant and resection are not possible
- TACE delivers chemotherapy and blocks blood supply to tumor
- RFA destroys tumor with heat
- TACE and RFA are promising treatments

Acknowledgements

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- Quang Nguyen, MD
- Joseph Singer

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