Year in Review
HCC and Liver Metastatic Disease

The Evolving Role of Hepatic Ablation

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October 22, 2021 – 11:25- 11:30 am

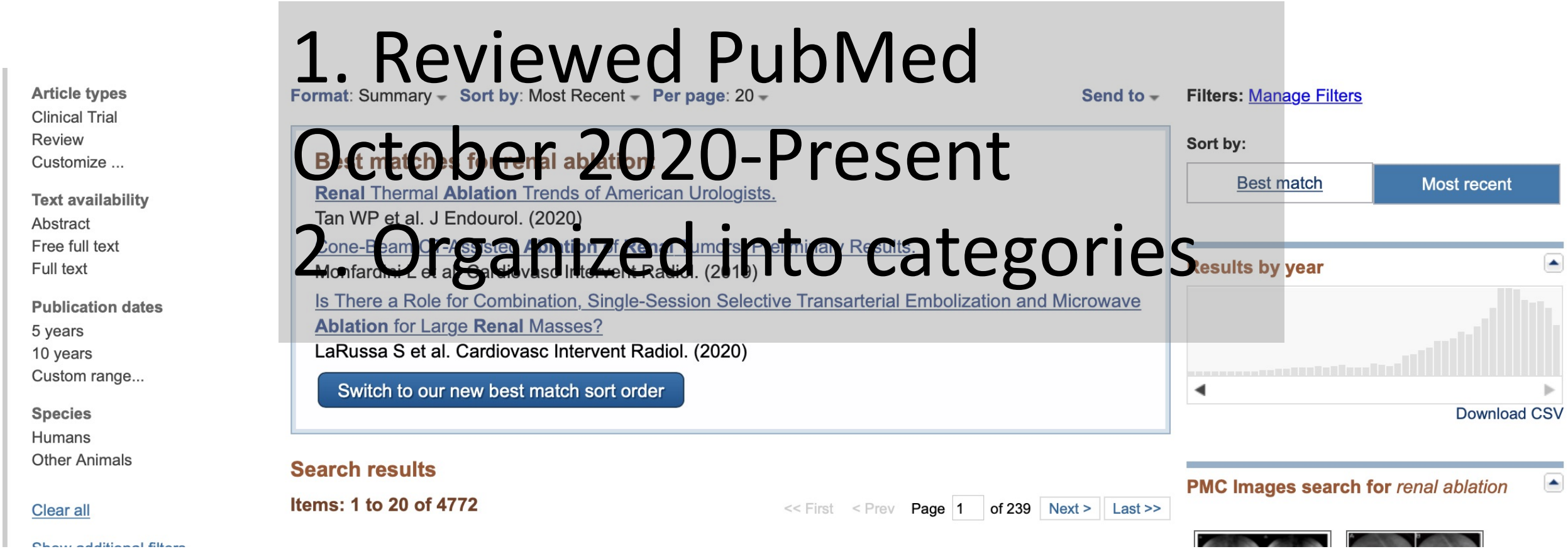
Disclosures

- Boston Scientific - Consultant
- Philips Healthcare - Consultant
- ACR Innovation Grant – Grant Recipient
- Case Western- Collaborator

Brand names are included in this presentation for participant clarification purposes only. No product promotion should be inferred.

Methods

1. Reviewed PubMed October 2020-Present
2. Organized into categories



Talk Summary- Cliff Notes

- Techniques to improve ablation outcomes for HCC
- Expansion of ablation for treatment of metastatic liver disease
- New tools/techniques in ablation

Improving Ablation Outcomes for HCC

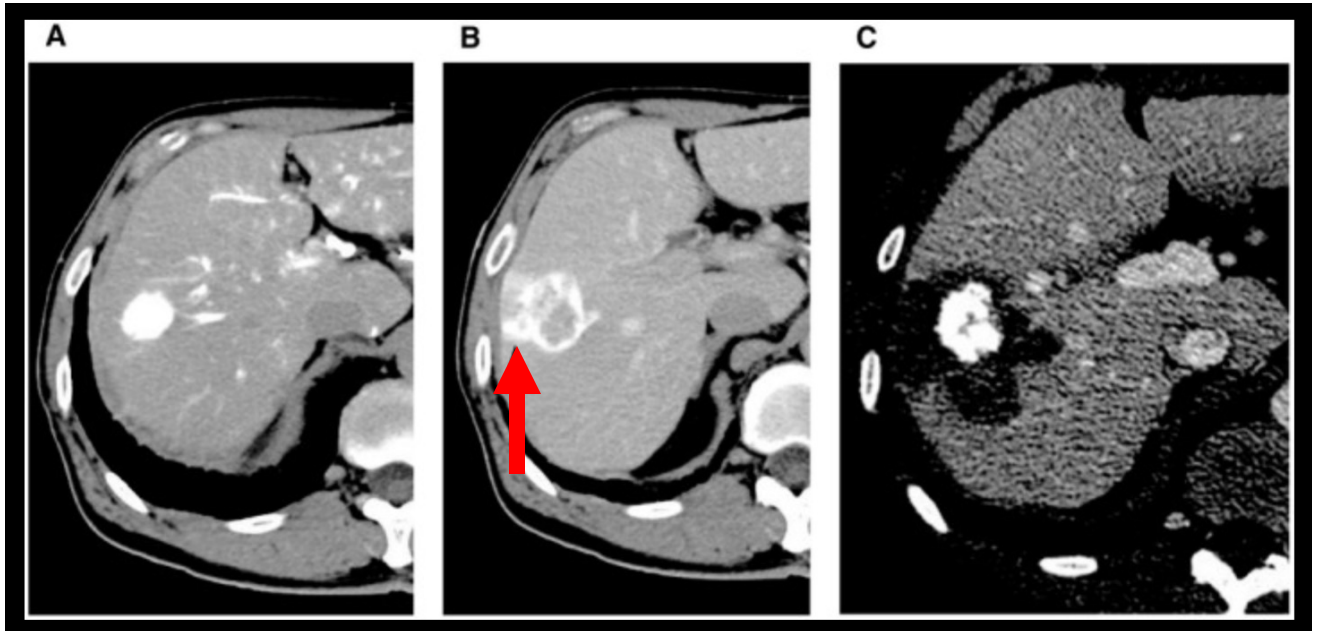
Radiofrequency Ablation Covering the Entire Tumor Blood Drainage Area Improves Survival in Hepatocellular Carcinoma

Masashi Hirooka [1], Yohei Koizumi [1], Takaaki Tanaka [1], Kotarou Sunago [1], Yoshiko Nakamura [1], Takao Watanabe [1], Osamu Yoshida [1], Yoshio Tokumoto [1], Masanori Abe [1], Yoichi Hiasa [1]

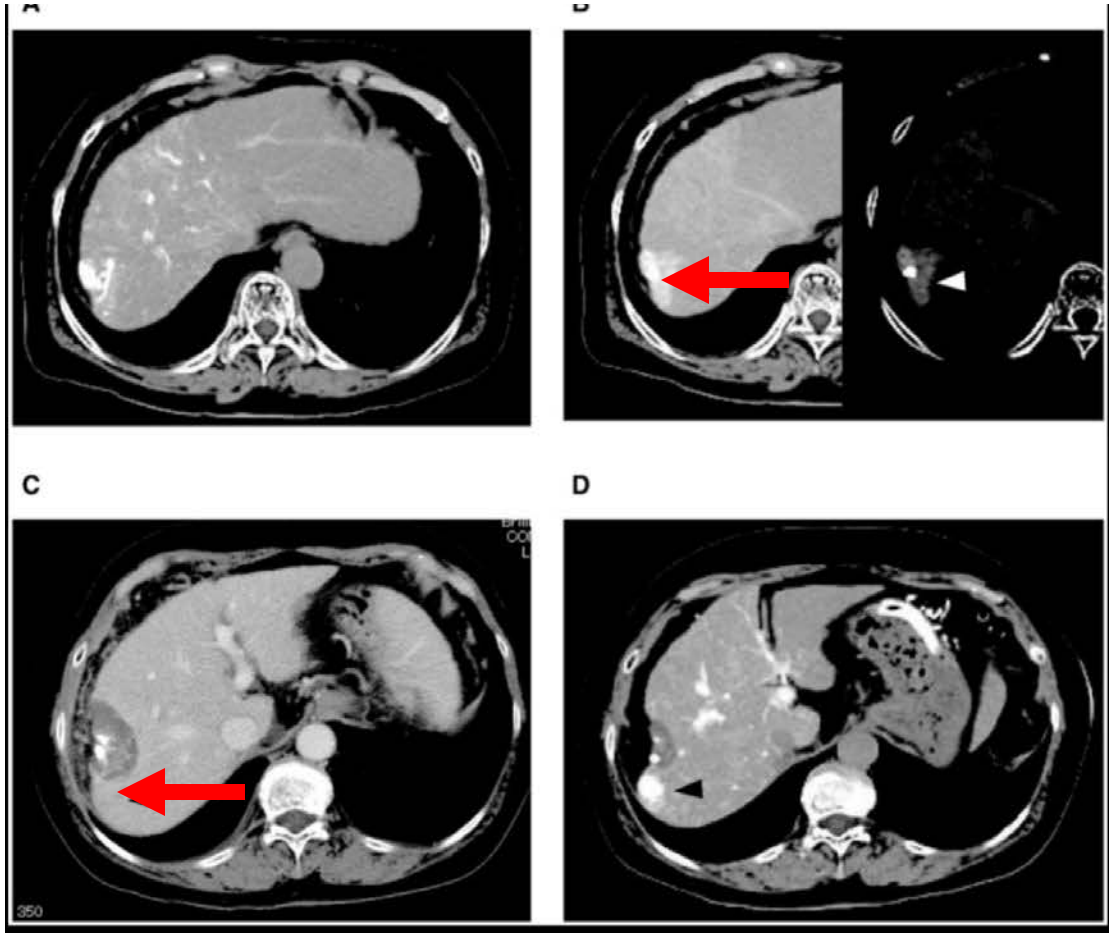
- 526 patients who underwent computed tomography during hepatic arteriography from April 2001 to May 2019
- Investigate whether RFA completely covering the blood drainage area can improve the overall and disease-free survival.
- Patients were categorized into a covered group or noncovered group.

Hirooka M, et al. *Hepatol Commun*. 2021;5(7):1300-1309.

Covered Group



Non-Covered Group



Overall survival rates were significantly higher in the covered group than in the noncovered group (hazard ratio, 0.63; 95% confidence interval, 0.48-0.84; *P* = 0.002)

Hirooka M, et al. *Hepatol Commun*. 2021;5(7):1300-1309.

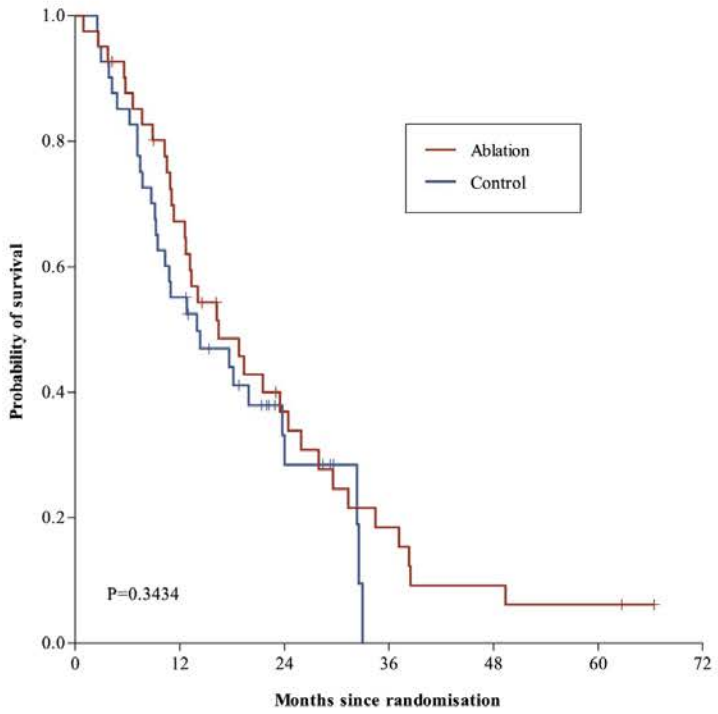
Percutaneous ablation for locally advanced hepatocellular carcinoma with tumor portal invasion

Lorraine Blaise [1], Helena Pereira [2], Valérie Vilgrain [3], Olivier Sutter [4], Elia Gigante [1], Aurélie Walter [1], Nathalie Ganne-Carrié [5], Pierre Nahon [5], Mohamed Bouattour [6], Marco Dioguardi Burgio [3], Véronique Grando [1], Gisèle Nkontchou [1], Olivier Seror [7], Jean-Charles Nault [8]

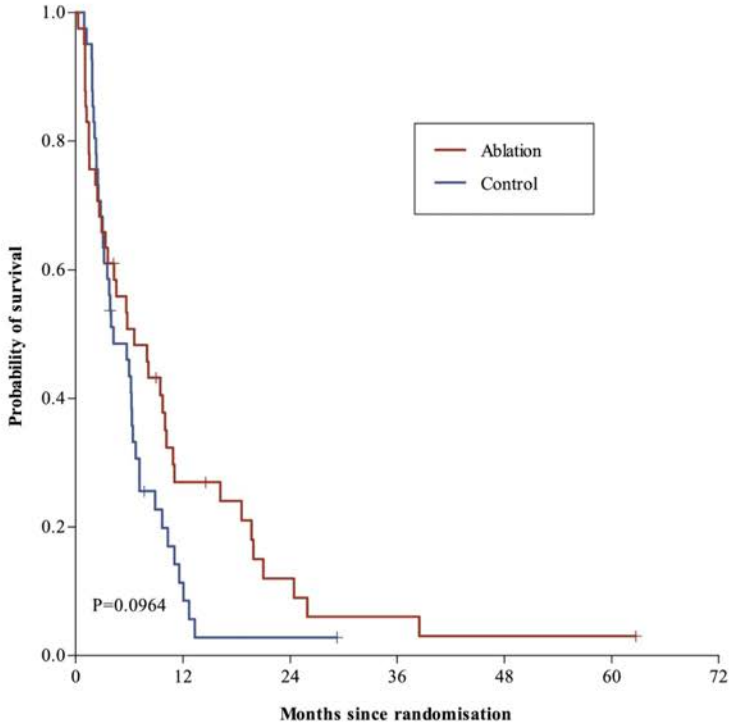
- 272 patients with HCC and tumor portal invasion treated by ablation (n = 44) compared to a control group treated with sorafenib (n = 123) or TARE (n = 105)
- Assess outcomes of ablation of locally advanced HCC with portal vein invasion compared to sorafenib or trans-arterial radioembolization (TARE).

Blaise L, et al. *Clin Res Hepatol Gastroenterol*. 2021;45(6):101731.

A. Overall survival



B. Progression-free survival



Overall survival (16.4 months in ablation group vs 14 months in the control group) was similar between the treatments

Progression-free survival (6.6 months in ablation group vs 4.2 in the control group) was similar between the treatments

Blaise L, et al. *Clin Res Hepatol Gastroenterol*. 2021;45(6):101731.

Radiofrequency Ablation of Liver Tumors: No Difference in the Ablation Zone Volume Between Cirrhotic and Healthy Liver

Christophe Cassinotto [1], Alban Denys [2], Frédérique Gay [3], Rafael Duran [3], Arnaud Hocquelet [3], Lauranne Piron [1], Boris Guiu [1]

- ”Oven effect" theory assumes that RFA would be more efficient on tumors of cirrhotic livers.
- Compare the size and volume of the ablation zone following RFA on tumors of cirrhotic versus healthy livers.
- 140 liver tumors: - 83 - "cirrhosis group" and 57 tumors - "healthy liver group"
- No differences in the size or volume of the ablation zone were found between groups at FU0 (end of procedure) FU1 (1.6 months), or FU2 (4.7 months).

Cassinotto C, et al. *Cardiovasc Intervent Radiol*. 2018;41(6):905-911.

Ablation for Non-HCC/Liver Metastasis

› Ann Hepatobiliary Pancreat Surg. 2021 Aug 31;25(3):366-370.
doi: 10.14701/ahbps.2021.25.3.366.

Microwave ablation of colorectal liver metastases: Impact of a 10-mm safety margin on local recurrence in a tertiary care hospital

Fabio Ausania [1], Alex Borin [2], Reyes Melendez [1], Paula Senra Del Rio [1], Alfonso Iglesias [3], Pilar Bodenlle [3], Marta Paniagua [1], Mercedes Arias [3]

Affiliations + expand

PMID: 34402437 DOI: 10.14701/ahbps.2021.25.3.366

Ausania F, et al. *Ann Hepatobiliary Pancreat Surg*. 2021;25(3):366-370.

› BJS Open. 2021 Jul 6;5(4):zrab060. doi: 10.1093/bjsopen/zrab060.

Liver resection and ablation for squamous cell carcinoma liver metastases

J Engstrand [1], L F Abreu de Carvalho [2], D Aghayan [3 4], A Balakrishnan [5], A Belli [6], B Björnsson [7], B V M Dasari [8], O Detry [9], M Di Martino [10], B Edwin [3], J Erdmann [11], R Fristedt [12], G Fusai [13], T Gimenez-Maurel [14], O Hemmingsson [15], C Hidalgo Salinas [13], B Isaksson [16], A Ivanecz [17], F Izzo [6], W T Knoefel [18], P Kron [19], N Lehwald-Tywuschik [18], M Lesurtel [20], J P A Lodge [19], N Machairas [21], M V Marino [22 23], V Martin [20], A Paterson [5], J Rystedt [12], P Sandström [7], A Serrablo [14], A K Siriwardena [24], H Taflin [25], T M van Gulik [11], S Yaqub [26], I Özden [27], J M Ramia [28], C Sturesson [29], E-AHPBA Scientific and Research Committee

Engstrand J, et al. *BJS Open*. 2021;5(4):zrab060.

› BJS Open. 2021 Jul 6;5(4):zrab062. doi: 10.1093/bjsopen/zrab062.

Long-term outcome after resection and thermal hepatic ablation of pancreatic neuroendocrine tumour liver metastases

J Kjaer [1], P Stålberg [1], J Crona [2], S Welin [2], P Hellman [1], A Thornell [3], O Norlen [1]

Affiliations + expand

PMID: 34291287 PMCID: PMC8295313 DOI: 10.1093/bjsopen/zrab062
Free PMC article

Kjaer J, et al. *BJS Open.* 2021;5(4):zrab062.

Review > Cancers (Basel). 2021 Jul 2;13(13):3336. doi: 10.3390/cancers13133336.

Locoregional Treatments in Cholangiocarcinoma and Combined Hepatocellular Cholangiocarcinoma

Matteo Renzulli [1], Daryl Ramai [2], Jameel Singh [3], Samridhi Sinha [2], Nicolò Brandi [1], Anna Maria Ierardi [4], Elisa Albertini [5], Rodolfo Sacco [6], Antonio Facciorusso [6], Rita Golfieri [1]

- The largest retrospective study consisting of 107 patients with primary or recurrent iCCA who underwent MWA found an OS at 1, 3, and 5 years of 93.5%, 39.6%, and 7.9%, respectively.
- Another paper reported a 60% survival at 1 and 2 years in 15 patients following MWA for iCCA
- 21 patients with iCCA treated with IRE found a reduction in tumor size

Renzulli M, et al. *Cancers (Basel).* 2021;13(13):3336.

Evolution in Techniques/Tools

> Radiology. 2021 Jul 13;203410. doi: 10.1148/radiol.2021203410. Online ahead of print.

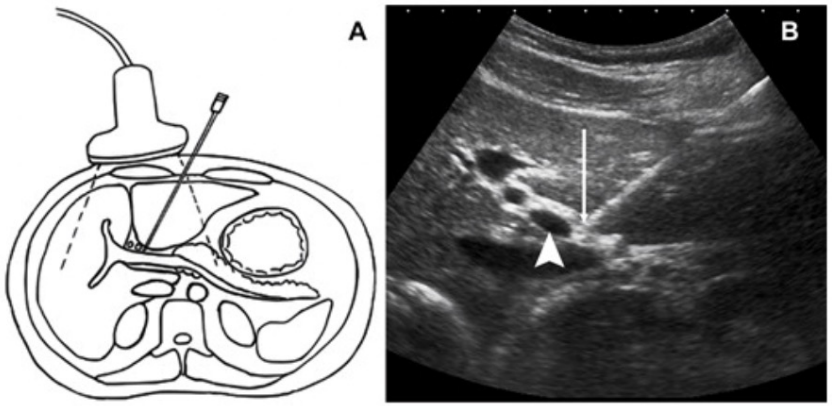
Hepatic Hilar Nerve Block for Hepatic Interventions: Anatomy, Technique, and Initial Clinical Experience in Thermal Ablation of Liver Tumors

Kevin S He [1], Rukshan Fernando [1], Tatiana Cabrera [1], David Valenti [1], Abdulaziz Algharras [1], Nicolás Martínez [1], David M Liu [1], Geoffroy Noel [1], Karl Muchantef [1], Ali Bessissow [1], Louis-Martin Boucher [1]

- Transhepatic placement of a needle adjacent to the main portal vein, under US guidance
- 12 patients who received the nerve block were compared with a control group regarding complications, safety, pain scores, and intraoperative opioid requirement.
- Participants who received the nerve block had a lower mean visual analog scale score for pain than the control group (3.9 ± 2.4 vs 7.0 ± 2.8, respectively; *P* = .01) and decreased need for intraprocedural fentanyl.

He KS, et al. *Radiology*. 2021;203410.

Hepatic Hilar Nerve Block for Hepatic Interventions: Anatomy, Technique, and Initial Clinical Experience in Thermal Ablation of Liver Tumors



(A) Conceptual drawing of the subcostal trans–left hepatic approach used to perform the HHNB. **(B)** In vivo US guidance of HHNB following the subcostal trans–left hepatic approach with needle entering from the top right of the picture to the hepatic hilum (arrow, needle tip; arrowhead, main portal vein).

- In cadaveric studies, the presence of methylene blue in the hepatic hilar perivascular space confirmed successful targeting of the hepatic nerves.
- Hepatic hilar nerve block (HHNB) with bupivacaine performed in 12 participants before liver thermal ablation demonstrated no major complications and was associated with less perceived pain and decreased need for intraprocedural fentanyl compared with findings in the control group (mean visual analog scale score for pain, 3.9 ± 2.4 vs 7.0 ± 2.8, respectively [*P* = .01]; mean dose of fentanyl, 152 µg ± 78.0 vs 235.4 µg ± 58.2 [*P* = .01]).

He K et al. Published Online: July 13, 2021
https://doi.org/10.1148/radiol.2021203410

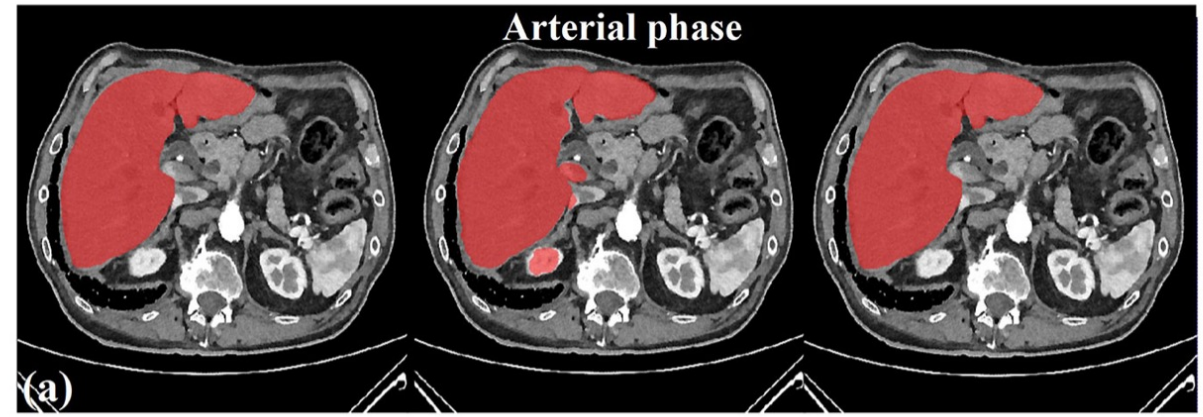
Radiology

He KS, et al. *Radiology*. 2021;203410.

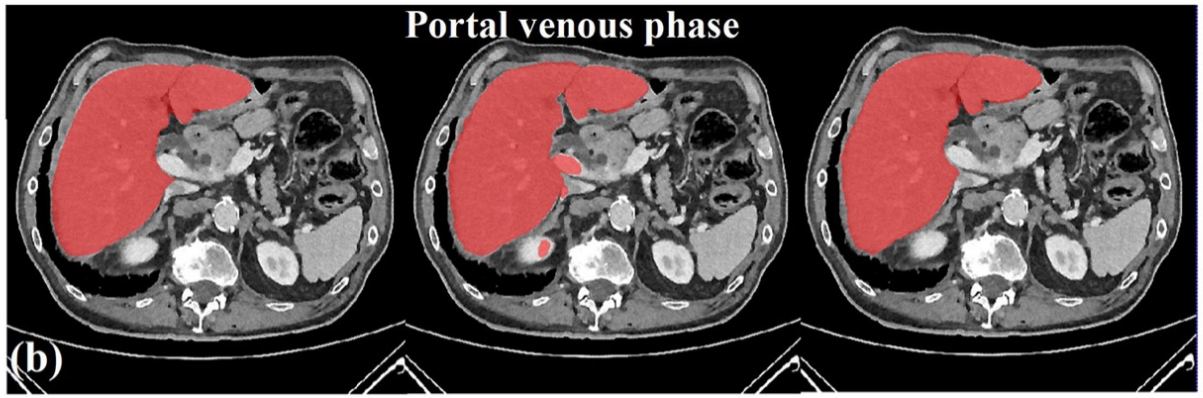
Advanced Deep Learning Approach to Automatically Segment Malignant Tumors and Ablation Zone in the Liver With Contrast-Enhanced CT

Kan He [1], Xiaoming Liu [2], Rahil Shahzad [3 4], Robert Reimer [4], Frank Thiele [3 4], Julius Niehoff [4], Christian Wybranski [4], Alexander C Bunck [4], Huimao Zhang [1], Michael Perkuhn [3 4]

He K, et al. *Front Oncol*. 2021 Jul;11:669437.

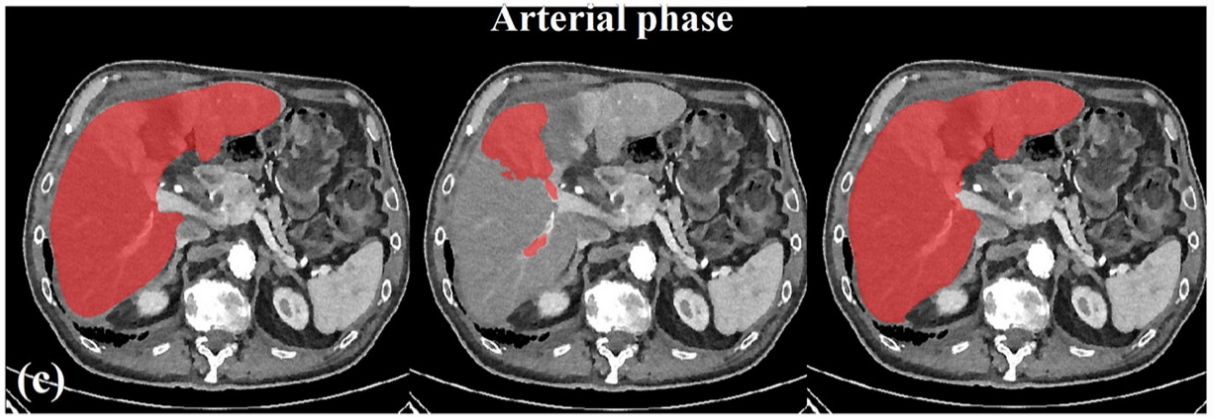


Ground Truth | Base model | Transfer-learning model

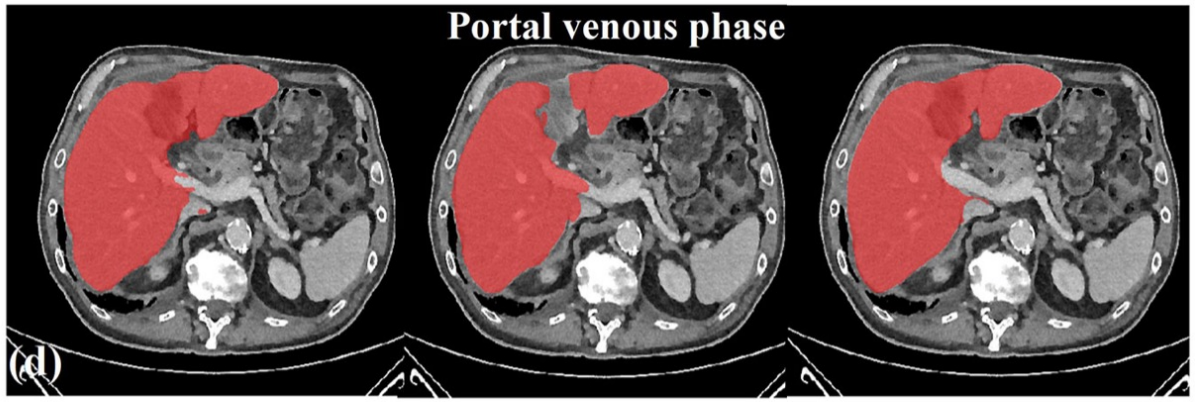


Ground Truth | Base model | Transfer-learning model

Pre-ablation



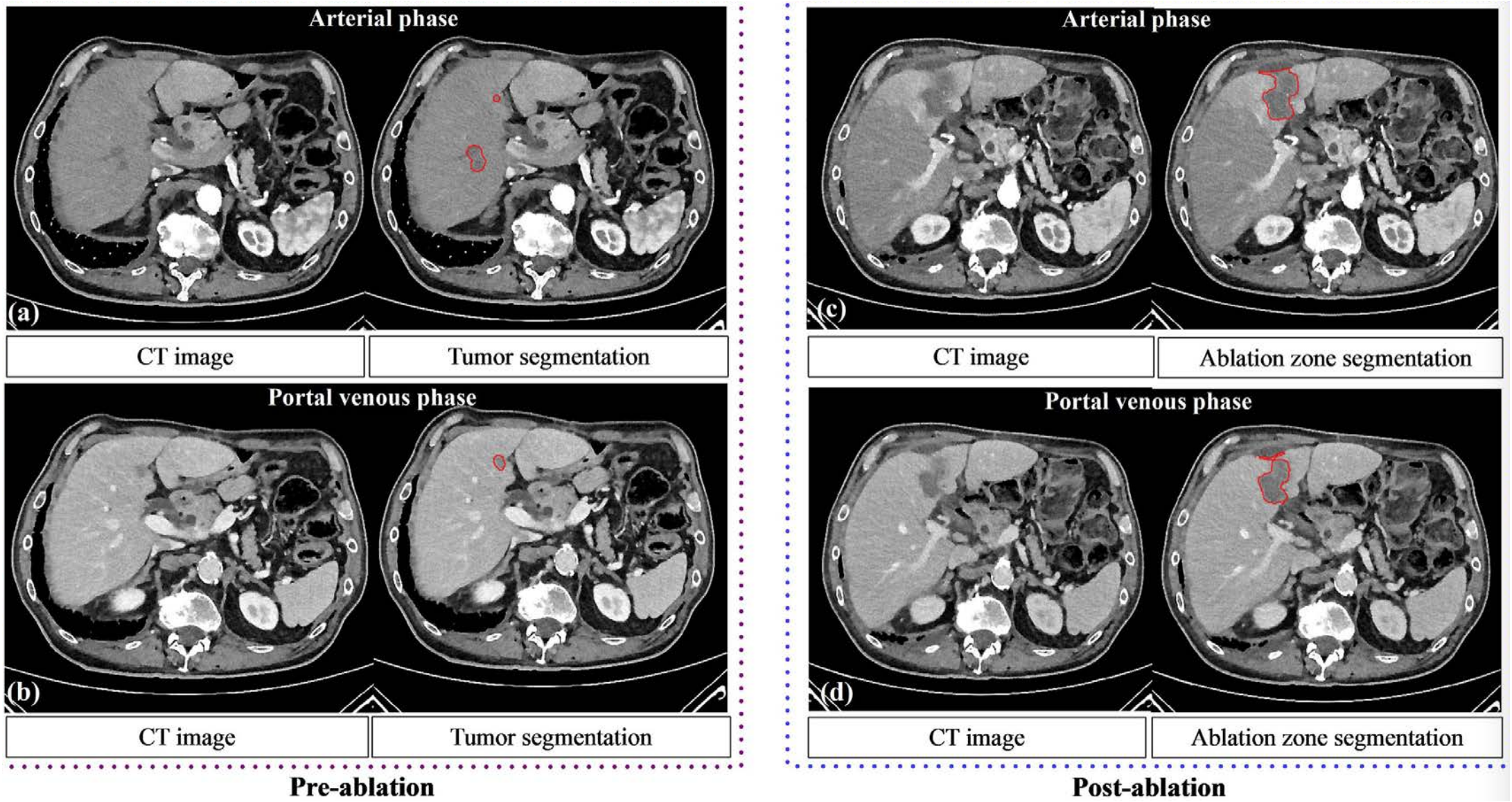
Ground Truth | Base model | Transfer-learning model



Ground Truth | Base model | Transfer-learning model

Post-ablation

He K, et al. *Front Oncol*. 2021 Jul;11:669437.



He K, et al. *Front Oncol*. 2021 Jul;11:669437.

Role of circulating microRNAs to predict hepatocellular carcinoma recurrence in patients treated with radiofrequency ablation or surgery

Matteo Canale [1], Francesco Giuseppe Foschi [2], Pietro Andreone [3], Giorgio Ercolani [4], Giorgia Marisi [1], Fabio Conti [2], Ranka Vukotic [5], Valeria Guarneri [5], Valentina Burgio [6], Francesca Ratti [7], Luca Aldrighetti [8], Francesco De Cobelli [9], Stefano Cascinu [10], Paola Ulivi [1], Andrea Casadei-Gardini [11]

- Customized a panel of 21 miRNAs correlated with relapse and prognosis after local curative treatment of HCC
- Expression levels of let-7c predict tumor relapse after RFA.
- Also investigated the same panel in a small cohort of HCC patients undergoing surgery, finding no statistically significance in predicting tumor relapse or survival

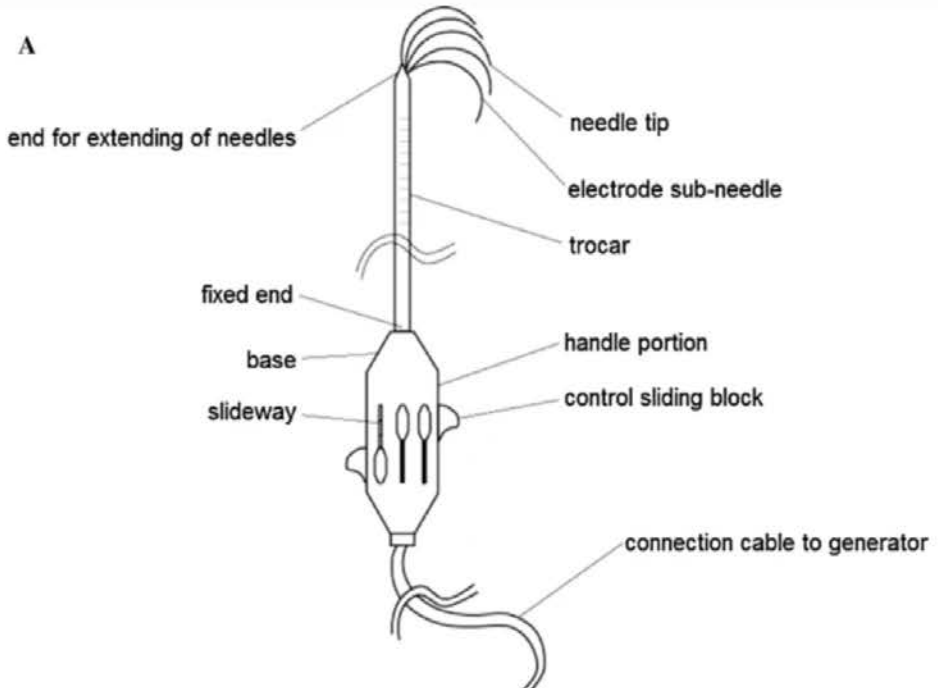
Canale M, et al. *HPB (Oxford)*. 2021;S1365-182X(21)00603-1.

Cardiovasc Intervent Radiol. 2019 Jun;42(6):893-904. doi: 10.1007/s00270-019-02182-0. Epub 2019 Feb 13.

The Role of a Curved Electrode with Controllable Direction in the Radiofrequency Ablation of Liver Tumors Behind Large Vessels

An-Na Jiang [1], Song Wang [1], Wei Yang [2], Kun Zhao [1], Xiu-Mei Bai [1], Zhong-Yi Zhang [1], Wei Wu [1], Min-Hua Chen [1], Kun Yan [1]

Jiang AN, et al. *Cardiovasc Intervent Radiol*. 2019;42(6):893-904.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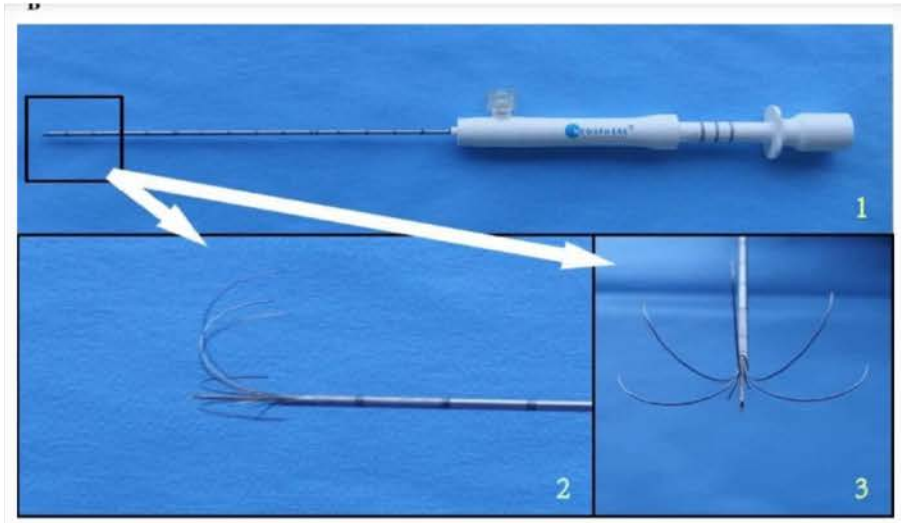
needle tip
electrode sub-needle
trocar
fixed end
handle portion
base
control sliding block
slideway
connection cable to generator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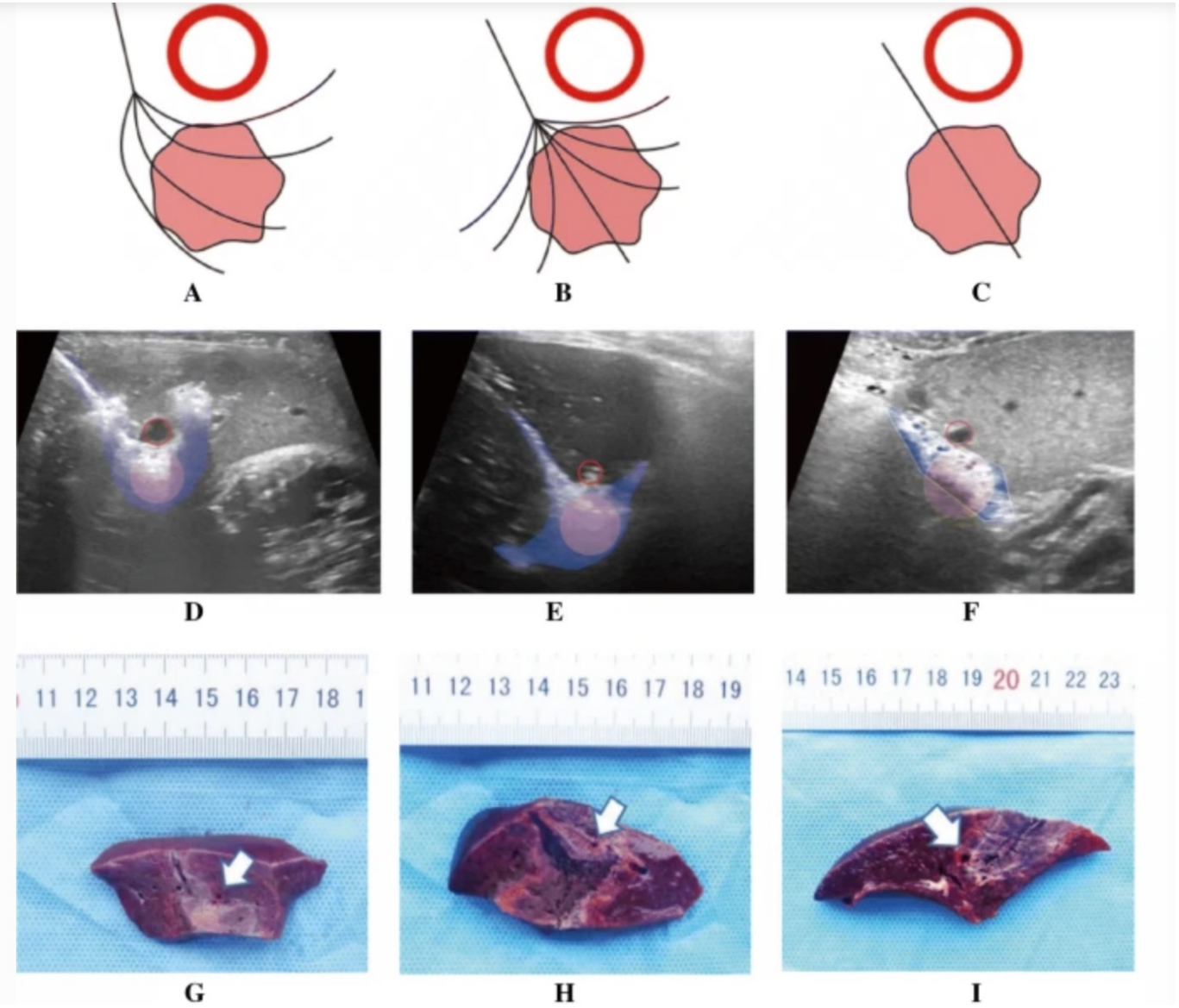
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> J Vasc Interv Radiol. 2020 Jul;31(7):1170-1177.e2. doi: 10.1016/j.jvir.2020.01.016.
Epub 2020 Mar 11.

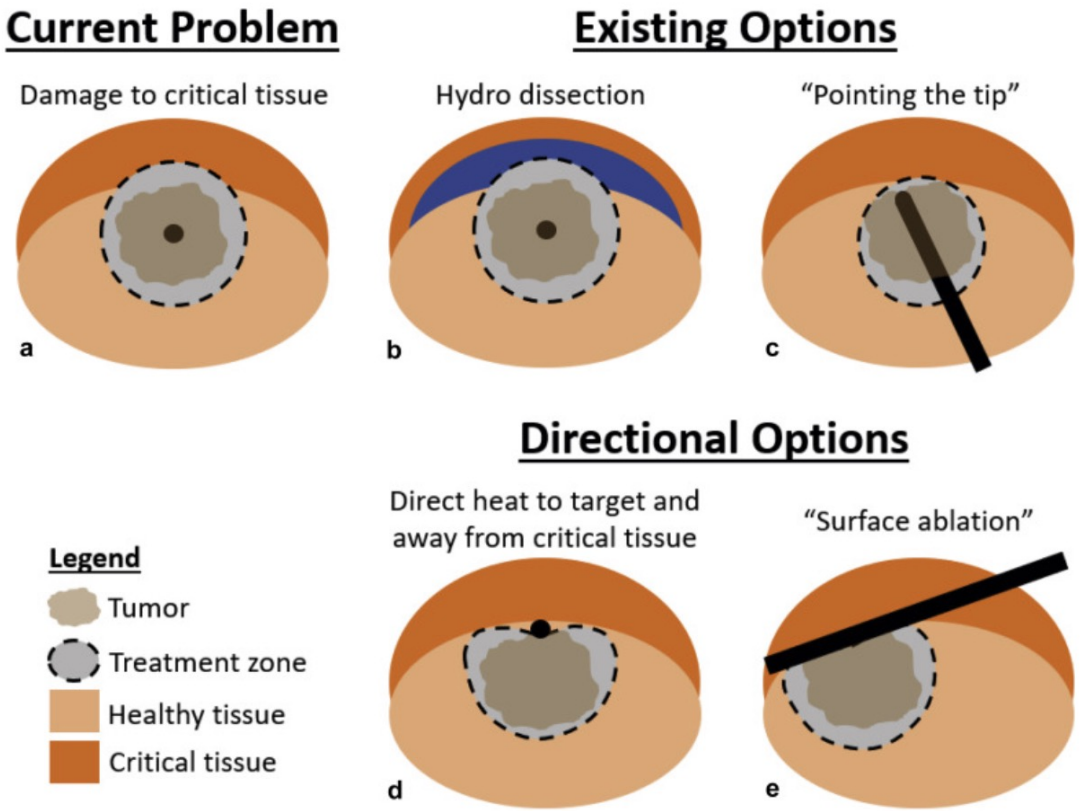
Directional Microwave Ablation: Experimental Evaluation of a 2.45-GHz Applicator in Ex Vivo and In Vivo Liver

Austin Pfannenstiel [1], Jan Sebek [2], Hojjatollah Fallahi [3], Warren L Beard [4], Charan K Ganta [5], Damian E Dupuy [6], Punit Prakash [7]

Affiliations + expand

PMID: 32171539 DOI: 10.1016/j.jvir.2020.01.016

Pfannenstiel A, et al. *J Vasc Interv Radiol.* 2020;31(7):1170-1177.e2. Epub 2020 Mar 11. Erratum in: *J Vasc Interv Radiol*. 2021;32(2):329. PMID: 32171539.



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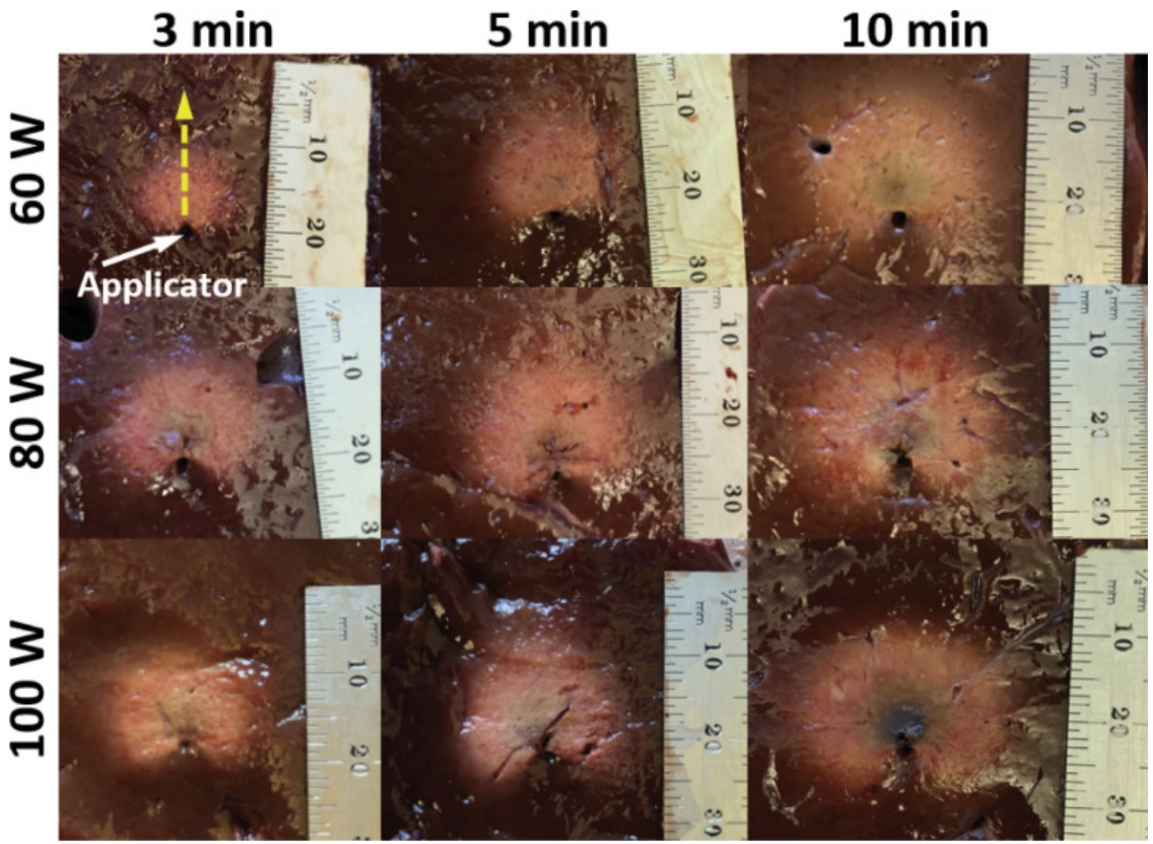

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Value of MRI/CT Image Fusion for Targeting "invisible" Lesions in Stereotactic Microwave Ablation (SMWA) of Malignant Liver Lesions: A Retrospective Analysis

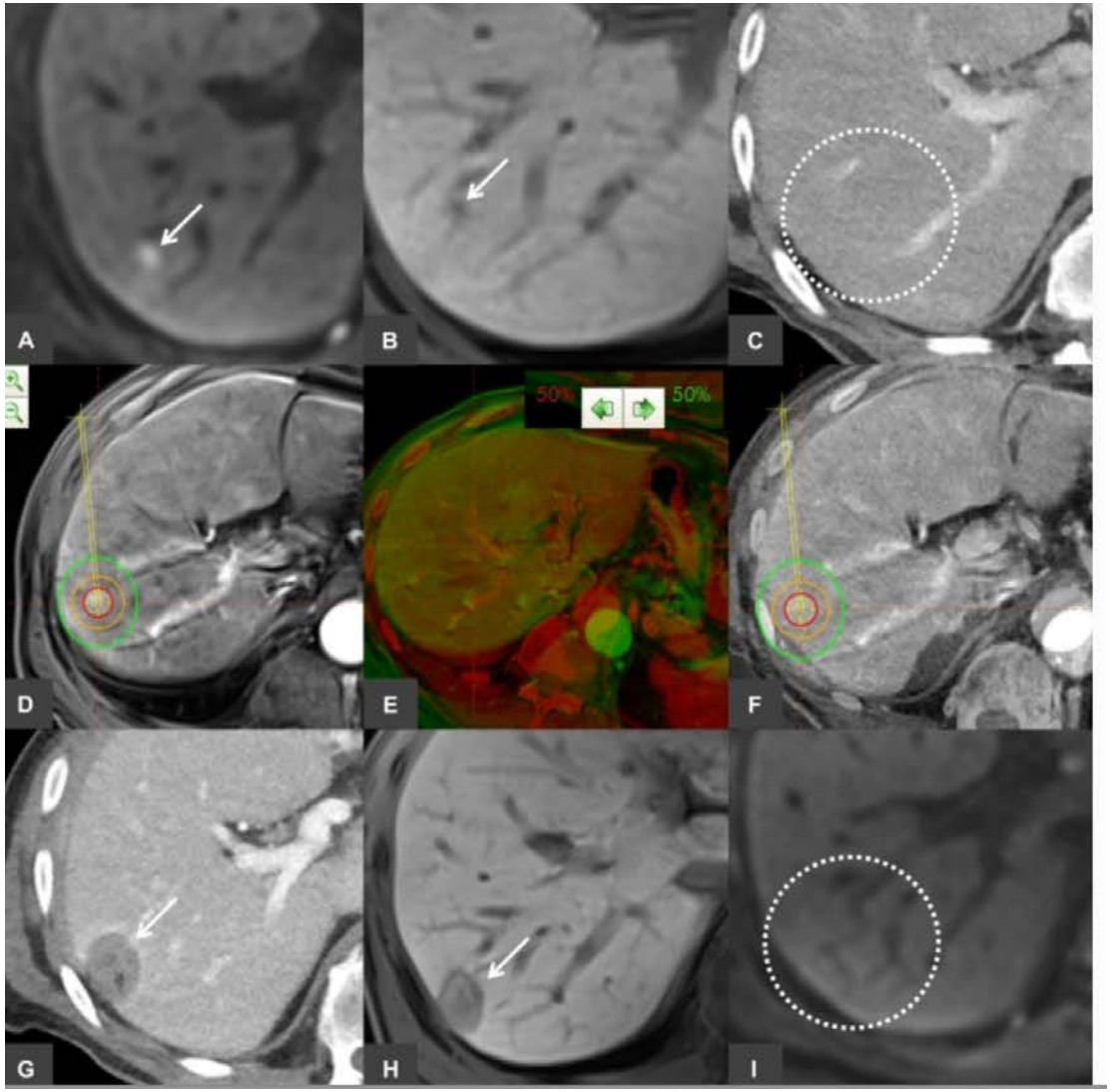
M Cathomas [1], N Mertineit [2], C Kim-Fuchs [1], A Lachenmayer [1], M H Maurer [3]

Affiliations + expand

PMID: 32642989 DOI: 10.1007/s00270-020-02565-8

- Twenty-four lesions in 15 patients (mean age, 62 years; range, 43–80 years) were included.
- Following MRI/CT image fusion, all 24 lesions could be sufficiently localized to perform SMWA.
- The first follow-up imaging showed complete ablation of 22 lesions.

Cathomas M, et al. *Cardiovasc Intervent Radiol*. 2020;43(10):1505-1514.



Cathomas M, et al. *Cardiovasc Intervent Radiol*. 2020;43(10):1505-1514.

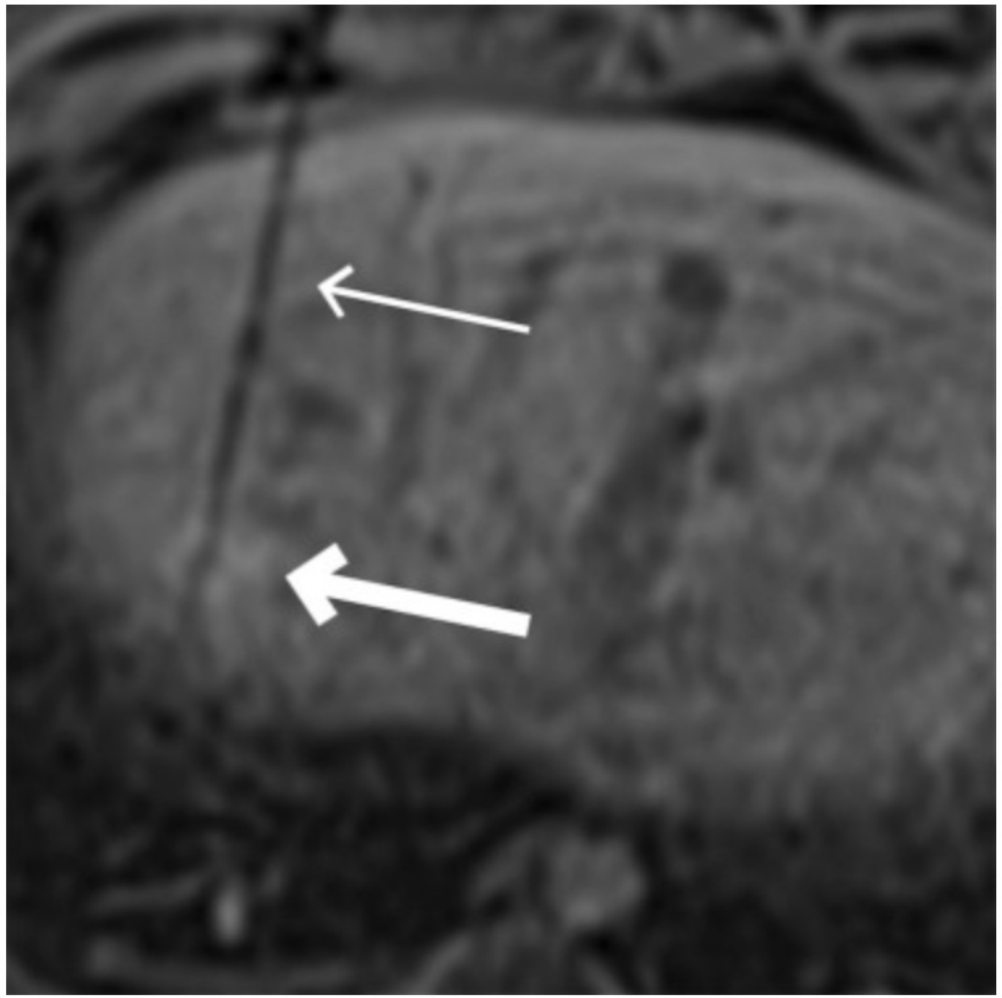
J Vasc Interv Radiol. 2020 Aug;31(8):1357-1364. doi: 10.1016/j.jvir.2020.01.010.
Epub 2020 May 23.

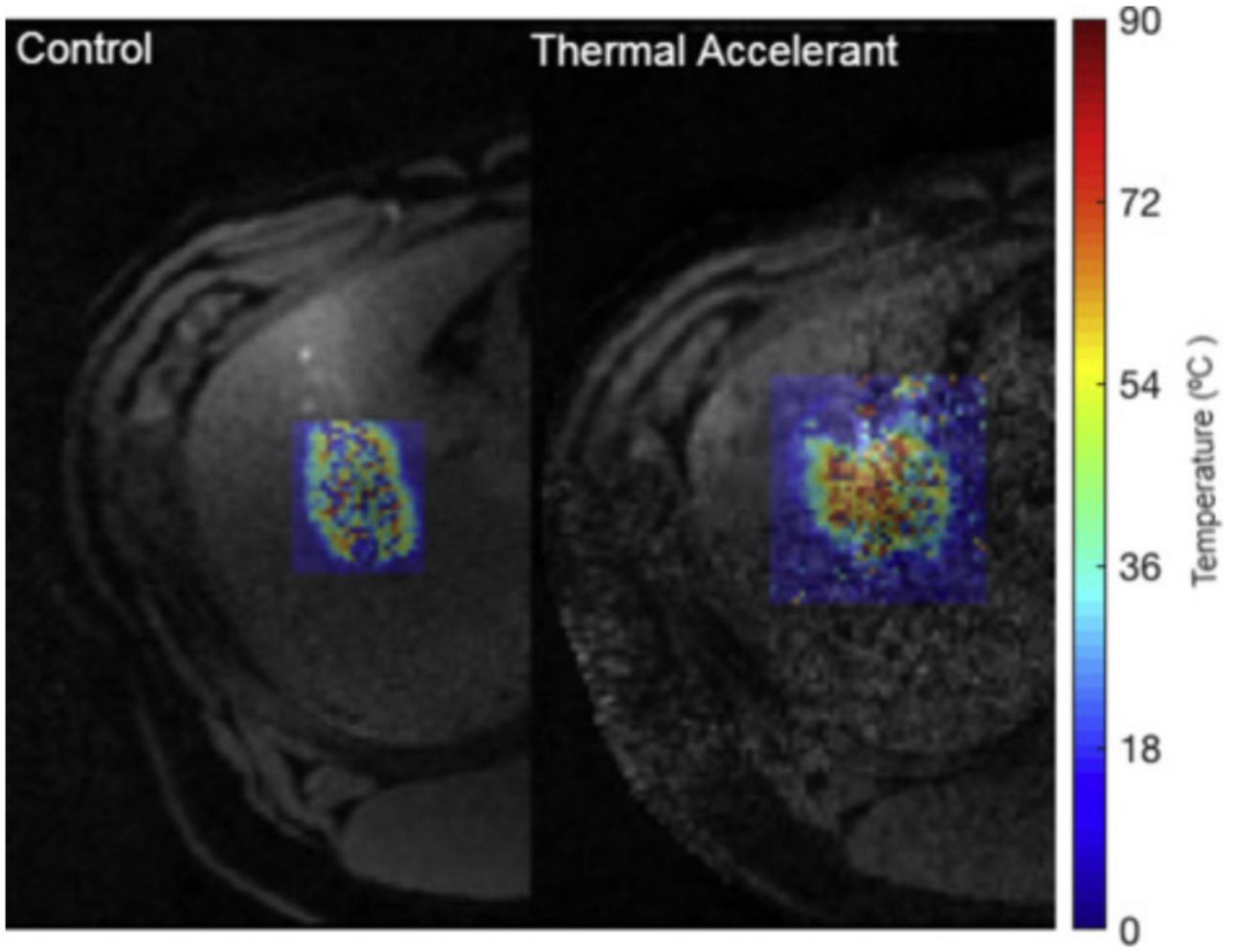
Adjuvant Thermal Accelerant Gel Use Increases Microwave Ablation Zone Temperature in Porcine Liver as Measured by MR Thermometry

Aaron W P Maxwell [1], William K C Park [2], Grayson L Baird [2], Edward G Walsh [2], Damian E Dupuy [2]

- Gel is a proprietary formulation (Theromics, Inc, West Bridgewater, Massachusetts) synthesized from fully biodegradable and biocompatible constituents.
- The gel viscosity allows for targeted delivery without migration from the site of administration.
- Is visible on MR imaging without the use of intravenous contrast medium.

Maxwell AWP, et al. *J Vasc Interv Radiol*. 2020;31(8):1357-1364.

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Thermal Accelerant
90
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Thank You