Renal Ablation: Year in Review

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Disclosures

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The following will be discussed for off-label use: VR/AR Equipment for IR training

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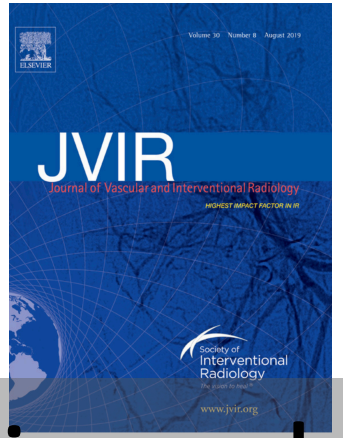
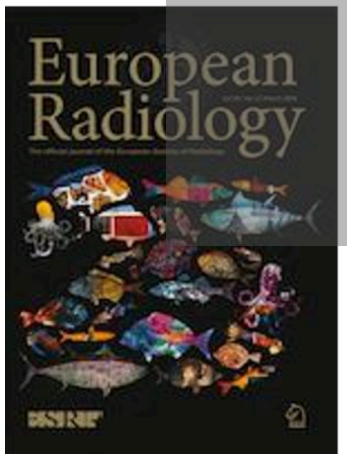
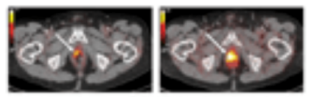
Methods

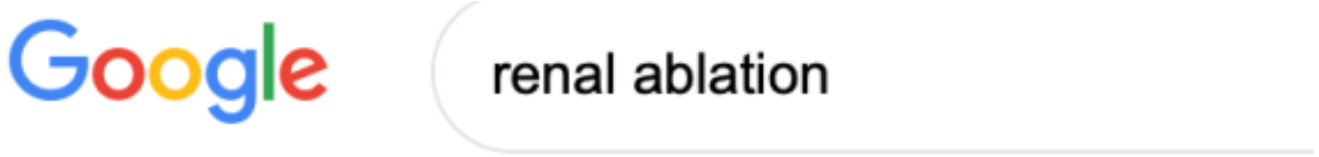
Reviewed PubMed October 2019-Present

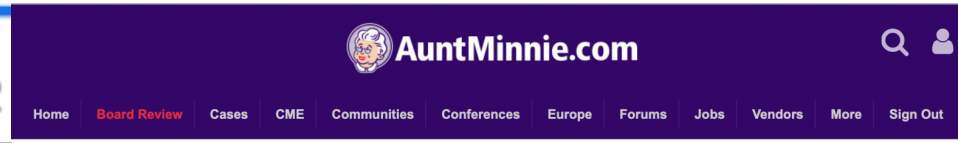


Reviewed All Major Journals October 2019-Present









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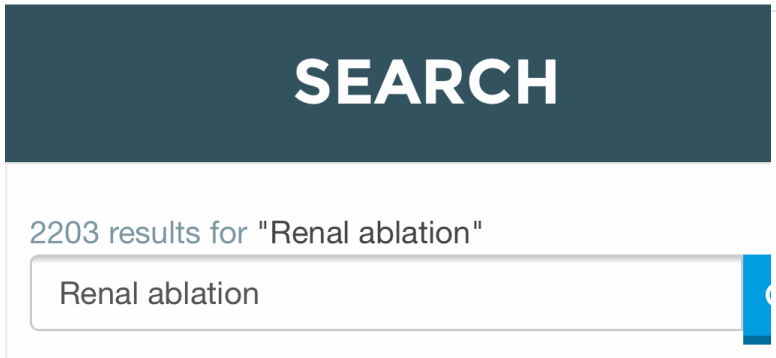

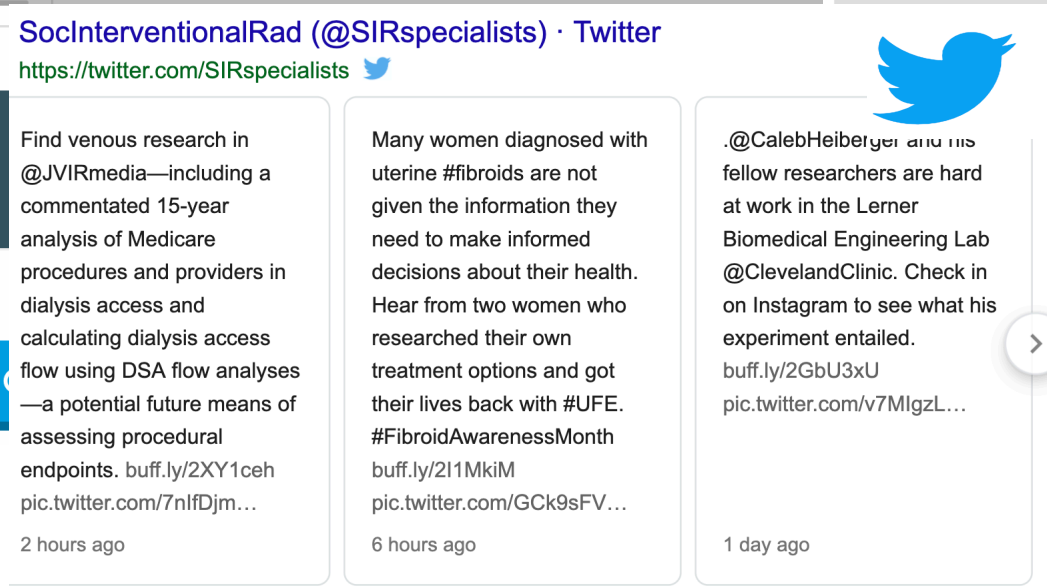

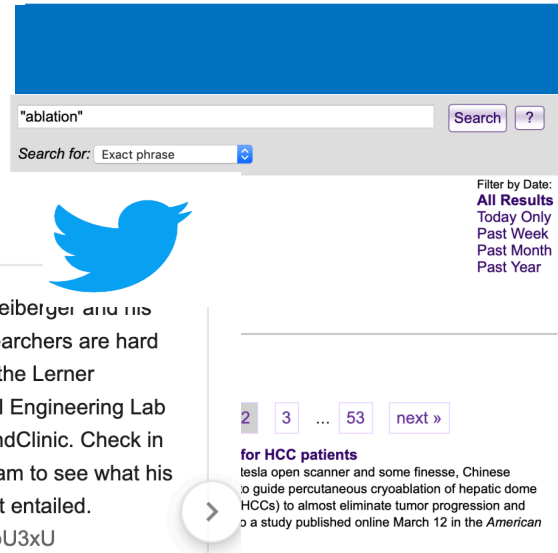

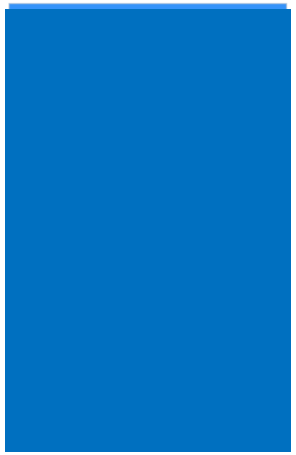

Methods

- Ranked all information in order of importance to the overall IR field and relevancy to clinical practice
- Organized into categories

One Slide Summary

- Intermediate-long term outcomes for ablation
- Increased application of microwave ablation
- Use of cone beam CT/combo embo + ablation
- New indications
- New imaging techniques

Intermediate-Long Term Outcomes

Radiology

ORIGINAL RESEARCH • VASCULAR AND INTERVENTIONAL RADIOLOGY

Percutaneous CT- and MRI-guided Cryoablation of cT1 Renal Cell Carcinoma: Intermediate- to Long-term Outcomes in 307 Patients

Sharath K. Bhagavatula, MD • Kemal Tuncali, MD • Paul B. Shyn, MD • Vincent M. Levesque, MS • Steven L. Chang, MD • Stuart G. Silverman, MD

- 307 patients (mean age: 68 years; 192 men).
- Median clinical follow-up = 95 months (range: 8–219 months)
- Median imaging follow-up lasted 41 months (range: 0–189 months)
- Primary and secondary technique efficacy were 96% and 99%, respectively.
- OS of 91%
- Overall adverse event rate was 14% (43 of 307)

Bhagavatula SK, et al. *Radiology*. 2020;296(3):687-695.

Oncology

Comparing Outcomes for Patients with Clinical T1b Renal Cell Carcinoma Treated With Either Percutaneous Microwave Ablation or Surgery

Daniel D. Shapiro, Shane A. Wells, Sara L. Best, Sean P. Hedican, Timothy J. Ziemlewicz, Meghan G. Lubner, James Louis Hinshaw, Fred T. Lee Jr, David F. Jarrard, Kyle A. Richards, Tracy M. Downs, Glenn O. Allen, Stephen Y. Nakada, and Edwin Jason Abel

- cT1b tumors following MW, PN, or RN from 2000 to 2018
- 325 patients (40 MW, 74 PN, and 211 RN)
- Median follow-up was 34, 35, and 49 months following MW, PN, and RN, respectively
- Estimated 5-year local recurrence-free survival was 94.5% for MW vs. 97.9% for PN (P = .34) and 99.2% for RN (P = .02)
- Median length of hospitalization was shorter for MW compared to surgical patients (1 day vs. 4 days, P <.0001)

Shapiro DD, et al. *Urology*. 2020;135:88-94.

Percutaneous Thermal Ablation for Treatment of T1a Renal Cell Carcinomas

Sepideh Shakeri, MD[a,*], Steven S. Raman, MD[a,b,1]

KEYWORDS

• Thermal ablation • Cryoablation • Radiofrequency ablation • Microwave ablation
• Percutaneous ablation • Minimal invasive surgery • Partial nephrectomy • Radical nephrectomy

- Long-term, single-center studies show excellent outcomes for T1a renal cell carcinoma (RCC), comparable to partial nephrectomy without affecting renal function and with much lower rates of complications
- Most studies are single-arm observational studies with short-term and intermediate follow-up
- No multicenter randomized controlled trials of multiple ablative modalities or comparison with partial nephrectomy

Shakeri S, Raman SS. *Radiol Clin North Am*. 2020;58(5):981-993.

INTERNATIONAL JOURNAL OF HYPERTHERMIA
2019, VOL. 36, NO. 2, 31–36
https://doi.org/10.1080/02656736.2019.1605097

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The current status of thermal ablation in the management of T1b renal masses

BT Welch[a], PH Shah[b], RH Thompson[b] and TD Atwell[a]

[a]Department of Radiology, Mayo Clinic, Rochester, MN, USA; [b]Department of Urology, Mayo Clinic, Rochester, MN, USA

ABSTRACT

The role of thermal ablation in the management of T1b renal masses is not well defined. The purpose of this review is to examine current evidence for cryoablation, radiofrequency ablation, and microwave ablation of T1b renal masses as well as review current AUA and EAU guidelines for thermal ablation of T1b masses. Given the size of these tumors, adjunctive maneuvers are often necessary to ensure patient safety and protect vital adjacent structures.

ARTICLE HISTORY
Received 12 February 2019
Revised 22 March 2019
Accepted 1 April 2019

KEYWORDS
Renal cell carcinoma; thermal ablation; cryoablation; radiofrequency ablation; microwave ablation

- Current evidence for ablation of T1b tumors is heterogeneous and limited by thermal modality utilized, number of probes/antennae used, and operator technique (laparoscopic vs. percutaneous, method of intraprocedural monitoring)
- AUA: Ablation for larger tumors may be considered in the presence of comorbidities that preclude the use of surgery
- EAU does not acknowledge a role for thermal ablation in tumors > 4 cm in size

Welch BT, et al. *Int J Hyperthermia*. 2019;36(2):31-36.

Increased Use of Microwave Ablation

Percutaneous Microwave Ablation of Stage T1a Renal Cell Carcinoma: Intermediate Results on Safety, Technical Feasibility and Clinical Outcomes of 119 Tumors

Jianhai Guo, MD, Ronald S. Arellano, M.D.

doi:10.2214/AJR.20.22818
Accepted: May 7, 2020

- 106 patients (70 men/36 women, overall mean age, 68.8 years ± 9.2; range, 49-88 years) with 119 T1a renal cell carcinomas were treated with CT-guided microwave ablation
- Technical success was achieved for 100% of tumors
- Complete response was achieved in 101 (95.3%) patients and partial response was achieved in 5 (4.7%) patients
- Local progression-free survival was 100.0%, 92.8%, and 90.6% at 1 , 2 , and 3 years, respectively. Overall survival was 99.0%, 97.7%, and 94.6% at 1 , 2 , and 3 years, respectively
- Six patients (5.7%) had 7 complications (Clavien-Dindo Grade I, SIR category A, *n* = 5; Clavien-Dindo Grade III, SIR category B, *n* = 2) within 30 days of the procedure

Guo J, Arellano RS. *AJR Am J Roentgenol*. 2020;10.2214/AJR.20.22818.

Cardiovasc Intervent Radiol (2020) 43:76–83
https://doi.org/10.1007/s00270-019-02313-7

CIRSE

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CLINICAL INVESTIGATION INTERVENTIONAL ONCOLOGY

Percutaneous Microwave Ablation Versus Cryoablation in the Treatment of T1a Renal Tumors

Francesco De Cobelli[1,2,3] · Maurizio Papa[4] · Marta Panzeri[1] · Michele Colombo[1] · Stephanie Steidler[1] · Alessandro Ambrosi[2] · Roberta Cao[1] · Simone Gusmini[1] · Paolo Marra[1] · Umberto Capitanio[5,6] · Roberto Bertini[5,6] · Massimo Venturini[1] · Andrea Losa[7] · Franco Gaboardi[7] · Francesco Montorsi[2,5,6] · Gianpiero Cardone[4]

- 51 nodules were treated with Cryo and 32 with MWA (44 and 28 patients, respectively)
- No statistical differences were observed following Cryo or MWA in median tumor size (p = 0.6), mRENAL (p = 0.1) or technical success (p = 0.8)
- Median procedure time was significantly lower using microwave ablation (p = 0.003)
- Renal function was preserved regardless of techniques
- Disease recurrence was observed in 3/47 and in 1/30 treated nodules in the Cryo and MWA groups, respectively, without reaching statistical significance (p = 0.06)

De Cobelli F, et al. *Cardiovasc Intervent Radiol*. 2020;43(1):76-83.

CIO

Cone Beam CT/ Combo Embo + Ablation

Cardiovasc Intervent Radiol (2019) 42:1718–1725
https://doi.org/10.1007/s00270-019-02296-5

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CLINICAL INVESTIGATION NON-VASCULAR INTERVENTIONS

Cone-Beam CT-Assisted Ablation of Renal Tumors: Preliminary Results

Lorenzo Monfardini[1] · Nicolò Gennaro[2] · Paolo Della Vigna[3] · Guido Bonomo[3] · Gianluca Varano[3] · Daniele Maiettini[3] · Luke Bonello[4] · Luigi Solbiati[5,6] · Franco Orsi[3] · Giovanni Mauri[3]

- 14 patients (mean age 69, range 54–83, 7F, 7M) underwent 21 renal ablations for histologically proven renal cell carcinoma (RCC)
- All treatments were performed with ultrasound (US) and CBCT guidance under general anesthesia in a dedicated angiography room setting
- CBCT was proven to be technically successful in all 21 procedures to guide or assist tumor ablation
- A primary technical efficacy of thermal ablation was achieved in 19/21 ablations (90.1%) at 1 month
- Mean procedure duration was 100.2 min. (range 160-64).
- Mean length of hospital stay was 2 days (range 1–10 days)

Monfardini L, et al. *Cardiovasc Intervent Radiol*. 2019;42(12):1718-1725.

CIO

Cardiovasc Intervent Radiol
https://doi.org/10.1007/s00270-020-02568-5

CIRSE

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CLINICAL INVESTIGATION INTERVENTIONAL ONCOLOGY

Is There a Role for Combination, Single-Session Selective Transarterial Embolization and Microwave Ablation for Large Renal Masses?

Samuel LaRussa[3] · Rand Wilcox Vanden Berg[1] · Kiersten M. Craig[1] · David C. Madoff[2,4] · Timothy D. McClure[1,2]

- 11 patients were identified meeting inclusion criteria
- Mean age 73 years, 64% male
- 9 tumors were identified as clear cell carcinoma; one as papillary carcinoma; one as an oncocytic neoplasm
- Average tumor size was 4.5 cm (2.7–8.3)
- Successful ablation with a 5 mm margin was achieved in all patients; ablation & embolization performed on same day
- Average follow-up was 419.5 days (range 27–747)

Single-session transarterial embolization and microwave ablation is technically feasible, safe, and efficacious in treating large renal tumors.

LaRussa S, et al. *Cardiovasc Intervent Radiol*. 2020;10.1007/s00270-020-02568-5.

CIO

Table 1 Patient demographics and tumor characteristics

Characteristics	
Total patients, no.	11
Age, mean, years	73 ± 9.6
BMI, mean	26.5 ± 4.5
Smoking status, no. (%)	
Never	6 (55)
Former	5 (45)
Sex, no. (%)	
Female	4 (36)
Male	7 (64)
Race, no. (%)	
White	6 (55)
Asian	1 (9)
Unknown	4 (36)
Comorbidities	
CCI, mean	6.7 ± 2.3
Hypertension, no. (%)	8 (73)
Diabetes mellitus, no. (%)	5 (45)
Cardiovascular disease, no. (%)	2 (18)
Concurrent biopsy and treatment, no. (%)	4 (36)
Biopsy pathology, no. (%)	
Papillary, type I	1 (9)
Clear cell RCC	9 (82)
Oncocytic neoplasm	1 (9)
Renal nephrometry score, mean	8.5 ± 1.6
Distance from collecting system, mean, cm	1.0 ± 3.0
Exophytic, no. (%)	1 (9)
Endophytic, no. (%)	6 (55)
Partially exophytic, no. (%)	4 (36)
Tumor size, mean, (range) cm	4.5 ± 1.7 (2.7–8.3)

CCI Charleston Comorbidity Index, *RCC* renal cell carcinoma, *BMI* Body mass index

Table 2 Treatment parameters and outcomes measures

	n = 11
Parameters	
Anesthesia, no. (%)	
General (embolization and ablation)	3 (27)
MAC (embolization) general (ablation)	2 (18)
MAC (embolization and ablation)	6 (55)
Antennae used, mode (range), no.	2 (1–3)
Treatment parameters	
Power, mean (W)	65 ± 0
Ablation time, mean (range) (min)	14.5 ± 5.9 (10–29)
Hydrodissection, no. (%)	6 (55)
Immediate outcomes	
Complications, no. (%)	
Groin hematoma	1 (9)
Nausea/vomiting	1 (9)
None	9 (82)
Length of stay	
0 day	6 (55)
1 day	5 (45)
Long-term outcomes	
Complications, no. (%)	
None	11 (100)
Recurrence	0 (0)
Follow-up, mean (range) (days)	419.5 (27–747)
Efficacy, no. (%)	
Technical success	11 (100)
Primary technique effectiveness	11 (100)
Total technique effectiveness	11 (100)

MAC monitored anesthesia care

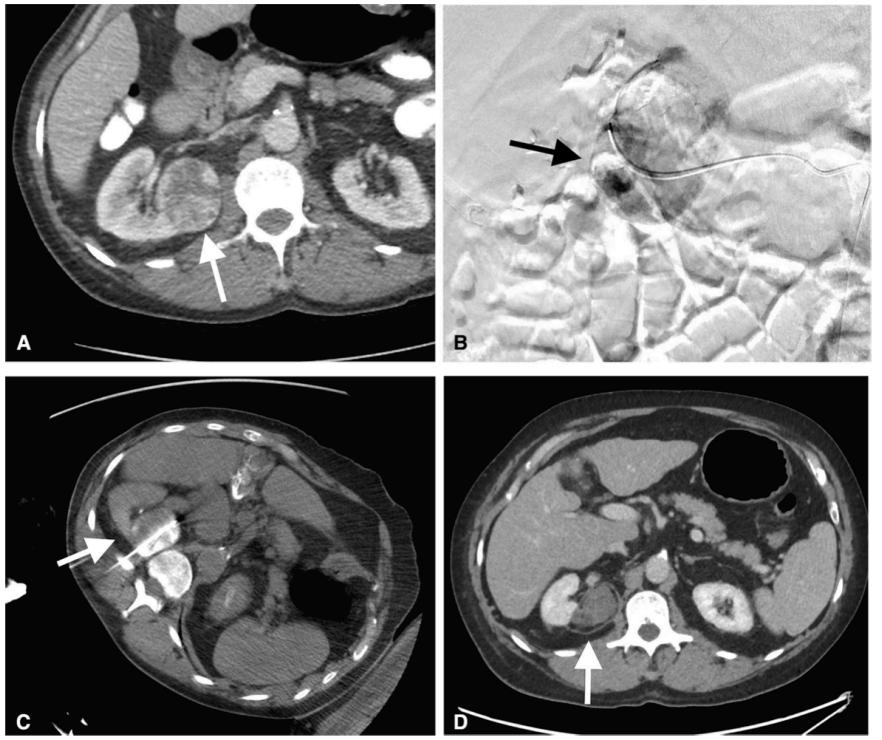

Fig. 1 Case 1. 53-year-old male with laryngeal squamous cell cancer status post-resection, adjuvant chemotherapy, and radiation therapy, found to have a right hilar renal mass measuring 5.2 cm, clear cell, renal cell carcinoma, stage T1b. **A** Pre-procedure axial CT image of the tumor. **B** Intraoperative fluoroscopic imaging of selective transarterial embolization. **C** Intraoperative axial CT image of percutaneous microwave ablation. **D** Axial CT post-procedure follow-up imaging at 19 months

New Indications

World Journal of Transplantation

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World J Transplant 2020 June 29; 10(6): 147-161

DOI: 10.5500/wjt.v10.i6.147

ISSN 2220-3230 (online)

REVIEW

Treatment options for localised renal cell carcinoma of the transplanted kidney

Gloria Motta, Mariano Ferraresso, Luca Lamperti, Dhanai Di Paolo, Nicholas Raison, Marta Perego, Evaldo Favi

- Reported incidence of primary RCC in kidney allografts varies between 0.2% and 0.5%
- Extensive review of the literature focused on epidemiology, clinical presentation, diagnostic workup, staging strategies, tumor characteristics, treatment modalities, and follow-up protocols

"…both [nephron sparing surgery] and focal ablation represent a valuable alternative to graftectomy for kidney transplant recipients"

Motta G, et al. *World J Transplant*. 2020;10(6):147-161.

Thermal Ablation of Renal Cell Carcinoma in Morbidly Obese Patients: Assessment of Technical Results, Procedural Safety, and Oncological Outcomes

Wenhui Zhou, MD, PhD, Sanna Herwald, MD, PhD, Raul N Uppot, MD, Ronald S Arellano, MD

- Patients were stratified into two cohorts on body mass index of ≥ 40 kg/m^2 (morbidly obese) and body mass index of 18.5 to 24.9 kg/m^2 normal weight
- 34 patients were morbidly, and 73 patients were normal weight
- Morbid obesity was associated with longer procedural duration (p = 0.001), sedative doses (p = 0.002), and radiation exposure (p = 0.001) compared to normal-weight patients.
- Hematomas were more prevalent in the morbidly obese than normal body mass index patients (p = 0.01)
- Treatment efficacy and local recurrences were comparable to normal-weight individuals (p = 0.81, p = 0.12, respectively)
- Cancer-related outcomes were equivalent between the two groups based on five years of imaging observation data

Zhou W, et al. *AJR Am J Roentgenol*. 2020;10.2214/AJR.20.23803.

International Journal of Radiation Oncology biology • physics
www.redjournal.org

Clinical Investigation—Genitourinary Cancers

Stereotactic Ablative Radiotherapy for ≥T1b Primary Renal Cell Carcinoma: A Report From the International Radiosurgery Oncology Consortium for Kidney (IROCK)

Shankar Siva, PhD, MBBS, FRANZCR,*,† Rohann J.M. Correa, MD, PhD,‡ Andrew Warner, MSc,‡ Michael Staehler, MD, PhD,§ Rodney J. Ellis, MD,||,¶ Lee Ponsky, MD,|| Irving D. Kaplan, MD,# Anand Mahadevan, MD,** William Chu, MD, MSc, FRCPC,††,‡‡ Senthilkumar Gandhidasan, MBBS, FRANZCR,*,‡ Anand Swaminath, MD, FRCPC,§§ Hiroshi Onishi, MD,|||| Bin S. Teh, MD, FACR, FASTRO, FACRO,¶¶ Simon S. Lo, MD, FACR, FASTRO,## Alexander Muacevic, MD,§ and Alexander V. Louie, MD, MSc, PhD, FRCPC‡,††,‡‡

- Individual patient data from 9 institutions in Germany, Australia, USA, Canada, and Japan were pooled
- 95 patients were included; median age was 76 years
- Median tumor diameter was 4.9 cm
- Median follow-up was 2.7 years
- Cancer-specific survival, overall survival, and progression-free survival were 96.1%, 83.7%, and 81.0% at 2 years and 91.4%, 69.2%, 64.9% at 4 years, respectively.
- SABR for larger RCC in this older, largely medically inoperable cohort, demonstrated efficacy and tolerability and had modest impact on renal function

SABR appears to be a viable treatment option in this patient population.

Siva S, et al. *Int J Radiat Oncol Biol Phys*. 2020;S0360-3016(20)31255-4.

Abdominal Radiology
https://doi.org/10.1007/s00261-020-02613-4

KIDNEYS, URETERS, BLADDER, RETROPERITONEUM

Renal biopsies performed before versus during ablation of T1 renal tumors: implications for prevention of overtreatment and follow-up

Christiaan V. Widdershoven[1] · Brigitte M. Aarts[2,3] · Patricia J. Zondervan[1] · Michaël M. E. L. Henderickx[1] · Elisabeth G. Klompenhouwer[2] · Otto M. van Delden[4] · Warner Prevoo[2,5] · Alexander D. Montauban van Swijndregt[5] · Reindert J. A. van Moorselaar[1] · Axel Bex[6,7] · Brunolf W. Lagerveld[8]

Received: 16 April 2020 / Revised: 28 May 2020 / Accepted: 6 June 2020

- Biopsy performed in 714 patients: 231 patients received biopsy before planned ablation, 483 patients at the time of ablation
- Pathology results before ablation were malignant in 63% (145/231), benign in 20% (46/231), and nondiagnostic in 17% (40/231)
- Pathology results at the time of ablation were malignant in 67.5% (326/483), benign in 16.8% (81/483), and non-diagnostic in 15.7% (76/483) — leading to a total of 32.5% of ablation of benign or non-diagnostic lesions
- Patients with a benign biopsy obtained before ablation, 80.4% (37/46) chose not to undergo ablation

Obtaining a biopsy prior to the ablation procedure in a separate session can lower the rate of potentially unnecessary ablations.

Widdershoven CV, et al. *Abdom Radiol (NY)*. 2020;10.1007/s00261-020-02613-4.

New Imaging Techniques

Current Urology Reports (2019) 20: 73
https://doi.org/10.1007/s11934-019-0936-y

NEW IMAGING TECHNIQUES (S RAIS-BAHRAMI AND K PORTER, SECTION EDITORS)

Contrast-Enhanced Ultrasound in Renal Imaging and Intervention

Michael C. Olson[1] · E. Jason Abel[2] · Lori Mankowski Gettle[1]

Published online: 17 October 2019

- Current evidence suggests that CEUS allows accurate differentiation of solid and cystic renal masses
- Acceptable alternative to either computed tomography (CT) or magnetic resonance imaging (MRI) for characterization of indeterminate renal masses
- CEUS is sensitive and specific for diagnosing residual or recurrent renal cell carcinoma (RCC) following percutaneous ablation

Olson MC, et al. *Curr Urol Rep*. 2019;20(11):73.

Utility of Intraprocedural Contrast-Enhanced CT in Ablation of Renal Masses

Arleen Grewal[1]
Satinderpal Singh Khera[2]
John P. McGahan[2]
Machelle Wilson[3]
Thomas W. Loehfelm[2]
Marc A. Dall'Era[4]
Christopher P. Evans[4]

OBJECTIVE. The purpose of this study was to evaluate the efficacy of radiofrequency ablation (RFA) of renal masses comparing a group who did not undergo intraprocedural CT and a group who did.

MATERIALS AND METHODS. A retrospective review included 45 consecutively registered patients who underwent RFA of renal masses. If an adequate biopsy specimen was not obtained or follow-up was inadequate, the patient was eliminated from review from calculation of primary technical efficacy. The inclusion criterion was having undergone RFA with two cooled-tip electrodes. Baseline demographics (age, body mass index, and sex), renal mass

- 35 patients met inclusion criteria
- 10 patients were in the group who did not, and 25 were in group who did undergo intraprocedural contrast-enhanced CT
- 89% overall technical efficacy rate, with a 96% primary technical efficacy rate in the group who underwent intraprocedural CT compared, with a 70% rate in the group who did not undergo intraprocedural CT

Intraprocedural contrast-enhanced CT yields important information about completeness of ablation during the procedure.

Grewal A, et al. *AJR Am J Roentgenol*. 2020;214(1):122-128.

Thank You