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PUBLICATION SUMMARY — RENAL

Image-guided Cryoablation for Sporadic Renal Cell Carcinoma: Three- and 5-year Outcomes in 220 Patients with Biopsy-proven Renal Cell Carcinoma

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OVERVIEW

- Guidelines for the management of small renal tumors issued by the American Urological Association (AUA) and the European Association of Urology (EAU) continue to recommend relatively invasive partial nephrectomy as the standard of care for T1a tumors, with thermal ablation techniques as a conditional recommendation for elderly patients and/or those with comorbidities because of the limited data available that illustrates a standardized approach to renal tumor ablation.
- However, the most recent National Comprehensive Cancer Network kidney cancer guidelines recommend thermal ablation as an acceptable treatment option in selected patients with clinical T1 (cT1) RCC – due to the accumulating supportive evidence.
- Because of the variability of reports in the current peer- reviewed literature, many lacking biopsy proof of RCC and outlining variable techniques, this single institution aimed to prospectively record both technical and oncologic outcomes using a consistent procedure and imaging technique with diligent radiographic follow-up using a prospective registry database from May 2007-December 2016.
- The retrospective analysis of registry data provides 3- and 5-year outcome data, demonstrating high treatment efficacy (95-98% at first and secondary treatments, respectively), low complication rates (5%) and successful oncologic outcomes in a defined subset of RCC patients.

OBJECTIVES

- To analyze the long-term efficacy of image-guided percutaneous cryoablation of sporadic cT1 biopsy-proven RCC
- To assess treatment efficacy and safety of all renal cryoablation treatments

METHODS

- All patients were discussed at a multidisciplinary Urology team meeting and underwent formal Urology consultation before a treatment pathway was determined. Primary clinical indications for image-guided renal cryoablation included contraindications to surgery, major comorbidities, and patient preference, where appropriate.
- Data from 433 patients who had 484 cT1 renal masses (mean size, 33 mm) was recorded prospectively in a registry database from May 2007 – December 2016.
- Patients were treated under general anesthesia and the procedures performed with the patient in a prone-oblique position.
- At least one 18-G core biopsy sample was taken from the tumor either at a procedure prior (with US guidance) or at the time of tumor ablation with CT guidance.
- Galil Medical products (cryoablation system and 1.5 cryoablation needles) were used to conduct the cryoablation procedures
- Retroperitoneal contrast-material-tinted saline hydrodissection was used to displace critical structures (bowel or pancreatic tail) in 239 procedures (47%)
- Ablation procedures (freeze 10 minutes, thaw 8 minutes, freeze 10 minutes) were conducted with CT assessments every 4 minutes to assure the iceball extended at least 5 mm beyond the tumor margin.
- Follow-up CT assessments were conducted ~4 weeks postcryoablation.
  - If marginal assessment was unclear, patients returned for a 3-month assessment.
  - Residual disease (enhanced ablation margin persisted and was asymmetric or enlarged) was retreated with cryoablation
  - Residual disease at 6 months or later was noted as a treatment failure, "late local recurrence"
- Further CT assessments were conducted at 1, 3, and 5 years.

PARAMETER	ENTIRE TREATED POPULATION (N = 433)	RCC SUBPOPULATION WITH ≥ 3 MONTHS OF FOLLOW-UP (N = 220)
Age at first cryo ablation procedure (y)		
Mean ± standard deviation	67.2 ± 11.81	66.1 ± 12.19
Median and Range	68 (19-90)	68 (19-88)
Sex		
Male	293 (67.7)	147 (66.8)
Female	140 (32.3)	73 (33.2)
Tumor characteristics		
No. of tumors	484	221
Size		
Mean ± standard deviation (cm)	3.3 (1.05)	3.4 (0.97)
Median and range (cm)	3.2 (0.9-6.7)	3.4 (1.3-6.2)
No. of tumors ≤ 4 cm	375 (77.5)	166 (75.1)
No. of tumors ≤ 4 cm	109 (22.5)	55 (24.9)

Table 1: Demographics Data and Tumor Characteristics in All Treated Patients and in an RCC Subpopulation with 3 or More Months of Follow-up.
Note: Unless otherwise specified, data are numbers of patients or tumors, with percentages in parentheses. RCC — Renal cell carcinoma.

RESULTS

- Retrospective analysis of registry data revealed that a total of 433patients (293 men and 140 women) with a total of 484 tumors cT1 tumors (375 smaller than 40 mm (T1a) and 109 greater than 40 mm (T1b)), were treated in 473 separate cryoablation procedures.
  - Some patients had more than one tumor treated during asingle procedure, and some had a tumor re-treated in a secondprocedure (primary failure or tumor recurrence)
  - Ten tumors were lost to initial follow-up (4 week CT) and were excluded from the assessment of treatment efficacy
  - Oncologic outcomes were assessed for a subset of 220 patients with biopsy proven RCC and CT imaging follow up >3 months
- Complete response (no residual enhancing tumor seen at 3-month follow-up) was achieved at the first treatment in 95.6% of all treated tumors (453/474 tumors), and with secondary cryoablation treatment in 465/474 tumors (98.1%).
  - Multivariable analysis identified two variables contributing to primary treatment failure
- Female patients were less likely to experience primary treatment success (P = .009)
- Patients who underwent pyeloperfusion or stent placement were less likely to experience primary treatment success (P = .018)
- Oncologic results were calculated for the 220 RCC-patient subset (median 31.1 months follow-up (range 3-99 months)
  - Kaplan-Meier estimates of Local Recurrence-Free Survival (LRFS) rates were 97.2% at 3 years, 93.9% at 5 years
  - Kaplan-Meier estimates of Metastasis-Free Survival (MFS) rates were 97.7% at 3 years, 94.4% at 5 years
- Kaplan-Meier estimates of Overall Survival (OS) rates
  - In the 433 patients treated were 91.7% at 3 years, 78.8% at 5 years
  - In the 220 patients with confirmed RCC were 93.2% at 3 years, and 84.8% at 5 years.
- In spite of a low rate of local tumor progression (6.1% at 5 years), the extended time range for occurrence, (6-61 months) supports the importance of 3- and 5-year radiologic surveillance
- Major complications (Clavien-Dindo grade ≥ III) occurred in 4.9% of procedures (23/473)
  - 87% of the major complications were Grade III (20/23)
- 43.5% of major complications were related to small-to-moderate pneumothoraces (10/23)
  - Changing needle placement to avoid a pleural reflection reduced the potential for pneumothorax when treating upper-pole tumors
  - Considerably fewer hemorrhagic complications occurred (3/23),causing the authors to speculate that this reduction may be possibly related to use of 1.5 mm (17-G) needles.
- Median hospital stay was short (1.0 day), in contrast to the longer median stay (4 days) reported following a partial nephrectomy

CONCLUSIONS

- Renal cryoablation provides a minimally invasive, effective alternative to active surveillance or surgery for patients with reasonable life expectancies

CLAVIEN-DINDO GRADE AND COMPLICATION	TOTAL NO.
Grade III	20 (4.2)
Pneumothorax (treated with chest drain)	10 (2.1)
Pelvicalyceal or ureteric injury (treated with uteteric stent)	4 (0.8)
ric obstruction due to clot (treated with ureteroscopy with or without stent placement)	3 (0.3)
Hematuria and clot retention (treated with bladder irrigation)	2 (0.4)
Hemorrhage (treated with embolization)	1 (0.2)
Grade IV	1 (0.4)
Myocardial infarction (treated with coronory stent placement)	1 (0.2)
Cerebrovascular accident (treated with thrombosis)	1 (0.2)
Grade V	1 (0.2)
Venous thromboembolism	1 (0.2)

Table 2: Complications (Clavien-Dindo Grade ≥ III) as a Percentage of the 473 Procedures Performed.
Note: Numeric data in parentheses are percentages.

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