Video

International Braz J Urol

Vol. 36 (2): 249-251, March - April, 2010
doi: 10.1590/S1677-55382010000200034

Laparoscopic, Ultrasound-Guided Microwave Thermal Ablation with Direct, Real-Time Temperature Monitoring of a 3.4 cm Renal Tumor in an Anti-Coagulated Patient

Robert I. Carey, Tariq S. Hakky, John Shields, Vincent G. Bird, Raymond J. Leveillee

The Urology Treatment Center, Florida State University College of Medicine, Sarasota Florida and The Department of Urology, The Miami Miller School of Medicine, Miami Florida, USA

ABSTRACT

Purpose: We report the first case of a laparoscopic, ultrasound-guided microwave ablation (MWA) of a renal tumor. The case was performed in a 79 year old female with atrial fibrillation requiring anti-coagulation with successful core biopsy being performed at the same time as the ablation.
Methods: A 3.4 cm right lower pole enhancing renal mass was exposed laparoscopically. A microwave ablation probe (3.7 cm active tip, Valley Lab) was positioned under direct vision and laparoscopic ultrasound guidance. Independent fiberoptic, non-conducting temperature sensors (Lumasense, CA) were placed at the deep and peripheral margins of the tumor. Core biopsies of the tumor were performed prior to beginning the ablation. The ablation was continued until all temperature sensors reached greater than 60 degrees Celsius.
Results: The patient's surgery was performed using Lovenox-bridging with reinstitution of coumadin within 24 hours. There was minimal blood loss (less than 20 mol). The preoperative hematocrit was 45.8% and post-operatively 44.8%. Operative time was 56 min, of which the ablation time consisted of 10 min. There were no preoperative or postoperative complications. Follow-up CT scan of the abdomen at six weeks with and without contrast showed no post-operative hematoma and no residual enhancement.
Conclusions: MWA is a safe, effective means of thermal ablation of renal tumors. Excellent hemostasis is achieved without the need for hilar dissection and clamping. Tissue ablation is effected via coagulative necrosis and the technique has been applied successfully in an anti-coagulated patient for a mesophytic tumor greater than 3 cm.

Int Braz J Urol. 2010; 36 (Video #5): 249_51
Available at: www.brazjurol.com.br/videos/march_april_2010/Carey_249_251video.htm

Accepted:
March 30, 2010

Correspondence address*:*
Dr. Robert Ira Carey
Urology Treatment Center
1921 Waldemere St Ste 310
Sarasota, FL, 34239, USA
E-mail: ricarey@juno.com

EDITORIAL COMMENT

The widespread use of noninvasive imaging studies has increased the diagnosis of small renal masses; particularly among patients over 70 years of age (1). There are limitations in terms of treatment choices in this subset due to their co-morbidities, which can often preclude some of the traditional surgical options. Radical nephrectomy and partial nephrectomy whether performed using an open or laparoscopic approach can have important morbidity and surgical risk (2). In this regard, renal ablative procedures have emerged, with these options well suited to poor surgical candidates. The two most widely used and available technologies are radiofrequency ablation (RFA) and cryoablation (3).

In this video submission, Leiveillee and colleagues present a case of a 79 years old female with underlying atrial fibrillation requiring anticoagulation and an incidentally discovered right enhancing renal mass (3.4 cm). The indication for the procedure was an increase in size from 2.3 to 3.4 cm over a two year period. The ablative technique described is laparoscopic guided ultrasound guided microwave (MW) ablation. Anticoagulation was re-initiated the same day after the procedure.

Emerging technologies such as the one presented in this video are novel treatment options. Compared to RFA, MW ablation offers several advantages including higher intra-tumoral temperatures, larger ablation volumes, faster ablation time, and optimal heating of cystic masses (4). The microwaves cause molecules to vibrate in a high frequency electromagnetic field generating friction and heat and inducing cellular death through coagulation necrosis (5). One of the interesting advantages of this technology over RF is that the effect of the microwaves is not affected by large blood vessels as is RF creating a heat sink effect, with potential incomplete tumor ablation particularly when applied to cystic lesions. RF can be affected by increase in impedance with tissue boiling and charring which become electrical insulators, while this is not a limitation for microwaves (4).

Divergent data utilizing experimental studies with VX-2 carcinoma in rabbits has been published (6,7). The few clinical studies published to date have reasonable results with a maximum follow-up of 11 months (8,9). In a phase I study, Clark et al. reported microwave ablation followed by nephrectomy demonstrating adequate ablation zones using 1 to 3 probes (10).

It is important to emphasize that this is still considered an emerging technology for the treatment of renal masses. Larger studies are needed in order to increase the evidence regarding safety and efficacy of this new technology in the management of renal malignancies.

REFERENCES

1. Chow WH, Devesa SS, Warren JL, Fraumeni JF Jr.: Rising incidence of renal cell cancer in the United States. JAMA. 1999; 281: 1628-31.
2. Campbell SC, Novic AC, Steem SB, Klein E, Licht M: Complications of nephron sparing surgery for renal tumors. J Urol. 1994; 151: 1177-80.
3. Ankem MK, Nakada SY: Needle-ablative nephron-sparing surgery. BJU Int. 2005; Supp 2: 46-51.
4. Simon CJ, Dupuy DE, Mayo-Smith WW: Microwave ablation: principles and applications. Radiographics. 2005; 25 supp1: S69-83.
5. Hope WW, Schmelzer TM, Newcomb WL, Heath JJ, Lincourt AE, Norton HJ, Heniford BT, Iannitti DA: Guidelines for power and time variables for microwave ablation in an in Vivo porcine kidney. J Gastrointest Surg. 2008; 12: 463-7.
6. Zhang D, Dong B, Wang Y, Liu L, Zhang X, Yu X, Liang P, Gao Y: Percutaneous microwave ablation or nephrectomy for VX-2 carcinoma in rabbit kidney. J Urol. 2009; 182: 1588-93.
7. Eichel L, Kim IY, Uribe C, Khonsari S, Basillote J, Steward E, Coad J, Bishof J, Rudie E, Kluge S, McDougall EM, Clayman RV: Third Prize: Comparison of radical nephrectomy, laparoscopic microwave thermotherapy, cryotherapy, and radiofrequency ablation for destruction of experimental VX-2 renal tumors in rabbits. J Endourol. 2005; 19: 1082-7.
8. Liang P, Wang Y, Zhang D, Yu X, Gao Y, Ni X: Ultrasound guided percutaneous microwave ablation for small renal cancer: Initial Experience. J Urol. 2008; 180: 844-8.
9. Carrafiello G, Mangini M, Fontana F, Recaldini C, Piacentino F, Pellegrino C, Lagana D, Cuffari S,

Marconi A, Fugazzola C: Single-antenna microwave ablation under contrast-enhanced ultrasound guidance for treatment of small renal cell carcinoma: preliminary experience. Cardiovasc Intervent Radiol. 2009 Nov 14 [Epub ahead of print].

10. Clark PE, Woodruff RD, Zagoria RJ, Hall MC: Microwave ablation of renal parenchymal tumors before nephrectomy: Phase I study. AJR Am J Roentgenol. 2007; 188(5):1212-4.

Dr. Jose Jaime Correa
Urologic Oncology Department
Hospital Pablo Tobon Uribe
Medellin, Colombia
E-mail: jocorreao@uces.edu.co