

Radiofrequency ablation of small renal masses as an alternative to nephron-sparing surgery: preliminary results

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Abstract

Introduction: Radical endoscopic minimal-invasive treatment methods, such as thermal ablation, are sought as an alternative to standard radical surgical treatment of kidney neoplasms. We analysed patients who could be qualified for radical treatment due to T1a renal tumour.

Material and methods: Twenty-three patients out of 129 who underwent radiofrequency thermal ablation of kidney tumours in the years 2003-2010 were analysed. The inclusion criteria were age below 70 years, lack of major comorbidities (ASA score 1, 2), and competent contralateral kidney. In all cases tumour size was below 4 cm. All patients were followed up with computed tomography (CT) and ultrasonography (USG) every 6 months for 3 years.

Results: In 20 patients kidney tumour was biopsied before radiofrequency ablation (RFA) and 10 of these biopsies were positive and revealed cancer. Six patients required additional treatment due to recurrence visible in CT – 3 with a positive biopsy result, 1 with negative and 2 without biopsy. Three of them were treated with a second session of RFA, 1 with radical nephrectomy and 2 with partial nephrectomy. No disease dissemination was observed and all patients who received additional treatment remain disease free.

Conclusions: The RFA can be safely used in selected patients with T1a tumour as an alternative to partial nephrectomy. Careful follow-up is required after thermal ablation and allows early detection and successful treatment of recurrences.

Key words: radiofrequency ablation, small renal masses, nephron-sparing surgery.

Introduction

Radiofrequency ablation (RFA) is a treatment method that utilizes radiofrequency alternating current to ablate tissue around the needle electrode. Over the last 10 years, this technique has been gaining popularity in several fields of oncological surgery [1-3]. The introduction of RFA into other fields of surgery has fuelled the interest to study its application

in treatment of small renal masses (SRM), less than 4 cm. Some controversies remain, however, regarding its oncological efficacy. The RFA is a minimally invasive therapeutic modality for renal tumours. It can be an alternative to nephrectomy in patients with single kidney, bilateral tumours, von Hippel-Lindau disease and in those with contraindications for surgery [4-6]. The aim of this paper is to present our experiences

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with application of RFA in patients who could be qualified for nephron-sparing surgery (NSS) due to T1a kidney tumours.

Material and methods

Twenty-three patients out of 129 who underwent RFA in the years 2003-2010 were retrospectively analysed. The inclusion criteria were age below 70

years, lack of major comorbidities (ASA score 1 or 2), and competent contralateral kidney (Table I). Tumours were qualified based on computed tomography (CT) and all were staged as T1a (average size 2.6 ± 0.5 cm). Pre-treatment biopsy was performed. Ultrasound-guided RFA was performed using alternating current (460 kHz) conducted directly to the tumour with a needle electrode. Patients were followed according to guidelines prepared for NSS.

Table I. Patients undergoing radiofrequency ablation (RFA) due to small renal masses

No.	Age [years]	ASA score	Initial creatinine [$\mu\text{mol/l}$]	Tumour size [cm]	Pre-treatment biopsy	Re-treatment	Final histology	Follow up [months]
1	60	2	84	2.0	Indefinite			70
2	56	2	61	2.8	Indefinite			54
3	56	2	65	2.0	cRCC	Radical surgery	cRCC	52
4	50	1	99	2.5	Indefinite			50
5	46	2	80	2.7	Not assessed			43
6	52	2	45	3.4	Indefinite			40
7	60	1	88	2.9	Indefinite			39
8	60	2	53	2.5	cRCC			35
9	60	2	72	4.0	Indefinite			29
10	58	2	60	2.4	cRCC			28
11	37	1	57	2.0	cRCC	NSS	Necrosis	26
12	52	2	71	2.5	cRCC			17
13	50	2	70	1.0	cRCC			16
14	64	2	62	2.6	cRCC	RFA		16
15	62	2	67	3.0	Not assessed	RFA		15
16	63	2	71	3.0	Indefinite	RFA		14
17	68	2	77	1.8	Indefinite	NSS	Oncocytoma	13
18	70	2	81	1.5	Indefinite			11
19	64	2	70	3.4	cRCC			11
20	62	2	62	4.0	cRCC			6
21	55	2	74	2.5	Not assessed			6
22	58	1	84	3.0	Cancer cells			6
23	47	2	43	2.3	Indefinite			5

cRCC – clear cell type renal carcinoma, NSS – nephron-sparing surgery

Results

In 20 of 23 patients the tumour was successfully biopsied before RFA and 10 of these biopsies were positive and revealed cancer. Six patients required additional treatment due to recurrence visible in CT – 3 with a positive biopsy result, 1 with negative and 2 without biopsy. Three of them were treated with a second session of RFA, 1 with radical nephrectomy and 2 with partial nephrectomy (Table I). No disease dissemination was observed and all patients who received additional treatment due to recurrence remain disease free. Average follow-up time was 2 years (5 months to 5.8 years).

Discussion

While RFA allows ablative success to be achieved, it requires acceptance of re-treatment necessity in a certain percentage of cases. Although the recurrence risk after RFA is higher in comparison to radical nephrectomy, early detection with an appropriate follow-up often allows successful treatment with an additional RFA session or partial nephrectomy. In certain cases radical nephrectomy is required. Most of the patients retain their kidney and remain disease free. In our experience, the recurrence risk did not influence the survival or progression rate.

It must also be stressed that RFA is a minimally invasive treatment which can even be performed under local anaesthesia and is connected with shorter hospital stay than NSS or even laparoscopic nephrectomy. Complications after RFA are less frequent and they are more often minor in comparison to surgical series [4, 7]. These facts render RFA an attractive minimally invasive treatment for SRM, which can be offered instead of partial nephrectomy [4]. The study cohort was small because of specific inclusion criteria – such patients should, according to guidelines, undergo NSS, while RFA is mainly recommended for older ones with serious comorbidities.

An important issue to be resolved is an informative and appropriately performed renal tumour biopsy (RTB). The RTBs gained popularity in the evaluation of SRM because imaging alone is insufficient to assess the underlying tumour aggressiveness. The complication rate was low, and neoplasm seeding along the needle track has been reported to be extremely rare [8]. A certain disadvantage of RTB is a considerable, although improving over time, per-

centage of 'indefinite' biopsy results. The RTB is recommended to help differentiating benign from malignant SRM prior or during ablative therapies and in follow-up, especially after RFA [6-8].

The RFA was planned based on computed tomography examination prior to treatment while the procedure itself was performed under USG guidance. Effectiveness of US-guided RFA is reported to be comparable with CT-guided RFA results [9]. The RFA is safe and effective in renal tumours; corticomedullary lesions and tumours > 3 cm, however, are associated with an increased probability of incomplete ablation. In tumours > 5 cm, RFA has a significant failure rate [7]. The RFA provided successful treatment of SRM with a low recurrence rate as well as prolonged metastasis-free and cancer-specific survival rates at 5 years after treatment [5].

Conclusions

It seems that RFA can be safely performed in selected patients with T1a tumour as an alternative to partial nephrectomy. The tumour should be biopsied prior to RFA. Careful follow-up, similar to the one after NSS, is required after thermal ablation and allows early detection and successful treatment of recurrences.

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