Case report - Thoracic oncologic

Feasibility of ablation as an alternative to surgical metastasectomy in patients with unresectable sarcoma pulmonary metastases

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Abstract

Percutaneous radiofrequency ablation (RFA) is an alternate treatment modality for pulmonary metastasis in non-surgical candidates. Four patients not suitable for surgery underwent percutaneous RFA for pulmonary metastases from leiomyosarcoma. Success of RFA was assessed with computed tomography (CT). The median length from the radiographic diagnosis of metastatic pulmonary disease (CT-scan) from the primary tumor diagnosis was 67.0 months with a range of 15.0–81.0 months. The median disease free interval following RFA was 19.0 months with a range of 4.0–35.0 months. Three of four patients underwent the procedure uneventfully. RFA is a safe and minimally invasive intervention in non-surgical candidates with sarcoma pulmonary metastases.

Keywords: Leiomyosarcoma; Pulmonary metastases; Radiofrequency ablation; Sarcoma

1. Introduction

Leiomyosarcoma is a smooth muscle tumor that has a biological propensity to establish a metastatic niche within the lung [1–3]. Surgery has been the preferred treatment modality in selected patients with pulmonary metastases. However, there remains no consensus with regards to the practice of surgical metastasectomy, with particular concerns raised over the treatment related morbidity, post-treatment effect of loss of lung volume on quality of life, and the optimal approach to resecting pulmonary metastases [4].

Percutaneous radiofrequency ablation (RFA) is an ablative treatment option for solid tumors for which its role in ablation of sarcoma pulmonary metastases remains unclear. This study describes our unit’s experience with RFA in patients with leiomyosarcoma with a focus on the survival outcomes, and treatment related morbidity.

2. Methods

Between January 2001 and March 2009, four patients who were non-surgical candidates with leiomyosarcoma underwent percutaneous RFA for pulmonary metastases. RFA procedures were performed under computed tomography (CT) guidance by an interventional radiologist. The CT machine (Xpress SX; Toshiba, Japan) coupled with a Rita 1500 generator (Rita Medical, Mountain View, CA) enabled real-time imaging display, and along with temperature, power and impedance. This was performed using a 14-guage probe of either 10 cm or 15 cm. A representative figure of the procedure is shown in Fig. 1.

3. Results

There were 4 females. The mean (S.D.) age at the time of clinical diagnosis of the primary tumor was 55.8 (6.4) years. The median length from the radiographic diagnosis of metastatic pulmonary disease (CT-scan) from their primary tumor diagnosis was 67.0 months, with a range of 15.0–81.0 months. The median survival post-RFA treatment was 46.5 months (range 37.0–83.0 months) (Table 1). The median disease-free interval following RFA was 19.0 months with a range of 4.0–35.0 months. Three of four patients underwent the procedure uneventfully. One patient developed a small pneumothorax that spontaneously resolved without invasive intervention.

The first patient remained asymptomatic 12 months after the RFA; but developed multiple lung metastases for which she was treated with Ifosfamide and Adriamycin. This patient died from progressive disease in her lung and abdomen 37 months after RFA treatment. In the second patient, the disease recurred 26 months post-RFA in the liver and bone. Follow-up CT in the patient 12 months later demonstrated multiple lung metastases and she was subjected to a clinical trial and died from disseminated multi-organ disease 83 months after RFA treatment. The third patient developed recurrent lung metastases four months post-RFA and was treated with Carboplatin and Gemcitabine, and died from progressive lung metastases 40 months...
Fig. 1. Representative computed tomographic (CT) images of a patient with pulmonary metastases from leiomyosarcoma. (a) Pre-lung RFA CT image showing a solitary pulmonary metastasis. (b) Opacification during lung RFA treatment.

Table 1

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (years)</th>
<th>Site of primary tumor</th>
<th>Tumor grade</th>
<th>Duration between primary resection and pulmonary metastases (months)</th>
<th>Number of lesions</th>
<th>Max size of largest lesion (cm)</th>
<th>Laterality</th>
<th>Survival post-RFA (months)</th>
<th>Disease-free interval post-RFA (months)</th>
<th>Current status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>62</td>
<td>Retroperitoneal (upper abdomen, behind IVC/right renal vein)</td>
<td>High</td>
<td>81</td>
<td>1</td>
<td>4</td>
<td>Unilateral</td>
<td>37</td>
<td>12</td>
<td>DOD</td>
</tr>
<tr>
<td>2</td>
<td>53</td>
<td>Uterus</td>
<td>Low</td>
<td>78</td>
<td>2</td>
<td>3</td>
<td>Unilateral</td>
<td>83</td>
<td>26</td>
<td>DOD</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>Uterus</td>
<td>Low</td>
<td>15</td>
<td>1</td>
<td>5</td>
<td>Unilateral</td>
<td>40</td>
<td>4</td>
<td>DOD</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>Pelvis (right iliac and ovarian)</td>
<td>Low</td>
<td>56</td>
<td>2</td>
<td>5</td>
<td>Bilateral</td>
<td>53</td>
<td>35</td>
<td>AWD</td>
</tr>
</tbody>
</table>

*DOD refers to died of disease, AWD refers to alive with disease.

4. Discussion

In most patients with primary leiomyosarcoma, tumor metastases predominantly involve the lungs. Various studies have described the value of surgical resection for pulmonary metastases in the absence of other effective treatment. This therapeutic option is reported to improve long-term survival in patients with pulmonary metastases. Recently, Sano et al. reported the advantages of the combining RFA and surgical resection in selected patients with metastatic pulmonary tumors, improving curability and avoiding highly invasive procedures [1]. Nevertheless, not all patients are suitable surgical candidates as they are carefully selected with different selection factors, crucial to maximize patient outcome through this procedure. The selection criteria include: the primary malignancy is controlled, the absence of metastatic disease elsewhere in the body, the patient is medically stable for surgery, and preoperative radiographic evidence of a completely resectable lesion [1]. Furthermore, in most metastatic pulmonary disease where malignant cells disseminate hematogenously, removing the tumor by pulmonary metastasectomy would not address the systemic metastases. Hence, combining treatment modalities to include radiotherapy or chemotherapy such as with Doxorubicin and Ifosfamide may appear to be a reasonable approach to improve survival. However, the poor response of sarcoma to chemotherapy may limit the effectiveness of this treatment strategy of addressing microscopic and macroscopic tumors [4, 6].

In this study, we reviewed patients who underwent percutaneous RFA therapy for pulmonary metastases to determine the feasibility of this treatment approach in patients with unresectable disease. Interestingly, the first patient who received adjuvant radiotherapy (55 Gy) to the tumor bed after the surgical resection of her primary tumor demonstrated a relatively longer interval from the primary tumor resection to the diagnosis of pulmonary metastasis, suggesting the importance of complete primary tumor clearance in delaying and preventing pulmonary metastases. Given that patients with pulmonary metastases often develop disease progression by formation of lesions at new sites, this explained the short disease-free interval post-RFA. Nonetheless, ablation of these lesions may be a viable option. All four patients demonstrated complete tumor response to the RFA and survived >1 year after the therapy.
The patient’s responsiveness to this therapeutic option appears to be an important determinant of treatment efficacy.

In the absence of other effective treatment modalities, the findings in this study suggest a useful role of percutaneous RFA as an alternative therapeutic tool for treating non-surgical candidates with pulmonary metastases. Percutaneous RFA has been shown to be a safe, minimally invasive method for non-resectable lung tumors, with reduced morbidity, negligible mortality and an improved quality of life in patients. Nevertheless, the possible risk of failure of lung RFA in patients with large pulmonary lesions as reported in previous studies should be considered when selecting patients for this procedure [7]. We acknowledge the small sample size of this study and recognize the inherent limitations of the reported survival results. However, the disease-free survival from this procedure appears encouraging.

Acknowledgment

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References