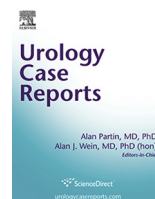


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Oncology

Palliative Radiation Therapy for Symptomatic Control of Inoperable Renal Cell Carcinoma

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ABSTRACT

Renal cell carcinoma (RCC) is traditionally considered to be resistant to conventional low dose radiation therapy (RT). The emergence of image-guided stereotactic body radiation therapy (SBRT) made it possible to deliver much higher doses of radiation. Recent clinical trials of SBRT for RCC showed improvement in local control rates and acceptable toxicity. Here we report a case of inoperable symptomatic RCC that was managed with SBRT. Strikingly, the presenting symptoms of gross hematuria and severe anemia were completely resolved following a course of SBRT. Thus, our case report highlights the potential benefit of this technique for patients with inoperable RCC.

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Introduction

The incidence of renal cell carcinoma (RCC) is gradually increasing, with 61,560 new cases and 14,080 deaths reported in 2015.¹ The common presenting symptoms of RCC are hematuria, flank pain and flank mass.² The standard of care for the stage I–III RCC is nephrectomy,² either open or laparoscopic. RCC was traditionally considered to be resistant to conventional radiation therapy with doses up to 6 Gy having little effect on tumor cell viability.³ While early studies in the 70s and 80s failed to show a significant clinical benefit of a conventional post-operative radiation therapy,⁴ more recent trials that used a high dose image-guided adjuvant RT demonstrated a significant reduction of loco-regional failure.⁵ Stereotactic radiotherapy ablation showed some promise in patients with unresectable renal cancer, but more studies are needed to further evaluate this approach in patients with inoperable RCC.⁵ Here, we report a case of unresectable renal mass with radiographic features of the renal cell carcinoma that was treated with ionizing radiation.

Results

Our patient is a pleasant 85 year old male with a 3 year history of metastatic adenocarcinoma of the lung, in remission, s/p chemotherapy (Carboplatin and Trimetrexate), on Pemetrexed maintenance chemotherapy, who presented with gross hematuria. He was found to have Hg of 10, Hct 32.1, and MCV 81.7. Renal imaging (CT of abdomen and pelvis) revealed a partially calcified enhancing mass in the anterior mid right kidney with infiltration and expansion of the adjacent calyx, and bilateral renal cysts (Fig. 1). Radiographic findings were suspicious for a renal cell carcinoma. Cystoscopy performed by his urologist confirmed the renal mass to be the source of his bleeding. Renal angiography and subsequent embolization were performed in an effort to treat hematuria and anemia associated with RCC. Right renal embolization resulted in the temporary relief of patient's symptoms. However, about 1 year later, patient had a recurrence of a gross hematuria with a resultant anemia (Hg 7.8, Hct 23.9, MCV 82.7) requiring multiple blood transfusions. Patient was not felt to be a good surgical candidate and biopsy was not performed due to high risk of bleeding. A follow-up MRI of the abdomen with and without contrast showed an irregular slightly contrast enhancing lobulated mass projecting off the anterior mid-portion of the right kidney (Fig. 2). Since there was enough circumstantial evidence to suggest that the renal mass represented a renal cell carcinoma, and given the lack of other treatment options, a palliative SBRT of renal mass was proposed as

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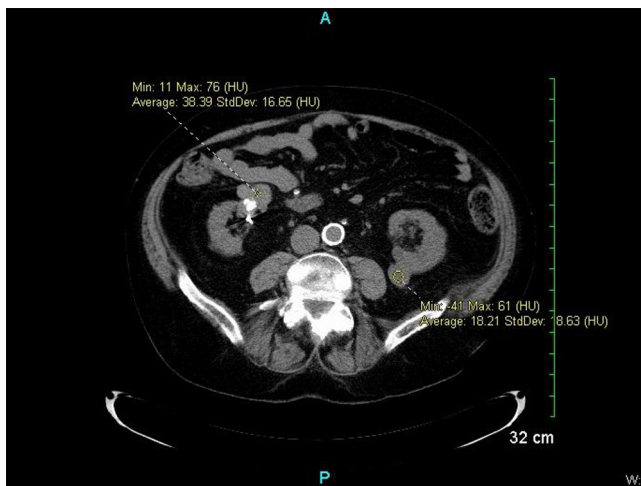


Figure 1. CT scan of the abdomen and pelvis demonstrating a partially calcified mass in the right kidney with infiltration and expansion of the adjacent calyx, and bilateral renal cysts.

an attempt to control clinical symptoms of RCC. Patient was treated with SBRT over the course of 5 days with 5 fractions, 8 Gy per fraction. He received 4000 cGy to the inner ITV and 3500 cGy to the outer PTV. Overall, dose was limited secondary to the adjacent bowel (Fig. 3). An early biologically effective dose (BED) range for 35/5–40/5 Gy was calculated to be 59.51–92.46 Gy ($\alpha/\beta = 6.1$). Six weeks following the completion of the treatment patient was still complaining of intermittent hematuria, although the color of his urine was not as dark as the one before treatment. Remarkably, this intermittent hematuria completely resolved 3 months after the definitive SBRT treatment. Most recent CBC showed Hgb of 10.2, HCT of 31.1, and MCV of 85.6.

Discussion

Renal cell carcinoma was traditionally considered to be relatively radio-resistant to a conventionally fractionated radiation therapy.^{2,3} A detailed analysis of radiation survival curves of human renal tumor cell lines revealed that radiation doses of up to 6 Gy have relatively mild effects on renal tumor cell viability, while doses above 6 Gy cause an exponential decrease in cell survival in the in vitro clonogenic assay.³ Therefore, failure of a conventional

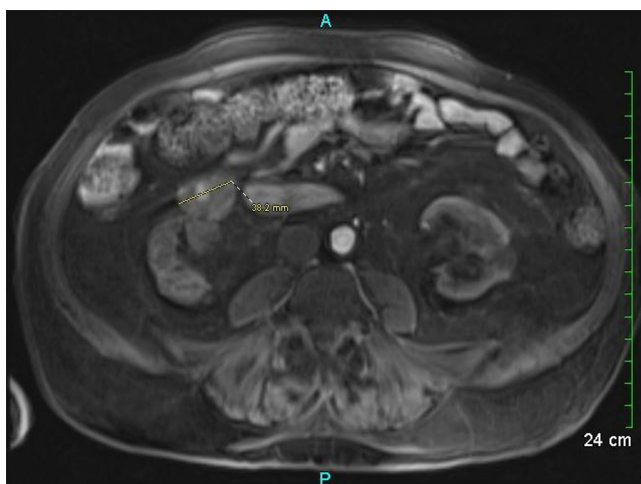


Figure 2. MRI of abdomen with contrast showing an irregular slightly contrast enhancing lobulated mass projecting off the anterior mid-portion of the right kidney.

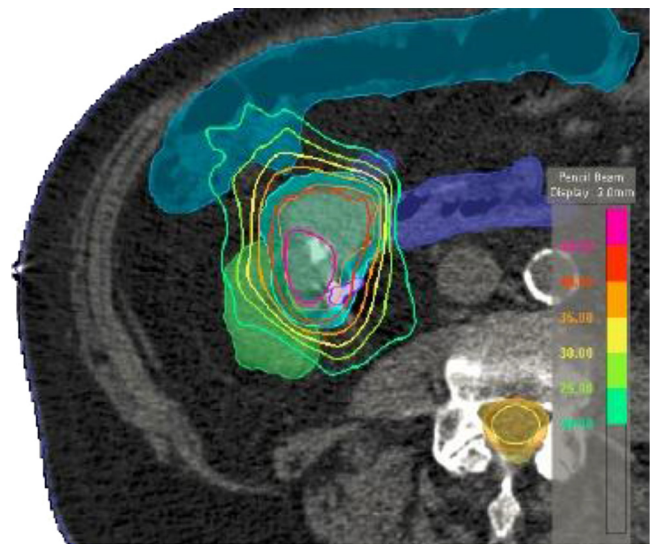


Figure 3. Axial image of the abdominal CT scan showing radiation dose distribution within the right kidney mass (pink, red and yellow lines) with the right kidney highlighted in green, and the adjacent bowel in blue colors.

radiation therapy to show a significant benefit for patients with RCC can perhaps be explained by a relatively low dose per fraction (1.8–2 Gy) which, according to the above mentioned studies, is not sufficient to eliminate the majority of renal tumor cells.³ In contrast, stereotactic body radiation therapy (SBRT) delivers a much higher dose per fraction (8 Gy or higher), which is expected to kill the majority of the renal tumor cells based on the in vitro studies.⁵ Since SBRT is highly effective in destroying tumor vasculature, it is expected to be beneficial for highly vascularized tumors, especially in combination with anti-angiogenic agents. Therefore, a new clinical trial is urgently needed to evaluate the effectiveness of SBRT in combination with anti-VEGF for RCC treatment.⁵

Conclusions

Image-guided high dose SBRT appears to be an effective treatment option for palliative symptomatic management of the inoperable RCC. Although our case report does not warrant change in clinical practice, we hope to highlight this technique for unresectable RCC patients. The relatively small number of clinical trials evaluating SBRT effectiveness in RCC treatment may reflect lack of referral of these patients for RT as RCC was traditionally considered to be a radio-resistant tumor.

Conflict of interest

The authors state that they have no financial conflict of interest.

References

1. American Cancer Society. *Cancer Facts and Figures 2015*. Atlanta, GA: American Cancer Society; 2015.
2. Rini BI, Campbell SC, Escudier B. Renal cell carcinoma. *Lancet*. 2009 Mar 28;373(9669):1119–1132.
3. Ning S, Trisler K, Wessels BW, Knox SJ. Radiobiologic studies of radio-immunotherapy and external beam radiotherapy in vitro and in vivo inhuman renal cell carcinoma xenografts. *Cancer*. 1997;80:2519–2528.
4. Kjaer M, Iversen P, Hvidt V, et al. A randomized trial of postoperative radiotherapy versus observation in stage II and III renal adenocarcinoma. A study by the Copenhagen Renal Cancer Study Group. *Scand J Urol Nephrol*. 1987;21:285–289.
5. Svedman C, Sandström P, Pisa P, et al. A prospective phase II trial of using extracranial stereotactic radiotherapy in primary and metastatic renal cell carcinoma. *Acta Oncol*. 2006;45(7):870–875.