



## EUS-guided radiofrequency ablation for a left adrenal oligometastasis of an esophageal adenocarcinoma

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A 65-year-old man was referred for treatment of a poorly differentiated Her2-negative adenocarcinoma of the distal esophagus. Staging, according to the guidelines of the European Society of Digestive Oncology (ESMO) for esophageal cancer,<sup>1</sup> showed locoregional lymph nodes and was suspicious for a solitary metastasis in the left adrenal gland (T3N1M1) (Fig. 1).

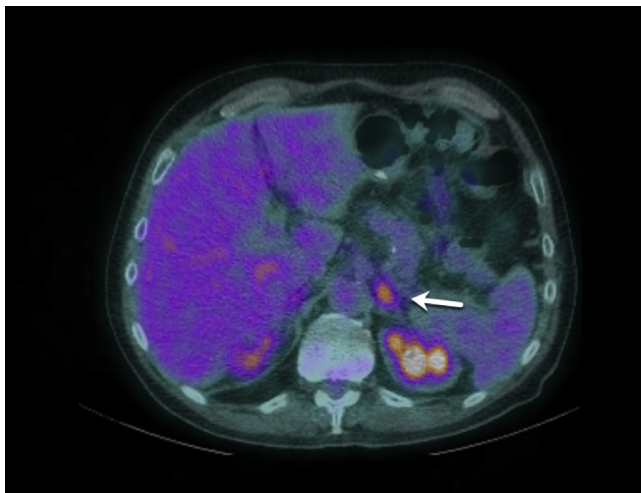
Additional percutaneous cytologic puncture confirmed the diagnosis of an oligometastasis. After 3 cycles of induction chemotherapy (oxaliplatin and capecitabine), restaging showed partial response of the primary tumor and the left adrenal gland metastasis. No additional metastases were detected.

In the multidisciplinary meeting, it was decided to treat the patient with neoadjuvant chemoradiotherapy (paclitaxel and carboplatin) and concurrent radiotherapy with 41.4 Gy to downstage the primary tumor and to facilitate radical surgical resection.<sup>2</sup> It is believed that the chemotherapy regimen has a radiosensitizing effect rather than a systemic effect.<sup>3,4</sup> Adding the left adrenal gland to the radiation field would cause significant injury to the kidneys and was therefore not considered an option.

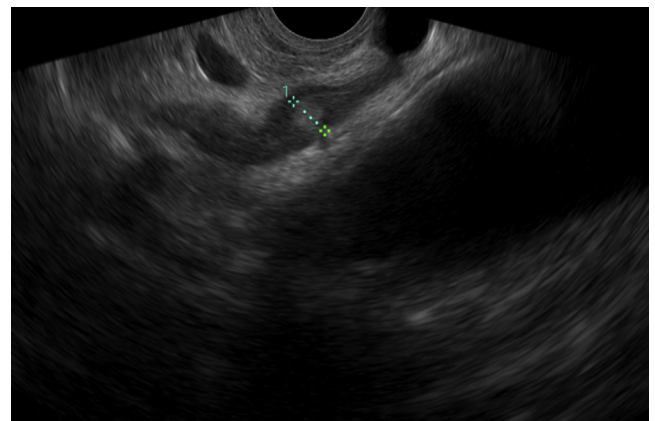
To prevent growth of the left adrenal metastasis during chemoradiotherapy, 3 options were discussed: laparoscopic extirpation, percutaneous radiofrequency ablation (RFA), and EUS-guided RFA. The first option, being an invasive approach, was considered least attractive. Because of the location of the left adrenal gland and adjacent vessels, the percutaneous route was considered too dangerous. Therefore, after the patient gave informed consent, we decided to perform EUS-guided RFA of the metastasis of the left adrenal gland (Video 1, available online at [www.VideoGIE.org](http://www.VideoGIE.org)).

### PROCEDURE

Both endoscopists (A.I. and J.J.B.) followed an EUS-guided RFA in vivo animal training organized by the manufacturer. With the patient under propofol sedation and antibiotic prophylaxis, a linear EUS endoscope (EG-580UT; SU-1 ultrasound processor; Fujinon, Dusseldorf, Germany) was positioned in the proximal part of the stomach, and visualization of the left adrenal gland showed a 5.8-mm hyperechogenic lesion with sharp borders (Fig. 2). The EUSRA (CE0120; STARmed, Koyang, Korea)



**Figure 1.** Positron emission tomographic CT image showing increased <sup>18</sup>F-fluorodeoxyglucose uptake in left adrenal gland (white arrow).



**Figure 2.** EUS image of 5.8-mm hyperechogenic lesion with sharp borders.

Written transcript of the video audio is available online at [www.VideoGIE.org](http://www.VideoGIE.org).

is a 19-gauge water-cooled monopolar RFA needle with a 10-mm-long active tip. The total length of the electrode, including the delivery system, is 150 cm.

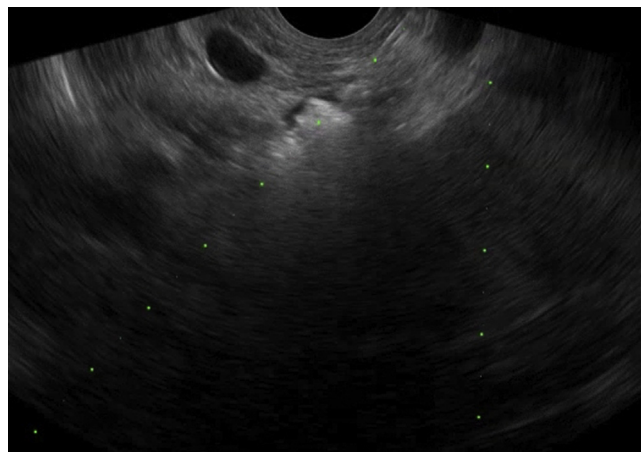
The VIVA combo RF Generator System (STARmed) with variable power settings is connected to the handle of the needle electrode. Energy delivery is controlled by a foot switch. The RF power output is generated continuously with the setting value until the impedance value reaches 100 ohms. The VIVA pump (STARmed) circulates saline solution through the electrode to lower the temperature around the active tip. The needle is positioned in the periphery of the lesion to create an ablation zone around the tip of the needle that overlaps the lesion with a margin of a few millimeters.

Little is known about the optimal settings for EUS-guided RFA. The settings that have been used with the EUSRA probe to treat pancreatic lesions vary between 20W and 50W. The duration of RFA ablation varies between 10 and 15 seconds.<sup>5-7</sup> On the basis of the manufacturer's information about the ablation volume with a 19-gauge needle and a tip exposure of 1 cm, tested in bovine livers, we chose, on empirical grounds, a setting of 35W.<sup>8</sup> Using real-time EUS imaging, we performed 2 overlapping applications of RFA. After the first application, no echogenic bubbles occurred. These echogenic bubbles (or steam popping) occur when the tissue temperature in the ablation zone increases more than 100°C.

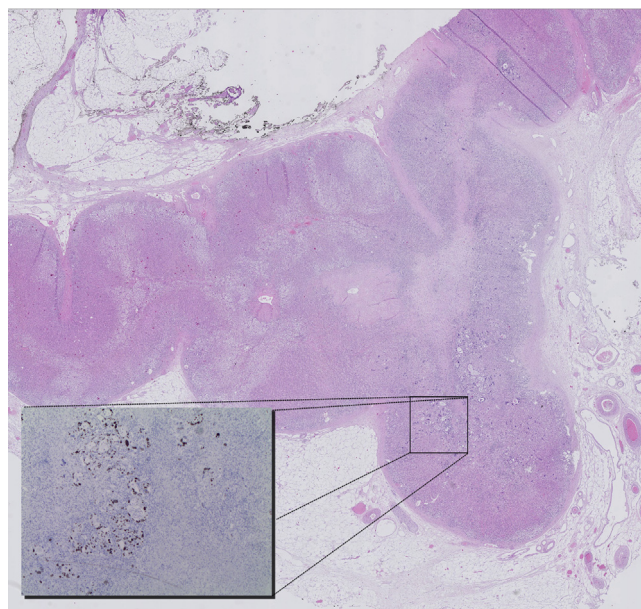
Controversy exists about the phenomenon of steam popping. Some regard these bubbles as a surrogate marker of the maximum effect of the ablation; others believe that steam popping should be avoided because this leads to increased tissue impedance and limits tumor coagulation.<sup>9,10</sup> We decided to perform a second application to maximize the effect of the ablation. In the second application, echogenic bubbles appeared in a large area around the needle tip (Fig. 3). It has been calculated that when the intratissue fluid vaporizes as a result of elevated tissue temperature, the tissue volume expands to approximately 1700 times that of the initial volume.<sup>10</sup> After a recovery time of 1 hour, the patient was transferred to the ward. Pain score and blood pressure measurement were done once in 3 hours, and the patient was given a normal diet. After 1 night, the patient was discharged the next day without any symptoms.

## OUTCOME

After chemoradiation, restaging showed no additional metastasis or avidity of the left adrenal gland. Transhiatal esophagectomy with left adrenalectomy was performed. Pathologic examination showed extensive fibrosis but still vital tumor cells at the edge of the adrenal gland (Fig. 4). This could have been due to suboptimal probe placement but was probably more likely a result of inadequate RFA settings. Furthermore, it cannot be ruled



**Figure 3.** EUS image during radiofrequency ablation of left adrenal gland metastasis. Echogenic bubbles appear around the needle tip.



**Figure 4.** Hematoxylin and eosin–stained specimen showing extensive fibrosis but still vital tumor cells at edge of adrenal gland. At lower left, P53 staining that confirmed the presence of tumor cells at the margin.

out that the neoadjuvant chemotherapy also contributed to the fibrosis seen in the resection specimen.

## CONCLUSION

We conclude that EUS-guided RFA is safe and feasible for local disease control of left adrenal gland metastasis. Settings should be optimized, and more ablation and resection studies are necessary to determine the optimal RFA settings in correlation with histopathologic findings and patient outcome. A prospective study is conducted to determine the feasibility and safety of EUS-guided RFA in the treatment of patients with oligometastasis in the left adrenal gland or upper abdominal lymph nodes.

## DISCLOSURE

*All authors disclosed no financial relationships relevant to this publication.*

*Abbreviations: ESMO, European Society of Digestive Oncology; FDG, <sup>18</sup>F-fluorodeoxyglucose; RFA, radiofrequency ablation.*

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