

## Endoscopic ultrasound-guided radiofrequency ablation of a pancreatic neuroendocrine tumor

Radiofrequency ablation (RFA), a method of achieving tumor necrosis by cell protein denaturation that is induced by heating tissues to above 45 °C, is applied in the treatment of several malignancies. Energy is provided by an RFA current generator, which is connected to an active electrode needle that is placed into the tumor under image guidance. The lesions created have variable diameters, depending on the intensity of the current used, the active tip length, and the treatment duration [1]. Recently a novel RFA needle (EUSRA RF Electrode; STARmed, Koyang, Korea) has been developed for use under endoscopic ultrasound (EUS) guidance [2]. It is an 18G

water-cooled needle, with a long active tip of 5–30 mm (▶ Fig. 1), which is connected to a radiofrequency generator (VIVA RF generator; STARmed).

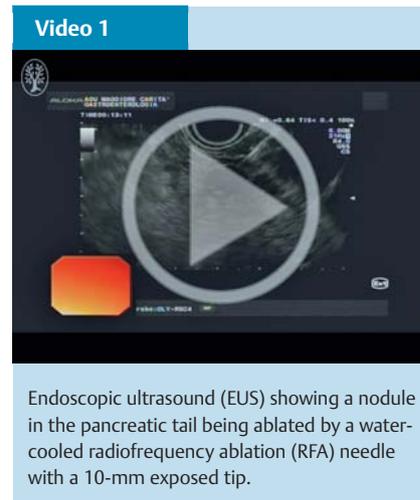
A 76-year-old man was referred for treatment of a pancreatic nodule. His laboratory results were within the normal ranges. An abdominal computed tomography (CT) scan showed a hypervascular 20-mm nodule in the pancreatic tail. EUS-guided fine needle aspiration (FNA) revealed a pancreatic neuroendocrine tumor (pNET) with a Ki67 proliferative index of >5%, consistent with a G2 grading (▶ Fig. 2).

The patient refused to undergo surgical resection and we decided to treat the lesion by EUS-guided RFA. With the patient under general anesthetic, the nodule was ablated in a single session, with two passes of an exposed-tip needle (10-mm long) (▶ Video 1). Indometacin 100mg was administered via suppositories. The patient remained asymptomatic, with normal serum pancreatic enzymes, and was discharged on the third day. A CT scan and contrast-enhanced EUS performed after 1 month confirmed complete radiological ablation (▶ Fig. 3). No complications were observed and to date the patient remains free of disease.

The recommended standard of care of pNETs is surgical resection of functioning nodules, and of large or high grade non-functioning nodules (>2 cm, G2–G3), with a burden of relevant costs and post-operative complications [3]. In this case EUS-guided RFA appeared feasible and



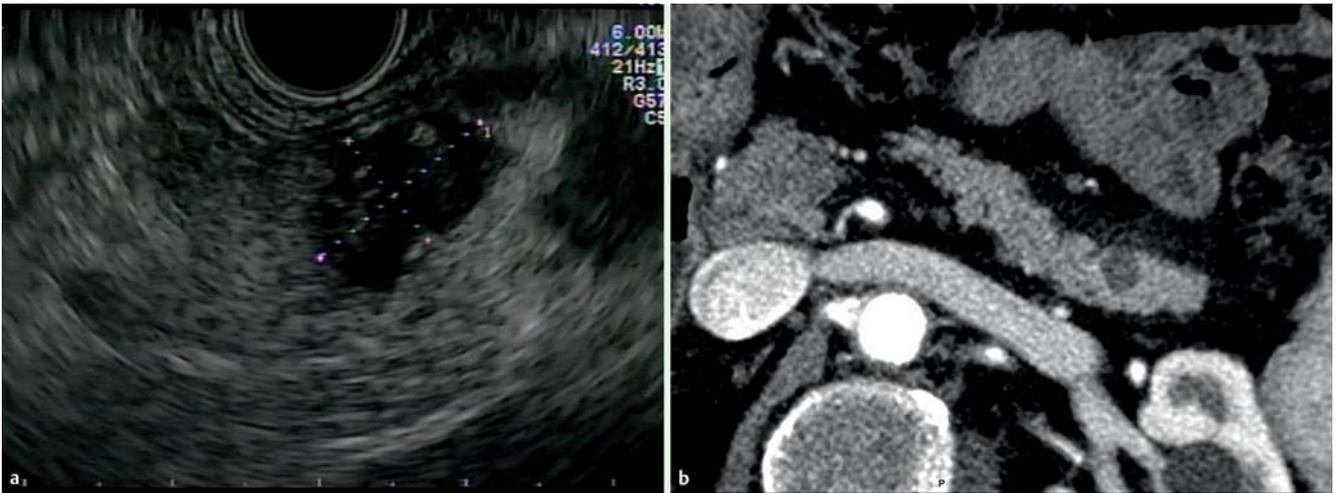
**Fig. 1** The novel EUSRA radiofrequency ablation (RFA) needle, with a 10-mm active tip. The handle is connected to the water cooling device and to the VIVA RF generator.



Endoscopic ultrasound (EUS) showing a nodule in the pancreatic tail being ablated by a water-cooled radiofrequency ablation (RFA) needle with a 10-mm exposed tip.



**Fig. 2** Images of the nodule in the pancreatic tail on: **a** endoscopic ultrasound (EUS); **b** computed tomography (CT) scanning.



**Fig. 3** Images taken 1 month after the endoscopic ultrasound (EUS)-guided radiofrequency ablation (RFA) showing: **a** on endoscopic ultrasound (EUS), a hypo/anechoic nodule; **b** on a computed tomography (CT) scan, a smaller round area without enhancement at the site of the previously ablated neuroendocrine tumor, consistent with necrotic tissue.

effective. This report adds to the increasing evidence of pNETs being successfully treated by ablative therapies, which may represent a potential alternative to surgery in selected cases [4–5].

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**Competing interests:** None

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