

# Pancreatic cancer: Does it work if EUS and laser ablation get married?

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EUS has been evolved into potential therapeutic method, which initially was only a diagnostic tool.<sup>[1]</sup> Pancreatic cancer (PC) is a clinically fatal disease with genetic susceptibility and familial aggregation.<sup>[2]</sup> The poor prognosis mainly resulted from a locally advanced or metastatic stage, low resection rates, and insensitive to radiotherapy and chemotherapy.

Here we reported a case of a 61 yearold male with pancreatic adenocarcinoma diagnosed by biopsy, who underwent FOLFOXIRI (oxaliplatin 85 mg/m<sup>2</sup> d1, irinotecan 165 mg/m<sup>2</sup> d1, 5FU 400 mg/m<sup>2</sup> d1 iv, and continuous micropump infusion of 2400 mg/m<sup>2</sup> for 46 h, repeated every 2 weeks) between December 2014 and February 2015, GS (gemcitabine 1000 mg/m<sup>2</sup> on d1 and d8, tegafur/gimeracil/oteracil potassium 1000 mg/m<sup>2</sup> d114, repeated every 3 weeks) from October 2015 to May 2016, and DX (docetaxel 40 mg/m<sup>2</sup> d1, capecitabine 1000 mg/m<sup>2</sup> d110, repeated every 2 weeks) from June 2016 to August 2016. This case has a 20 year history of smoking and alcohol. On admission, he complained of abdominal pain, and computed tomography presented a mass of 5.3 cm × 4.6 cm in size in the pancreatic head. After fasting for 8 h, the

case underwent the left lateral position examination by oral intake of lidocaine hydrochloride and mild sedation. We used a curved linear array echoendoscope (Olympus Ltd., Tokyo, Japan) orally. We detected pancreatic tail lesions in the upper part of the cardia and gastric body, checking pancreatic body lesions in the lower part of the stomach and gastric antrum, observing uncinate process lesions near pancreatic head and ditch lesions. Color doppler ultrasonography was used to observe the blood flow around the puncture site. After determining the depth, 22G aspiration needle was punctured, then we pulled out the needle core and inserted 3-meter thin laser fibers into the center of tumor away from the lower capsule wall (approximately 1.3 cm), which have a wave length of 800-1064 nm, core diameter of 300 μm, and minimum bend radius of 36 mm. In the initial ablation, the Nd: YAG ablation (Echolaser X4, ESAOTE, Italy) was conducted about energy of 4000 J under EUS guidance. In this process, we ablated the lesion three times using one fiber at 1.3 cm to the edge of the tumor. We firstly performed the ablation with 1000J energy, then withdrawing 1.5 cm and

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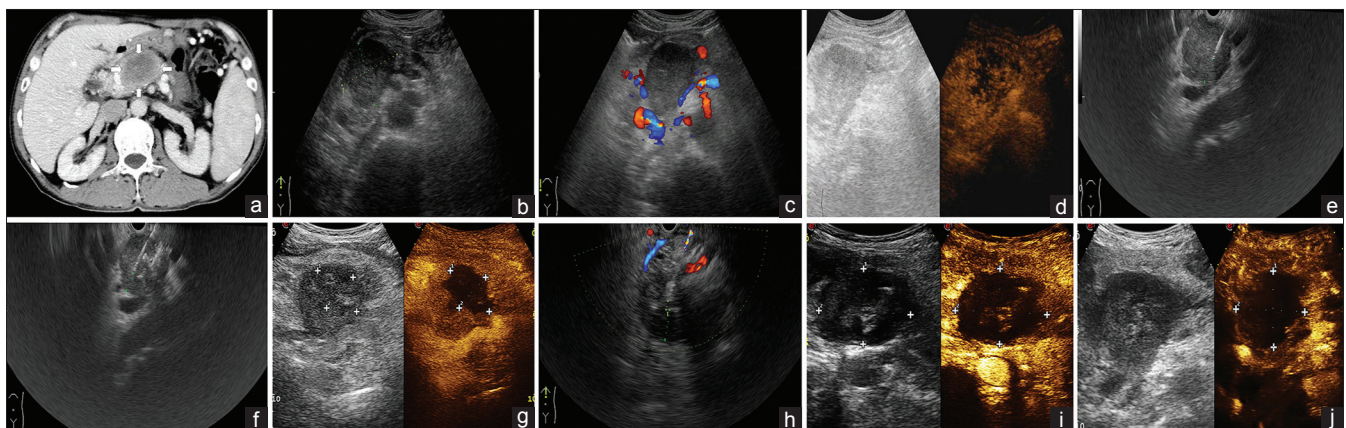
having another 500J. After parallelly adjusting puncture needle about 1 cm away from previous ablation, we secondly ablated the lesion about 1000J energy. Then by repeating parallel puncture and needle procedures, we repeated additional 1500J for this tumor. But two days after initial ablation, contrast-enhanced ultrasound (CEUS) showed an abnormal residual near the left of the tumor. Then, after 6 day-follow up, the target tumor was repeatedly ablated by another EUS-guided multiple ablation of 14,000 J energy. At 2 day followup, CEUS image revealed that no enhancement was detectable in the tumor, which meant complete necrosis. Moreover, 2 months later after two ablations, CEUS showed the tumor nearly complete necrosis and shrunk [Figure 1].

There were no serious procedurereleted complications. In 2month followup, alpha fetoprotein (AFP), carbohydrate antigen 199 (CA 199), and CA 125 levels were normal (AFP: Before: 3.8 ng/mL; after: 3.6 ng/mL; CA 199: Before: 11.3 U/mL; after: 4.7 U/mL; CA 125: Before: 15.6 U/mL; after: 14.2 U/mL), but pre- and postoperative carcinoembryonic antigen (CEA) concentration was beyond the reference value (CEA: Before: 46.2 ng/mL; after: 63.9 ng/mL). The patient's abdominal pain was relieved.

The development of lineararray EUS in the 1990s enabled fineneedle aspiration biopsy under EUS guidance. Currently, EUSguided treatment could be alternatives of the laparotomy, laparoscopic, or transcuteaneous ways. Subsequently, a preliminary

study showed that EUSguided radiofrequency ablation (RFA) in porcine models was successful in destroying pancreatic tissue.<sup>[3]</sup> It was reported that EUSRFA was performed successfully in all 6 cases with PC located in the head or body of the pancreas.<sup>[4]</sup> Complications after these procedures might include abdominal pain, duodenal bleeding, jaundice, and duodenal stricture.<sup>[3,5]</sup> Photodynamic therapy guided by EUS for advanced PC was technically feasible in a porcine model<sup>[6,7]</sup> and PC patients.<sup>[8]</sup> EUS techniques with fineneedle injection (FNI) have the potential to directly allow high dose of antitumor agents for limiting tumor growth in patients with unresectable PC. Irisawa *et al.* treated seven patients with advanced PC by injection of 10 billion or more immature DCs at 2–3 sites through EUSFNI. No significant complications were detectable, and median survival was 9.9 months.<sup>[9]</sup> In addition, adenovirus such as TNFerade<sup>[10]</sup> and ONYX-015<sup>[11]</sup> may be delivered into the tumor for a potential antitumor therapy. However, there need more samples to confirm these findings.

Laser ablation (LA) is a minimally invasive thermal therapy for local malignant tumor. Endosonography could be the optimal approach to real timely display the pancreas, and it allowed targeting tumor easily wherever they were situated in the pancreas. Among ablative methods, LA offered higher focal temperature decreasing splitting or falling off for ablation area. It clinically enabled controlled energy with output power



**Figure 1.** A 61 yearold male with pancreatic cancer. Preoperative computed tomography scan and contrastenhanced ultrasound image showed a tumor measuring 5.3 cm × 4.6 cm in size in the pancreatic head (ad) (arrowheads). Endoscopic ultrasonography real timely guided laser fiber being inserted into the center of tumor away from the capsule wall (approximately 1.3 cm) (e and f). Two days later, contrastenhanced ultrasound showed an abnormal residual near the left of the tumor (g). Then, after 6 days, another endoscopic ultrasonographyguided laser ablation was performed for target tumor (h), and the followup contrastenhanced ultrasound image showed the mass was completed necrosis without enhancement (i). And 2 months later after two ablations, contrastenhanced ultrasound showed the tumor nearly complete necrosis and shrunk (j)

of 1–7 w comparing with 10–100 w in RFA and microwave ablation (MWA). It reported that massive energy input may account for neoplasm recurrence and rapid growth.<sup>[12,13]</sup> Thus, better prognosis will be feasible within the lower power and energy. In addition, unambiguous and thin boundary between the ablative zone and the surrounding normal tissues was available in LA while not in RFA and MWA.<sup>[14]</sup> Moreover, CEUS could immediately show the clearer focal zone and reduce the number of incomplete treatments and re-treatments, which was deemed as accurate as other imaging modalities for estimating post-treatment technical success, and had better cost-effectiveness than the standard procedure.<sup>[15,16]</sup> Based on these, they could increase the probability of PC being successfully treated by LA. It suggested that EUS-guided LA could be feasible and effective, which could be a promising alternative to surgery in selected cases. However, more largescale prospective studies with longterm followup are necessary to confirm this finding in the future.

#### *Declaration of patient consent*

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initial will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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#### *Conflicts of interest*

There are no conflicts of interest.

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