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LETTER TO THE EDITOR

Microwave Ablation with Percutaneous Approach for the Treatment of Pancreatic Adenocarcinoma

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Introduction

Pancreatic adenocarcinoma, characterized by a late presentation and by high aggressiveness, is one of the most lethal human cancers and currently the fifth most common cause of cancer-related death in men [1]. Only 10% of the tumors are confined to the pancreas at the time of presentation, 30–40% are locally advanced, and 50% have distant metastases [1, 2]. Only approximately 20% of pancreatic cancers are found to be resectable at the time of presentation. Surgical resection is the only potentially curative treatment for pancreatic cancer [2].

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Some palliative therapeutic modalities have been applied in treatment of unresectable locally advanced pancreatic carcinoma, such as chemotherapy and chemoradiation [3]. In a few patients, thermal ablative techniques, such as radiofrequency ablation (RFA) and microwave ablation (MWA), have been reported, especially in association with surgery [4, 5].

Date RS [6] reviewed the results of local ablative therapies for the treatment of pancreatic cancer; photodynamic therapy (PDT), high-intensity ultrasound (HIFU), cryoablation, and RFA may have role in ablation of pancreatic tumors. Wu et al. [7] reported encouraging results on the feasibility of HIFU ablation of pancreas tumor, but they excluded patients with carcinoma located in the head to avoid damage of the biliary duct. Photodynamic therapy has major disadvantages of organizational and technical difficulties in setting up the treatments and potential side effects, such as skin photosensitivity reaction [8]. Matsui et al. [9] performed laparotomy and radiofrequency heating in 20 patients with unresectable pancreatic carcinomas. They have reported an intraperitoneal abscess in one patient who died of septic shock.

Potential benefits of these techniques include treatment of patients who are not surgical candidates and reduced morbidity compared with surgery. Ablation with microwave has several intrinsic advantages over RFA, including the capability to generate very high tissue temperature, less intraprocedural pain, larger coagulation zones, less sensitivity to tissue type and charring, improved performance near blood vessels, and no requirement of ground pads [10–12].

Recently, this technique has been proposed in different organs, such as liver, lung, and kidney [10]. However, only few cases regarding the use of MWA in pancreatic cancer have been published and they were performed under laparotomy [5]. To the best of our knowledge, our case

represents the first pancreatic head cancer with the percutaneous approach treated with MWA.

Case Report

Our institutional ethic committee approved the procedure. In November 2010, MWA with percutaneous approach was performed in a patient (male, 65 years old) with histologically proven unresectable pancreatic head carcinoma (maximum axial diameter of 42 mm; Fig. 1). The patient was judged to be unsuitable for surgery on the basis of tumor location, in particular the tumor's proximity to major vascular structures and the duodenum. The patient had normal coagulation parameters. Informed written consent was obtained.

Local anesthesia at the puncture site was achieved by subcutaneous injection of a solution of 10 ml of 2% carbocaine. Two antennas of 17 cm were positioned by using ultrasound (US) and contrast-enhanced US (CEUS) guidance (Philips iU22, Best, NL). Antennas were inserted in the lesion, keeping a distance of 1 cm between each other. The exact localization of the antennas was monitored before beginning treatment with XperGuide CBCT (Philips Allura, FD 20, NL; Figs. 2A–C).

MWA system (Evident Microwave Ablation System, Covidien Ltd) consists of generators capable of producing 45 W of power at a frequency of 915 MHz and coaxial cables to 14.5-gauge straight microwave antennas with a 3.7-cm radiating section for each. Generators were activated simultaneously, and ablation time was 10 min; MW antennas were cooled by a continuous flow of saline solution.

The procedure was executed with continuous anesthesia assistance, in particular with moderate sedation of the patient, using a combination of midazolam (0.07–0.08 mg/kg), propofol (0.5–2 mg/kg), and fentanyl (1–2 μg/kg) administered i.v. Heart rate, electrocardiographic tracing, oxygen saturation, and respiratory rate were continuously monitored. Blood pressure was determined every 4 min.

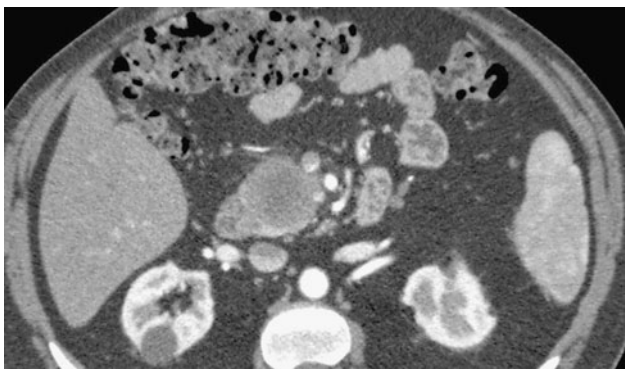


Fig. 1 CT scan shows a lesion of the head portion of pancreas (maximum axial diameter of 42 mm)

Antibiotic prophylaxis against infection was provided with 1 g of i.v. cefazolin sodium (Ancef, SmithKline Beecham Pharmaceuticals, Philadelphia, PA) administered every 8 h for 24 h, beginning just before the procedure. The day after the procedure, a CT scan was performed; it revealed the absence of complications, classified according to SIR classification (Fig. 3) [13]. Postablation syndrome was not registered in our patient. During the hospital stay, complete blood counts and electrolyte levels were monitored and liver function tests were performed twice a week. The patient stayed in the hospital for 8 days.

After 1 month, he presented a mild pancreatitis, which resolved through the use of drugs without resorting to surgery (Fig. 4). Pancreatitis resulted in a pseudo-cyst, detectable at the CT scan performed 3 months after the ablation date (Fig. 5).

Serum marker (CA 19.9) was investigated before, during, and after treatment; the elevated values at the diagnosis returned to the normal range after treatment to the present time. Moreover, the absence of enhancement in the treated region was interpreted as absence of residual tumor or recurrence (Fig. 5) [14]. During the period of the study, the patient was treated for pancreatitis; other therapy was not performed.

Discussion

Local ablative techniques, such RFA and MWA, have been developed to enable local control of tumors and cytoreduction, without damage of the healthy parenchyma [15]. Recently they have been proposed in different organs, such as liver, lung, bone, kidney, and adrenal gland [15, 16].

These procedures presented several common advantages and disadvantages. They both allowed flexible treatment approaches, including percutaneous, laparoscopic, or open surgical access, with ultrasonographic or computer tomographic guidance [10]. Furthermore, because local targeting results in the effective sparing of uninvolved tissue, treatments are generally well tolerated, even in patients with limited reserve [15].

The two ablation modalities differ substantially on the basic mechanism of energy deposition. Radiofrequency uses current flow through conducting electrodes within body tissue, whereas microwave uses an electromagnetic field around an insulated and electrically independent antenna [17]. Consequently, MWA is more amenable to the simultaneous use of multiple antennas to achieve larger coagulation volumes, whereas similar applications with

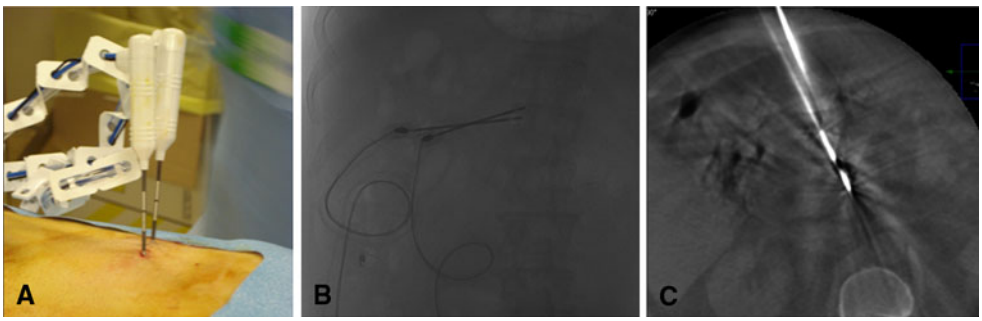


Fig. 2 XperGuide CBCT confirmed the exact position of the two antennas



Fig. 3 CT scan performed the day after the procedure demonstrated the absence of complications

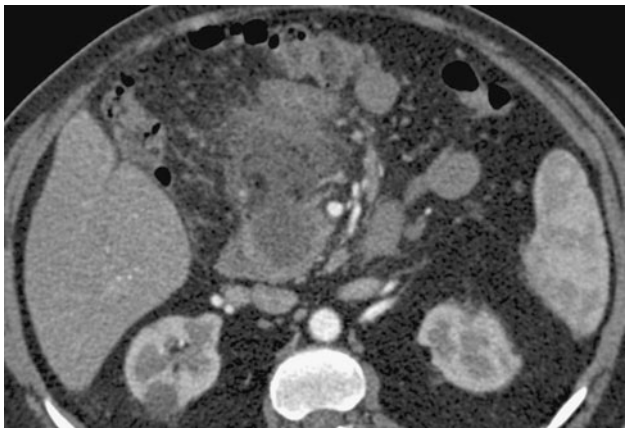


Fig. 4 CT scan shows a fluid collection and edema in the area adjacent the ablation zone



Fig. 5 CT scan performed 3 months after the ablation date revealed a pseudo-cystis, without evidence of local tumor recurrence

RFA may be limited by electrical interference between electrodes [18].

Multiple ablations simultaneously allow the treatment of large tumors or the ablation of several anatomically separate lesions at one time. Multiple antennas ablation reduces the need to repeat treatments, decrease inadequate treatment of larger tumors and therapy length, thereby decreasing the complication rate [19, 20].

There is little reported experience of thermal ablative techniques of pancreatic tumors. The pancreas is surrounded by structures, such as the stomach, duodenum, colon, and vessels, and the risks of thermal injury to these structures have limited the use of radiofrequency or microwave ablation for nonresectable pancreatic tumors [21]. Wu et al. [7] reported HIFU ablation of pancreatic tumor of the body and tail with encouraging results.

A recent review [22] concluded that RFA is a feasible procedure, but its safety still remains under debate; complications rate seems to be much influenced from tumor localization (head, body, tail).

A nonrecent multi-institutional study showed the efficacy of hyperthermia as adjuvant treatment in advanced or inoperable cancer of deep-seated organs, including pancreas [23]. Tang et al. confirmed this result, using RFA under laparotomy in unresectable cancer of pancreas [4]. They demonstrated that RFA could be used safely for pancreatic tumors located in the body and tail, but it is dangerous for those located in the head because they are too close to portal vein [4].

Lygidakis et al. [5] reported the feasibility and safety of open MWA after laparotomy in 15 patients. In all 15 patients, partial necrosis was achieved and there was no major procedure-related morbidity or mortality. Minor complications (mild pancreatitis, asymptomatic hyperamilasia, ascites, minor bleeding) were seen in 6 of 15 patients [5].

To our knowledge, our case is the first report of MWA of a head portion carcinoma with percutaneous approach. The US-guided percutaneous approach certainly simplifies the procedure and makes it more acceptable to the patient, with good cost-benefit ratio and lower incidence of complications.

Currently, the procedure could be proposed only in very selected patients who are unsuitable for surgery or other ablative techniques. Further studies are needed to evaluate MWA long-term efficacy and to compare it with RFA and other ablative techniques.

Conflict of interest The authors declare that they have no conflict of interest.

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