

## Radiofrequency ablation in pancreatic cancer

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### Abstract

**Introduction and aim.** Radiofrequency ablation (RFA) is effective in the treatment of unresectable hepatic tumors and promising results have also been described in tumors of kidney, lung, brain, prostate, and breast. The radiofrequency destruction of solid pancreatic tumors sounds logical but also seems risky due to the friable pancreatic parenchyma, the fear of pancreatitis and the prejudiced myth of ‘the pancreas is not your friend’. **Patients and methods.** We present our initial experience and we describe our technique during intraoperative RFA in four patients with locally advanced and unresectable pancreatic adenocarcinoma (head of pancreas, three; body-tail, one; diameter, 3–12 cm). In all the patients, the RFA was followed by bypass palliative procedures (cholecystojejunostomy and Brown’s anastomosis and/or gastrojejunostomy). A drainage tube was left close to the ablated area. Serum amylase and fluid amylase (drain) were measured for 5–7 days postoperatively. Sandostatin was also administered prophylactically for 3–5 days. **Results.** The postoperative period was uneventful in all the patients, without complications or evidence of pancreatitis. The post RFA CT scan showed remarkable changes in the density and the characteristics of the tumors in all the patients. All the patients are alive, at 12, 8, 5 and 3 months postoperatively, respectively. In one patient (with cancer of the body of the pancreas) who was receiving morphine because of intolerable pain, significant pain relief has been observed. **Conclusions.** From our initial results, RFA seems to be a feasible, potentially safe and promising option in patients with locally advanced and unresectable pancreatic cancer. Nevertheless, larger series of cases are needed to secure our encouraging results.

**Key Words:** Radiofrequency ablation, pancreatic cancer, unresectable or locally advanced

### Introduction

Pancreatic cancer is one of the most aggressive human malignancies. Despite the advances in diagnosis and therapeutic means the outcome for these patients remains poor. Because of the insidious course and rapid growth, tumors are diagnosed at an advanced stage and therefore only the minority of these patients, about 20%, can benefit from pancreatectomy (resection) [1]. An additional 20% of patients have localized disease but are not resectable. In patients with unresectable or locally advanced pancreatic cancer several palliative therapeutic modalities have been applied for tumor regression, local control, slowing of growth and relief of pain/symptoms, such as chemoradiation, intraoperative electron beam irradiation/IORT, interstitial or intraluminal brachytherapy [2–7]. It is well known that hyperthermia has catastrophic or anti-tumor effects.

Radiofrequency ablation (RFA) as the new, local thermal ablative therapy, is effective in the treatment of unresectable hepatic tumors and promising results have also been described in tumors of kidney, lung,

brain, prostate, and breast [8]. The local destruction of solid pancreatic tumors by radiofrequency sounds logical but it can also be deemed as risky because of the ‘soft’, friable pancreatic tissue/parenchyma, the fear of pancreatitis and the prejudiced myth of ‘the pancreas is not your friend’.

### Patients and methods

We present below our initial experience and we describe our technique during intraoperative RFA in patients with locally advanced and unresectable pancreatic cancer. Since May 2004, four patients (two male, two female, aged 59–79, mean = 70 years) presented or were referred to our department with obstructive jaundice (three patients) because of tumor (diameter = 3–7 cm) of head of pancreas and one with gastric outlet obstruction due to huge tumor (diameter = 10–12 cm) of the body of the pancreas. Ultrasound (US) and computed tomography (CT) scans were performed on all four patients. An attempt to stent the oldest patient via ERCP had failed.

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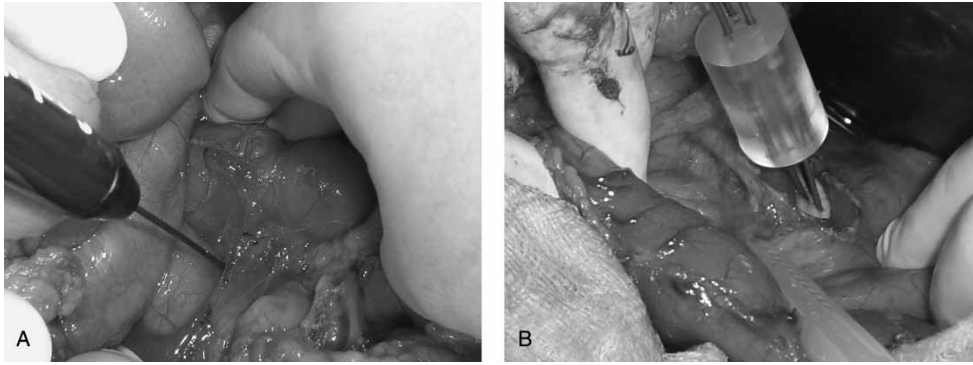


Figure 1. (A) Kocher mobilization and RFA of tumor of the head of pancreas. (B) RFA with cluster electrodes of the huge tumor of the body of the pancreas.

All the patients underwent thorough exploratory laparotomy in which the tumor was confirmed as adenocarcinoma. All four patients had positive results with fine needle aspiration and frozen section, frozen section of hepatoduodenal lymph node was positive in three of the four patients. The tumors were considered locally advanced and therefore unresectable. In light of these results we decided to proceed with palliative procedures and RFA of the tumors. Informed consent was obtained from the patients preoperatively.

A Kocher mobilization of the duodenum and the head of pancreas was performed – as far as this was feasible – and RFA was performed (usually three ablations were carried out, according to the overlapping technique from 2 to 8 min) under direct vision of the duodenum to avoid burn damage. Simultaneously infusion/perfusion with cold normal saline of the areas around the tumors was done during the ablation. We used the latest Cool-tip™ RFAblation system (Radio-nics), with the cooled electrode (17-gauge, 15 cm with 3 cm length for rapid tumor destruction) and the Cool-tip Cluster electrodes for the huge tumor of the body of the pancreas (Figure 1A, B).

In all patients the RFA was followed by bypass palliative procedures (cholecystojejunostomy and Brown's anastomosis and/or gastrojejunostomy). A drainage tube was always left in the ablated area. Serum amylase and fluid amylase (drain) were mea-

sured for 5 days postoperatively. Sandostatin was also administered prophylactically for 3–5 days.

## Results

In all the patients the postoperative period was uneventful without complications or evidence of pancreatitis. In all the patients the post RFA CT scan showed remarkable changes in the density and the characteristics of the tumor (Figure 2A, B). In one patient the tumor (diameter = 3 cm) could not be detected in the CT scan 6 months post RFA (Figure 3A, B, C). In the others the tumors remained the same size or decreased (Figure 4A, B). The tumor marker CA 19-9 was decreased in all patients. In one patient, who had cancer of the body of the pancreas and was receiving morphine because of intolerable pain, a significant level of pain relief was observed. The patients are alive 12, 8, 5, and 3 months postoperatively.

## Discussion

The local selective destruction of solid tumors, especially liver tumors, by RFA is now well established. The application of this method in solid pancreatic tumors is still at a very early stage and is still undergoing research for safer results. The sensitive, friable pancreatic tissue, the prejudice about the 'unfriendly pancreas' may still have an adverse effect

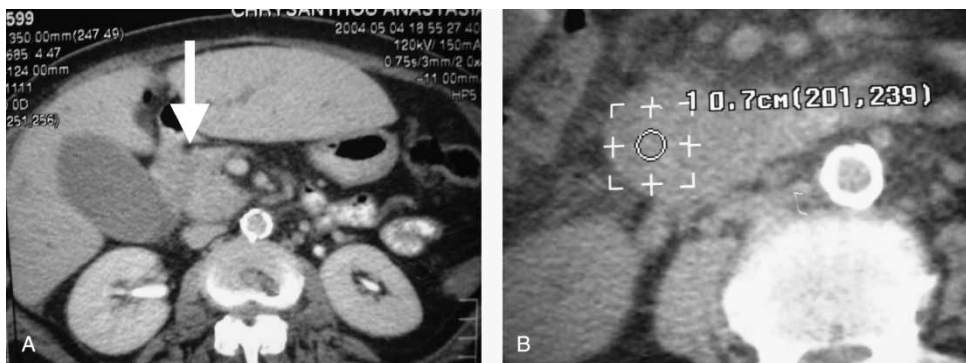


Figure 2. (A) Tumor of head of pancreas (arrow) before RFA. (B) Changes in density of tumor 2 weeks post RFA.

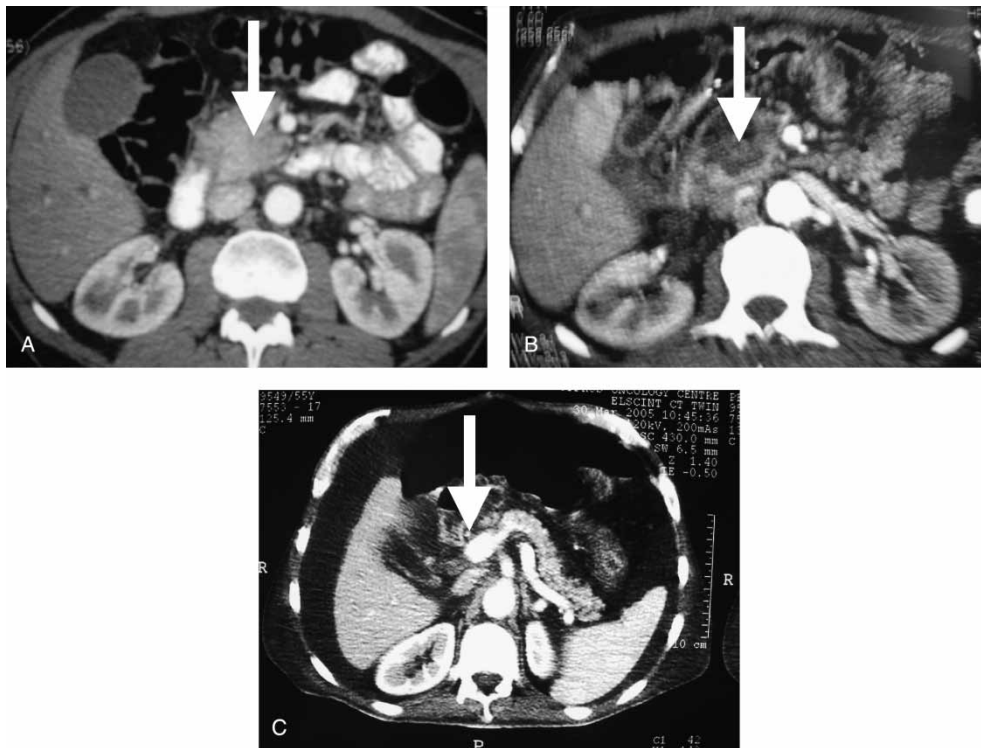


Figure 3. (A) Cancer of head of pancreas before RFA (arrow). (B) Destruction of tumor 2 weeks post-RFA (arrow). (C) The tumor cannot be detected 6 months post-RFA (arrow).

on this method. This may be the main explanation why the latest references are very poor concerning RFA and pancreatic tumors. Matsui et al. in 2000 [9], first reported 20 patients with unresectable pancreatic adenocarcinoma treated with RFA. This article should be the continuity of a previous one from the same team in Osaka, Japan [10]. Two patients (10%) died from critical complications and there was no difference in average survival (3 months) between the treated and control group. The authors consider that the method is relatively safe and could be interesting to treat unresectable tumors without metastasis or patients with benign pancreatic tumors such as insulinomas and glucagonomas. Previously Goldberg et al., in a porcine model trial, concluded that endoscopic ultrasound-guided RFA can be used safely to create discrete zones of coagulation necrosis in the

porcine pancreas [11]. More recently, Elias et al. [12] reported their experience in two patients with pancreatic metastatic tumors (from renal cancer), who died from severe post RFA necrotizing pancreatitis, and concluded that because of severe complications, RFA in the pancreas is not recommended.

We have taken the decision to start using RFA in pancreatic cancer – partly because of our expertise with RF in liver, partly from our observation that the use of diathermy or argon in pancreatic resection was not followed by pancreatitis – and the remarkable uneventful early and late postoperative period of the first patient encouraged us to use the method in other cases as well. We believe that because of the differences between parenchyma in the pancreas and the liver, the RFA sessions should be of shorter duration for the pancreas (2–8 min). With the Cool-tip™

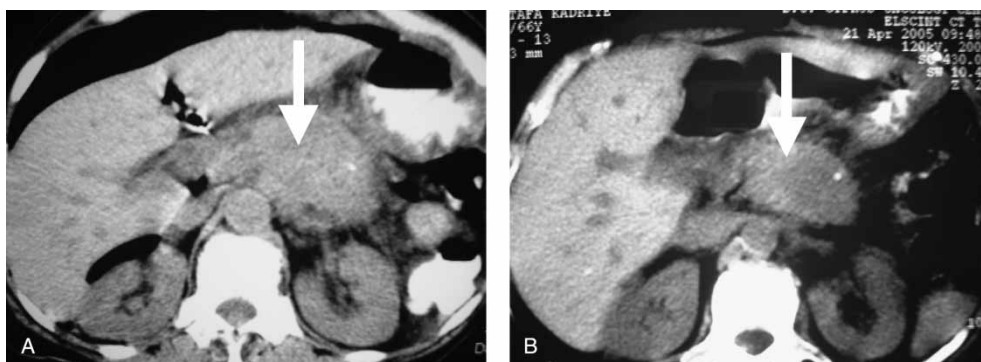


Figure 4. (A) A huge tumor of the body-tail of the pancreas (arrow) before RFA. (B) Destruction and regression of the tumor (arrow) 5 months post-RFA.

(Radionics) device the tumor destruction is direct and controllable, avoiding undesirable damage of normal pancreatic tissue. Although we did not attempt the procedure percutaneously (78% in our liver series), we strongly believe that laparotomy has the advantage of protecting the adjacent viscera, by cooling the area, to perform the ablation under direct vision. Furthermore, we believe that as regards RFA in pancreatic tumors (especially of the head of pancreas), it is prudent to follow the RFA with palliative bypass procedures such as cholecystojejunostomy and gastrojejunostomy. In this case the internal cooling of the common bile duct is meaningless. A surprising result was the pain relief observed in a patient with huge tumor of the body of pancreas, who was almost addicted to morphine because of the intolerable pain.

From our initial experience we conclude that RFA appears to be a feasible, potentially safe and promising option in patients with locally advanced and unresectable pancreatic cancer. The observation of local control (possibly slow growth) in large tumors and the disappearance of small tumors (diameter = 3 cm) post RFA may result in longer survival and better quality of life (i.e. less pain, cachexia) of these patients. We now apply RFA as the standard approach in this type of patient; nevertheless, a greater number of cases is needed to support our encouraging results.

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