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Nine-year survival of a 60-year-old female with locally advanced pancreatic cancer under repeated open approach radiofrequency ablation: A case report

PDAC under repeated RFA

Zhang Jiayi, Ding Jianmin, Zhou Yan, Xiang Jing

Abstract

BACKGROUND

Radiofrequency ablation (RFA) is gaining popularity as an additional therapy for pancreatic ductal adenocarcinoma. RFA appears to be an attractive treatment option for patients with unresectable, locally advanced and non-metastatic pancreatic cancer.

CASE SUMMARY

A 60-year-old female with 2-month intermittent upper abdominal pains was admitted by the hospital, who had undergone a radical gastrectomy (Billroth II) oriented to gastric antral cancer. Contrast-enhanced computed tomography (CE-CT) and abdominal ultrasound displayed a primary tumor in the neck of the pancreas. Pathological examination exhibited that the lesion was a Pancreatic Ductal Adenocarcinoma. According to the results of the imaging, the open approach RFA was selected to treat the primary tumor. 8 mo later, CE-CT follow-up revealed a local recurrence of the tumor, and another open RFA was performed. Although there is evidence that RFA for recurrence of other cancers such as hepatocellular carcinoma may prolong patient survival, it remains unclear whether repeat RFA for local recurrence of pancreatic cancer is feasible. The patient continued to enjoy her 9 years of life following the first RFA.

CONCLUSION

To sum up, RFA of locally advanced, non-resectable but non-metastatic, pancreatic tumors is featured by feasibility-based treatment giving rise to tumor reduction based on the improvement of life quality. It is promising that some cases still reveal the attainment of long-term survival based on repeated open RFA.

Key Words: Locally advanced pancreatic cancer; Radiofrequency ablation (RFA); Recurrence; Pancreatic ductal adenocarcinoma

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Core Tip: A 60-year-old female who once went through radical gastrectomy (BillrothII) oriented with gastric antral cancer was found a primary tumor on the neck of pancreas. Pathological examination exhibited that the lesion is a Pancreatic Ductal Adenocarcinoma (PDAC). The open approach radiofrequency ablation (RFA) therapy was selected to treat the primary tumor. A local recurrent tumor was discovered in the follow-up CE-CT after 8 mo with the performance of another open RFA. The patient still enjoys her 9-year existence following the first RFA. It is promising that some cases still reveal the attainment of long-term survival based on repeated open RFA.

INTRODUCTION

Despite substantial breakthroughs in the diagnosis and treatment of pancreatic ductal adenocarcinoma (PDAC), the disease-oriented oncologic outcomes present a relatively poor profile^[1]. PDAC, removed as the fourth leading cause of death from third-degree cancer in 2016^[2], ranks the diagnosis of approximately 340,000 times each year throughout the world^[3] with a total five-year survival rate of less than 10%^[4]. Radical resection remains the only chance for the cure of PDAC^[5]; comparatively, only less than 20% of patients present suitability for resection at diagnosis; nearly 70% present with locally advanced or metastatic illness. The median survival of untreated patients fluctuates in the range of 3 to 4 mo; less than 5% of patients survive one year following diagnosis^[6]. No consensus was reached upon the most appropriate treatment for patients with local advanced pancreatic cancer (LAPC). Chemotherapy and chemoradiotherapy had been applied as the most-valued frequently suggested treatments as they offer modest survival benefits for patients who have LAPC^[7]. Additionally, as revealed, locally destructive illness accounted for 1/2 of the mortalities of LAPC patients, despite that distant metastasis was proved to be one of the most common

forms of disease progression^[8], indicating the importance of local destructive therapies. Considering the limited successful cases of the present therapy in controlling the disease by prolonging the survival of LAPC patients, novel locally destructive therapies, have been piloted and are considered to be increasingly important therapeutic approaches^[9].

Radiofrequency ablation (RFA) is gaining popularity as an additional therapy for PDAC. RFA, a local thermal therapy, has been enjoying broad application to treat solid parenchymal tumors. At present, RFA is a welcome treatment option oriented to patients with unresectable, locally progressed, and non-metastatic pancreatic cancer. In virtue of analyzing the safety and efficacy of open RFA for LAPC, our study aimed at describing the case of a locally advanced-pancreatic-cancer patient under the treatment of open RFA and gained an over 9-year survival.

CASE PRESENTATION

Chief complaints

A 60-year-old woman presented with intermittent upper abdominal discomfort lasting two months.

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History of present illness

The symptoms of discomfort uncomfortable included post-eating fullness symptoms in the upper abdomen, dull pains in the upper abdomen, and radiating pains in the lower back. The patient, who had lost 5 kg in weight, had been experiencing poor appetite and poor sleep since the beginning of the disease.

History of past illness

The patient had experienced four years of a maximum 150/90 mmHg (1 mmHg = 0.133 kPa) hypertension with no systemic treatment, presented type-II diabetes, and had been

treated with metformin and coronary heart disease for four years. She had gone through radical gastrectomy (Billroth II) for gastric antral cancer four years ago, after which, the patient underwent up to three chemotherapy treatments; however, in the absence of known tumor recurrence or metastasis observations, she has enjoyed a satisfactory physical status, which has lasted for almost four years.

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Personal and family history

The patient had no personal and family history.

Physical examination

Physical examination: the temperature: 36 °C; the pulse: 76 beats/minute; the blood pressure: 135/80 mmHg; respiratory: 18 breaths/minute; no cutaneous or sclera icterus.

Laboratory examinations

Laboratory findings displayed a normal total bilirubin count and conjugated bilirubin count with marked elevations in CA19-9 Level of 74.57 (reference range, 0-30U/mL), CA-50 Level of 111.92 (reference range, 0.6 - 16.3 U/mL).

Imaging examinations

Abdominal ultrasound showed a 3.6 cm×2.9 cm hypoechoic mass with unclear borders and irregular shape in the anterior superior part of the pancreatic neck, the diameter of the common bile duct was 0.9 cm, and gallstones with cholecystitis. According to the Contrast-enhanced Computed Tomography (CE-CT), heterogeneous enhancing masses dwelled at the location of the neck of the pancreas, which was closely connected to the common hepatic artery (Figure 1 A).

PRIMARY DIAGNOSIS AND TREATMENT SELECTION

In virtue of body surface lymph node examination, the exclusion was made on chest CT, gastroscopy, gastric cancer recurrence, and metastasis. Taking into combined

consideration of the imaging reports and auxiliary examination, the patient was initially diagnosed with pancreatic cancer and gallstone cholecystitis. Considering her reference to our hospital oriented to surgical treatment, the decision was made on open laparotomy.

FINAL DIAGNOSIS

Biopsy confirmed the injury as pancreatic ductal adenocarcinoma

TREATMENT

Laparotomy revealed a firm mass in the neck of the pancreas, protruding from the upper edge of the pancreas. In accordance with Intraoperative ultrasound (IOUS), showed a tumor size of 4.0 cm × 3.5 cm that encased and invaded the root of the common hepatic artery; biopsy confirmed the injury as pancreatic ductal adenocarcinoma (Figure 2). In combination with the intraoperative conditions, the patient displayed no signs of recurrence of gastric cancer; therefore, we conducted radio-frequency ablation abiding by the plan, due to the promise that radical resection based on revascularization was once considered impossible. Mobilization of the pancreatic head and duodenum was performed using a Kocher incision. In addition, the patient underwent radical gastrectomy and mobilization of the upper edge of the pancreas for membrane adhesions; the separation was performed at the right edge of the hepatoduodenal ligament before the surrounding tissues and organs were covered with wet gauze and the head and neck of the pancreas were completely exposed. Our operation group employed the Cool-tip™ RFA system (Radionics, USA) along with a cooled electrode (17-gauge) (Figure 3 A). The radio-frequency needle was then set precisely into the tumor under IOUS (Figure 3 B). The tumor was ablated starting at 40 watts and then the energy delivery rate was increased to 10 watts/minute, with 90 watts as the maximum energy output. The ablation lasted three times (in the range of 6-10 minutes, separately). A tube was placed in the body of the pancreas and Winslow

hole for drainage (Figure 1 B) before the patients received anti-infection, acid suppression, and pancreatic secretion inhibition treatments.

The 11th postoperative day witnessed the patient developing complications of pancreatic fistula. Moreover, the abdominal drainage tube continuously drained clear pancreatic fluid with a maximum volume of nearly 500 mL/day. The patient was treated while maintaining drainage patency, including supplemental percutaneous transhepatic drainage tube drainage, food fasting in addition to water, and parenteral nutrition. The patient, who had a smooth recovery, was allowed to be discharged with a drainage tube the 44th day following the procedure. No sign of tumor recurrence could be found in the 1-month follow-up CE-CT.

Around 8 mo after surgery, follow-up CE-CT presented a local recurrent tumor in the body of the pancreas along with splenic vein involvement (Figure 1 C). The patient was in good general condition with no distant metastasis of the tumor but suffered from another laparotomy radio-frequency ablation on November 17. Thereby, guided byIOUS, the radio-frequency needle was precisely placed into the tumor and the manual radio-frequency conditions were placed as the previous condition; besides, the ablation operation was conducted at the following two points (8 and 6 minutes individually). Following the operation, the patient got into a pancreatic fistula with no obstruction of the drainage tube. Second, intraperitoneal hemorrhage occurred, which was prevented by hemostasis under the alleviation of interventional therapy. The abdominal drainage had a gradual decrease without discomfort following the removal of the drainage tube.

OUTCOME AND FOLLOW-UP

The patient was recovering and discharged from the hospital as well as being in good health for 108 mo postoperatively with no signs of tumor recurrence (figure 1 D).

DISCUSSION

Recent years have seen the success that a variety of ablation treatment approaches have been applied for tumor mass reduction in the patients with locally advanced pancreatic cancer with no distant metastases, including the following treatments as Radiofrequency Ablation (RFA), Microwave Ablation (MWA), cryotherapy, Irreversible Electroporation (IRE, NanoKnife®), High-Intensity Focused Ultrasound (HIFU), and Stereotactic Radiation Therapy (Gamma-Knife®, CyberKnife®)^[10-14]. These techniques consist of two main categories: (1) Methods in virtue of thermal ablation; (2) Methods via non-thermal ablation causing direct damage to neoplastic cells. The therapeutic effects exerted by those palliative treatments presented relevance to the induction of intralesional necrosis, cytolysis, and cell death, ultimately leading to tumor cytoreduction^[15]. Data in terms of the clinical application of radiofrequency and microwave ablation, irreversible electroporation, cryoablation, and radiotherapy coupled with high-intensity focused ultrasound, these procedures have a relative safety profile for the (temporary) local control of inoperable pancreatic cancer^[16]. Due to the thinner electrodes and the non-thermal action mechanism, IRE might be advantageous in protecting neighboring large vessels and nerves^[17]. Nevertheless, the growth in tumor size has hindered the effectiveness of the treatment. Meanwhile, the process has evolved into a more demanding task based on the growing electrode numbers. Hence, it has been suggested that IRE should be limited to the largest tumors with a diameter of 5.0 cm^[18]. Direct comparison of the local ablation processes harbors the least possibility ever since the publishing of the corresponding research based on distinctively explained and unbalanced populations of patient groups and indications; the controlled comparative research feature no availability at present.

According to the present case, good exposure via open process overcame the damages to adjacent organs such as jejunum, colon, omentum, and other organs. Spiliotis *et al*^[19] revealed good results in their report in virtue of open RFA in five patients with inoperable pancreatic cancer. Varshney and coworkers^[20], besides, held up the feasibility and safety of intra-operative RFA in three patients with LAPC. From a

technical point of view, reports can be seen on the significance of the US guidance of the ablation process, which majorly occurred in the duration of the needle positioning into the part of the lesion. Not only that,IOUS was able to ensure the security of ablation on the largest scale. It is worth mentioning that the complete removal of tumors around large vessels is difficult due to the cooling effect of blood flow. This case expounded that the conducts of higher power were made to defeat heat sink effectiveness on the greatly vascularized pancreas to avoid incomplete ablation. Furthermore, the present research investigations have been made on RFA in the open setting; in the meanwhile, larger numbers of recent researches have also reported the feasibility harbored by minimal invasive ablation^[11, 21]. It can reduce the morbidity associated with cesarean surgery; nevertheless, probe placement in a less controlled setting is always performed. As a result, it is suggested that the safety of endoscopic-ultrasound guided or percutaneous RFA be applied to an in-depth investigation subject, which is meanwhile preceding the present effect research in the open setting.

The patient developed a pancreatic fistula twice after being treated, and hemorrhage after the second procedure, indicating severe symptoms of post-ablation complications. Considering this case, the postoperative pancreatic fistula came from the leakage of pancreatic fluid *via* a small pancreatic duct after the conduct of RFA. Another suggestion is the vitality of importance for drainage when conducting the open RFA. The occurrence of pancreatic fistula could be stopped in virtue of heating the needle, spraying protein gel onto the wounded surface, passing a drainage tube surrounding the pancreas, and somatostatin. Worthily speaking, the pancreatic fistula, coming from RFA could be under control in one month on the basis of conservative treatments on the condition that the main pancreatic duct is not blocked^[22, 23]. In general, two high risk factors will bring about postoperative bleeding. First, the possible damage to the pancreatic duct during radiofrequency ablation treatment, and second, the placement of the pancreatic duct around the tumor rupture, so that the pancreatic fluid activated during RFA treatment can erode the surrounding

blood vessels. A major study of pancreatic RFA in 16 LAPC patients reportedly described relatively high complications based on a 25% mortality rate. Ablation with temperatures exceeding 90°C at a safe distance of 5 mm from the probe to the main structure suggested by the investigation was studied. Each patient went through 2-5 sessions of ablations^[23]. The Verona group ensured the safety of the procedure by ablating more carefully, reducing the ablation temperature to a maximum of 90°C, to make the undefined peritumor margin a safe margin for the surrounding tissue^[24]. Based on these measurements, physicians can create a decrease in morbidity rates of 40% towards a complete complication rate of 26% on 100 patients under the treatment of RFA. Of all the research, the temperature on the tumor was seemingly functioning as the merely indispensable considered aspect. Thereby, it is suggested that future research with larger sample sizes and well-designed ought to underline the investigation of other factors relevant to post-ablation complications.

It is commonly considered that recurrent pancreatic cancer is a systemic illness.^[25] Thereby, patients can be treated with palliative chemotherapy. The lack of available literature may be only about the safety and outcome of repeat resection for isolated local recurrence. This case revealed that our highlighting the repeated RFA ought to be a feasibly practical option for locally recurrent pancreatic cancer. The progression-free survival following the occurrence of the first RFA treatment was 7 months. After repeated committed RFA for the local recurrent tumor, no signs of tumor relapse were seen for over 100 months. In-depth research is still exerting an indispensable role in clinically validating the repeated RFA.

CONCLUSION

In our patient, RFA was shown to be a feasible treatment giving rise to tumor reduction and extend survival. IOUS features vital significance as it powerfully confirms the property of safety and feasibility of the RFA procedure. Constant RFA for local recurrent tumor is likely to lengthen survival, according to our practical case. More

researches are necessary for validating therapeutic approaches and associations oriented with the ideal possible survival results.

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