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CASE REPORT

Cryoablation for liver metastasis from solid pseudopapillary tumor of the pancreas: A case report

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Abstract

BACKGROUND

Solid pseudopapillary tumor (SPT) of the pancreas is a rare pancreatic tumor and 10% to 15% of cases are associated with metastasis. Cryoablation is a new method that can induce tumor necrosis, and treatment of tumors by cryoablation can cause anti-tumor immune responses.

CASE SUMMARY

A 16-year-old woman with SPT of the pancreas developed liver metastases 5.3 years after complete resection of the primary pancreatic tumor. She was admitted with chief complaints of abdominal pain in the upper abdomen and a weight loss of approximately 5 kg over 4 mo. Carbohydrate antigen (CA) 125, carcinoembryonic antigen, and CA 199 were normal. An abdominal computed tomography scan found multiple nodules in the right lobe of the liver that measured approximately 13.5 cm × 10.8 cm × 21.4 cm. Immunohistochemical staining results showed that CD10 and CD56 were positive, and the patient was diagnosed with SPT of the pancreas with liver metastasis. The patient underwent percutaneous cryoablation and interventional embolization. During the 5-year follow-up, the patient remained disease-free after cryoablation, with relatively normal immune function.

CONCLUSION

Herein, we for the first time report the treatment of liver metastasis from SPT of the pancreas using cryoablation plus interventional embolization, which could be a promising alternative therapy for pancreatic SPT liver metastasis.

Key words: Solid pseudopapillary tumor; Pancreas; Liver metastasis; Cryoablation; Interventional embolization; Case report

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Core tip: In this study, we report the case of a 16-year-old female patient with solid pseudopapillary tumor (SPT) of the pancreas with liver metastasis who obtained a favorable outcome after combined cryoablation and transcatheter arterial embolization treatment. Our study showed that SPT liver metastasis is rare and occurs at various time points after diagnosis. Cryoablation with transcatheter arterial embolization could be utilized as an alternative therapy for pancreatic SPT liver metastasis.

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INTRODUCTION

Solid pseudopapillary tumor (SPT) of the pancreas is a rare tumor type with low malignant potential. Its incidence accounts for 0.3%-3% of all pancreatic tumors, accounting for 3%-15% of pancreatic cystic tumors; the ratio of male to female is about 1:10[1]. Although SPT shows low malignant potential, 10%-15% of tumors show aggressive behavior, with metastatic involvement of the liver. SPT was first reported by Frantz in 1959, and the number of reported cases has increased[2]. Domestic and foreign scholars have used a variety of different diagnostic names according to their characteristic solid, cystic, and pseudo-papillary structures, such as solid papillary epithelioma, solid cystic tumor, papillary cystic tumor, solid cystic papillary acinar cell tumor, and Frantz tumor[3-5]. The World Health Organization redefined SPT as a low-grade malignant tumor in 2010[6]. Surgery is the preferred treatment for SPT, and most tumors are completely resected and the prognosis is good[7].

Cryoablation is based on the Joule-Thomson principle that uses argon as a refrigerant to rapidly cool down, helium as a heat medium for rapid temperature rise, biosensing, timely monitoring, and other aerospace technology patents[8]. Compared with traditional surgery and other ablation techniques, cryoblation has been accepted by doctors and patients because of its little trauma, visualization of an ice ball, less pain, mild damage to large blood vessels, activation of the immune function in the body, and many other advantages, such as high safety and good curative effect. In tumors of the pancreas, liver, kidney, and other organs, encouraging results have been achieved[8-10].

Transcatheter arterial embolization (TAE) is a technique in which an embolic agent is injected or delivered into a target vessel to occlude the vessel for the intended therapeutic purpose. TAE has become an accepted treatment option for patients[11,12]. The human liver receives double blood supply from the hepatic artery and the portal vein, and when one of the two experiences blood flow obstruction, the blood flow through the other can maintain the normal function of the liver. TAE can reduce tumor blood supply or block tumor blood supply and maintain unaffected normal liver tissue.

Herein, we report the case of a 16-year-old female patient with liver metastasis from SPT of the pancreas who obtained a favorable outcome after combined cryoablation and TAE treatment.

CASE PRESENTATION

Chief complaints

A 21-year-old female patient presented on January 1, 2014 with complaints of persistent abdominal distension and abdominal pain in the upper abdomen, accompanied by edema of the lower extremities. The above symptoms were progressively aggravated with a weight loss of approximately 5 kg over 4 mo (May 2014), and the patient was admitted to our hospital.

History of present illness

Approximately five years ago, the 16-year-old female patient was admitted to a local hospital on March 22, 2009. The patient inadvertently touched a mass in the left

middle and upper abdomen. A computed tomography (CT) scan of the abdomen showed a large mass in the patient's left middle and upper abdominal cavity, and a surgical resection was performed. Pathological results showed SPT of the pancreas. Subsequent radiological studies showed no residual lesions in the pancreas.

Laboratory examinations

The levels of carbohydrate antigen (CA) 125, carcinoembryonic antigen (CEA), and CA 199 were normal. Percutaneous liver tumor biopsies were performed using ultrasound-guided biopsy needles. Immunohistochemical staining results showed that CD10 and CD56 were positive, and the patient was diagnosed with SPT of the pancreas with liver metastasis (Figure 1).

Imaging examinations

An abdominal CT scan found multiple nodules in the right lobe of the liver that measured approximately 13.5 cm × 10.8 cm × 21.4 cm (Figure 2A).

FINAL DIAGNOSIS

The patient was diagnosed with SPT of the pancreas with liver metastasis.

TREATMENT

Surgery is the first choice for SPT of the pancreas with liver metastases. However, after informed consent, the patient refused surgery due to the risk of surgery and the possibility of incompletely resected tumors. As a less invasive and alternative technique, cryoablation was accepted by the patient and informed consent was obtained for cryoablation treatment.

After the diagnosis of liver metastasis from SPT of the pancreas, the patient underwent TAE of the liver metastases. A total of 7.5 mL of super-liquefied lipiodol and gelatin sponge particles in ten capsules were administered five times in approximately two years. Simultaneously, liver metastasis was treated by cryoablation under general anesthesia on August 21 and December 1, 2014. The patient showed a reduced platelet count and activated partial thromboplastin time, and a prolonged thrombin time post-operation. Fresh frozen plasma infusion was given to correct recurrence of coagulation abnormalities.

OUTCOME AND FOLLOW-UP

After treatment, serum tumor markers CA199, CEA, and CA125 were within the normal range. During follow-up, abdominal CT scans were performed every 12 mo. The patient remained disease-free 5.1 years after cryoablation (*i.e*. 10.4 years after removal of the primary pancreatic tumor) (Figure 2). As shown in Figure 3, we analyzed the patient's peripheral blood lymphocyte immune function on August 12, 2019. The results revealed that the percentages of CD3+, CD4+, and CD8+ T lymphocytes were 44.2%, 67.6%, and 24.8%, respectively (Figure 3A and B). Natural killer cell function analysis showed a 17% percentage of CD56+ T lymphocytes (Figure 3C).

DISCUSSION

Herein, we report the case of a 16-year-old female patient with SPT of the pancreas who underwent surgery. After 5.3 years, the patient was diagnosed with liver metastasis and received TAE and cryoablation shortly after detection of the liver metastasis. The patient showed a prolonged survival and good health 10.4 years after the initial diagnosis, with normal immune function.

Solid pseudopapilloma is a rare pancreatic inert tumor that accounts for 0.9%-2.7% of all exocrine pancreatic tumors[13,14]. However, previous studies have shown that the incidence of SPT is increasing, and that it usually occurs in young women in the second or third decade of life, as seen in the present study[5]. It is difficult for patients to find SPT. Most patients have normal CA 125, CEA, and CA 199 levels. In the present case, CA 125, CEA, and CA 199 did not increase before and after liver metastasis, suggesting that laboratory examination was not meaningful for this patient.

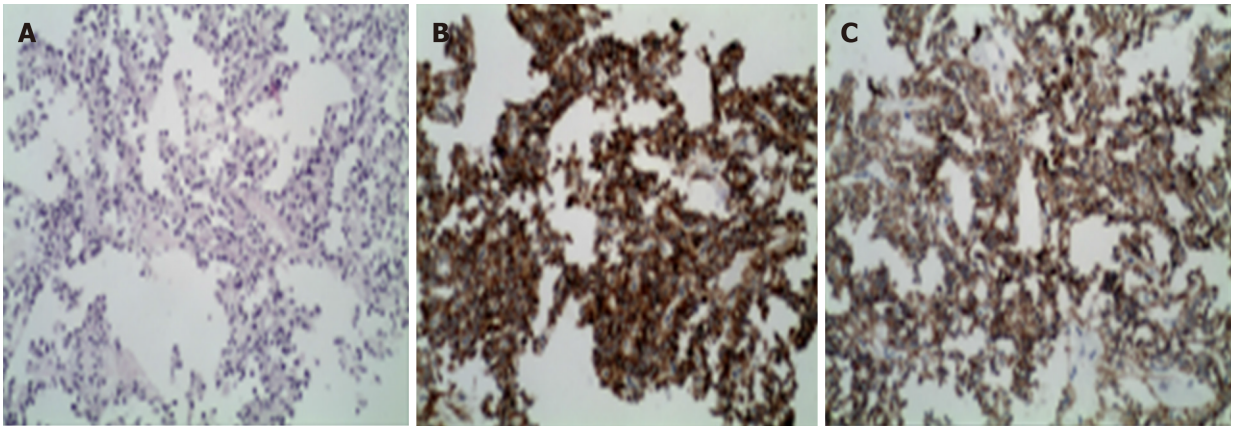

Figure 1 Pathology of solid pseudo-papillary tumor of the pancreas with liver metastasis. A: The tumor is less heterogeneous, the cytoplasm is eosinophilic, and the tumor cells are arranged in a pseudo-nipple around the blood vessels; B: Positive cytoplasmic staining for CD10 (×200); C: Positive cytoplasmic staining for CD56 (×200).

SPT is usually considered a low malignant tumor and has a good overall prognosis. Therefore, surgical resection has been considered an option for treatment[15,16]. The specific procedure depends on the location and size of the tumor and whether there is adjacent invasion or distant metastasis. Most tumors are completely resected and the prognosis is good[7]. Owing to the rarity and generally indolent biology of SPT of the pancreas, optimal management of liver metastasis is not well defined. Approximately 6% of all SPTs are reported to invade surrounding organs and about 10%-15% develop distant metastases[17]. The most common metastatic organ is the liver; tumor cells may metastasize to the liver through the superior mesenteric vein and portal vein. Law *et al*[18] analyzed data from 2744 SPT patients who underwent surgery from 1961 to 2012 and found that 4.4% (86 patients) had recurrence, with 50.5 mo as the median time to recurrence. Our case presented with liver metastasis five years after surgical resection. Currently, the longest time to liver metastasis is 15.8 years after surgical resection[19]. The World Health Organization defines malignant SPT as tumors with surrounding tissue invasion, perineural invasion, vascular invasion on microscopic pathology, and metastasis[20].

Systemic chemotherapy with gemcitabine and cisplatin or 5-fluorouracil for the treatment of SPT remains controversial, and there has been no obvious response to radiation therapy[21]. Compared with traditional surgery, cryoablation is less traumatic, with slight adverse reactions, short recovery time, and short hospital stay. Ravindranath *et al*[22] have shown that anti-tumor-related ganglioside antibodies are significantly increased in patients with metastatic liver cancer treated with argon-helium cryoablation compared with surgical treatment and radiofrequency ablation. Therefore, argon-helium cryoablation results in the release of this antibody into the blood. In theory, it can effectively induce a tumor-specific immune response. Radiofrequency ablation causes cell membrane melting and protein denaturation due to high temperature and no tumor antigen is released into the blood. Therefore, it is impossible to stimulate immune enhancement using radiofrequency ablation, which could instead increase the risk of complications. During the 5-year follow-up, the patient remained disease-free after cryoablation, with relatively normal immune function.

CONCLUSION

In conclusion, SPT liver metastasis is rare and occurs at various time points after diagnosis. Cryoablation with TAE could be utilized as an alternative therapy for pancreatic SPT liver metastasis.

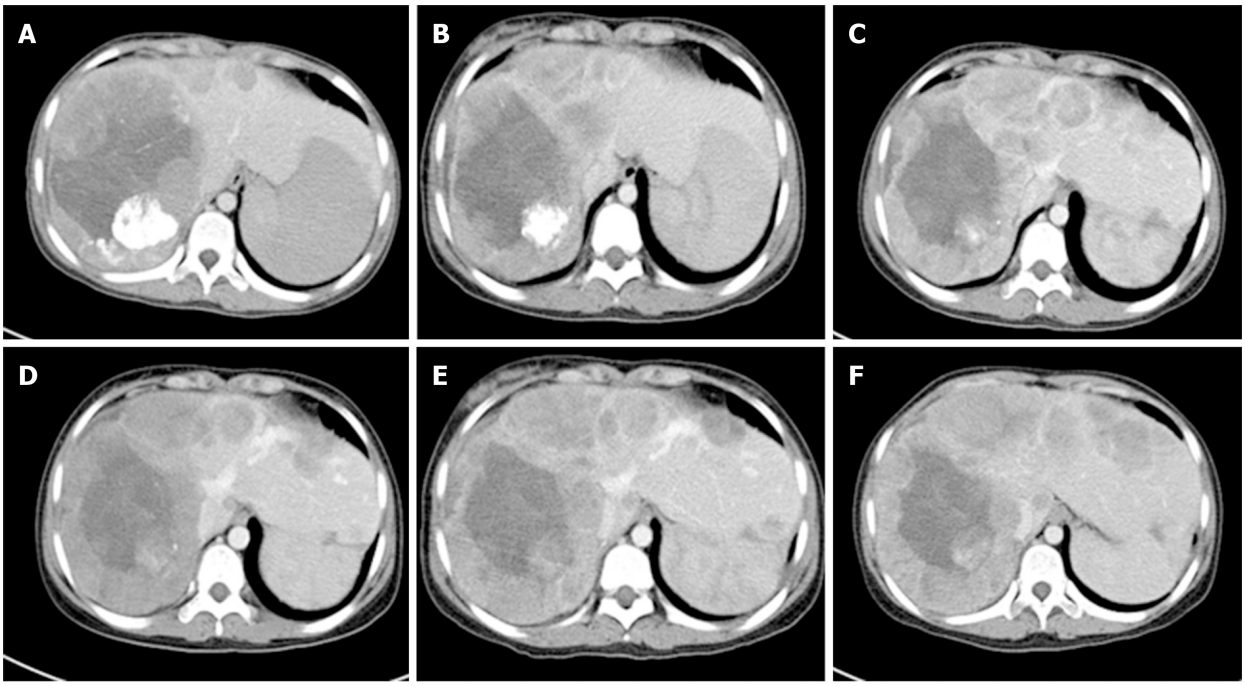

Figure 2 Computed tomography of the liver. A: Before cryoablation, abdominal computed tomography found multiple nodules in the right lobe of the liver; B-F: Follow-up computed tomography scans at 1 year (B), 2 years (C), 3 years (D), 4 years (E), and 5 years (F).

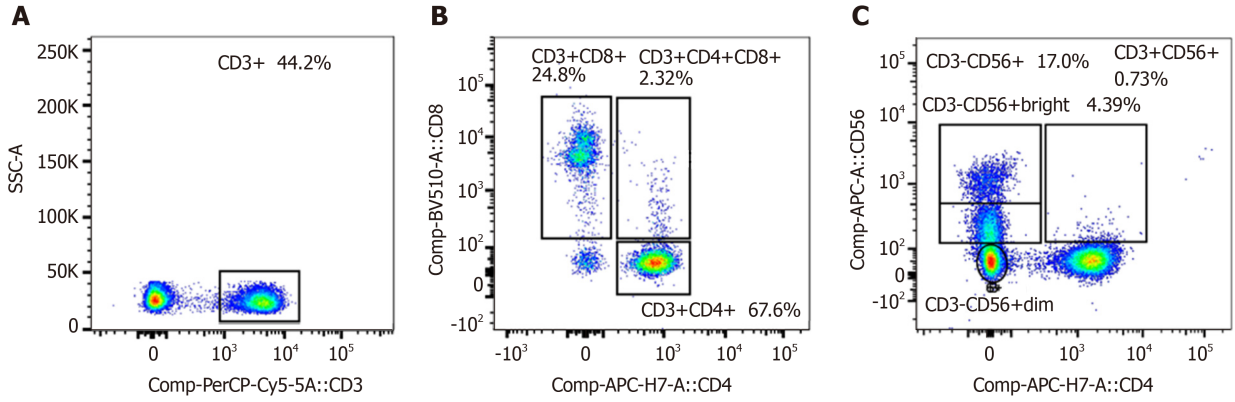

Figure 3 T cell subsets in patient's peripheral blood post-treatment. A: CD3+ cell population; B: CD4+ and CD8+ cell population; C: Natural killer cell population.

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