CASE REPORT

Solid pseudopapillary tumour (Frantz's tumour) of the pancreas in childhood: successful management of late liver metastases with sunitinib and chemoembolisation

Mauricio Antonio Escobar,¹ John Mason McClellan,² William Thomas³

¹Mary Bridge Children's Hospital and Health Center, Pediatric Surgical Services, Tacoma, Washington, USA

²Department of General Surgery, Madigan Army Medical Center, Tacoma, Washington, USA

³Mary Bridge Children's Hospital and Health Center, Tacoma, Washington, USA

Correspondence to

Dr Mauricio Antonio Escobar Jr, mauricio.escobar@multicare.org

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SUMMARY

The patient is a girl aged 17 years who originally presented at age 11 years with a solid pseudopapillary tumour (SPT) in the head of the pancreas treated by an R0 pylorus-preserving Whipple procedure. The patient underwent surveillance CT every 3 months for the first year followed by MRI every 6 months. She was noted to have a new liver lesion in Couinaud segment VI highly suspicious for metastasis at 30 months. Liver wedge biopsy confirmed metastatic SPT. Two months later two new lesions were noted in Couinaud segment VII. The family preferred medical management to surgery resulting in a treatment combination of the tyrosine kinase inhibitor sunitinib and hepatic artery embolisation. The patient developed a hepatic abscess following embolisation but recovered with antibiotics. The patient has subsequently been followed with serial MRIs every 3 months, and 20 months following chemoembolisation, she has no evidence of recurrence of the metastases.

BACKGROUND

Solid pseudopapillary tumour (SPT) or solid pseudopapillary neoplasm (SPN) of the pancreas (Frantz's tumour) is an uncommon neoplasm of low malignant potential.¹ As noted previously, Frantz's tumour in children is rare and pathologically and clinically distinct from adults.² Malignant potential and late metastases is exceedingly rare in paediatric patients, and mortality resulting from this type of tumour is approximately 1%–1.2%.^{3,4} The mortality related to distant metastasis in children is 1%,⁴ and liver metastases are unusual.⁵ Early metastases have been successfully treated with resection and/or adjuvant chemotherapy.^{3,5–12} However, there are no chemotherapeutic agents that are known to be effective without surgical resection.¹³ Late metastases are virtually unheard of in the paediatric population, and no report could be found by the authors. The authors therefore present the first case of a successful treatment of late metastases of SPN of the pancreas to the liver with hepatic artery chemoembolisation and targeted therapy.

CASE PRESENTATION

The patient is a girl aged 17 years who was originally successfully treated at 11 years of age for a Frantz's tumour in the head of the pancreas with an

R0 pylorus-preserving Whipple procedure.^{1,4,5,9–12}

The unique clinical and pathological features of this paediatric case prompted the senior surgeon (MAE) to collaboratively prepare a case summary and review of the literature comparing paediatric with adult presentations of SPN of the pancreas.² Based on the review of the literature, the authors recommended: *serial CT or MRI every 3 months for the first year spacing out to 6 months during the second year and yearly thereafter for a total of 5 years.*²

INVESTIGATIONS

The patient underwent serial CTs every 3 months for the first year, followed by MRIs every 6 months thereafter to minimise ionising radiation exposure. The patient remained symptom free. Interestingly, the authors did not follow the recommended surveillance programme and continued obtaining MRIs every 6 months during the third year following resection after discussion with the patient and her guardian.

The patient was noted to have a new lesion of the liver on her routine surveillance MRI approximately 30 months following her Whipple. The patient had a normal comprehensive metabolic panel including normal liver function tests—serum glutamic oxaloacetic transaminase (SGOT)/aspartate aminotransferase (AST), serum glutamic pyruvic transaminase (SGPT)/alanine aminotransferase (ALT) and total bilirubin, normal complete blood count and normal sedimentation rate and C reactive protein (CRP). Quantiferon, *Cryptococcus* antigen and *Aspergillus* antigen were all normal. She also had a normal cancer antigen 19-9 (CA 19-9 level). The patient was presented at tumour board. A PET scan was considered, but given the size of the lesion (5 mm), it was felt that the size may make further lesions difficult to detect. No further imaging was sought due to SPT normally locally metastasising in paediatric patients. The patient's surgeon and oncologist (WT) agreed to repeat the MRI within 6 weeks, and at this time the lesion was noted to be growing to 7 mm, highly suspicious for metastasis (figure 1).

The lesion was located in the right posterior lateral segment of the liver (Couinaud segment VI). The patient underwent an exploratory laparotomy and wedge resection of the metastatic lesion. The lesion was excised in their entirety, and the

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Figure 1 MRI revealing a single metastasis located in the right posterior lateral segment of the liver (Couinaud segment VI). Arrows demonstrate the metastases. (A) Demonstrates the metastasis on axial T2 hASTE sequences and (B) demonstrates the metastasis on the postcontrast T1 vibe.

pathology returned *SPN of the pancreas*. The surgical margins were uninvolved by the lesion. The patient recovered relatively quickly from the biopsy.

Two months later, two new lesions were noted in the right posterior dome of the liver well away from the biopsy site (Couinaud segments VII) (figure 2). The lateral lesion measured 4 mm, and the more medial lesion measured 7 mm. Again, the patient was symptom free. On retrospective review, the foci were likely present in the preoperative MRI. The foci were concerning for additional developing metastatic foci. The pancreas never demonstrated evidence of recurrence. A chest X-ray performed at the time of eventual hepatic artery embolisation was normal.

TREATMENT

A careful review of the literature and expert consultation was sought nationally. A formal right hepatectomy was recommended, but the patient's family strongly preferred to avoid surgery and pursue medical management. The oncologist and surgeon worked collaboratively to honour the family's wishes. After consultation with colleagues at Yale Cancer Center and Memorial Sloan Kettering, a combination of the tyrosine kinase inhibitor sunitinib and hepatic artery embolisation was recommended.¹³

The treatment that was proposed was to monitor the growth of the tumour on sunitinib and proceed with local therapy if the tumour progressed. The tumour was then to be monitored for either involution, or at least cessation of growth. If the growth continued, then the plan was to proceed with chemoembolisation.

A 4-week trial of daily sunitinib malate 18.75 mg by mouth once daily was therefore begun followed by repeat MRI scanning. This sequence was also consistent with published reports of use in pancreatic neuroendocrine tumours (PNET) therapy.¹⁴ The lesion

Figure 2 MRI revealing postoperative changes and two new metastases located in the right posterior lateral segment of the liver (Couinaud segment VII) on the B50 diffusion sequence. (Arrows demonstrate the different metastases in A and B).

Figure 3 CT revealing a large posthepatic artery embolisation liver abscess.

was deemed stable, and the patient was continued on sunitinib malate 25 mg by mouth once daily thereafter. Two months later, there was a slight increase in size of the lesions with the dominant lesion measuring 10 mm. A repeat MRI one month later showed no change in size to the lesions. However, given the evidence of growth on sunitinib, the decision was made to proceed with hepatic artery chemoembolisation.

The patient underwent a successful fluoroscopically guided right hepatic artery transarterial chemoembolisation under general anaesthesia delivering the dose of 100–300 μ m LC Beads (BTG International, London, UK) onto which 75 mg of doxorubicin had been adsorbed overnight to near stasis with the first dose of LC Beads. Sunitinib was held prior to embolisation, and the patient received a total of 4 months of targeted therapy. Following the procedure, the patient was observed overnight and sent home the next day in good condition. She was followed weekly by the paediatric oncology service.

OUTCOME AND FOLLOW-UP

Two weeks following the hepatic artery embolisation, the patient presented to the oncology clinic with high fevers, decreased appetite, dizziness and vomiting. She was admitted to the hospital with *Streptococcus anginosus* bacteremia and started on vancomycin and ceftriaxone. CT of the abdomen was obtained and revealed a 7 cm hepatic abscess and an incidental finding of splenomegaly (figure 3). Paediatric infectious disease was consulted and recommended 6 weeks of ceftriaxone given the penicillin sensitivity of the organism. After a 6-day hospitalisation, the patient was sent home with 2 weeks of ceftriaxone via a peripherally inserted central catheter (PICC) in place followed by 2 weeks of oral amoxicillin.

Serial CRP and liver function tests were monitored for improvement. The patient was followed with first monthly (two), then every 3 months (two) and now spaced out to every 6 months (one), MRIs (five total to date), each demonstrating continuing resolution of the hepatic abscess/fluid collection and no evidence of recurrence of the metastases. Sunitinib was never restarted.

DISCUSSION

Complete surgical resection (R0) continues to be the mainstay of therapy for SPT of the pancreas.^{1 2 4 5 9–12} Given the low malignant potential and favourable characteristics in paediatric patients tend to enjoy excellent long-term outcomes.^{1–4} Metastases, when they occur in children, are generally early and treated successfully by aggressive surgical resection and occasionally chemotherapy.^{3 5–12} To date, there have been two long-term adult survivors of metastatic SPT/SPN treated without curative resection.^{13 15}

There is, overall, very limited data present regarding chemotherapy options for Frantz's tumour in paediatric patients. This is due to both the high success in resection and the small number of patient's presenting with inoperable or recurrent disease. There are some reports of successful use of adjuvant and neoadjuvant chemotherapy in children.^{9 16 17} Adjuvant, neoadjuvant and radiation therapies all have been used in a variety of different regimens as reported in multiple case studies/series in adults.^{18–20}

Bochis *et al* described four adult cases using Gemcitabine 1000mg/m² on days 1, 8 and 15 for six cycles as adjuvant systemic chemotherapy.²¹ The mean follow-up was 18 months, and no evidence of recurrence was noted. Other chemotherapeutic regimens have been described including 5-fluorouracil (5-FU) and cisplatin.²² Gemcitabine and cisplatin appear to be the mainstay therapies in most protocols, but there is still not enough experience or literature supporting a specific regimen and use must be determined on a personalised basis.²¹

There is one successful report of chemotherapy to treat late occurrence of multiple liver metastases 32 months after resection in a woman aged 49 years.²³ The patient received different regimens because of slow disease progression: six cycles of weekly gemcitabine (1000mg/m²) initially, then three cycles of gemcitabine and irinotecan, eight cycles of oxaliplatin, irinotecan and capecitabine, six cycles of gemcitabine, capecitabine, then 2 months of weekly 5-FU and finally regular capecitabine (2000mg/m²).

Lee *et al* reviewed their experience with 62 patients with SPN, 9 of which were classified as malignant (14.5%).⁹ Only one patient received adjuvant chemotherapy—a girl aged 13 years with a synchronous liver metastasis. She underwent near total pancreatectomy with left lateral segmentectomy. The patient received a protocol described as the OCCG321P2 regimen for a total of 13 cycles. This regimen was a combination of cyclophosphamide, cisplatin, doxorubicin hydrochloride and etoposide phosphate. At 3 years follow-up, the patient had no evidence of recurrence.

Reindl *et al* described a woman aged 17 years who underwent an extensive distal pancreatectomy with particularly aggressive histopathological findings (prominent nuclear atypia, increased proliferative index and extensive necrosis) treated with adjuvant chemotherapy.²⁴ The patient was initially given gemcitabine single-agent chemotherapy and received two of the three planned doses but had enlargement of her metastases. She was then switched to a more aggressive treatment of cisplatin, etoposide and doxorubicin. Further enlargement was noted, and the patient chose to stop chemotherapy, received palliative abdominal radiation and succumbed to the disease 11 months following diagnosis.

Gemcitabine was successfully used as neoadjuvant chemotherapy in a girl aged 14 years to downsize a head of the pancreas SPT.¹⁶ Gemcitabine was started at a dose of 1 g/m² intravenously given on days 1, 8 and 15 of each cycle. After two cycles of therapy, there was a significant interval decrease in size of the pancreatic mass, and the patient underwent a successful pylorus-preserving Whipple procedure. The patient was in full clinical remission at 24 months follow-up. Cisplatin and 5-FU was used in a girl aged 15 years for 6 months with successful

shrinking of an initially unresectable tumour leading to complete resection.¹⁷

Fried *et al* reported a case that was treated solely by radiotherapy in a woman aged 18 years with locally invasive primary SPN.²⁵ The tumour invaded the porta hepatis, displaced the stomach and involved the portal vein and hepatic artery. She received 4000 cGy in 20 fractions over 6 weeks starting 4 weeks after surgery. At the time of the case report, the patient had been followed for 3 years with substantial shrinkage of the tumour and normal lactate dehydrogenase (LDH). Although, the tumour was still present, the results suggested this case of SPN was radiosensitive.

Li *et al* described the use of radiofrequency ablation (RFA) in conjunction with primary surgical resection (pancreatectomy and partial hepatectomy) in a woman aged 20 years.²⁶ The reported follow-up was relatively brief (3 months), but no recurrence was noted on CT during that interval. However, Tajima *et al*¹⁵ caution incomplete RFA may induce dedifferentiation²⁷ and epithelial-mesenchymal transition of the tumour²⁸ as noted in hepatocellular carcinoma when reviewing the report by Li *et al*.

Recently, Tajima *et al* described the use of chemoembolisation in metastatic and recurrent SPT in a woman aged 33 years.¹⁵ The patient was diagnosed with metastatic SPT and underwent distal pancreatectomy and adjuvant gemcitabine and S-1, an oral fluoropyrimidine derivative. Metastases growth was noted during adjuvant therapy, and the patient underwent a subsequent combined hepatic artery embolisation followed by hepatic resection. No follow-up interval was reported.

To the authors' knowledge, this is the first report of a successful treatment of late metastatic Frantz's tumour treated non-operatively in a child. The patient's treatment team (MAE/WT) performed an extensive review of the literature and sought expert consultation internationally. Colleagues at Yale shared the sole known report at the time of a survivor treated with hepatic artery embolisation at Sloan Kettering.¹³ Violari *et al* treated their patient with 13 sessions of hepatic artery embolisation over a 6-year period. Based on genetic evaluation of their patient, tamoxifen was unsuccessfully tried, and the patient did have an attempted surgical debulking of the tumour. Unfortunately, the patient developed recurrence requiring further embolisation. Subsequent unsuccessful attempts at systemic therapy included sulindac and atorvastatin, FOLFOX for four cycles and valproate. The authors finally achieved stabilisation of extrahepatic disease with sunitinib, a tyrosine kinase inhibitor.¹³

In this case, the family strongly preferred an oral therapeutic agent and declined further surgery, so the currently described regimen was devised based on this case report.¹³ Further investigation into sunitinib revealed successful use in PNETs, which mirror SPTs indolent growth patterns.¹⁴ Furthermore, in the case of PNETs, stable disease is often a reasonable goal due to that relatively indolent nature of growth.²⁹ Combined with the fact that sunitinib was administered orally in compliance with the family's wishes, the decision was made to proceed with a trial of this targeted therapy.

Chemoembolisation is not without risks or complications, however. Postembolisation syndrome (PES) occurs in up to 90% of patients undergoing hepatic chemoembolisation and may manifest as abdominal pain, fever and/or nausea and vomiting.^{30 31} PES is thought to be multifactorial and is a combination of both tumour ischaemia and the cytotoxicity of the chemotherapeutic agents themselves.³² In most patients, the symptoms of PES are self-limited and respond to conservative pain management, antiemetics and supportive care. However, a more complicated scenario may also arise such as hepatic abscess, spontaneous

bacteria peritonitis, sepsis, tumour rupture and even generalised hepatic ischaemia.³² Furthermore, sunitinib has been associated with bleeding, pancreatitis, hepatic complications including inflammation and abscess (due to hepatic clearance) and acalculous cholecystitis.³³ The patient described in the current report presented with positive blood cultures for *S treptococcus* and findings on CT concerning for a hepatic abscess, and sunitinib may have contributed to the clinical picture. While a right hepatectomy may have been the treatment of choice in this particular case, given the family's wishes the therapy described has resulted in an ultimately successful outcome at 20 months follow-up.

The authors recommend serial CT or MRI every 3 months during the first year, 6 months for the second year and yearly thereafter, for a total of 5 years of surveillance following successful treatment of metastatic Frantz's tumour in paediatric patients.² The authors still recommend the surveillance programme as outlined originally for primary tumours. SPTs are slow growing biologically. In this case, if the initial recommended surveillance programme was followed,² waiting another 6 months may have resulted in detection of the three total lesions and saved an intermediate difficult wedge biopsy step. At that time right hepatectomy would have been recommended more strongly.

Learning points

- In children, late metastases to the liver of solid pseudopapillary neoplasm of the pancreas is exceedingly rare.
- The majority of case reports of early metastases recommend resection as definitive therapy.
- We report the first successful management in a paediatric patient of late liver metastases of solid pseudopapillary neoplasm of the pancreas with hepatic artery chemoembolisation and a tyrosine kinase inhibitor.
- Paediatric patients are at risk for developing posthepatic artery embolisation abscess and should be monitored closely following the procedure.
- Sunitinib may increase the risk of infection or haemorrhagic complications and patients should be monitored closely following an invasive procedure.

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REFERENCES

- 1 Yu PF, Hu ZH, Wang XB, et al. Solid pseudopapillary tumor of the pancreas: a review of 553 cases in Chinese literature. *World J Gastroenterol* 2010;16:1209–14.
- 2 Escobar MA, Bond BJ, Schopp J, et al. (Frantz's tumour) of the pancreas in childhood. *BMJ Case Rep* 2014;2014.
- 3 Wang KS, Albanese C, Dada F, et al. Papillary cystic neoplasm of the pancreas: a report of three pediatric cases and literature review. *J Pediatr Surg* 1998;33:842–5.
- 4 Zhou H, Cheng W, Lam KY, et al. Solid-cystic papillary tumor of the pancreas in children. *Pediatr Surg Int* 2001;17:614–20.
- 5 Choi SH, Kim SM, Oh JT, et al. Solid pseudopapillary tumor of the pancreas: a multicenter study of 23 pediatric cases. *J Pediatr Surg* 2006;41:1992–5.
- 6 Andronikou S, Moon A, Ussher R. Peritoneal metastatic disease in a child after excision of a solid pseudopapillary tumour of the pancreas: a unique case. *Pediatr Radiol* 2003;33:269–71.
- 7 Hassan I, Celik I, Nies C, et al. Successful treatment of solid-pseudopapillary tumor of the pancreas with multiple liver metastases. *Pancreatology* 2005;5:289–94.
- 8 Lack EE, Cassady JR, Levey R, et al. Tumors of the exocrine pancreas in children and adolescents. A clinical and pathologic study of eight cases. *Am J Surg Pathol* 1983;7:319–27.
- 9 Lee SE, Jang JY, Hwang DW, et al. Clinical features and outcome of solid pseudopapillary neoplasm: differences between adults and children. *Arch Surg* 2008;143:1218–21.
- 10 Park M, Koh KN, Kim BE, et al. Pancreatic neoplasms in childhood and adolescence. *J Pediatr Hematol Oncol* 2011;33:295–300.
- 11 Yu DC, Kozakewich HP, Perez-Atayde AR, et al. Childhood pancreatic tumors: a single institution experience. *J Pediatr Surg* 2009;44:2267–72.
- 12 Todani T, Shimada K, Watanabe Y, et al. Frantz's tumor: a papillary and cystic tumor of the pancreas in girls. *J Pediatr Surg* 1988;23:116–21.
- 13 Violar E, Brody LA, Covey AM, et al. Successful control of liver metastases from pancreatic solid-pseudopapillary neoplasm (SPN) using hepatic arterial embolization. *Cardiovasc Intervent Radiol* 2015;38:479–83.
- 14 Raymond E, Dahan L, Raoul JL, et al. Sunitinib malate for the treatment of pancreatic neuroendocrine tumors. *N Engl J Med* 2011;364:501–13.
- 15 Tajima H, Takamura H, Kitagawa H, et al. Multiple liver metastases of pancreatic solid pseudopapillary tumor treated with resection following chemotherapy and transcatheter arterial embolization: a case report. *Oncol Lett* 2015;9:1733–8.
- 16 Kanter J, Wilson DB, Strasberg S. Downsizing to resectability of a large solid and cystic papillary tumor of the pancreas by single-agent chemotherapy. *J Pediatr Surg* 2009;44:e23–25.
- 17 Strauss JF, Hirsch VJ, Rubey CN, et al. Resection of a solid and papillary epithelial neoplasm of the pancreas following treatment with cis-platinum and 5-fluorouracil: a case report. *Med Pediatr Oncol* 1993;21:365–7.
- 18 Bostanoglu S, Otan E, Akturan S, et al. Frantz's tumor (solid pseudopapillary tumor) of the pancreas. a case report. *JOP* 2009;10:209–11.
- 19 Tipton SG, Smyrk TC, Sarr MG, et al. Malignant potential of solid pseudopapillary neoplasm of the pancreas. *Br J Surg* 2006;93:733–7.
- 20 Maffuz A, Bustamante FT, Silva JA, et al. Preoperative gemcitabine for unresectable, solid pseudopapillary tumour of the pancreas. *Lancet Oncol* 2005;6:185–6.
- 21 Bochi OV, Bota M, Mihut E, et al. Solid pseudopapillary tumor of the pancreas: clinical-pathological features and management of 13 cases. *Clujul Med* 2017;90:171–8.
- 22 Machado MC, Machado MA, Bacchella T, et al. Solid pseudopapillary neoplasm of the pancreas: distinct patterns of onset, diagnosis, and prognosis for male versus female patients. *Surgery* 2008;143:29–34.
- 23 Sperti C, Berselli M, Pasquali C, et al. Aggressive behaviour of solid-pseudopapillary tumor of the pancreas in adults: a case report and review of the literature. *World J Gastroenterol* 2008;14:960–5.
- 24 Reindl BA, Lynch DW, Jassim AD. Aggressive variant of a solid pseudopapillary neoplasm: a case report and literature review. *Arch Pathol Lab Med* 2014;138:974–8.
- 25 Fried P, Cooper J, Balthazar E, et al. A role for radiotherapy in the treatment of solid and papillary neoplasms of the pancreas. *Cancer* 1985;56:2783–5.
- 26 Li JX, Wu H, Huang JW, et al. Synchronous intraoperative radiofrequency ablation for multiple liver metastasis and resection of giant solid pseudopapillary tumors of the pancreas. *Chin Med J* 2012;125:1661–3.
- 27 Tajima H, Ohta T, Okamoto K, et al. Radiofrequency ablation induces dedifferentiation of hepatocellular carcinoma. *Oncol Lett* 2010;1:91–4.
- 28 Tajima H, OHTA T, SHOJI Y, et al. Expression of epithelial-mesenchymal transition markers in locally recurrent hepatocellular carcinoma after radiofrequency ablation. *Exp Ther Med* 2010;1:347–50.
- 29 Liu IH, Kunz PL. Biologics in gastrointestinal and pancreatic neuroendocrine tumors. *J Gastrointest Oncol* 2017;8:457–65.
- 30 Brown KT, Nevins AB, Getrajdman GI, et al. Particle embolization for hepatocellular carcinoma. *J Vasc Interv Radiol* 1998;9:822–8.
- 31 Leung DA, Goin JE, Sickles C, et al. Determinants of postembolization syndrome after hepatic chemoembolization. *J Vasc Interv Radiol* 2001;12:321–6.
- 32 Dhand S, Gupta R. Hepatic transcatheter arterial chemoembolization complicated by postembolization syndrome. *Semin Intervent Radiol* 2011;28:207–11.
- 33 Ngo D, Jia JB, Green CS, et al. Cancer therapy related complications in the liver, pancreas, and biliary system: an imaging perspective. *Insights Imaging* 2015;6:665–77.

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