Multifocal Pancreatic and Liver PEComas Mimic Metastatic Tumors: Case Report and Literature Review

Jian Guan
Chinese Academy of Medical Sciences Cancer Institute and Hospital: Cancer Hospital Chinese Academy of Medical Sciences
https://orcid.org/0000-0001-9194-3167
Guihua Shen
Chinese Academy of Medical Sciences Cancer Institute and Hospital: Cancer Hospital Chinese Academy of Medical Sciences
Wenting Huang (huangwt@cicams.ac.cn)
Chinese Academy of Medical Sciences Cancer Institute and Hospital: Cancer Hospital Chinese Academy of Medical Sciences

Research Article

Keywords: case report, perivascular epithelioid cell tumor (PEComa), multifocal, pancreas, liver

Posted Date: July 9th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-692687/v1

Abstract

Background: Perivascular epithelioid cell tumor (PEComa) is a mesenchyme tumor derived from soft tissues and organs. Its morphology includes several types such as angiomyolipoma, lymphangiomyomatosis and pulmonary clear-cell “sugar” tumor with similar immunophenotype. Multifocal PEComas are rare lesions, which would confuse imaging examination and clinical management. We reported a case of multifocal angiomyolipomas in the pancreas and liver in a young patient. And we reviewed the literature to explore the clinicopathological characteristics and possible pathogenesis of multifocal PEComas.

Case presentation: A 28-year-old woman presented with a lesion in the head of the pancreas and liver 5/6 segment respectively, initially suspected of a pancreatic tumor with liver metastasis. To explore the nature of the lesion, a liver mass resection and a pancreatic mass biopsy were performed at the first operation. After the postoperative pathology was confirmed as an epithelioid angiomyolipoma, the patient underwent a pancreatic segmental resection. After the operation, the patient did not receive any adjuvant treatment and was followed up for 25 months without tumor recurrence or metastasis.

Conclusion: Multifocal PEComas present a chronic clinical course and have a good prognosis. Surgical resection is the main treatment. In the diagnosis, in addition to metastatic tumors, multifocal lesions also need to be differentiated with multifocal PEComa; in the treatment, radical treatment should not be performed for this type of disease; in the long-term monitoring of the disease, it is necessary to consider the possibility of a second or a greater number of PEComa lesions even many years later.

Background

Perivascular epithelioid cell neoplasm (PEComa) is a type of tumor originating in soft tissues and organs. The tumor cells exhibit an association with the vascular wall and typically express melanocytic and smooth muscle markers. Regarding pathological morphology, PEComas are classified as angiomyolipoma (AML), lymphangiomyomatosis (LAM), pulmonary clear cell sugar tumor (CCST) and other tumor types with perivascular epithelioid cell differentiation (PEComa-not otherwise specified, PEComa-NOS), which are characterized by similar immunohistochemical presentations[1]. In rare cases, PEComas manifest as multiple tumors in solitary or multiple organs. In particular, the cases that occur in different organs would be misdiagnosed as metastatic tumors and cause confusion in clinical management. We reported here an extremely rare case of PEComa in the pancreas and liver in a young patient, which was suspected as a pancreatic tumor with liver metastasis.

Case Report

A 28-year-old woman was referred to our hospital for a lesion on the head of the pancreas. She had no obvious clinical symptoms and no personal or family history of other diseases. Abdominal contrast-enhanced computed tomography (CE-CT) demonstrated a 1.9-cm-sized low-density lesion at the pancreatic head, which was enhanced in the arterial phase and decreased during the portal and delayed phases (Fig. 1). The lesion had an irregular shape but was not related to the pancreatic duct system. Additionally, it was found a 1.1×1.0 cm sized low-density lesion located in the segment 5/6 junction area of the liver (Fig. 2). No enlarged lymph nodes were noted in the abdominal pelvic cavity or groin. Based on these findings, possible diagnoses, such as a solid pseudopapillary tumor or neuroendocrine tumor of pancreas, were considered. The nodule at the junction of liver S5/6 was suspected to be a metastasis from the pancreatic lesion.

Then the patient underwent an operation involving "fluorescence laparoscopic liver tumor resection + pancreatic tumor biopsy" to explore the tumor. In the intraoperative frozen tissue pathological examination, a well-defined 1.2×0.8-cm solitary nodule was noted in the liver segmental resection. The cut surface of the tumor was gray-yellow and soft, and the boundary was relatively clear. The remainder of the liver appeared noncirrhotic. Microscopic examination showed that the tumor cells were epithelioid or spindle-shaped and arranged in a nested pattern. The cytoplasm of the tumor cells was transparent and eosinophilic. No necrosis and mitotic figures were observed. During operation, a pancreatic puncture biopsy was performed; the pancreatic tumor had morphology similar to that of the hepatic tumor. Due to the similar morphology of the tumors at the two sites, it was difficult to determine whether they were metastatic or double primary tumors during surgery. Therefore, it was recommended to suspend the pancreatic surgery and wait for the postoperative pathological diagnosis to decide the next steps of management.

The morphology of the paraffin-embedded tissue showed thin-walled sinusoidal vascular structures and a small number of fat cells in hepatic tumor (Fig. 3a, 3b). The tumor cells were epithelioid or spindle-shaped. Epithelioid cells had obvious nucleoli and central concentrated cytoplasm, which were distributed in the perivascular region in a radial pattern (Fig. 3c). Some foci displayed more “myoid” spindle cells arranged in whorled and interlacing fascicles. Additionally, no necrosis or mitotic figures were observed. The same features were noted in the pancreatic tumor (Fig. 4a). The immunohistochemical assay showed that tumor cells in the liver were positive for HMB-45, Melan-A, and SMA (Fig. 3d, 3e, 3f), but negative for AE1/AE3, CK18, CK7, CK20, S-100, Hepatocytes, Arg-1, and GPC3. Ki-67 staining revealed a low proliferation index (5%+). The tumor cells in the pancreas were positive for HMB45 (because the tumor component was small, no additional immunohistochemical assay was performed in the biopsy specimen). Therefore, both hepatic and pancreatic tumors were diagnosed as angiomyolipoma with an epithelioid pattern. Half a month later, the patient underwent "laparoscopic resection of pancreatic tumor + release of intestinal adhesions". The gross examination of the resected pancreatic specimen showed a 2×2×1.5 cm solid mass located in the pancreatic body and neck, which was soft, grayish-yellow with clear borders.

The histomorphology was similar to the hepatic tumor except for more adipose components (Fig. 4b, 4c). No cell pleomorphism, necrosis or mitotic figures, vascular tumor thrombus or nerve invasion were observed. The border of the tumor was not infiltrative. Its immunophenotype was the same as that of the liver tumor, and Ki-67 staining also revealed a low proliferation index (2%+) (Fig. 4d, 4e, 4f). According to the criteria for malignancy of PEComa described by Folpe et al. [2], there was no malignant indication in two lesions. We suggested that the tumors were multifocal epithelioid angiomyolipomas originating from the liver and pancreas rather than tumors with distant metastasis.

Considering that the patient was young and had multiple PEComas, a thorough examination of the patient was performed. No other clinical symptoms related to tuberous sclerosis complex (TSC) were found. Next-generation sequencing (NGS) showed no TSC1/TSC2 germline mutations. After the surgical operation, the patient did not receive any adjuvant therapy. After 25 months of follow-up, she was in good condition, and no recurrence or metastasis was found.

Discussion

Multifocal PEComas are extremely rare lesions, which do not include malignant PEComa with metastasis. We reviewed PUBMED's English literature from 2000 to 2020 and collected a total of 12 cases (Table 1). Our case is the second case of multiple PEComas involving the liver and pancreas. Because of its rarity, some of these cases had caused clinical diagnosis difficulties or even misdiagnosis, and the opinions of authors varied about whether multicentric or metastatic tumors. To explore the nature of the lesion, we analyze the clinicopathological characteristic of these cases. Of the total of 12 patients, there were 4 male patients (33%) and 8 female patients (67%). The age was range from 38–68, the median age was 47. The most common organs involved in multi-organ cases were the kidney and lung, and the latter was often involved in both lung fields. 2 cases involved more than 2 organs (case #8: kidney, spleen, and bilateral lung; case #10: liver, left kidney, and bilateral lung). Moreover, most cases had multiple foci in one organ. The lung was the organ most frequently affected by multiple foci, followed by the liver and kidney. Angiomyolipoma (AML) was the most common type in multiple PEComas. There was no evidence of pathological malignancy in all cases, except for focal cell pleomorphism (case #4), and epithelioid AML (case #12). Some authors believe that pure epithelioid PEComa has malignant potential, and is often related to younger patients, larger tumor sizes, and disease progression[2]. While the diagnostic criteria for malignant PEComa summarized by Folpe et al [3] based on soft tissue and gynecologic origin did not include epithelioid morphology. Most cases were treated surgically, and no recurrence or metastasis during the follow-up period. One case (case #1) was treated with mTOR inhibitor sirolimus 2mg/d, with reduction of multiple AML lesions in the lung and kidney in 8 months, while the lymphangiomyomatosis (LAM) lesions in the lung were unchanged. In some cases, multiple small lesions had not undergone any clinical treatment, but did not cause clinical symptoms for a long time. Overall, the prognosis of multifocal PEComas was good. Although some cases did not provide follow-up data or lost contact with the patients, the tumors in most cases remained stable for a long time, and the longest follow-up time recorded was 12 years.

There are different opinions on the pathogenesis of multifocal PEComa, and the exploration of its cause would help to determine the clinical treatment of such lesions. Although the clinical course of PEComa is benign or inert, some authors believe that because of the lack of clear criteria for the diagnosis of PEComa malignancy, multifocal PEComa cases, especially those unrelated to tuberous sclerosis complex (TSC), are potentially malignant and cannot be ruled out as metastatic disease[4]. There are also authors believe that multifocal PEComas are multicentric lesions[5], with benign characteristics.

About 20% of PEComa cases are associated with tuberous sclerosis complex (TSC), which were due to the germline mutations of TSC1 (9q3.4) and TSC2 (16p13.3) genes[6]. PEComas related to TSC often occur in young patients with bilateral or multifocal origin and a fast growth rate. According to the clinical diagnostic criteria of TSC proposed by the 2012 International Tuberous Sclerosis Complex Consensus Conference[7], the occurrence of ≥2 angiomyolipoma or lymphangiomyomatosis is one of the major features, respectively. Therefore, for multifocal angiomyolipoma or lymphangiomyomatosis cases, it is best to check for other TSC-related clinical evidence or perform genetic testing to assist in the diagnosis of TSC. Among the 12 collected cases, 2 cases were reported as clinically definite TSC (case #4 and #6). The two cases were both bilateral renal angiomyolipomas and multiple lymphangiomyomatosis in the lung. Two other cases (case #1 and #9)showed no mutations in the TSC1/2 gene based on genetic analysis, just like our case, and no other TSC-related clinical manifestations were mentioned in the report, indicating that multifocal PEComas were not always related to TSC. PEComas unrelated to germline mutations in the TSC1/2 gene are sporadic cases. Some of these cases also have somatic mutations in the TSC1/2 gene[8], and some have other genetic changes[9].

The study of Henske, E. P. suggested that PEComa cells could migrate with blood, rather than metastasis[10]. From the clinicopathological characteristics of these multifocal PEComa cases, several points support the opinion: 1) although PEComas exhibit a wide anatomical distribution, the most prevalent locations are blood-rich organs, such as kidney, lung, and liver. In multifocal PEComas, we found that the lung was the most involved organ (10 out of 12 collected cases). And in almost all metachronous cases (7 out of 8), the later onset tumors were always pulmonary PEComa (LAM or AML). Organs with abundant blood supply are conducive to the dissemination of tumor cells. 2) Multifocal PEComas can involve two or more organs or locations, and most cases (11 out of 12) have multi-foci within one organ. The growth pattern of multiple foci in an organ is also similar to that of metastatic tumors. 3) Angiomyolipoma, lymphangiomyomatosis, or other types of PEComa are rich in vascular lymphatic vessels and exhibit the characteristics of perivascular growth patterns. It is prone to the spread of tumor cells through the vasculature. 4) These multifocal PEComa cases have a chronic clinical course. The onset of the later tumor in the majority of metachronous multifocal PEComa cases (6 out of 8) was found years later (ranged from 5 to 26 years). From the above points, it seemed the pathogenesis of multiple PEComa involved tumor

cells spreading by blood, which may be due to the operation performed for the first tumor or the close relationship with the blood vessel wall. During a long dissemination process, migrating cells encounter blood-rich organs, forming multiple tumors with similar cell morphology and immunophenotype. Therefore, the occurrence of multifocal PEComas is the result of distant migration of “angiotropic” tumor cells, which is a type of “benign” metastasis. However, this hypothesis that is inferred from the clinicopathological characteristics of multifocal PEComas must be supported by further molecular biology research.

In conclusion, multifocal PEComas, excluding metastatic cases of malignant PEComa, are benign or indolent tumors. The genesis of such tumors may be related to the blood dissemination of tumor cells that ultimately encounter distant organs. It is a benign dissemination process rather than metastasis. Therefore, radical treatment should not be performed for such tumors in clinical management. However, for large tumors, because of rich in blood supply, it requires early treatment for the risk of bleeding and other symptoms. In addition, although it is rare, for multifocal lesions occurring in organs such as kidney, lung, liver, and pancreas, the diagnosis of multiple PEComas should also be considered. And even cases of PEComa with benign pathological morphology should be monitored for a long time, because a second or a greater number of PEComa lesions may appear many years later.

Abbreviations

PEComa: Perivascular epithelioid cell neoplasm; AML: angiomyolipoma; LAM: lymphangiomyomatosis; CCST: clear cell sugar tumor; PEComa-NOS: PEComa-not otherwise specified; CE-CT: contrast-enhanced computed tomography; TSC: tuberous sclerosis complex; NGS: next-generation sequencing; MMPH: multifocal micronodular pneumocyte hyperplasia; M: metachronous; S: simultaneous

Declarations

Funding:

Supported by Sanming Project of Medicine in Shenzhen（No.SZSM201812076）

Competing interests:

The authors declare that they have no competing interests.

Availability of data and materials:

All data generated or analyzed during this study are included in this published article.

Code availability:

Not applicable.

Authors' contributions:

All authors contributed to the writing of the manuscript and read and approved the final manuscript.

Ethics approval and consent to participate:

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Consent for publication:

Written informed consent for publication was obtained from the patient.

Acknowledgments:

Not applicable.

References

1. Thway K, Fisher C (2015) PEComa: morphology and genetics of a complex tumor family. Ann Diagn Pathol 19:359-368. https://doi.org/10.1016/j.anndiagpath.2015.06.003
2. Nese N, Martignoni G, Fletcher CD, Gupta R, Pan CC, Kim H, Ro JY, Hwang IS, Sato K, Bonetti F (2011) Pure Epithelioid PEComas (So-Called Epithelioid Angiomyolipoma) of the Kidney. American Journal of Surgical Pathology 35:161-176.
3. Folpe AL, Kwiatkowski DJ (2009) Perivascular epithelioid cell neoplasms: pathology and pathogenesis. Human Pathology 41:1-15.

4. Dimmler A, Seitz G, Hohenberger W, Kirchner T, Faller G (2003) Late pulmonary metastasis in uterine PEComa. J Clin Pathol 56:627-628. https://doi.org/10.1136/jcp.56.8.627
5. Fadare O, Parkash V, Yilmaz Y, Mariappan MR, Ma L, Hileeto D, Qumsiyeh MB, Hui P (2004) Perivascular epithelioid cell tumor (PEComa) of the uterine cervix associated with intraabdominal "PEComatosis": A clinicopathological study with comparative genomic hybridization analysis. World J Surg Oncol 2:35. https://doi.org/10.1186/1477-7819-2-35
6. Henske EP, Jóźwiak S, Kingswood JC, Sampson JR, Thiele EA (2016) Tuberous sclerosis complex. Nat Rev Dis Primers 2:16035. https://doi.org/10.1038/nrdp.2016.35
7. Northrup H, Krueger DA (2013) Tuberous sclerosis complex diagnostic criteria update: recommendations of the 2012 Iinternational Tuberous Sclerosis Complex Consensus Conference. Pediatr Neurol 49:243-254. https://doi.org/10.1016/j.pediatrneurol.2013.08.001
8. Dabora SL, Jozwiak S, Franz DN, Roberts PS, Nieto A, Chung J, Choy YS, Reeve MP, Thiele E, Egelhoff JC, Kasprzyk-Obara J, Domanska-Pakiela D, Kwiatkowski DJ (2001) Mutational analysis in a cohort of 224 tuberous sclerosis patients indicates increased severity of TSC2, compared with TSC1, disease in multiple organs. Am J Hum Genet 68:64-80. https://doi.org/10.1086/316951
9. Vannucchi M, Minervini A, Salvi M, Montironi R, Raspollini MR (2020) TFE3 Gene Rearrangement in Perivascular Epithelioid Cell Neoplasm (PEComa) of the Genitourinary Tract. Clin Genitourin Cancer 18:e692-e697. https://doi.org/10.1016/j.clgc.2020.04.004
10. Henske EP (2003) Metastasis of benign tumor cells in tuberous sclerosis complex. Genes Chromosomes Cancer 38:376-381. https://doi.org/10.1002/gcc.10252
11. Sun X, Feng R, Zhang Y, Shi J, Xu KF (2016) Coexistence of pulmonary lymphangioleiomyomatosis and pulmonary angiomyolipoma. BMC Pulm Med 16:120. https://doi.org/10.1186/s12890-016-0286-1
12. Neri S, Ishii G, Aokage K, Hishida T, Yoshida J, Nishimura M, Nagai K (2014) Multiple perivascular epithelioid cell tumors: clear cell tumor of the lung accompanied by angiomyolipoma of the liver. Ann Thorac Cardiovasc Surg 20 Suppl:453-456. https://doi.org/10.5761/atcs.cr.12.02179
13. Bhardwaj N, Garcea G, Lloyd D (2012) A rare case of multi-focal angiomyolipoma affecting the pancreas and liver. J Surg Case Rep 2012:5. https://doi.org/10.1093/jscr/2012.4.5
14. Nasir K, Ahmad A (2010) Giant renal angiomyolipomas and pulmonary lymphangiomyomatosis. Saudi J Kidney Dis Transpl 21:314-319.
15. Hino H, Ikeda S, Kawano R, Sato F, Tagawa K, Hoshino T, Yokota T, Hata E, Fujii A, Mori M (2010) Angiomyolipoma in the lung detected 15 years after a nephrectomy for renal angiomyolipoma. Ann Thorac Surg 89:298-300. https://doi.org/10.1016/j.athoracsur.2009.06.062
16. Chang MH, Yao-Peng H (2010) Lymphangioleiomyomatosis, multifocal micronodular pneumocyte hyperplasia, and clear-cell micronodules in a 39-year-old woman with tuberous sclerosis: a case report. Int J Surg Pathol 18:522-525. https://doi.org/10.1177/1066896910376241
17. Gleeson FC, de la Mora Levy JG, Zhang L, Levy MJ (2008) The differential broadens. EUS FNA appearance and cytological findings of pancreatic angiomyolipoma. Jop 9:67-70.
18. Kasuno K, Ueda S, Tanaka A, Tanaka-Kasuno Y, Kuwahara T (2004) Pulmonary angiomyolipoma recurring 26 years after nephrectomy for angiomyolipoma: benign clinical course. Clin Nephrol 62:469-472. https://doi.org/10.5414/cnp62469
19. Saito M, Tsukamoto T, Takahashi T, Sai K, Fujii H, Nagashima K (2004) Multifocal angiomyolipoma affecting the liver and lung without tuberous sclerosis. J Clin Pathol 57:221-224. https://doi.org/10.1136/jcp.2003.10330
20. Kim NR, Chung MP, Park CK, Lee KS, Han J (2003) Pulmonary lymphangioleiomyomatosis and multiple hepatic angiomyolipomas in a man. Pathol Int 53:231-235. https://doi.org/10.1046/j.1320-5463.2003.01460.x
21. Mai KT, Yazdi HM, Perkins DG, Thijssen A (2001) Fine needle aspiration biopsy of epithelioid angiomyolipoma. A case report. Acta Cytol 45:233-236. https://doi.org/10.1159/000327280

Table

Table 1

List of multifocal PEComa cases reported in the literature

NO.	Ref.	Sex	Age	TSC*	Onset interval**	1st tumor (Max diameter) (Time of occurrence)	2nd or more tumor (Max diameter) (Time of occurrence)	Pathological description	Clinical management	Prognosis
1	Sun, X. (2016)[6].	F	38	No (gene assay verified)	M	Right renal: AML (17 years before)	Bilateral lung: multiple LAM□AML; Left renal: AML	N/A	mTOR inhibitor: sirolimus therapy	The renal and pulmonary AML shrank, while pulmonary LAMs were unchanged
2	Neri, S. (2014) [19].	M	38	Unknown	M	Liver: AML(7.5cm) (5 years before)	Right lung: AML(1.8cm)	No malignant phenotype	Surgical resection	no recurrence
3	Bhardwaj, N. (2012) [20].	M	61	Unknown	S	Pancreas: solitary AML	Liver: multiple AML	N/A	Surgical resection	Intrahepatic lesions progressed
4	Nasir, K. and A. Ahmad (2010)[4]	F	48	Yes	M	Bilateral renal: AML(right: 16cm; left: 22cm)	Bilateral Lung: LAM(1.5cm) (2 month after hemodialysis for bilateral nephrectomy)	Renal AML: pleomorphism focally	Bilateral nephrectomy	The pulmonary tumors were stable
5	Hino, H. (2010) [21]	F	52	Unknown	M	Renal: AML(15 years before)	Lung: multiple AML	No malignant phenotype	Surgical resection	Stable
6	Chang, M. H. (2010)[5]	F	39	Yes	S	Bilateral renal : AML	Lung: LAM,MMPH, and clear-cell micronodules	No malignant phenotype	Surgical resection	N/A
7	Gleeson, F. Cl. (2008) [22].	F	44	Unknown	S	Right renal: multiple AML (2.6cm)	Pancreas: Multiple AML(0.6-1.2cm)	No malignant phenotype	Surgical resection	N/A
8	Kasuno, K., et al. (2004) [18].	F	57	Unknown	M	Renal: AML(26 years before)	Bilateral lung: multiple AML(0.5-1.5cm); Spleen: AML	No malignant phenotype	Surgical resection	No recurrence (followed up for 12 years)
9	Saito, M. (2004)[7].	F	57	No (gene assay verified)	M	Liver: AML(6cm)	Bilateral lung: multiple AML(0.2-1.0cm)(5 years later)	No malignant phenotype	Surgical resection	Stable (followed up for 3 years)
10	Kim, N. R., et al. (2003) [23]	M	47	Presumptive TSC(based on clinical presentation)	S	Liver: multiple AML(2-11cm)	Left kidney: AML(1cm) ; Bilateral Lung: multiple LAM	No malignant phenotype	Surgical resection	Lost follow up
11	Dimmler, A., et al. (2003) [16].	F	68	Unknown	M	Uterine: PEComa(4cm)	Lung: multiple PEComa(0.3-2.0 cm)(7 years later)	No malignant phenotype	Surgical resection	No recurrence

NO.	Ref.	Sex	Age	TSC*	Onset interval**	1st tumor (Max diameter) (Time of occurrence)	2nd or more tumor (Max diameter) (Time of occurrence)	Pathological description	Clinical management	Prognosis
12	Mai, K. T., et al. (2001) [12]	M	47	Unknown	M	Kidney: epithelioid AML(15 ×12cm)	Liver: multiple epithelioid AML(up to 5cm)(9 month later)	90% of epithelioid morphology	Surgical resection	N/A

*“TSC” represents tuberous sclerosis complex; **“M” represents metachronous and “S” represents simultaneous

AML: angiomyolipoma; LAM: lymphangiomyomatosis; MMPH: multifocal micronodular pneumocyte hyperplasia

Figures

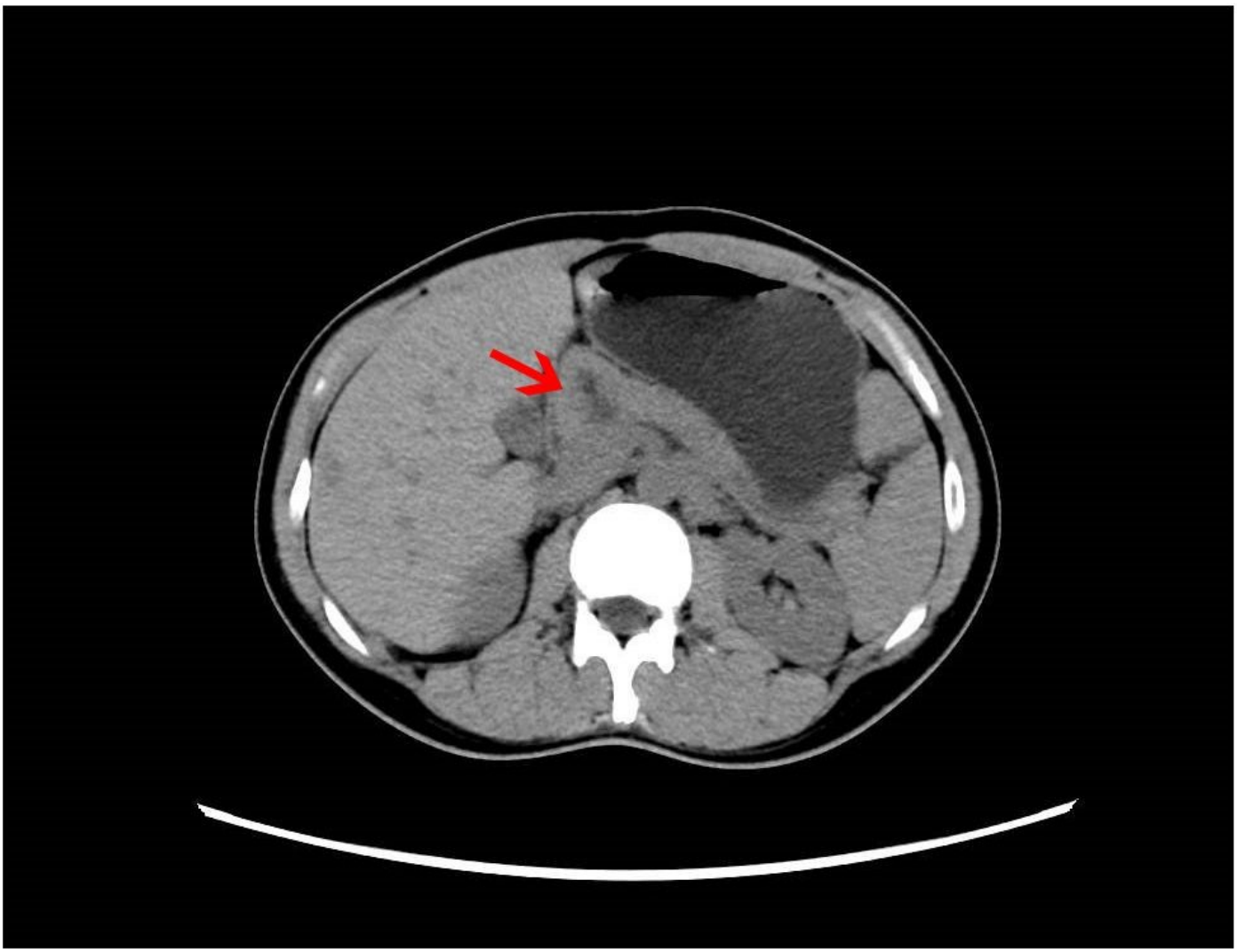

Figure 1

The lesion in the pancreas: CT showed that there was a low-density area in the head of the pancreas, the largest cross-section was about 1.9×1.8cm

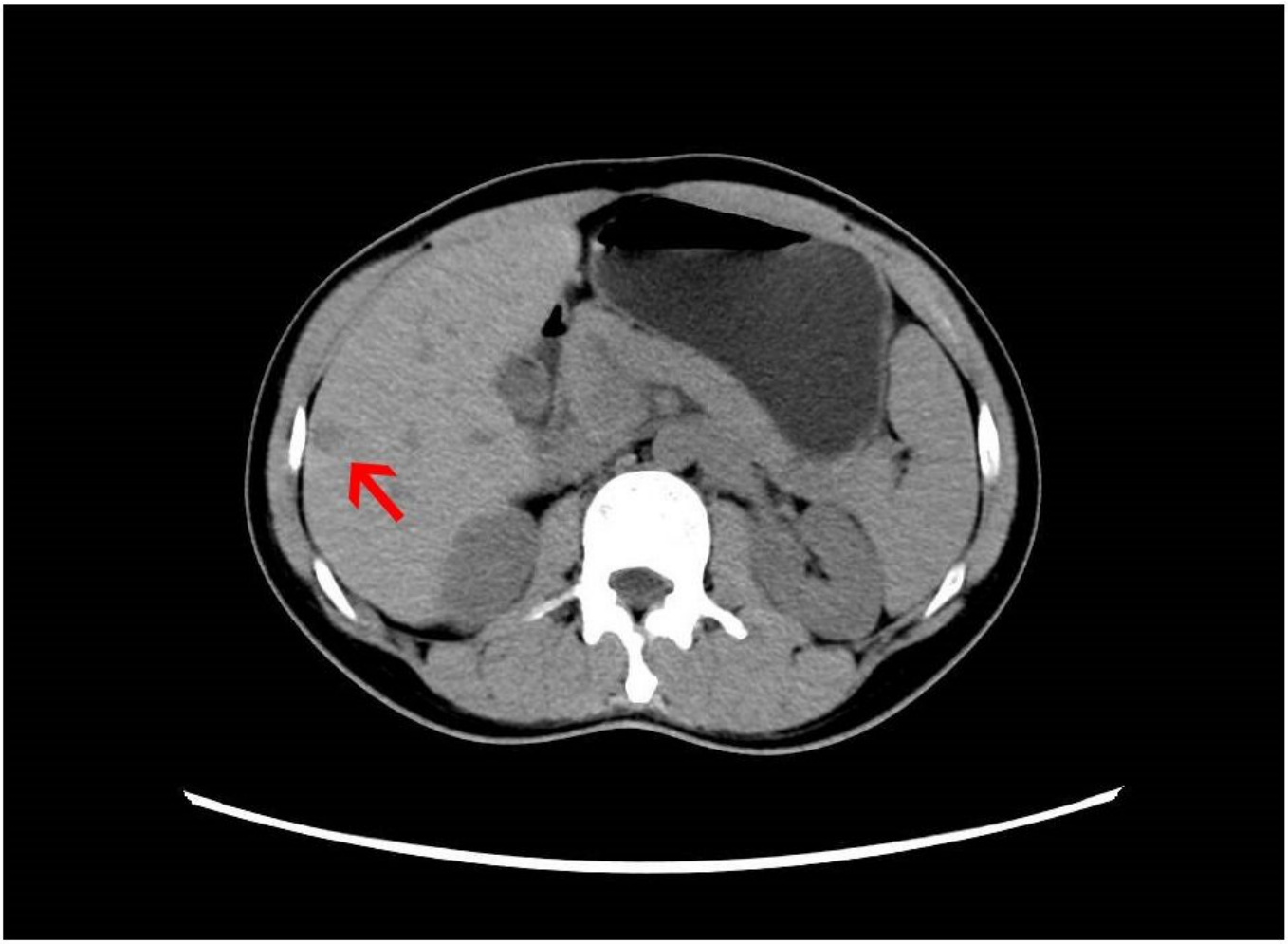

Figure 2

The lesion in the liver: There was a low-density area at the segment 5/6 junction of the liver, the size was about 1.1×1.0cm

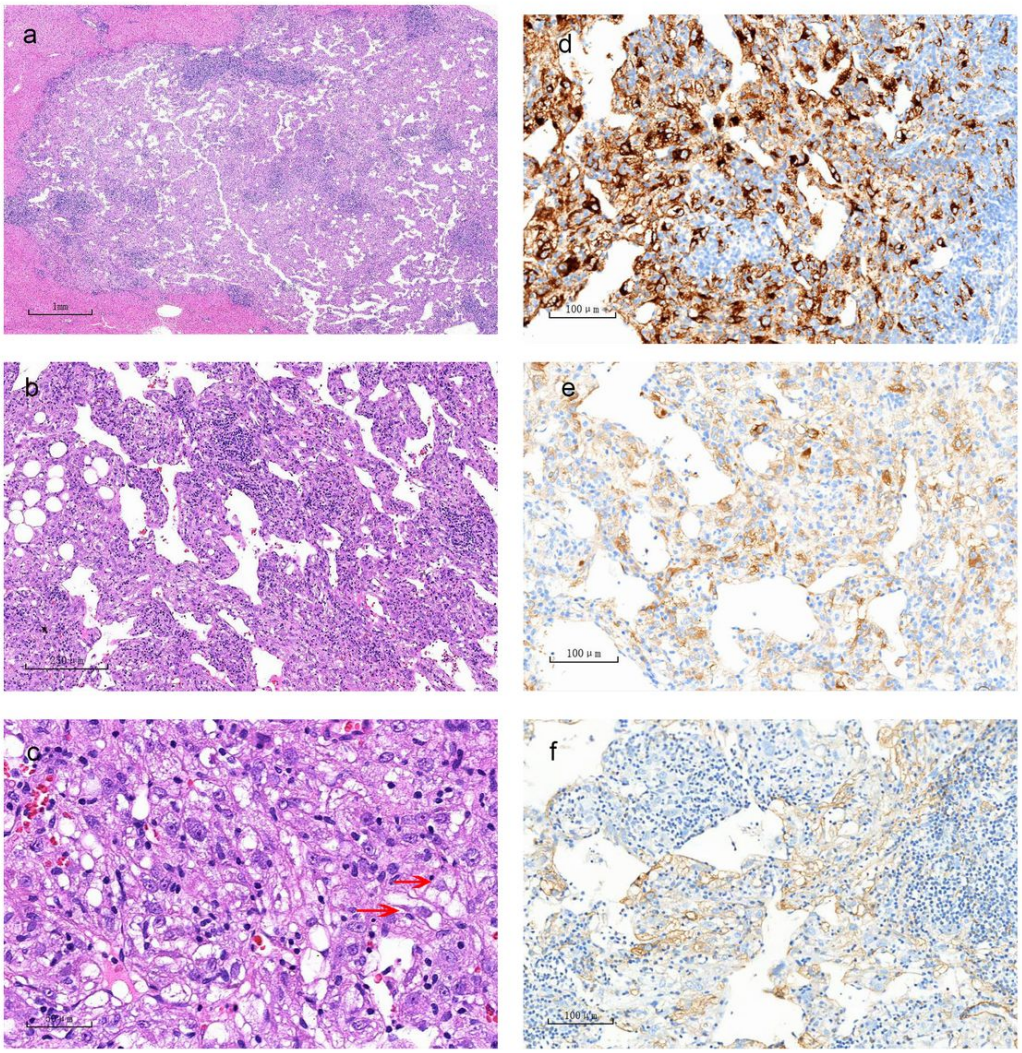

Figure 3

Histological morphology (H&E) and immunohistochemical staining of the lesion in the liver. There was a well-defined intrahepatic nodule (a), which was rich in blood vessels and had a small amount of adipose tissue (b). The tumor was mainly composed of epithelioid cells, among which a small number of short spindle cells and spiderweb-like cells (shown by arrows) were seen (c). It showed diffuse labeling for HMB45 (d) and MelanA (e), with weak positive expression of SMA in a small number of tumor cells (f).

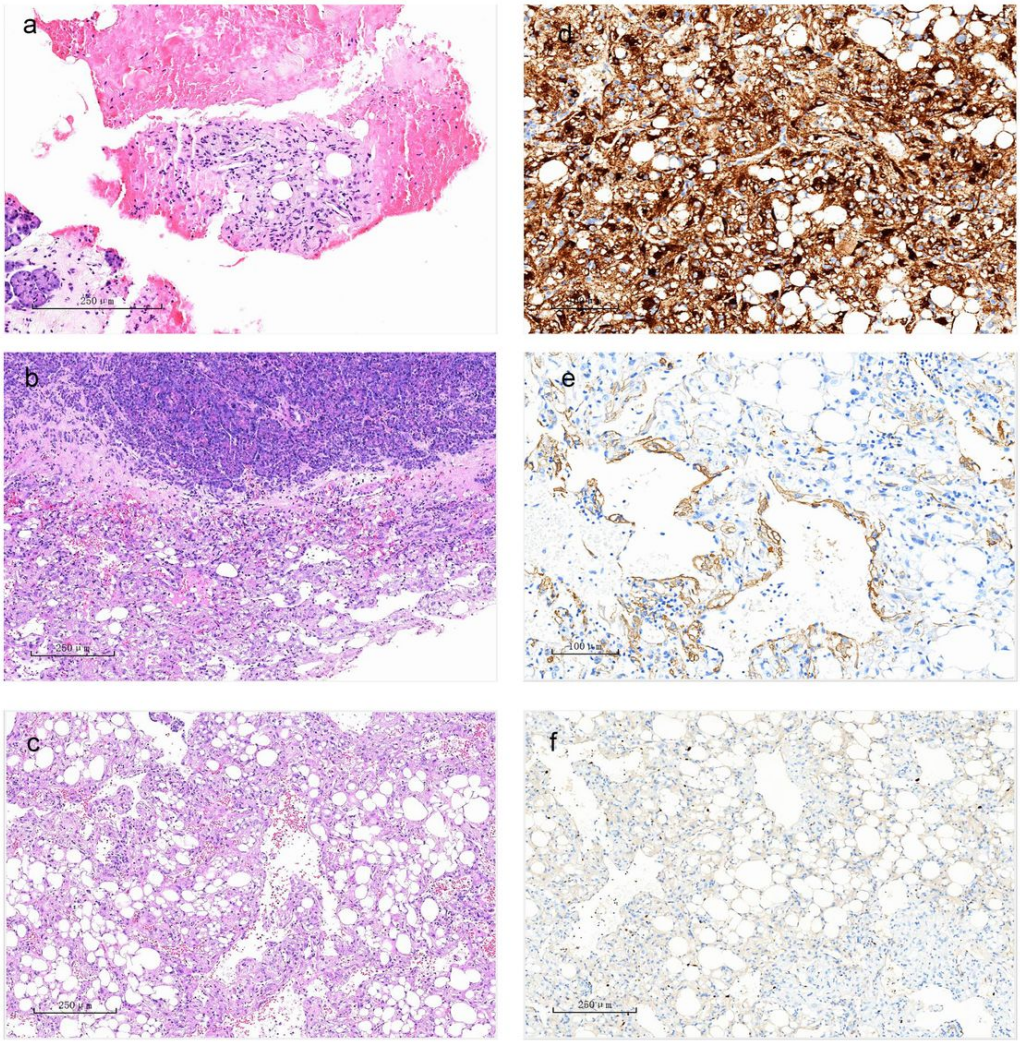

Figure 4

Histological morphology (H&E) and immunohistochemical staining of the lesion in the pancreas. There was a small amount of tumor tissue in intraoperative puncture biopsy of the pancreas (a). In the pancreatectomy specimen, the morphology of the tumor was consistent with the tumor in the liver (b). Compared with liver tumors, pancreatic tumor tissue contained more adipose components (c). HMB45 immunohistochemical staining showed the same diffuse and strong positive expression (d). SMA immunohistochemical staining showed positive in the perivascular area (e). Ki67 staining showed a low tumor proliferation index (f).

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- CAREchecklist.pdf