

# Calcified peripancreatic lymph nodes in pancreatic and hepatic tuberculosis mimicking pancreatic malignancy

## A case report and review of literature

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### Abstract

**Rationale:** Tuberculosis remains a serious menace to the health of people. Isolated hepatic tuberculosis is rare and pancreatic tuberculosis is extremely rare. The preoperative diagnosis of pancreatic tuberculosis remains a great challenge.

**Patient concerns:** A 58-year-old Asian woman was referred to our hospital for evaluation of low back pain for 4 years and abdominal pain for 1 month.

**Diagnoses:** Computed tomography (CT) of the abdomen showed a hypodense mass in the pancreatic head and neck with abundant calcifications, a hypodense lesion in the liver without calcification, peripancreatic lymphadenopathy, calcifications in some lymph nodes. CT-guided fine needle aspiration biopsy of the hepatic lesion was carried out and the cytological examination revealed hepatic tuberculosis.

**Interventions:** The patient was treated with antituberculous therapy for 1 year.

**Outcomes:** Low back pain and abdominal pain disappeared 3 months after initial treatment and after 2 year of follow-up, the patient was asymptomatic.

**Lessons:** Our data hint that calcifications in both pancreatic lesions and peripancreatic lymph nodes may suggest pancreatic tuberculosis rather than pancreatic malignancy.

**Abbreviation:** CT = computed tomography.

**Keywords:** calcification, hepatic tuberculosis, pancreatic carcinoma, pancreatic tuberculosis

## 1. Introduction

Mycobacterium tuberculosis, still a serious menace to human health, can infect almost any organ in the human body.<sup>[1,2]</sup> Nevertheless, hepatic involvement is rare and pancreatic involvement is extremely rare.<sup>[2–4]</sup> Majority of cases of pancreatic tuberculosis occur as a part of disseminated tuberculosis,

particularly in those with immunodeficiency.<sup>[4,5]</sup> The diagnosis of pancreatic tuberculosis can easily be missed or significantly delayed because of its rarity and lack of specificity.<sup>[2,3,6,7]</sup> Two articles reported the isolated tuberculosis lesion at liver or around the head of pancreas involved both liver and pancreas.<sup>[8,9]</sup> One article reported pancreatic and hepatic tuberculosis without involvement of other organs in an infant.<sup>[10]</sup> Here we reported a case of pancreatic and hepatic tuberculosis without involvement of other organs in an immunocompetent person. To our knowledge, similar cases have not been reported. Diagnostic value of calcifications in pancreatic lesions and peripancreatic lymph nodes was discussed here.

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## 2. Case presentation

A 58-year-old Asian woman was referred to our hospital for evaluation of low back pain and abdominal pain. The patient's symptom history was detailed as follows: intermittent low back pain with a tendency to spontaneous regression for 4 years, progressive aggravation of low back pain for 1 month, abdominal pain localized to the epigastrium unrelated to meals for 1 month. The patient denied fever, night sweat, weight loss, cough, vomiting, and jaundice. She denied a history of tuberculosis. Ultrasonography revealed a heteroechoic mass lesion with an unclear irregular border in the pancreatic head, several peripancreatic lymph nodes. Plain computed tomography (CT) of the abdomen showed a mass in the pancreatic head with a slightly low density, an unclear irregular border. Calcifications in the mass were very abundant. Several peripancreatic lymph nodes

and calcifications in some were noted. A hypodense lesion in the liver without calcification was observed. Contrast-enhanced CT showed moderate enhancement in the pancreatic mass and a hypodense lesion in the liver with a mild enhancement. Chest x-ray was normal. At the time of admittance to our hospital, physical examination was unremarkable, with epigastric tenderness without guarding. The initial diagnosis was pancreatic malignancy, hepatic and lymphatic metastasis. CT-guided fine needle aspiration biopsy of the hepatic lesion was carried out and the cytological examination revealed hepatic tuberculosis (Fig. 1). The diagnosis of pancreatic and hepatic tuberculosis was confirmed based on the above findings. Subsequently, the patient was treated with antituberculous therapy for 6 months (rifampicin, isoniazid, pyrazinamide, and ethambutol for 2 months, followed by rifampicin and isoniazid for 4 months). Low back pain and abdominal pain were disappeared 3 months after initial of treatment and after 2 year of follow-up, the patient was asymptomatic.

This study was approved by the Ethics Committee of Southwest Hospital, the Third Military Medical University. Informed consent was obtained from the patient for publication of this case report and accompanying images.

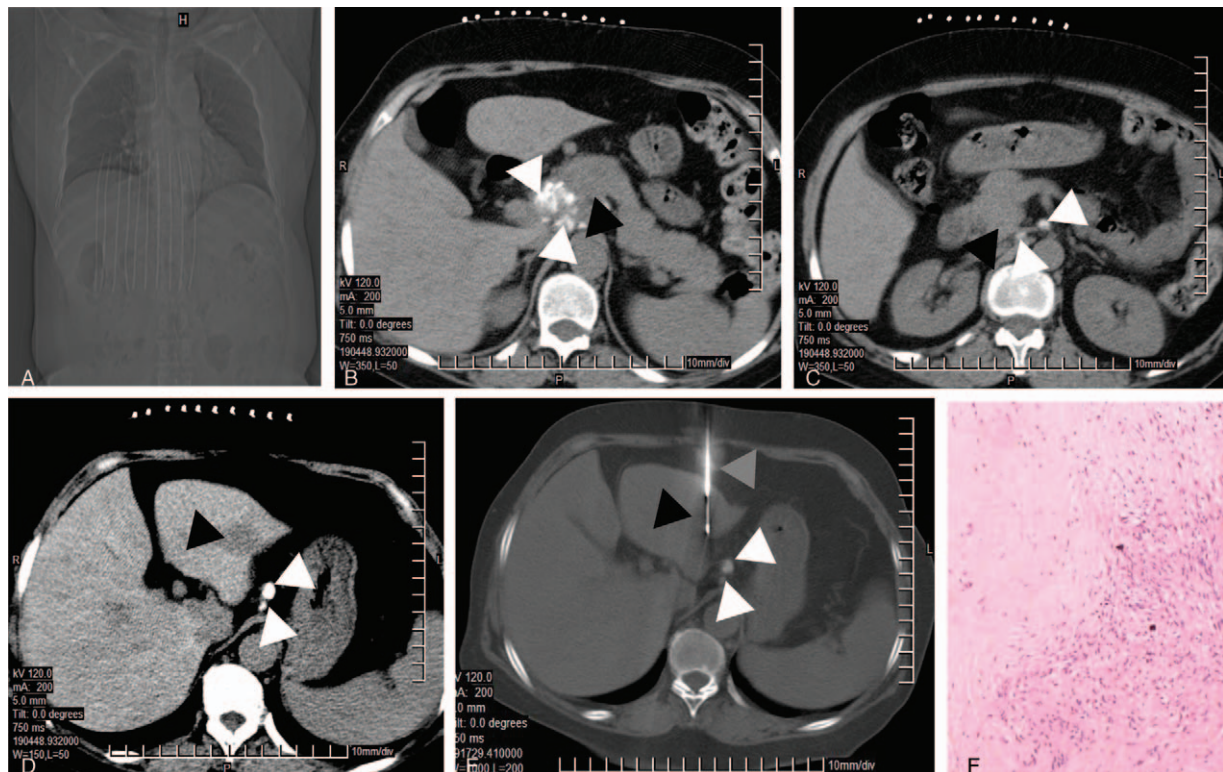
### 3. Discussion

Tuberculosis is still a major public health problem worldwide. In 2015, there were an estimated 10.4 million new (incident) tuberculosis cases, highest incidence being in developing

countries.<sup>[1]</sup> Isolated hepatic tuberculosis is rare and isolated pancreatic tuberculosis is extremely rare.<sup>[3,4]</sup> Although majority of cases occurred as a part of disseminated tuberculosis, about half of patients denied a previous history of tuberculosis infection and more than half showed normal findings on chest radiographs.<sup>[4,5,11,12]</sup>

Several excellent articles summarized and reviewed clinical manifestations of pancreatic tuberculosis previously.<sup>[2,7,12–15]</sup> The clinical manifestations can be diverse and are commonly caused by the mass in pancreas and/or tuberculous toxemia. They include abdominal or back pain/discomfort, palpable abdominal lump, jaundice, weight loss, anorexia, fever, night sweats, malaise/weakness/fatigue.<sup>[2,7,12–15]</sup> The diagnosis of pancreatic tuberculosis can easily be missed or significantly delayed because of its rarity and lack of specific manifestations.<sup>[2,7,11]</sup> Kim et al<sup>[11]</sup> reported that in about 52% of cases, first impression was wrong as pancreatic or peripancreatic malignancy. Some of these patients underwent unnecessary or improper surgery.<sup>[15,16]</sup> Saluja et al<sup>[16]</sup> reported that even 2 of 7 pancreatic tuberculosis patients were considered for palliative chemoradiotherapy because of misdiagnosis.

Accurate diagnosis may avoid delays in treatment and unnecessary surgery. Imaging features are helpful for diagnosis of pancreatic tuberculosis.<sup>[3,6,7,15,17]</sup> Pancreatic tuberculosis may present with a wide range of imaging findings.<sup>[3,6,7,15,17]</sup> It may present with masses or cystic lesions, mostly in the head or neck of the pancreas. Both solitary lesion and multiple lesions can be



**Figure 1.** (A) The computed tomographic (CT) scout view showed the chest was normal. (B) The pancreas was evaluated with abdominal window settings (width, 350 HU; level, 50 HU). A hypodense mass in the pancreatic neck (the black arrowhead) and calcifications in the lesion (white arrowheads) are observed. (C) The upper abdomen was evaluated with abdominal window settings (width, 350 HU; level, 50 HU). A hypodense mass in the pancreatic head (the black arrowhead) and calcified peripancreatic lymph nodes (white arrowheads) are observed. (D) The upper abdomen was evaluated with liver window settings (width, 150 HU; level, 50 HU). A hypodense mass in the liver (the black arrowhead) and calcified peripancreatic lymph nodes (white arrowheads) are observed. (E) The upper abdomen CT image shows CT-guided fine needle (the gray arrowhead) aspiration biopsy of the hepatic lesion (the black arrowhead) was carried out. Calcified peripancreatic lymph nodes (white arrowheads) are observed. (F) H&E staining of hepatic lesion.

observed. Mass lesions in most of cases mimic pancreatic carcinoma.<sup>[3,6,7,15,17]</sup> CT scans of mass lesions usually demonstrate homogeneous or inhomogeneous consistency with a slightly low density, irregular poorly defined borders. Necrotic cystic areas can be observed in some of patients. Following enhanced scanning, images demonstrate marked enhancement, moderate enhancement, or mild enhancement; they exhibit homogeneous enhancement or inhomogeneous enhancement. Other signs include dilation of the main pancreatic duct and/or upstream biliary, lymphadenopathies surrounding the pancreas, evidence of active tuberculosis in the form of infiltrates, pleural effusion, and so on.<sup>[3,6,7,15,17]</sup> Vascular invasion of abdominal vessels was often reported as point of distinction between pancreatic tuberculosis and malignancy.<sup>[18]</sup> Nevertheless, vascular involvement cannot be used as a criterion to discriminate pancreatic tuberculosis from malignancy, as there are multiple reports of vascular invasion in pancreatic tuberculosis.<sup>[2,18–20]</sup> Therefore, these imaging findings are nonspecific.

Calcifications in pancreatic lesions were reported as characteristic in diagnosis of pancreatic tuberculosis.<sup>[3,6,7,15,17]</sup> Although Xia et al reported that the presence of calcification in numbers as high as 56% patients, others reported a lower ratio of calcification in the lesions (Table 1).<sup>[6,15,17]</sup> Nagar et al<sup>[12]</sup> reported that in their study, no parenchymal or ductal calcification was seen in pancreatic tuberculosis on CT scan in 32 patients. However, calcifications may be seen in pancreatic malignancies, too (Table 1). More than 80% of pancreatic malignancies are ductal adenocarcinoma.<sup>[21]</sup> Some reports indicate the presence of calcification in numbers as high as 21% patients and others have not reported any calcification in the tumors.<sup>[21–23]</sup> Acinar cell carcinoma is the second most common type.<sup>[24–27]</sup> The ratio of calcification in tumor is from 0 to 50%.<sup>[24,26,27]</sup> Neuroendocrine neoplasms account for 1% to

2% of all pancreatic tumors.<sup>[28–31]</sup> Calcification in neuroendocrine neoplasms is not rare, especially in nonfunctioning and larger neoplasms.<sup>[28,30,31]</sup> Calcification in other rare types of pancreatic tumors is not rare.<sup>[30,32,33]</sup> For example, intratumoral calcification has been described as a common feature of solid pseudopapillary carcinomas and the ratio of calcification is >28%.<sup>[32,33]</sup> Morphological pattern of calcifications is thought as characteristic in pancreatic tuberculosis.<sup>[3]</sup> The morphologies are inconsistent, including irregular, striped, speckled, focal, sand-like calcifications, calcifications forming polycyclic structures, and so on.<sup>[2,5,6,11,13,15,17,18,34,35]</sup> Calcifications in pancreatic malignancies have been well described previously,<sup>[21,22,28,30]</sup> although there is a lack of summaries of calcifications in pancreatic tuberculosis, partly because of its rarity. Based on these reports, calcifications may be useful, but not specific imaging criteria for the differentiation of pancreatic tuberculosis from malignancy.<sup>[3,6,7,15,17,21,22,28,30]</sup>

In the case reported here, calcifications in the pancreatic mass were very abundant; moreover, abundant calcifications in several peripancreatic lymph nodes were observed. We searched the literature and no reports on diagnostic value of calcified peripancreatic lymph nodes in pancreatic tuberculosis or malignancy were found. We analyzed case reports on pancreatic tuberculosis and found that majority of cases of pancreatic tuberculosis with calcifications accompanied calcified peripancreatic lymph nodes. From 2010, >50 cases of pancreatic tuberculosis were reported.<sup>[2,3,5,7,13,14,17–20,34,36–75]</sup> Calcifications in pancreatic lesions were observed in 5 cases in limited images provided in articles.<sup>[5,13,17,20,48]</sup> In 3 of these 5 cases, calcifications in peripancreatic lymph nodes were observed.<sup>[5,17,48]</sup> One case should very likely have calcifications in peripancreatic lymph nodes. Because only 1 contrast CT image was provided in the article, it was difficult to distinguish calcified

**Table 1**  
Ratio of calcifications in pancreatic lesions in literature.

	Year, reporter	Patients number/sex	Age, y	Calcification (%)
Tuberculosis	2003, Xia et al <sup>[6]</sup>	16/6M	18–56	56.3
	2009, Song et al <sup>[15]</sup>	16/9M	25–57	25.0
	2009, Nagar et al <sup>[12]</sup>	32/22M	19–64	0
	2011, Ibrahim and Al-Nakshabandi <sup>[17]</sup>	14/9M	42–70	7.1
	2014, Kim et al <sup>[11]</sup>	42/14M	24–67	7.1
Malignancies				
Ductal adenocarcinoma	2006, Amin et al <sup>[21]</sup>	177/U	U	5.6
	2008, Ogawa et al <sup>[23]</sup>	26/U	U	0
	2011, Lv et al <sup>[22]</sup>	19/8M	42–76	21.1
Acinar cell carcinoma	2004, Chiou et al <sup>[27]</sup>	10/7M	49–75	50.0
	2010, Hsu et al <sup>[26]</sup>	6/U	41–71	16.7
	2013, Raman et al <sup>[24]</sup>	15/9M	47–77	0
Pure acinar cell carcinoma	2005, Tatli et al <sup>[25]</sup>	11/U	44–79	27.3
Neuroendocrine neoplasm	2012, Poultsides et al <sup>[31]</sup>	102/48M	20–94	15.7
	2015, Kim et al <sup>[29]</sup>	167/75M	52*	10.8
	2017, Hu et al <sup>[28]</sup>	13/7M	38–60	15.4
Solid pseudopapillary carcinomas	1996, Buetow et al <sup>[33]</sup>	56/3M	10–74	28.6
	2008, Lee et al <sup>[32]</sup>	8/0M	15–56	62.5

\* Average.

U = unreported.



**Table 2****Ratio of calcified peripancreatic lymph nodes accompanying pancreatic lesions with calcifications.**

	No. patients	No. cases with calcified lymph nodes
Pancreatic tuberculosis	4	3
Pancreatic ductal adenocarcinoma	6	0

peripancreatic lymph nodes from blood vessels.<sup>[13]</sup> In the left 1 case, it was uncertain whether there were peripancreatic lymphadenopathies with calcifications because of lack of images.<sup>[20]</sup> We collected all cases of pancreatic tuberculosis with calcifications as we could and collected 6 cases of pancreatic ductal adenocarcinoma with calcifications as control (Table 2). Calcified peripancreatic lymph nodes accompanied calcifications in pancreatic tuberculosis in 3 of 4 patients. No calcified peripancreatic lymph nodes were observed in 6 cases of pancreatic ductal adenocarcinoma with calcifications. Collectively, these hint that calcifications in both pancreatic lesions and peripancreatic lymph nodes may suggest pancreatic tuberculosis rather than pancreatic malignancy. Tuberculous lymphadenopathy is the most common manifestation of abdominal tuberculosis and majority of cases of pancreatic tuberculosis occur as a part of disseminated tuberculosis.<sup>[4,5,76]</sup> It is not surprising that majority of cases of pancreatic tuberculosis with calcifications accompanies calcified peripancreatic lymph nodes. Owing to the limited sample size, further experiments should be carried out to make the conclusion convincing.

#### 4. Conclusion

Pancreatic tuberculosis is extremely rare, with a wide range of nonspecific clinical presentation and image features. The diagnosis of pancreatic tuberculosis can easily be missed or significantly delayed. More than half of cases of pancreatic tuberculosis were initially diagnosed as pancreatic malignancy. Although the presence of calcifications should not dissuade the doctor from raising concern for malignancy and the diagnosis of pancreatic tuberculosis should be bacteriologically or cytologically confirmed, calcifications in both pancreatic lesions and peripancreatic lymph nodes may suggest pancreatic tuberculosis rather than pancreatic malignancy.

#### Author contributions

**Conceptualization:** Jianming He.

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#### References

- [1] Organization WH. *Global Tuberculosis Report 2016*. 2016.
- [2] Sharma V, Rana SS, Kumar A, et al. Pancreatic tuberculosis. *J Gastroenterol Hepatol* 2016;31:310–8.
- [3] McMullan GS, Lewis JH. Tuberculosis of the liver, biliary tract, and pancreas. *Microbiol Spectr* 2017;5:
- [4] Franco-Paredes C, Leonard M, Jurado R, et al. Tuberculosis of the pancreas: report of two cases and review of the literature. *Am J Med Sci* 2002;323:54–8.
- [5] Yang YJ, Li YX, Liu XQ, et al. Pancreatic tuberculosis mimicking pancreatic carcinoma during anti-tuberculosis therapy: a case report. *World J Clin Cases* 2014;2:167–9.
- [6] Xia F, Poon RT, Wang SG, et al. Tuberculosis of pancreas and peripancreatic lymph nodes in immunocompetent patients: experience from China. *World J Gastroenterol* 2003;9:1361–4.
- [7] Chaudhary P, Bhadana U, Arora MP. Pancreatic tuberculosis. *Indian J Surg* 2015;77:517–24.
- [8] Liu H, Zhu J, Dong H, et al. Isolated hepatic tuberculosis in the caudate lobe mimicking intrahepatic carcinoma. *Clin Res Hepatol Gastroenterol* 2017;41:e65–7.
- [9] Itoi T, Ang TL, Seewald S, et al. Endoscopic ultrasonography-guided drainage for tuberculous liver abscess drainage. *Dig Endosc* 2011;23 (Suppl 1):158–61.
- [10] Kacemi L, Dafiri R. [Imaging of pancreatic and hepatic tuberculosis in an infant presenting with jaundice]. *J Radiol* 2006;87(4 pt 1):396–8.
- [11] Kim JB, Lee SS, Kim SH, et al. Peripancreatic tuberculous lymphadenopathy masquerading as pancreatic malignancy: a single-center experience. *J Gastroenterol Hepatol* 2014;29:409–16.
- [12] Nagar AM, Raut AA, Morani AC, et al. Pancreatic tuberculosis: a clinical and imaging review of 32 cases. *J Comput Assist Tomogr* 2009;33:136–41.
- [13] Kumar PA, Singh G, Joseph JB, et al. Pancreatic tuberculosis: a puzzle for physicians. a rare case and review of literature. *J Clin Diagn Res* 2016;10: D29–31.
- [14] Khaniya S, Koirala R, Shakya VC, et al. Isolated pancreatic tuberculosis mimicking as carcinoma: a case report and review of the literature. *Cases J* 2010;3:18.
- [15] Song TJ, Lee SS, Park DH, et al. Yield of EUS-guided FNA on the diagnosis of pancreatic/peripancreatic tuberculosis. *Gastrointest Endosc* 2009;69(3 pt 1):484–91.
- [16] Saluja SS, Ray S, Pal S, et al. Hepatobiliary and pancreatic tuberculosis: a two decade experience. *BMC Surg* 2007;7:10.
- [17] Ibrahim GF, Al-Nakshabandi NA. Pancreatic tuberculosis: role of multi-detector computed tomography. *Can Assoc Radiol J* 2011;62:260–4.
- [18] Gupta D, Patel J, Rathi C, et al. Primary pancreatic head tuberculosis: great masquerader of pancreatic adenocarcinoma. *Gastroenterology Res* 2015;8:193–6.
- [19] Zhu M, Zhang N, Tao W, et al. Pancreatic tuberculosis with vascular involvement and peritoneal dissemination in a young man. *Case Rep Med* 2017;2017:4396759.
- [20] Rana SS, Sharma V, Sampath S, et al. Vascular invasion does not discriminate between pancreatic tuberculosis and pancreatic malignancy: a case series. *Ann Gastroenterol* 2014;27:395–8.
- [21] Amin Z, Theis B, Russell RC, et al. Diagnosing pancreatic cancer: the role of percutaneous biopsy and CT. *Clin Radiol* 2006;61:996–1002.
- [22] Lv P, Mahyoub R, Lin X, et al. Differentiating pancreatic ductal adenocarcinoma from pancreatic serous cystadenoma, mucinous cystadenoma, and a pseudocyst with detailed analysis of cystic features on CT scans: a preliminary study. *Korean J Radiol* 2011;12:187–95.
- [23] Ogawa H, Itoh S, Ikeda M, et al. Intraductal papillary mucinous neoplasm of the pancreas: assessment of the likelihood of invasiveness with multisection CT. *Radiology* 2008;248:876–86.
- [24] Raman SP, Hruban RH, Cameron JL, et al. Acinar cell carcinoma of the pancreas: computed tomography features—a study of 15 patients. *Abdom Imaging* 2013;38:137–43.
- [25] Tatli S, Mortelev KJ, Levy AD, et al. CT and MRI features of pure acinar cell carcinoma of the pancreas in adults. *AJR Am J Roentgenol* 2005;184:511–9.
- [26] Hsu MY, Pan KT, Chu SY, et al. CT and MRI features of acinar cell carcinoma of the pancreas with pathological correlations. *Clin Radiol* 2010;65:223–9.
- [27] Chiou YY, Chiang JH, Hwang JI, et al. Acinar cell carcinoma of the pancreas: clinical and computed tomography manifestations. *J Comput Assist Tomogr* 2004;28:180–6.
- [28] Hu J, Hu Q, Hu H. Characterization of single lesion nonfunctioning pancreatic neuroendocrine carcinoma via computed tomography. *Oncol Lett* 2017;13:2186–90.
- [29] Kim DW, Kim HJ, Kim KW, et al. Neuroendocrine neoplasms of the pancreas at dynamic enhanced CT: comparison between grade 3 neuroendocrine carcinoma and grade 1/2 neuroendocrine tumour. *Eur Radiol* 2015;25:1375–83.
- [30] Verde F, Fishman EK. Calcified pancreatic and peripancreatic neoplasms: spectrum of pathologies. *Abdom Radiol (NY)* 2017;42:2686–97.
- [31] Poultsides GA, Huang LC, Chen Y, et al. Pancreatic neuroendocrine tumors: radiographic calcifications correlate with grade and metastasis. *Ann Surg Oncol* 2012;19:2295–303.

- [32] Lee JH, Yu JS, Kim H, et al. Solid pseudopapillary carcinoma of the pancreas: differentiation from benign solid pseudopapillary tumour using CT and MRI. *Clin Radiol* 2008;63:1006–14.
- [33] Buetow PC, Buck JL, Pantongrag-Brown L, et al. Solid and papillary epithelial neoplasm of the pancreas: imaging-pathologic correlation on 56 cases. *Radiology* 1996;199:707–11.
- [34] Lee YJ, Hwang JY, Park SE, et al. Abdominal tuberculosis with periportal lymph node involvement mimicking pancreatic malignancy in an immunocompetent adolescent. *Pediatr Radiol* 2014;44:1450–3.
- [35] Cwik G, Solecki M, Wallner G. Applications of intraoperative ultrasound in the treatment of complicated cases of acute and chronic pancreatitis and pancreatic cancer—own experience. *J Ultrason* 2015;15:56–71.
- [36] Sonthalia N, Ray S, Pal P, et al. Fine needle aspiration diagnosis of isolated pancreatic tuberculosis: a case report. *World J Clin Cases* 2013;1:181–6.
- [37] Mohamadnejad M, Sotoudeh M, Malekzadeh R. Education and imaging. *Gastrointestinal: pancreatic tuberculosis masquerading as malignancy. J Gastroenterol Hepatol* 2014;29:418.
- [38] Puri R, Thandassery RB, Eloubeidi MA, et al. Diagnosis of isolated pancreatic tuberculosis: the role of EUS-guided FNA cytology. *Gastrointest Endosc* 2012;75:900–4.
- [39] Zacharia GS, Antony R, Kolassery S, et al. Isolated pancreatic tuberculosis masquerading as pancreatic cancer. *Gastroenterol Rep (Oxf)* 2014;2:154–7.
- [40] Catalya S, Tulpule S, Arshed S, et al. A rare case of pancreatic tuberculosis. *Pancreas* 2017;46:964–5.
- [41] Falkowski AL, Graber J, Haack HG, et al. Isolated pancreatic tuberculosis: a case report and radiological comparison with cystic pancreatic lesions. *J Radiol Case Rep* 2013;7:1–1.
- [42] Mora Cuadrado N, Berroa de la Rosa E, Velayos Jimenez B, et al. Tuberculosis, one more consideration in the differential diagnosis of a pancreatic mass. *Gastroenterol Hepatol* 2017;40:619–21.
- [43] Kaur M, Dalal V, Bhatnagar A, et al. Pancreatic tuberculosis with markedly elevated CA 19-9 levels: a diagnostic pitfall. *Oman Med J* 2016;31:446–9.
- [44] Garcia Del Olmo N, Bosca Robledo A, Penalba Palmi R, et al. Primary peripancreatic lymph node tuberculosis as a differential diagnosis of pancreatic neoplasia. *Rev Esp Enferm Dig* 2017;109:528–30.
- [45] Dong Y, Jurgensen C, Puri R, et al. Ultrasound imaging features of isolated pancreatic tuberculosis. *Endosc Ultrasound* 2017.
- [46] Abbaszadeh M, Rezai J, Hasibi M, et al. Pancreatic tuberculosis in an immunocompetent patient: a case report and review of the literature. *Middle East J Dig Dis* 2017;9:239–41.
- [47] Waintraub DJ, D'Souza LS, Madrigal E, et al. A rare case of isolated pancreatic tuberculosis. *ACG Case Rep J* 2016;3:e91.
- [48] Ueda K, Tamai H, Matsumoto M, et al. Diagnosis of pancreatic tuberculosis by combined, contrast-enhanced sonography and endoscopic ultrasound-guided fine-needle aspiration. *Clin J Gastroenterol* 2010;3:159–64.
- [49] Tosun S, Tosun A. Imaging of malignancy-suspected pancreatic involvement of extrapulmonary tuberculosis. *Turk J Gastroenterol* 2010;21:54–9.
- [50] Rana SS, Bhasin DK, Rao C, et al. Isolated pancreatic tuberculosis mimicking focal pancreatitis and causing segmental portal hypertension. *JOP* 2010;11:393–5.
- [51] Rana SS, Bhasin DK, Gupta N, et al. Pancreatic tuberculosis with common bile duct and pancreatic duct dilatation. *Endoscopy* 2011;43 (suppl 2):UCTN:E282-283.
- [52] Zheng ZJ, Zhang H, Xiang GM, et al. Coexistence of pancreatic carcinoma and pancreatic tuberculosis: case report. *Gut Liver* 2011;5:536–8.
- [53] Kiziltas S, Colak Y, Ulasoglu C, et al. A case of isolated pancreatic tuberculosis mimicking pancreatic carcinoma. *Turk J Gastroenterol* 2011;22:566–7.
- [54] Meesiri S. Pancreatic tuberculosis with acquired immunodeficiency syndrome: a case report and systematic review. *World J Gastroenterol* 2012;18:720–6.
- [55] Cheng CW, Tsou YK, Fan GW, et al. Duodenal bleeding caused by pancreatic tuberculosis in a patient with AIDS and disseminated tuberculosis. *Endoscopy* 2012;44(suppl 2):UCTN:E34-35.
- [56] Chatterjee S, Schmid ML, Anderson K, et al. Tuberculosis and the pancreas: a diagnostic challenge solved by endoscopic ultrasound. A case series. *J Gastrointest Liver Dis* 2012;21:105–7.
- [57] Yavuz A, Bulus H, Aydin A, et al. Pancreatic tuberculosis mimicking inoperable pancreatic cancer. *Turk J Gastroenterol* 2012;23:95–7.
- [58] Ozkan F, Bulbuloglu E, Inci MF, et al. Isolated pancreatic tuberculosis mimicking malignancy and causing obstructive jaundice. *J Gastrointest Cancer* 2013;44:118–20.
- [59] Hellara O, Noomene F, Toumi O. A pseudotumoral presentation of pancreatic tuberculosis. *J Visc Surg* 2012;149:e282–283.
- [60] Raghavan P, Rajan D. Isolated pancreatic tuberculosis mimicking malignancy in an immunocompetent host. *Case Rep Med* 2012;2012:501246.
- [61] Arora A, Mukund A, Garg H. Isolated pancreatic tuberculosis: a rare occurrence. *Am J Trop Med Hyg* 2012;87:1–2.
- [62] Assenza M, Simonelli L, Romeo V, et al. Isolated pancreatic tuberculosis: a diagnostic challenge. *Clin Ter* 2012;163:e327–329.
- [63] Huang CT, Lo CY, Lee TH. Isolated peripancreatic tuberculous lymphadenopathy: a rare manifestation of abdominal tuberculosis mimicking pancreatic cystic neoplasm. *J Dig Dis* 2013;14:105–8.
- [64] Ray S, Das K, Mridha AR. Pancreatic and peripancreatic nodal tuberculosis in immunocompetent patients: report of three cases. *JOP* 2012;13:667–70.
- [65] Patel D, Loren D, Kowalski T, et al. Pancreatic tuberculosis mimicking malignancy diagnosed with endoscopic ultrasound-guided fine needle aspiration. *Endosc Ultrasound* 2013;2:38–40.
- [66] Samuel DO, Majid Mukhtar AA, Philip IO. A diagnostic pitfall: pancreatic tuberculosis, not pancreatic cancer. *J Coll Physicians Surg Pak* 2013;23:211–3.
- [67] Mansoor J, Umair B. Primary pancreatic tuberculosis: a rare and elusive diagnosis. *J Coll Physicians Surg Pak* 2013;23:226–8.
- [68] Vafa H, Arvanitakis M, Matos C, et al. Pancreatic tuberculosis diagnosed by EUS: one disease, many faces. *JOP* 2013;14:256–60.
- [69] Sportes A, Kpoussou R, Bernardin S. Isolated pancreatic tuberculosis mimicking inoperable pancreatic cancer: a diagnostic challenge resolved using endoscopic ultrasound-guided fine-needle aspiration. *Can J Gastroenterol* 2013;27:445–7.
- [70] Rana SS, Chaudhary V, Gupta N, et al. Pancreatic tuberculosis presenting as an unusual head mass. *Endoscopy* 2013;45(suppl 2):UCTN:E317-318.
- [71] Laamrani FZ, Dafiri R. A rare pediatric case of pancreatic tuberculosis with venous thrombosis. *Diagn Interv Imaging* 2014;95:455–6.
- [72] Sun SL, Gao F, Cui DX, et al. Isolated pancreatic tuberculosis in non-immunocompromised patient treated by Whipple's procedure: a case report. *Chin Med Sci J* 2014;29:58–60.
- [73] Salahuddin A, Saif MW. Pancreatic tuberculosis or autoimmune pancreatitis. *Case Rep Med* 2014;2014:410142.
- [74] Sharma V, Chhabra P, Rana SS, et al. Pancreatic tuberculosis: look at the kidney!. *Dig Liver Dis* 2015;47:e1.
- [75] Pawar S, Ragesh R, Nischal N, et al. Disseminated tuberculosis masquerading as metastatic pancreatic carcinoma. *J Assoc Physicians India* 2015;63:66–8.
- [76] De Backer AI, Mortele KJ, Deeren D, et al. Abdominal tuberculous lymphadenopathy: MRI features. *Eur Radiol* 2005;15:2104–9.