

Neuroendocrine tumor of the gallbladder with spectral CT

Hai Du¹, Haoliang Zhang¹, Yandong Xu¹, Li Wang²

¹CT-MRI Room, ²Pathology Department, Ordos Center Hospital, Erdos, Inner Mongolia 017000, China

Correspondence to: Haoliang Zhang. CT-MRI Room 1, Ordos Center Hospital, Erdos, Inner Mongolia, China. Email: zhanghaoliang_1708@163.com.

Abstract: Neuroendocrine tumors (NETs) are neoplasms that arise from neural crest argyrophil cells, and often occur to the elderly, female and patients with cholelithiasis. In this case, the female patient was 38 years old and admitted into the hospital for interrupted right upward abdominal pain for 2 years plus aggravated with nausea and anorexia for 1 week. Ultrasound showed gallbladder space-occupying lesions and spectral computed tomography (CT) suggested of retroperitoneal lymph node metastasis. The patient was diagnosed with gallbladder neuroendocrine carcinoma after the surgery.

Keywords: Neuroendocrine tumor (NETs), gallbladder, lymph node metastasis, ultrasound, spectral computed tomography (spectral CT)

Submitted Jul 16, 2014. Accepted for publication Jul 18, 2014.

doi: 10.3978/j.issn.2223-4292.2014.08.04

View this article at: <http://dx.doi.org/10.3978/j.issn.2223-4292.2014.08.04>

Introduction

Neuroendocrine tumors (NETs) are neoplasms that arise from neural crest argyrophil cells, most of neuroendocrine cells are located in the mucous layers of gastrointestinal tract and respiratory tract, thus the chest and digestive system are both susceptible to neuroendocrine tumor. The primary gallbladder NETs are very rare and accounts for 2% in all kinds of gallbladder carcinomas (1), and about 0.5% in all neuroendocrine carcinomas (2).

Case report

A 38-year-old woman presented with intermittent right upper abdominal pain for 2 years, aggravation with nausea and anepithymia for 1 week. Ultrasonography revealed a 10.9 cm × 8.5 cm low-echo mass in the gallbladder, the mass had irregular shape and uneven internal echo, enclosed and compressed the bottom of the gallbladder. The internal membrane of gallbladder was intact, local intrahepatic tubular structure was not well visualized, intrahepatic bile ducts but not extrahepatic bile ducts had dilation, pancreas and both kidneys had no significant abnormal echoes. The ultrasonic diagnosis was a solid occupying lesion of gallbladder, indicating the origin from gallbladder, thus

computed tomography (CT) examination was suggested.

Non-enhanced and contrast-enhanced abdominal dual energy CT (GE Discovery CT 750HD) with CT spectral imaging mode was taken. Non-enhanced CT confirmed of a huge massive soft tissue density shadow surrounded the gallbladder in the fossa for gallbladder, and had no clear boundary with right lobe and quadrate lobe of liver, the size was about 7.8 cm × 5.5 cm; and a 5.7 cm × 4.9 cm massive soft tissue density shadow in front of right kidney and above the head of pancreas was also found. The intrahepatic bile ducts showed dead tree branch-like dilation. Low-keV monochromatic images of contrast-enhanced CT indicated that the massive soft tissue density shadow in the fossa for gallbladder was enhanced unevenly, the front of right kidney and the head of pancreas had similar enhancement pattern (*Figure 1A*), the phenomenon were much clear those in 70 keV images (*Figure 1B*). The vermiform filling defect of portal vein was observed, and the inferior vena cava was displaced laterally due to compression. The mass and enlarged lymph nodes had consistent pattern of spectral HU curve (*Figure 1C*). The CT diagnosis was occupying lesions of gallbladder, suspected carcinoma of gallbladder, with dilation of intrahepatic bile ducts, retroperitoneal lymph node metastasis, involvement of main portal vein, and the involvement of inferior vena cava cannot be excluded.

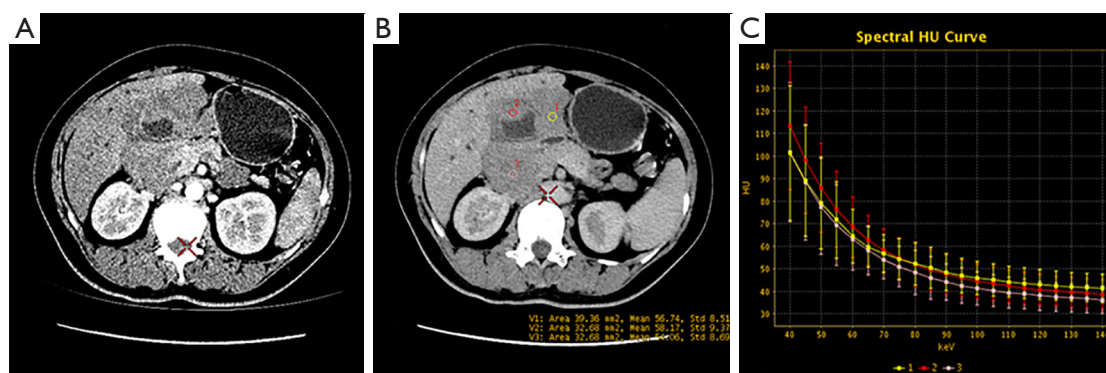


Figure 1 (A) (50 keV) and (B) (70 keV) showed a huge massive soft tissue density shadow surrounding the gallbladder in the fossa for gallbladder. The shape, blood supply arteries and the relationship with adjacent tissues was displayed clearly in *Figure 1A*. The consistent pattern of spectral HU curves at ROI 1, 2 and 3 indicated the same origin of tumor in *Figure 1C*.

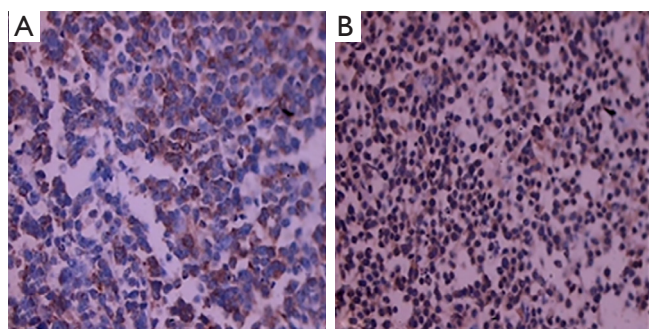


Figure 2 Infiltration of a large number of heterocysts. The cells were in a small to middle size, the nuclei were round or ellipse, there was a little cytoplasm, and the nuclear mitotic figure was observed. (A) Positive cgA (immunohistochemistry, 400 $\times$); (B) positive Syn (immunohistochemistry, 400 $\times$).

After admission, the routine examinations were completed. The results demonstrated significant abnormal liver function: ALT 274 μ mol/L, AST 140 U/L, TBIL 114.1 μ mol/L, IDBL 78.1 μ mol/L, ALP 318 U/L, GGT 218 U/L; and the tumor marker CA19-9 (204.7 U/mL) was significantly higher than the normal value. The cholecystectomy for carcinoma of gallbladder was thereby performed. The perioperative findings showed that the gallbladder had high tension and thick wall (10 cm $\times$ 8 cm), demonstrated florid exophytic growth, and was adhered to the middle segment of transverse colon. The stomach and duodenal ligaments were fused and adhered to the gallbladder closely. The first hepatic portal vein and hepatoduodenal ligament were invaded by tumor. The pathology results demonstrated that a large number of heterocysts in the

muscularis mucosa (of gallbladder) were infiltrated under microscope (HE, 400 $\times$), the cells had small to middle size, the nuclei were round or ellipse, there was a little cytoplasm, partial cells were pycnotic, and the nuclear mitotic feature was observed (*Figure 2A,B*). The immunohistochemistry showed positive CD56, Syn and cgA, negative CD20, CD3, CD21, CD10, MUM-1, BCL-6, BCL-2, TDT, CD34, PAX-5, MPO, LCA, CKL and CKH, and 70-80% positive KI-67. The pathological diagnosis was (gallbladder) neuroendocrine tumor.

Discussion

About 14-18% of patients with neuroendocrine carcinoma would have typical carcinoid syndromes, mainly characterized by skin flush, stomachache, diarrhea, asthma *et al.* (3,4). The patient showed no obvious carcinoid syndromes and specificity. Maitra *et al.* (5) summarized 12 cases of gallbladder small cell carcinoma who displayed right epigastric pain, accompanied with gallstone, which are consistent with the originally reported symptoms.

NETs usually have the clinical characteristics of carcinoid syndrome, such as erubescence, abdominal pain, diarrhea, asthma, and so on (3,4). This case had no carcinoid syndrome in the early stage, thus it was atypical. No neuroendocrine cells are present in the normal gallbladder, and neuroendocrine tumor may be attributed to neuroendocrine cells produced from mucous epithelization in cholelithiasis and cholecystitis (6). The elderly, women and cholelithiasis patients are all high-risk populations of NETs, about 75% patients have concomitant hepatic, pulmonary, peritoneal and lymph node metastases (7). This

case was female and suggested of retroperitoneal lymph node metastasis by spectral CT and was confirmed by pathology. Small cell carcinoma of the gallbladder has poor prognosis. In a review of 53 cases of individual reports, Fujii H *et al.* (8) reported that the median survival was 8 months, the 1-year survival was 28%, and the 2-year survival was 0%. Therefore, early diagnosis of neuroendocrine tumor is critical; the surgery should be taken immediately after diagnosis and CT examination should be taken to monitor the tumor recurrence. CT examination can identify gallbladder space-occupying and invasion to peripheral tissues, can also identify regional lymphatic metastasis and postoperative recurrence (2,9).

Spectral CT can provide multiple parameters, including monochromatic CT images, iodine-based material decomposition images and spectral HU curves for analysis and diagnosis of neuroendocrine tumor (10,11). In this case, spectral CT revealed that the tumor and its adjacent gallbladder were enhanced unevenly; low-keV monochromatic images showed the shape, blood supply arteries and the relationship with adjacent tissues more clearly; iodine-based material decomposition images indicated that high iodine aggregated in the tumor; and the tumor and enlarged lymph nodes had consistent pattern of spectral HU curve, suggested of retroperitoneal lymph node metastasis. The final diagnosis of neuroendocrine tumor depends on immunohistochemistry.

Acknowledgements

The authors would like to thank Dr. Guo Ning for his technical support and in editing the manuscript.

Disclosure: The authors declare no conflict of interest.

References

1. Duffy A, Capanu M, Abou-Alfa GK, Huitzil D, Jarnagin W, Fong Y, D'Angelica M, Dematteo RP, Blumgart LH, O'Reilly EM. Gallbladder cancer (GBC): 10-year experience at Memorial Sloan-Kettering Cancer Centre (MSKCC). *J Surg Oncol* 2008;98:485-9.
2. Eltawil KM, Gustafsson BI, Kidd M, Modlin IM. Neuroendocrine tumors of the gallbladder: an evaluation and reassessment of management strategy. *J Clin Gastroenterol* 2010;44:687-95.
3. Zhang A, Xiang J, Zhang M, Zheng S. Primary hepatic carcinoid tumours: clinical features with an emphasis on carcinoid syndrome and recurrence. *J Int Med Res* 2008;36:848-59.
4. Gravante G, De Liguori Carino N, Overton J, Manzia TM, Orlando G. Primary carcinoids of the liver: a review of symptoms, diagnosis and treatments. *Dig Surg* 2008;25:364-8.
5. Maitra A, Tascilar M, Hruban RH, Offerhaus GJ, Albores-Saavedra J. Small cell carcinoma of the gallbladder: a clinicopathologic, immunohistochemical, and molecular pathology study of 12 cases. *Am J Surg Pathol* 2001;25:595-601.
6. Moskal TL, Zhang PJ, Nava HR. Small cell carcinoma of the gallbladder. *J Surg Oncol* 1999;70:54-9.
7. Lane JE, Walker AN, Ayers GW, Foster JL, Williams JT. Small-cell undifferentiated carcinoma of neuroendocrine type originating in the gallbladder. *Curr Surg* 2002;59:495-7.
8. Fujii H, Aotake T, Horiuchi T, Chiba Y, Imamura Y, Tanaka K. Small cell carcinoma of the gallbladder: a case report and review of 53 cases in the literature. *Hepatogastroenterology* 2001;48:1588-93.
9. Sun XJ, Shi JS, Han Y, Wang JS, Ren H. Diagnosis and treatment of polypoid lesions of the gallbladder: report of 194 cases. *Hepatobiliary Pancreat Dis Int* 2004;3:591-4.
10. Wu LM, Li YL, Yin YH, Hou GQ, Zhu R, Hua XL, Xu JR, Chen ZA. Usefulness of dual-energy computed tomography imaging in the differential diagnosis of sellar meningiomas and pituitary adenomas: preliminary report. *PLoS One* 2014;9:e90658.
11. Li A, Liang H, Li W, Wang Z, Pang T, Li J, Shi H, Zhang C. Spectral CT imaging of laryngeal and hypopharyngeal squamous cell carcinoma: evaluation of image quality and status of lymph nodes. *PLoS One* 2013;8:e83492.

Cite this article as: Du H, Zhang H, Xu Y, Wang L. Neuroendocrine tumor of the gallbladder with spectral CT. *Quant Imaging Med Surg* 2014;4(6):516-518. doi: 10.3978/j.issn.2223-4292.2014.08.04