A previously healthy man suffered from watery diarrhea, right lower quadrant pain, leucocytosis, increased erythrocyte sedimentation rate and C-reactive protein level but without fever. Sonography of the right lower abdomen revealed a noncompressible thick-walled tubular structure with an atypical target pattern on short axis scan, attaching to the medial wall of the cecum. The outer diameter of this lesion was 8 × 9 mm. Sonographic appearance was suggestive of an inflamed appendix despite the clinical symptoms and signs were atypical. Appendectomy was performed and acute appendicitis with periappendiceal abscess was confirmed. Pathological study of the specimen revealed an incidental carcinoid tumor circumferentially involved the mucosa, submucosa and parts of the muscle layer.

Key words: Acute abdomen, ultrasound; Appendicitis; Carcinoid tumor, appendix

The term “carcinoid tumor” was first described by Oberndorfer in 1907 in the mistaken belief that it was only locally invasive and did not metastasize [1]. The tumor arises from neuroendocrine cells particularly in the gastrointestinal (GI) tract (90%), pancreas, and pulmonary bronchi [2]. Carcinoid tumors of the appendix are generally small, incidental tumors that are rarely metastasize [3]. Because ultrasound (US) has been widely used in the recent years to evaluate patients with acute right lower abdominal pain, and been utilized to confirm clinically suspected acute appendicitis, US demonstration of other appendiceal pathologies may be encountered. We hereby report a patient with clinical signs mimicking appendicitis. His US and surgical findings were also compatible with acute inflammation of appendix, but histopathologic study of the surgical specimen revealed a focus of carcinoid tumor in the appendix.

CASE REPORT

An otherwise healthy 52-year-old man presented with general malaise, watery diarrhea, and abdominal pain for 10 days. The patient was well in the past until he began to experience abdominal discomfort and watery diarrhea 10 days ago. Initially, he did not pay any attention to it and took some medications for GI disturbance. However, diffuse abdominal tenderness without rebounding pain was noted by himself. Leukocytosis up to 12000/mm³ (N/L = 71/17), a C-reactive protein level of 6.6 mg/dl, and erythrocyte sedimentation rate of 28 mm/h were noted. Under the impression of inflammatory bowel disease, oral antibiotics was prescribed, and the symptoms improved day by day. Nevertheless, right lower quadrant pain and watery diarrhea recurred. His body temperature was 36.5°C and white blood cell count was 13600/mm³ (N/L=82/12). US study of the right lower abdomen revealed a noncompressible thick-walled tubular structure with an echogenic center in some part and a

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central hyperechoic zone in another portion (so-called target pattern). The outer diameter of this lesion was 8 × 9 mm, and the diameter of the central hyperechoic area was 5 mm (Fig. 1). The lesion attached to the cecum on the medial wall. US appearance was compatible with an inflamed appendix. Surgical intervention was subsequently done in 12 hours. A retrocecal-located, distally perforated appendix with minimal periappendiceal abscess formation was found. Appendectomy was performed and acute appendicitis was confirmed on the surgical specimen; however, focal pathology on distal part of the appendiceal wall was incidentally found (Fig. 2). Islands of tumor cells consistent with carcinoid tumor circumferentially involved the mucosa, submucosa and muscle layer. The serosa was free from invasion but tumor cells were identified in fibrinous exudate of the ruptured site. Right hemicolectomy was performed one month later, and only foreign body granulomas and fibrosis were found in the appendiceal stump without lymph node metastasis. The patient had an uneventful postoperative course and had been doing well and followed up periodically since then for more than 9 years.

**DISCUSSION**

Carcinoid tumors may be endocrinologically inert or produce a variety of vasoactive substances, including serotonin, bradykinin, histamine, prostaglandin, and polypeptide hormones [4, 5]. They are usually asymptomatic (66%) [6], unless liver metastasis are present or primary tumor does not involve the GI tract [7, 8, 9]. Since metabolic products released by the tumor are rapidly destroyed by blood and liver enzyme in portal circulation; for instance, serotonin is degraded by hepatic monoamine oxidase [10, 11]. About 7% of small bowel carcinoid tumor produce carcinoid syndrome with episodic cutaneous flushing (75 ~ 90% in symptomatic patients), recurrent diarrhea and abdominal cramp (70%), right-
sided endocardial fibroelastosis resulting in tricuspid regurgitation and pulmonary valve stenosis (35%), and asthmatic wheezing from bronchospasm (15 - 25 %) [6,9]. Since the majority of carcinoid tumors are asymptomatic, a correct preoperative diagnosis is difficult to make unless liver metastases occur. Carcinoid tumors can be found incidentally in 0.5 to 0.75 % of autopsies [9]. They are found in both sexes and at any age [12]. The most common site of occurrence is in the appendix where they are single and mainly at the tip, followed by the ileum where they are frequently multiple [3, 12, 13]. Although not rarely seen at autopsies, appendiceal carcinoid was only reported once in a total of 212 appendectomies in the years 1992 and 1993 in our hospital. Carcinoid tumor is often benign or only locally invasive; however, carcinoid tumors of the ileum and bronchus are frequently malignant [8]. The prognosis of the patient with carcinoid tumors depends upon on the localization of the primary tumor and the stage of disease [8, 14]. Carcinoid tumors of the GI tract and appendix may present with pain, luminal bleeding, and obstruction from tumor growth [2, 5]. Once appendiceal obstruction occurs, the secretion of mucus results in increased intraluminal pressure and luminal distension. If increasing intraluminal pressure eventually exceeds capillary perfusion pressure, which leads to venous engorgement, arterial compromise, and tissue ischemia. As the epithelial mucosal barrier becomes compromised, luminal bacteria multiply and invade the appendiceal wall, which in turn causes transmural inflammation. Continued tissue ischemia results in appendiceal infarction, perforation, and subsequent abscess formation and peritonitis [15]. The normal appendix can frequently be visualized by using US if the patient is lean. However, an inflamed appendix can be seen in a maximum of about 90 % of patient with acute appendicitis [16, 17]. Appendicitis was diagnosed if the appendix was visualized and was not compressible, if maximal cross-sectional diameter with compression exceeded 6mm, or if an appendicolith or complex mass was noted [15, 17]. In our patient, the sonographic appearance of the diseased appendix is highly suggestive but not very typical for appendicitis. However, during sonographic study of appendicitis, there can be various presentations in some parts of the inflamed appendix due to focal changes of the muscle layers, contents of the lumen, and periappendiceal tissue reaction or abscess formation. It is almost impossible for us to diagnose carcinoid tumor of the appendix with US, but the large diameter of the appendix in combination with atypical symptoms suggest the possibility of underlying neoplasm [6]. Because carcinoid tumors of the appendix does metastasize even less than 1 cm in size [18], imaging specialist should remind the pathologist to review the histopathologic study more carefully if imaging finding is not typical for acute appendicitis or if there is discrepancy between the US findings and the clinical manifestations.

REFERENCES

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一位原本健康的52歲男性發生水性腹瀉，右下腹痛，自血球增加，紅血球沉降速率及C-反應蛋白質增加，但是沒有發燒。超音波掃描顯示右下腹有右下腹有一個壓迫而不變形的厚壁管狀構造，連接於盲腸的內側壁，其橫切面呈卵形，外圍直徑約8×9mm，雖然臨床症狀與類型的盲腸炎稍異，但其超音波表徵與盲腸炎相吻合。手術中發現闌尾末端有穿孔，併有周圍膿瘍。病理報告顯示該穿孔部位有類癌侵及黏膜層；黏膜下層及部分的肌肉層，漿膜層未被侵及。病人術後至今九年一切正常，並無其他腹部不適。

關鍵詞：腹部急症，超音波；闌尾炎；類癌，闌尾