



Neuroendocrine Tumor of the Small Intestine Diagnosed With Transabdominal Ultrasonography: A Case Report

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Background: Tumors of the small intestine are rare. In addition, clinical symptoms are nonspecific, and neoplasm-related symptoms occur late.

Methods: We report a case of neuroendocrine tumor of the small intestine that was diagnosed early with transabdominal ultrasonography (US). The patient was a 61-year-old man. Abdominal contrast-enhanced computed tomography (CT) was performed because the patient complained of abdominal pain. The CT showed a tumor lesion in the mesentery. Transabdominal US was undertaken to evaluate this tumor lesion, and a tumor lesion of the small intestine was found nearby. A diagnosis of lymph node metastasis of a small intestine tumor was made as a preoperative diagnosis. A laparotomy was performed with partial resection of the ileum, together with the small intestine mesentery, including an enlarged lymph node.

Results: Histologic examination revealed neuroendocrine tumor of the ileum and lymph node metastasis. Transabdominal US is useful in the diagnosis of small-intestine NET.

Key words: Neuroendocrine tumor – Transabdominal ultrasonography – Small intestine

Tumors of the small intestine are rare. In addition, clinical symptoms are nonspecific, and neoplasm-related symptoms occur late. Further, gastroscopy and colonoscopy are not useful for the detection of these tumors. This rarity, nonspecific symptomatology, and inaccessibility make these tumors liable to being overlooked, with delayed or erroneous diagnosis.¹ Here, we report a case of

neuroendocrine tumor (NET) of the small intestine that was diagnosed early with transabdominal ultrasonography (US).

Case Report

Informed consent was obtained for the publication of this case from the patient concerned.

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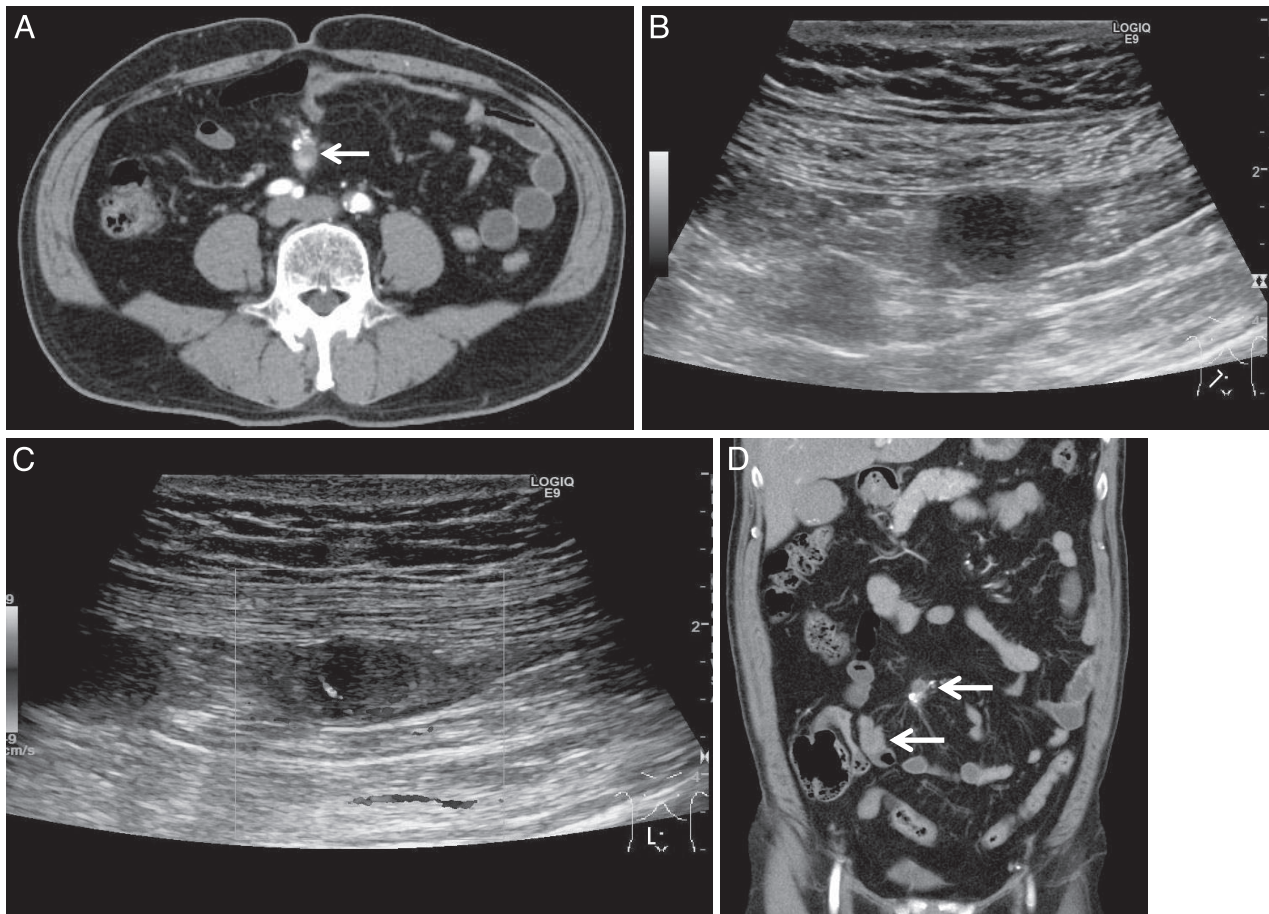


Fig. 1 (A) A contrast-enhanced CT image shows a tumor lesion (arrow) with partial contrast enhancement and calcification of the lesion edge in the mesentery. The size of the tumor lesion is 15 mm. (B) An US image shows a well-defined hypoechoic, homogeneous tumor lesion in the small intestine near the tumor mass in the mesentery. The size of the tumor lesion is 15 × 9 mm. (C) A color Doppler image shows hypervascularity within the tumor. (D) A CT image shows a tumor lesion with weak contrast enhancement in the small intestine near the tumor lesion in the mesentery (arrows).

The patient was a 61-year-old man. His medical history included appendectomy decades previously, hyperlipidemia, and hyperuricemia. He presented at our department because of continuous lower abdominal pain. We performed abdominal contrast-enhanced computed tomography (CT) to investigate this pain. The CT revealed a tumor lesion 15 mm in diameter in the mesentery at the level of the lower navel. The lesion showed partial contrast enhancement and calcification of the lesion edge (Fig. 1A). After admission, we performed transabdominal US to evaluate this tumor lesion in the mesentery. The US revealed a well-defined hypoechoic, homogeneous oval (15 × 9 mm) tumor lesion in the small intestine near the tumor lesion in the mesentery (Fig. 1B). Color Doppler examination showed hypervascularity within the tumor (Fig. 1C). Reevaluation

of the CT images revealed a tumor lesion with weak contrast enhancement in the small intestine near the tumor lesion in the mesentery (Fig. 1D). At the time of these CT and US examinations, no metastasis to other organs was found. From these imaging findings we made a diagnosis of lymph node metastasis of a small intestine tumor as a preoperative diagnosis. The patient continued to have abdominal pain for 3 days after admission, so exploratory laparotomy was scheduled.

The laparotomy was performed with partial resection of the ileum, together with the small intestine mesentery including an enlarged lymph node. Laparotomy revealed only 1 small intestine tumor (15 mm in size) and 1 enlarged lymph node in the small intestine mesentery (Fig. 2A).

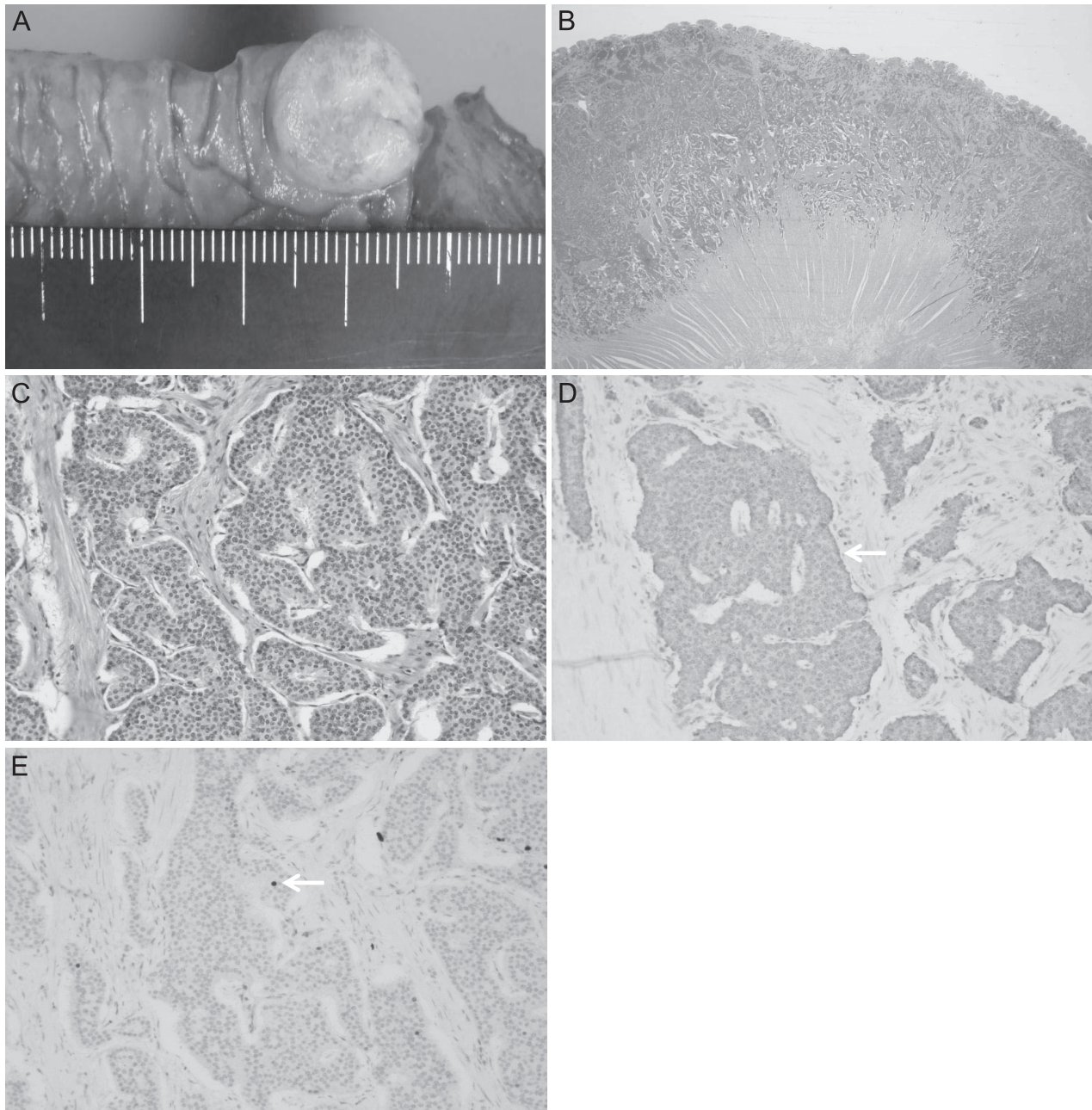


Fig. 2 (A) A surgical specimen of the small intestine shows a polypoid tumor. The size of the tumor is 15 mm. (B) Hematoxylin and eosin (HE) staining of the small intestine tumor (original magnification $\times 12.5$). (C) HE staining of the small intestine tumor (original magnification $\times 200$). (D) Chromogranin A staining of the small intestine tumor (original magnification $\times 200$). (E) Ki-67 staining of the small intestine tumor (original magnification $\times 200$).

Histologic examination revealed NET of the ileum with invasion of the muscle layer (Fig. 2B and 2C). Chromogranin A staining of the specimens was positive, and the positive rate of Ki-67 staining was less than 2% (Fig. 2D and 2E). According to the Ki-67 labeling index and the 2010 World Health

Organization classification, the histologic classification of the tumor was an NET grade 1. The resected enlarged lymph node showed metastasis of the NET.

After the operation, the general condition of the patient was good. Six months after the operation, we

performed US, abdominal contrast-enhanced CT, and positron emission tomography CT. These imaging modalities showed no recurrence.

Discussion

The rate of NETs originating from the small intestine is comparatively high, with a frequency of approximately 30%.^{2,3} Small intestine NETs differ from those occurring in other sites of the internal organ in that they are often at an advanced stage at the time of presentation. Tumors of the small intestine are usually discovered after resection of the bowel for symptoms of obstruction, or during exploration of the small intestine in search of a primary tumor after distant metastases have occurred.⁴ The percentage of nonlocalized lesions in NETs of the small intestine is high at approximately 70%, and their 5-year survival rate is approximately 50%.²

In the patient in this case, we performed abdominal contrast-enhanced CT because he complained of lower abdominal pain. Initially, we could only detect the tumor lesion in the mesentery on this CT. Thereafter, we performed transabdominal US to further investigate the tumor lesion in the mesentery, and we detected the tumor lesion in the small intestine. Transabdominal US is generally difficult, and the precision becomes lower when there is a lot of gas in the intestinal tract. Comparison of transabdominal US images with other images (*e.g.*, CT images) requires advanced operator skills. These are disadvantages of transabdominal US. However, Kala *et al*⁵ reported that transabdominal US could be recommended as the preferred method in the diagnosis of small intestine tumors. Primary NETs of the small intestine were visualized on transabdominal US in 13 of 17 patients (76.5%).⁶ In other words, small intestine tumors may be detected with transabdominal US even if they are not detected with other imaging modalities. With the application of transabdominal US, we could diagnose lymph node metastasis of a small intestine tumor relatively early and before surgery. Therefore, it is particularly important that trans abdominal US be performed in cases in which there is a tumor lesion in the mesentery of unknown cause. The US appearance of lesions of primary small intestine NET has been reported previously. They appeared as hypoechoic, homogeneous oval masses that were predominantly intraluminal and had a well-defined contour, and color Doppler examination showed hypervascularity in 2 of 3 cases.⁷ In this case, the findings of

transabdominal US were similar to those of the previous report.

Tumor size had the greatest effect on the frequency of metastatic disease at the time of surgery. The relationship between tumor size and the presence of metastases was investigated in the series by Moertel *et al*,⁸ which showed a metastatic rate of 2% for tumors less than 1 cm in diameter, 50% for tumors 1 to 2 cm in diameter, and 80% for tumors greater than 2 cm in diameter. In this case, there was lymph node metastasis on histologic examination, even though the size of the small intestine NET was relatively small, at 15 mm. With regard to prognosis, it is reported that patients with R0 resection of small intestine malignancy have significantly high survival rates.^{9,10} In this case, the entire primary lesion and lymph node metastasis in the mesentery were resected, and the prognosis is probably excellent.

In conclusion, transabdominal US is useful in the diagnosis of small intestine NET. The rate of metastasis, including lymph node metastasis, is high in small intestine NET. Therefore, when lymph node metastasis in the mesentery is suspected, we need to check the small intestine with transabdominal US.

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