Endoscopic Ultrasonography in Analysing Peri-Intestinal Lymph Node Abnormality

Preliminary Results of Studies in Vitro and in Vivo

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Endoscopic ultrasonography (EUS) was performed on fresh postmortem material, intraoperatively in patients with lymph node abnormality, preoperatively (in vivo), and on corresponding resection specimens (in vitro). Well-defined round or ellipsoid structures adjacent to the intestinal wall, manifesting a more hypoechoic pattern than the surrounding tissues, were interpreted as lymph nodes, which was confirmed by histology. Lymph nodes with an inhomogeneous echo pattern, either similar or more hypoechoic than the pattern of the primary lesions and revealing sharply demarcated borders, were interpreted as highly suggestive of malignancy. In contrast, lymph nodes with a homogeneous but more hyperechoic pattern than that of primary lesions with non-sharply delineated (pseudopoid) boundaries were indicative of inflammatory changes. Small micrometastatic lymph nodes were difficult to detect and often missed. Moreover, lymph nodes that could not be brought adequately into the focus of the ultrasonic beam were not clearly identified. Further studies both in vivo and in vitro, particularly preoperatively and intraoperatively, should be performed to enhance our knowledge and accuracy in interpreting lymph node abnormalities.

Key words: Endoscopic ultrasonography; lymph node abnormality; upper GI tract

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Transcutaneous ultrasonography is an inadequate investigation for the detection of lymph nodes along the gastrointestinal tract because of the interfering intestinal gas and ribs. Endoscopic ultrasonography (EUS) enables visualization of intestinal abnormalities together with adjacent lymph nodes (1–11). The purpose of this study was to discuss our experience in detecting and staging lymph node abnormalities in the upper gastrointestinal tract.

MATERIALS AND METHODS

Between April 1983 and October 1985 EUS was performed on fresh autopsy material, intraoperatively and preoperatively (in vivo), and on corresponding resected specimens (in vitro). Five autopsy specimens had abnormalities in and adjacent to the gastrointestinal tract. One autopsy specimen showed a bronchus carcinoma penetrating into the oesophagus. Intraoperative EUS examinations were performed in patients suspected of having the Zollinger–Ellison syndrome (one patient), pancreatitis (two patients), pancreatic cancer (five patients), and bronchus carcinoma (one patient). To correlate the EUS findings in vivo (preoperatively) and in vitro, resected specimens of oesophagogastric malignancy (10 patients) and biliopancreatic carcinoma (9 patients) were also investigated.

Methods of examination

First, we investigated fresh autopsy material to ascertain the shape, size, and internal echo pat-

tern of lymph nodes. Prospectively, lymph nodes detected sonographically were recorded on video tape and then removed for histological examination. The results were compared with the corresponding histological findings.

Second, we performed an intraoperative investigation to detect lymph node abnormalities that could be removed surgically for histological examination.

Third, EUS was performed preoperatively in a series of patients and compared with the EUS findings obtained in the corresponding resected specimens. The results of these investigations were also correlated with subsequent detailed histological examination.

All studies were performed with a 3rd or 4th generation Olympus echoendoscope. All examinations were recorded on videotape, which enabled the investigator to review the sonographic images when necessary.

RESULTS

Investigation of fresh postmortem material

EUS detected round or ellipsoid echo structures that manifested a more hypoechoic pattern than the surrounding tissues. Such structures were confirmed by histology to be lymph nodes in all five specimens. Lymph nodes with an inhomogeneous hypoechoic pattern similar to or more hypoechoic than the echo pattern of the primary lesion, together with sharply demarcated borders, were highly suggestive of malignant lesions as confirmed by histology in all five removed lymph nodes. Lymph nodes with a homogeneous echo pattern, more hyperechoic than the echo pattern of the primary lesion, and with unsharply delineated or pseudopoid boundaries were indicative of benign inflammatory changes, as confirmed by histology.

Intraoperative investigations

EUS visualized lymph nodes with a homogeneous echo pattern and unsharply demarcated borders, interpreted as non-metastatic lymph nodes and confirmed as benign inflammatory nodes in one patient with chronic pancreatitis. EUS erroneously interpreted round well-demarcated structures with a diameter of 1 cm and with a homogeneous hypoechoic pattern similar to the echo pattern of the spleen as metastasis in a patient with the Zollinger–Ellison syndrome. The structure, however, proved to be an accessory spleen. Three lymph nodes along the splenic artery measuring less than 5 mm were interpreted as non-metastatic, as confirmed by histology.

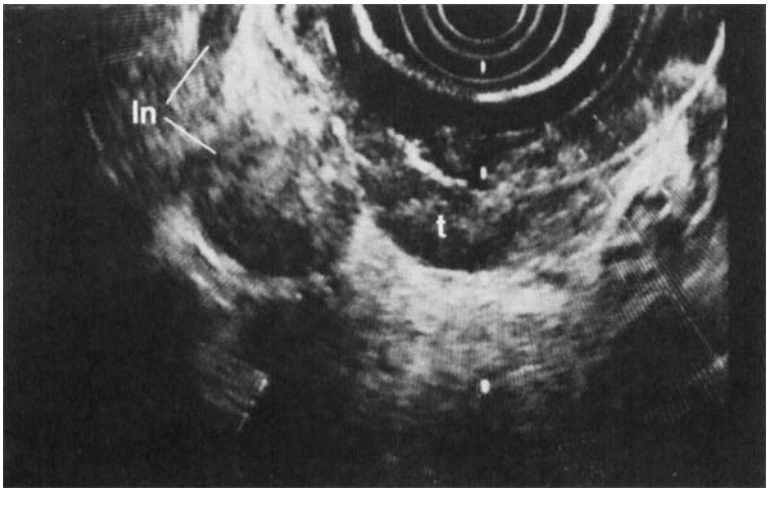

Fig. 1. EUS picture showing two lymph nodes (ln) with inhomogeneous hypoechoic echo pattern similar to that of the oesophageal carcinoma (t), revealing sharply demarcated borders highly suggestive of malignancy and confirmed histologically.

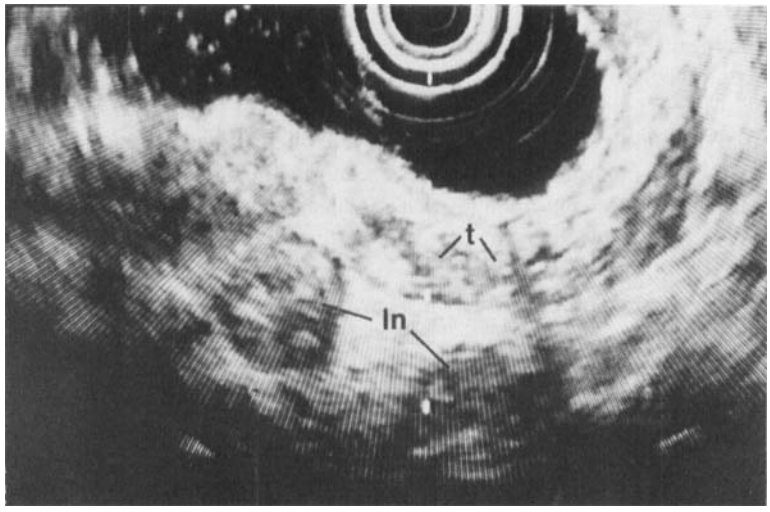

Fig. 2. EUS picture showing a round and ellipsoid lymph node with inhomogeneous hypoechoic structure more hypoechoic than the gastric carcinoma, revealing sharply delineated boundaries proven to be malignant by histology.

EUS correctly diagnosed metastatic invasion in 8 of 10 lymph nodes surrounding the primary malignant lesion (Figs. 1 and 2). Two micrometastatic lymph nodes measuring less than 2 mm in diameter were erronously diagnosed as benign lesions.

EUS in vivo (preoperatively) and in vitro (surgical resection specimens) correctly diagnosed malignant infiltration in lymph nodes with a diameter of more than 5 mm adjacent to the primary tumours or the gastric intestinal wall in 8 of 10 resection specimens (Figs. 3 and 4). In one resection specimen of pancreatic cancer EUS erroneously diagnosed micrometastasis as reactive inflammation (Fig. 5). EUS also misinterpreted malignant nodes as inflammatory in a patient with polypoid ulcerating advanced gastric cancer because of the hypoechoic pattern and unsharply demarcated borders. These lymph nodes, however, could not accurately be brought into the focus of the beam because of its limited penetration depth.

DISCUSSION

At present, computerized tomography (CT) scan is widely used for detecting and staging lymph node abnormalities in patients with oesophagogastric and biliopancreatic malignancy (11, 12). However, CT scan only detects lymph node enlargement and does not enable visualization of internal echoic features that might be helpful to determine the nature of the nodal abnormality

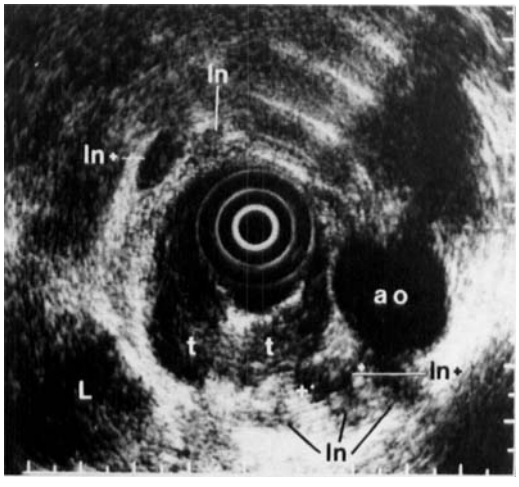

Fig. 3. EUS picture showing ellipsoid lymph nodes (ln^+) with inhomogeneous echo pattern similar to that of the oesophageal carcinoma, revealing sharply delineated borders proven to be malignant histologially, contrasting with the hyperechoic homogeneous echo structure with unsharply delineated boundaries of benign lymph nodes (ln).

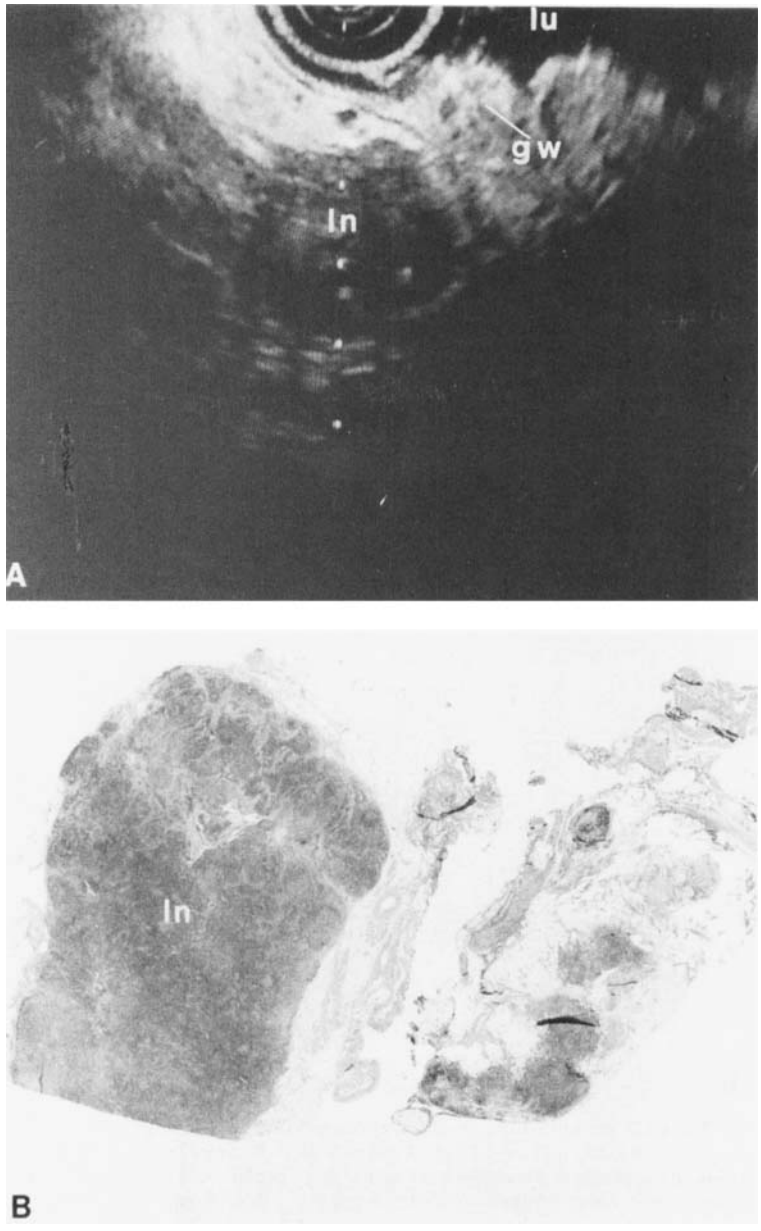

Fig. 4A. EUS picture showing hypoechoic inhomogeneous echo structure adjacent to the gastric wall, revealing nodular sharply demarcated boundaries. 4B. Corresponding histology of the lymph node proven to be malignantly infiltrated. The correspondence between EUS image and correspondence between EUS image and corresponding histology is readily appreciated.

(12). In contrast to conventional ultrasound, EUS provides clear visualization of lymph nodes adjacent to the gastrointestinal tract or biliopancreatic system because of the high resolution of this new diagnostic modality. Such lymph nodes are readily recognized on the basis of their more hypoechoic pattern compared with the echo pattern of the surrounding tissues. It appears from our studies

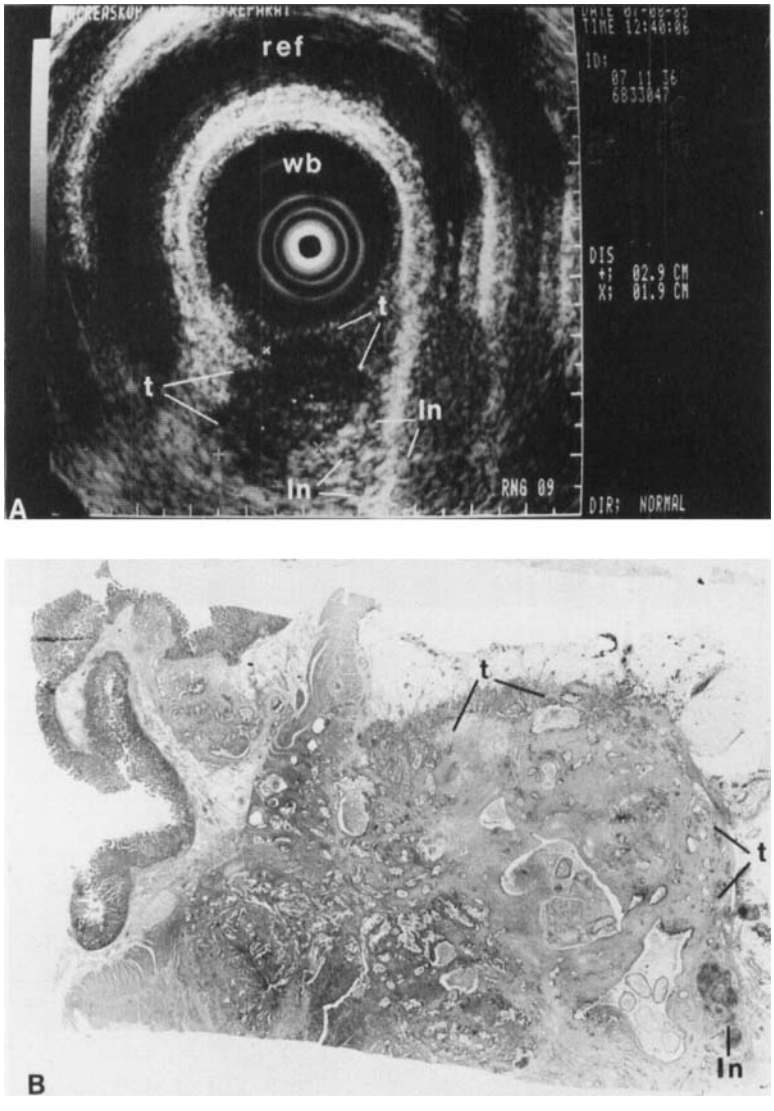

Fig. 5A. EUS picture of the resection specimen of a pancreatic cancer (Whipple resection), showing quite small lymph nodes with a diameter between 1 and 2 mm, revealing hyperechoic structures with unsharply or pseudopoid boundaries adjacent to pancreatic cancer (t) indicative of benignancy. 5B. Corresponding histology of pancreatic cancer (t) with micrometastasis in lymph nodes. The correspondence of the tumour and lymph nodes in size and configuration are obvious.

that lymph nodes with an inhomogeneous hypoechoic structure similar to or more hypoechoic than the echo pattern of the primary lesion together with sharply demarcated borders are highly suggestive of malignancy. In contrast, lymph nodes with a hyperechoic homogeneous echo pattern as compared with the primary lesion together with unsharply delineated or pseudopod boundaries are often indicative of reactive inflammatory changes. Difficulties may arise when lymph nodes cannot accurately be brought into the focus of the beam or when the diameter of

the nodes is smaller than 2 mm. Moreover, micrometastasis often cannot be differentiated from inflammatory changes.

Although the number of prospective investigations in vivo and in vitro is still limited, we believe that EUS will become an important diagnostic tool in detecting and staging lymph node abnormality. Further studies in preoperative staging of oesophagogastric malignancy and biliopancreatic carcinoma and prospective ultrasonic evaluation of resection specimens may enhance our knowledge in the interpretation of lymph node abnormalities.

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