Ultrasonographic Diagnosis of Colitis

Key words: ultrasound, color Doppler US, computed tomography, intestine, colitis

Two-dimensional ultrasonography (US) of the abdomen was first applied to the diagnosis of tumors of the liver, gallbladder and pancreas. Initially, US was not used for the gastrointestinal tract itself. Later, however, US came to be used for the diagnosis of tumors of the gastrointestinal tract, and its use in the diagnosis of non-tumorous diseases of this area has recently been attracting close attention.

The category “colitis” includes many diseases of diverse pathophysiological features. Ultrasonographic features of colitis have been reported for Crohn’s disease, ulcerative colitis, ischemic colitis, pseudomembranous colitis, bacterial colitis, Behçet’s disease, collagenous colitis, lymphocytic colitis, amebic colitis, small bowel involvement of adult Henoch-Schonlein purpura, and neutropenic enterocolitis, etc. (1–14). When gray-scale US is used, the basic and important findings for the differential diagnosis of colitis are bowel wall thickness and echotexture. Arterial signal and resistive index are basic and important features when color Doppler US is used for the differential diagnosis of colitis.

The normal bowel wall thickness determined by US is less than 4–5 mm (15, 16). Bowel wall thickening is the most characteristic ultrasonic feature of colitis. When bowel wall thickening was analyzed by color Doppler US for patients divided into three groups (inflammation group, vasculitis group and ischemia group), bowel wall thickening was observed in all three groups (4). Defects of color Doppler flow or arterial signal on color Doppler US images are characteristic to ischemia. Abundant color Doppler flow and stratified echotexture suggest inflammation. The resistive index was significantly higher in the ischemia group than in the inflammation group (1, 4). The activity of inflammatory bowel disease was significantly correlated with bowel wall thickness as measured by US (6). Longitudinal ulcers, known as a characteristic of Crohn’s disease, are depicted by US as focal disappearance of the wall stratification sign (7). When the diagnostic value of US was compared with that of clinical and laboratory findings in cases of ischemic colitis, the ability to predict progression into complicated ischemic colitis was highest with color Doppler US which can visualize defects of the arterial flow signal (5). US is useful not only in the differential diagnosis of colitis (1–4, 8) but also in the evaluation of response to treatment (10).

Neutropenic enterocolitis is a type of colitis which develops during intensive chemotherapy for malignant diseases. Since neutropenic enterocolitis is a life-threatening severe condition, early diagnosis and treatment are essential when dealing with this disease. A number of reports on neutropenic enterocolitis observed in patients with leukemia have been published, and many of them emphasized that early diagnosis of this disease was possible with US (12, 13). Some investigators reported neutropenic enterocolitis associated with combination chemotherapy for lung cancer (14).

What can we say about the capability of US to diagnose colitis, as compared to the capability of computed tomography (CT) (17, 18)? With CT, only transverse images are evaluated. With US, on the other hand, the cross-section perpendicular to the intestine can be evaluated, allowing more accurate measurement of bowel wall thickness than CT. Furthermore, Color Doppler US allows evaluation of blood flow, without necessitating contrast material. A shortcoming with US lies in that ultrasound is scattered irregularly in the presence of gas, making it impossible to collect information of the deeper tissue. When the diagnostic capability for small intestinal Crohn’s disease was compared between US and CT, the sensitivity was higher with CT, the specificity was higher with US, and the accuracy was equal for both modalities (17). In terms of the information collected concerning abscess and sinus tract, US was superior to CT (17).

Basic techniques of US used for colitis are gray-scale US and color Doppler US. New techniques of US have recently been reported (19–21). When used in combination with the ultrasound contrast material Levovist, the sensitivity of color Doppler US and power Doppler US to detect blood flow signals was increased, facilitating colored representation of even minimal blood flow (20, 21). The sensitivity to evaluate the activity of inflammatory bowel disease was high in the following order: Levovist-enhanced power Doppler US > power Doppler US > color Doppler US, indicating that the use of Levovist markedly elevated the sensitivity of power Doppler US (20). Levovist-enhanced power Doppler US is therefore beneficial and recommendable as a means of diagnosing early stage colitis or making the differential diagnosis of colitis.

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References


