

Materials and Methods: We retrospectively reviewed US, CT, and surgical findings of 41 patients with surgically proven adhesive SBO (18 male, 23 female; mean age: 52 years). US was evaluated for possibility of undergoing examination; location of transition zone; location, shape, and echo of adhesion. CT and surgical findings were reviewed for location of transition zone; location and shape of adhesion. US and CT findings were compared with surgical findings as reference standard.

Results: Two of 41 patients underwent limited US examination due to poor sonic window and severe abdominal pain. US detected the transition zone of 39 patients and adhesions of 28 patients. Twenty seven patients showed hypoechoic asymmetrical thickening of bowel wall which were proven fibrotic bands; one patient showed hyperechoic ring-like lesion surrounding the transition zone, which proven an omental band. CT detected the transition zone of 32 patients and adhesions of 11 patients. Adhesions were identified as thickening of bowel wall ($n = 8$), perienteric infiltrations ($n = 8$), and adjacent peritoneal thickening ($n = 8$) on CT. Diagnostic accuracy of US and CT for detecting the transition zone were 90.7% and 75%. Detection rate of US and CT for adhesions were 68.3% (28/41) and 26.8% (11/41).

Conclusion: US may be a useful modality for detecting transition zone and adhesions of adhesive SBO, especially when CT findings are equivocal.

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Acute Colonic Uncomplicated Diverticulitis: Clinical, Ultrasound Findings to Combine with CT in 22 Cases

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Purpose: To describe the ultrasound findings of acute colonic uncomplicated diverticulitis (ACUD) and how to improve the accuracy of diagnosis.

Materials and Methods: From December 2005 to January 2008, twenty-two cases were collected, 17 male and 5 female, aged from 22 to 70 years (mean, 44), in which 19 cases with right abdominal pain, 3 cases with left abdominal pain, all of them with tenderness. All cases were performed with US, 12 cases were combined with CT. Ultrasound scanning from cecum to sigmoid colon and determining their positions thanks to the characteristic US findings of colon (haustral patterns).

Results: Among twenty-two cases suspected of ACUD, 21 cases were true (95%), in which 10 cases of cecum, 7 cases of ascending colon, 1 case of transversal colon, 2 cases of descending colon, 1 case of sigmoid colon. Eighteen cases were conservatively treated with antibiotic. Four cases underwent operation because surgeons suspected acute appendicitis, with post-operative diagnoses 3 cases of diverticulitis of cecum and 1 case of acute appendicitis. US revealed thickness of part of the colonic wall, and inflammatory paracolonic fatty thickness with small echogenic structure inside with or without shadowing, which had findings similar to "thyroid in abdomen", non-compressible and tender. Doppler may be hyperemia intra-colonic and diverticular wall. CT confirmed inflammatory fatty lesion with or without air inside along colonic wall.

Conclusions: Acute colonic uncomplicated diverticulitis has fairly characteristic features, therefore US enable diagnosis. Exact determination of colon and cecum can improve accurate diagnosis of colonic diverticulitis.

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Evaluation of Usefulness of Extracorporeal Ultrasonic Examination for Active Ulcerative Colitis

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Background/Aims: Endoscopy is mainly useful for the diagnosis and evaluation of ulcerative colitis. However, frequent endoscopic examination is sometimes contraindicated for patients with severe attacks of ulcerative colitis. Therefore, it is desirable that endoscopic examinations should be performed only at appropriate times. Recently, extracorporeal ultrasonic examination has been accepted as the diagnostic follow-up ulcerative colitis at the clinically active stage. Therefore, we compared findings from extracorporeal ultrasonic examinations with findings from endoscopy and blood tests of the patients. We report the evaluation of the usefulness of extracorporeal ultrasonic examinations.

Methods: We selected twenty patients of active ulcerative colitis on whom ultrasonic examination and endoscopy were performed within a certain period at Surugadai Nihon University Hospital, and compared classification of activity based on endoscopy with results of ultrasonic B-mode imaging and blood flows from color Doppler imaging.

Results/Conclusion: It was confirmed that ultrasonic examinations including evaluation of blood flow yields findings that reflect the status of the disease; therefore, it was suggested that this examination will be a useful method for deciding appropriate timing of endoscopy and for determining the effectiveness of therapy.

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Transrectal Ultrasound-Guided Biopsy of Primary Rectal Cancer

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Purpose: About 10 % of biopsy-negative villous adenomas harbour invasive carcinoma. Transrectal ultrasound (TRUS) -guided biopsy is routinely being performed in the diagnosis of recurrent rectal cancer and used in the diagnosis of prostate cancer. However, to the best of our knowledge, we are not aware of any reports in which a TRUS-guided biopsy of primary rectal tumours has been used. We recently performed this new method of TRUS - guided biopsy of a primary rectal tumour.

Results: Because three set of clinical examination-based biopsies of a primary rectal tumour were negative, a TRUS - guided biopsy was attempted. The tumour was situated 9 cm above the anal verge and was staged based on CT, MRI and TRUS. All methods of assessment showed a T4,N0,M0 rectal tumour. A forward "looking" 6.5 MHz transrectal transducer was used. Two passes with a histologic 1,2 mm Gallini needle biopsy of a suspicious hypoechoic area within the tumour was carried out. The biopsy guide system permitted us to maintain the transducer in position and repeat the needle pass without to reintroducing the transducer into the rectum. Both biopsies were consistent with adenocarcinoma. No pain or other complications of the procedure were encountered.

Conclusion: TRUS has the advantage over blind biopsy in that it allows targeting of suspicious hypoechoic areas within the rest of the hyperechoic villous adenoma and is therefore likely to be more accurate. The procedure could be considered for use prior to radiotherapy in cases with biopsy-negative tumours.

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Dynamic Sonography in Diagnosis and Follow-Up After Pneumatic Balloon Dilatation of Achalasia

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Purpose: We would like to evaluate the role of dynamic sonography in diagnosis and follow-up after pneumatic balloon dilatation of achalasia.

Materials and Methods: From 2006 to 2008, we have 50 cases of achalasia confirmed by esophageal manometry. All of them underwent dynamic sonography in which the cardia was noticed while the patient were sitting and drinking a cup of water. And then a pneumatic balloon dilatation was done. Another post-dilatation dynamic sonography was performed to see how effective the dilatation was.

Results: The diagnosis of achalasia was made when there was a stagnation of water at the cardia while the patient were drinking. The sensitivity of the test was 96% and the specificity was 100%. One patient having no stagnation was due to not drinking enough water and another patient was negative with slight achalasia. Post-dilatation sonography performed with the same procedure showed good results in 86%, fairly well in 10% and failure of dilatation in 4% of the patients. **Conclusions:** Dynamic sonography was a simple, easy, effective way to diagnose achalasia and evaluate the effectiveness of the treatment after pneumatic balloon dilatation.

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Carcinoid Duodenum Tumor Metastasizing to Spleen and Liver

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Purpose: To evaluate the role of ultrasound in characterizing carcinoid tumor and its metastases in the abdomen.

Result: We had a case of carcinoid tumor of the duodenum with the clinical signs of carcinoid syndrome. 53yo male patient suffered from cutaneous flushing, abdominal cramps and episodic diarrhea for one month and a half. He had no appetite and lost 10 kilograms. Ultrasound detected liver and spleen metastases with hypoechoic well demarcative lesions without hypervascularisation. By mean endoscopy there were a small yellow tumor of the duodenum and others of the colon, having a characteristic umbilicated appearance. The histopathologic results were carcinoid of duodenum.

Discussions and Conclusions: Majority (95%) of patients with carcinoid syndrome will have liver metastasis. In our case with metastatic spread to the liver and spleen, vasoactive substances may be release directly into systemic circulation giving rise to carcinoid syndrome.

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Tissue Harmonic Imaging of Thoracic Benign Lesions: Comparison with Conventional Gray-Scale Sonography

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Objective: Tissue Harmonic Imaging (THI) is a newly developed gray-scale ultrasound mode that improves image quality prominently. This study is to compare the imaging quality of pulmonary benign lesions between THI and conventional gray-scale sonography (CS).

Methods: A commercial ultrasound machine with a 3.75 MHz convex transducer was used to examine 75 benign lesions (57 pulmonary consolidations and 18 lung abscesses), with all sonographic images recorded on the hard disc. Two experienced chest specialists with unknown underlying thoracic lesions reviewed and compared the images between THI and CS.

Results: Both observers ranked that THI was the same as or better than CS in all 75 benign lesions, with agreement reaching 95% (54/57) and 94% (17/18) in 57 pulmonary consolidations and 18 lung abscesses, respectively. Of these, THI had better images than CS in 32% (18/57) of pulmonary consolidations and 72% (13/18) of lung abscesses. Moreover, THI alone might affect and/or change the diagnosis in 23% (13/57) of pulmonary consolidations and 17% (3/18) of lung abscesses than CS. Analysis of the sonographic appearances in 57 pulmonary consolidations, THI provided better images reaching 32% (18/57) in internal echogenicity and only 4% (2/57) in lesion margin. In 18 lung abscesses, THI provided better images reaching 61% (11/18) in cavity ring, but only 11% (2/18) in lesion margin and 6% (1/18) in air-bronchograms.

Conclusions: For imaging pulmonary benign lesions, THI prominently provides better image quality than CS, and even affects and/or changes the diagnosis of pulmonary benign lesions achieving 21%.

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Lateral Cosine Modulation for Next-Generation Ultrasound Equipment

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We have realized effective ultrasound (US) beamformings using steering of the plural beams and apodizations, i.e., lateral cosine modulations (LCMs) [1]. These LCMS can be used for B-mode imaging with a high lateral resolution and accurate measurement of tissue or blood displacement vector and/or strain tensor using our previously developed multidimensional autocorrelation and Doppler methods that yield the measurements of all displacement components simultaneously.

In order to obtain the better apodization function to be used for realizing a designed point spread function (PSF) than Fraunhofer approximation (FA), we developed a regularized linear optimization (LO) method through simulations. Moreover, to gain the insight about the ideal shape of the PSF, the accuracies of the 2D displacement vector measurements were compared for typical PSFs with distinct lateral envelop shapes. Because the power functions that had wide FWHMs and short lengths of the feet yielded accurate measurements, in conjunction with the reduction of electric consumption, we also developed the more effective nonlinear optimization (NLO) method, in which the feet of the main lobes in apodization function obtained by LO method were properly truncated. NLO also allows the decrease in the channels of US equipment. Through the experiments on human in vivo tissues (liver, breast, etc), in conjunction with virtual sources, the effectiveness of the improved LCM will be shown. We hope that our developed LCM will be used as a fundamental beamforming scheme in the next-generation US systems.

[1] C. Sumi et al, IEEE Trans UFFC, vol. 55, pp. 2607-2625, 2008.