Hepatic Nodule Hemodynamics Using Contrast-enhanced Ultrasonography (CEUS) with Sonazoid

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Although CT and EOB-MRI are useful modalities for diagnosing hepatocellular carcinoma (HCC), we initially employ contrast-enhanced ultrasound (CEUS) with the new contrast agent Sonazoid. Compared to Levovist, this allows acquisition of clearly enhanced real-time images with minimal amount (0.01ml/kg) and has no adverse effects.

Since February 2007, approximately 1000 hepatic nodules were examined by CEUS with Sonazoid. We selected 81 (9 ICCs, 56 HCCs and 16 hypervascular benign nodules) in 79 cases because pathological findings were available, and analyzed enhancement characteristics. Arterial phase images (1 - 40 seconds) and subsequent enhancement at 1, 2, 3, 5, 10 and 30 minutes were observed with mainly ePHD (Prosound α10).

In the arterial phase, feeding arteries and/or hyperechoic enhancement was observed in 100%, 75%, 100% and 44% of ICC, poorly, moderately, and well-differentiated HCC, respectively. More than 80% of malignant nodules showed washout during subsequent phases. It appeared within 3 min in all ICC and poorly differentiated HCC, within 10 min in all moderately differentiated HCC, while well-differentiated HCC showed delayed (5-30 min.) or no washout. Benign nodules showed various washout patterns, though 63% of these nodules remained iso-enhanced. Additional capture-mode was useful for analyzing vascular structure.

In conclusion, CEUS with Sonazoid revealed remarkable hemodynamic differences among ICC, HCC and hypervascular benign nodules, possibly reducing the need for tumor biopsy.
The Possibility of Ultrasound Investigation of Large Intestine

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Practically, abdominal ultrasound is performed, if the large intestine is unable to being investigated by endoscopy and radiological examination. In most cases, saline enema was used in ultrasound investigation of large intestine. We can measure wall, diameter and gaustra of the large intestine by this methodology, but can’t evaluate intestinal movements.

We used our new methodology on ultrasound investigation of large intestine. This method is based on physiological activity of GI tract. Patient drink saline solution with temperature of 35-36, do exercises to increase peristalsis of bowel and after colon cleansing drink some saline solution as a contrast. During the ultrasound examination, we evaluated transit time, wall thickness, diameter and gaustra of the large intestine. The method is less stressful for patients than radiological and endoscopic examination. So it is more suitable for children and elders. We determined normal ultrasound measurements of large intestine in Mongolians.

Diameter of caecum is 48.4±1.09 mm, ascending part of large intestine 42.5±0.18 mm, transverse part 34.3±0.85 mm, descending part 42.3±0.64 mm, sigmoid part of of the large intestine is 40.5±0.64 mm. A distance between inter gaustral part of caecum 23, 70, 12 mm, ascending part 22.86±0.06 mm, of sigmoid part 21.9±0.06 mm. Wall thickness of large intestine 1.91±0.20 mm. Transit time of large intestine was 36.4±1.15 min. Also, we investigated patients with functional disorders.

Constipation is the most common digestive complaint in the general population, and is associated with substantial economic costs. Each year more than 2.5 million Americans visit their healthcare provider for relief from this problem. Our study included 190 (128 women, 62 men) patients aged 45.6±1.3 from multiple centers in Ulaanbaatar city. Chronic constipation was observed in 66% of the participants with the main cause being unhealthy dietary habits, especially fiber lacking food. Patients with constipation had prolonged stool passage time (128.4±1.86 minute), with increased colonic diameter (54.8±0.24 mm). The size of the colonic haustration was also altered significantly. Chronic constipation was observed in 66% of the study patients with the main cause being unhealthy dietary habits, especially fiber lacking food. We added locally produced “food fiber” supplement to the meals of the patients. Daily dosage of the added fiber was 30-60 mg and stool passage dynamic was observed with prior ultrasound examination. Treatment response after using the fiber supplement for 1 week was 5.6% and the response rate rose to 80% after 30 days. The complaints of the patients were decreased 1.8 times compared to the control group. Overall stool passage time was shortened (p<0.01) with the diameter of the descending part of colon being significantly decreased on ultrasound examination from 4,1±0,01 cm to 3,2±0,08 cm.
Challenges for Liver Ultrasound in the 21st Century

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Ultrasound has long been the first line imaging investigation for suspected liver disease. For many years this was mainly limited to basic B-mode and Doppler ultrasound, but increasing clinical requirements for accuracy in the early diagnosis of both diffuse and focal liver diseases, as well as monitoring of tumour therapy, have stimulated a rapid growth in new ultrasound technologies. Ultrasound can now compete with and often out-perform other modalities such as CT and MR, but with added advantages of rapid real-time imaging, lack of side-effects and lower cost.

This presentation will focus on how new technology, such as compound imaging, adaptive image processing, microbubble contrast, elastography, quantification and matrix volume techniques are helping to meet the clinical needs for the management of liver diseases.

Fibroscan and Elastography in Hepatology

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Tissue elasticity is characterized by the amount of tissue's displacement or distortion in response to the application of an external load. Recent research indicates the mechanical properties of biologic tissues correlate with their states of health. Ultrasonographic elastography is a new imaging modality for assessing the elasticity distribution in biologic tissues. A growing literature suggests that elastography is useful for characterization of hepatic tumors and for noninvasive assessment of liver tissue stiffness. Two ultrasonographic elastography modalities, acoustic radiation force impulse (ARFI) technology and transient elastography (TE), were shown to accurately predict the fibrosis stages of chronic liver disease. Real-time elastography and ARFI could help to characterize the nature of focal hepatic lesions. Ultrasonographic elastography is a promising tool and may be integrated into routine practice of hepatology.
Real-time Fusion of PET/CT with Ultrasound: Preliminary Experience

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FDG-PET/CT is a powerful imaging modality which integrates both anatomical and metabolic information and has gained widespread acceptance in clinical oncology. However, the localization of FDG-avid lesion might sometimes be problematic due to motion mis-registration of PET and CT images or certain CT-related artifact. In addition, FDG-avid lesions might need further histological approval and/or local interventional therapy. Sonography, with the advantages of easy availability, no radiation exposure and real-time imaging, is a modality of choice to meet the needs following FDG-PET/CT study.

Real-time virtual sonography (RVS) is an advanced imaging technique which provides the same cross-sectional multiplanar reconstruction images of CT or MRI as ultrasound images on the same monitor screen in real time to facilitate localizing the target lesions during performing sonography. However, the original design of RVS can only fuse with CT or MRI, but not for PET/CT. In recent, we have successfully developed a method to incorporate the PET/CT images into RVS.

In brief, our methods included the following procedures: (1) the FDG-avid lesions shown on PET images were segmented by an operator-defined threshold and then generated on the CT images of PET/CT. (2) the modified CT images were captured slice by slice. (3), the color of captured images was converted into monochrome and then saved in a DICOM format as CT volume data. In addition to PET/CT, we found that this method was also able to be applied to another kind of nuclear medicine images, SPECT/CT.

To the best of our knowledge, the presented method first successfully merged PET/CT images in real-time with the ultrasound. In RVS, the positive lesions on PET/CT could be quickly identified by ultrasound with high confidence, which might help clarify equivocal lesions on PET/CT and also allow for further PET/CT guided biopsy or interventional therapy without additional radiation exposure.
Computer-aided Diagnosis Using High Frequency Ultrasound in Chronic Liver Disease

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Background: The penetrating depth of the routinely used 3.5MHz probe for liver is good but resolution is not satisfactory. High frequency probe can provide better resolution for the liver architecture. Computer-aided diagnosis using high frequency images may provide better identification of fibrosis and steatosis grading in liver. Aims: To investigate computer-aided diagnosis by high-frequency images for detection of liver fibrosis and steatosis. Methods: B-mode 12MHz ultrasound images of 86 patients with chronic liver diseases were obtained before liver biopsy from year 2009 to 2010. A 64 x 64 pixels of sub-image was selected from each image. Image features derived from gray-level concurrence and non-separable wavelet transform were extracted for classification using a support vector machine. This classification was tested with leave-one-out method for whole / each grade of fibrosis or steatosis and correlated with histology. Liver fibrosis was graded as Metavir classification from 0 to 4 and as NAFLD Activity Score from 0 to 3. Results: Distribution of patients with grade 0, 1, 2, 3, 4 fibrosis was 10, 29, 16, 20, and 11; whereas for patients with grade 0, 1, 2, 3 steatosis was 32, 23, 19, and 12. Best classification accuracy by computer-assisted diagnosis of cirrhosis and steatosis was 88.2 % and 72.5%. Best classification accuracy of cirrhosis in sub-groups with steatosis grade 0, 1 and 3 were 85.4%, 93.5% and 91.7% (no cirrhotic patients in steatosis grade 2). Best classification accuracy of steatosis in sub-groups with fibrosis grade 0, 1, 2, 3, 4 was 83.3%, 81.0%, 82.3%, 65.8% and 82.3%. Conclusions: The classification accuracy of most sub-groups was better than that of whole group (containing different grades of steatosis and fibrosis) in cirrhosis or steatosis detection. High interference between fibrosis and steatosis was observed in computer-aided diagnosis using high frequency ultrasound in patients with chronic liver disease.

Epiploic Appendagitis and Omentitis

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From 1998 to 2010, we have 19 cases of epiploic appendagitis and omentum inflammation(omentitis) and all were diagnosed with ultrasound by single operator.11 cases were classified as epiploic appendagitis and 8 as omentitis. There are three patterns of epiploic appendagitis:1. ovoid hyperchoic lesion with halo in six cases 2. hyperechoic lesion in three cases 3. hypoechoic lesion with hyperechoic rim in two cases. The adjacent colon can be showed in most of them. There were two patterns of omentitis,either an ovoid or triangular hyperechoic mass without halo just beneath the abdominal wall. These are usually more than 3cm. There are two omentitis in the left abdomen and six in the right abdomen. KEY WORDS: epiploic appendagitis , omentitis, ultrasound
A Pitfall in the Ultrasonographic Diagnosis: Posttraumatic Hepatic Cyst

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Background: To describe an unusual presentation of a giant, posttraumatic hepatic cyst as pseudomyxoma peritonei on diagnostic ultrasonography. Method: A case report. Result: A 27-year-old man presented to the emergency department with painless progressive abdominal distention. One month previously, scrotal pain and heaviness with moderate pitting edema of bilateral lower legs developed, especially while prolonged standing or running. He had undergone right side radical nephrectomy 2 years ago because of severe kidney laceration; meanwhile, low grade liver injury was treated conservatively. Physical examination was remarkable for ascites associated with dilated superficial veins over the abdominal wall. An enlarged, tortuous right spermatic vein as “a bag of worms” of the scrotum, being intensified by pressing on the distended abdomen, characteristic of varicocele. Abdominal ultrasonography demonstrated massive intraperitoneal fluid accumulation, scalloping of the liver, and few free-floating bowel loops, suggestive of pseudomyxoma peritonei (Fig. 1). However, computed tomography of the abdomen illustrated a huge, well-encapsulated, multilocular hepatic cyst with displacement of the intestine and external compression with near-occlusive narrowing of the inferior vena cava (Figures 2 and 3, axial and coronal reformatted view, respectively). Surgical intervention with en bloc resection of the giant hepatic cyst was carried out, leading to complete resolution of clinical features without recurrence. Conclusion: Solitary nonparasitic cysts of the liver, also known as simple cysts, are commonly encountered in general practice. However, posttraumatic solitary hepatic cyst is much less prevalent and can develop with various sizes from a few days to years after major abdominal insult. Although the pathogenetic basis remains unclear, it should be always considered in the differential diagnosis of intraabdominal cystic lesions. To obviate unnecessary intervention, preserve organ function, and achieve better outcomes, clinicians must maintain a heightened awareness of this distinct entity.

Ultrasound Diagnosis of Asymptomatic Wandering Spleen: A Case Report and Review of the Literature

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Wandering spleen is a rare condition resulting from laxity or absence of the suspensory ligaments of the spleen. The hypermobile spleen can “wander” in variable areas of the abdominal cavity. It can be asymptomatic, but splenic torsion is a potential serious complication clinically. Wandering spleen can be diagnosed with ultrasonography by revealing an abdominal mass with contour and echogenicity similar to the spleen but abnormally located, while the normal spleen is absent in the splenic fossa. We herein report an asymptomatic 31-year-old male patient who was diagnosed as a case of wandering spleen by ultrasonography incidentally. The ultrasonography showed a hypermobile spleen located in different areas when patient changing position. The literature was briefly reviewed.
Accidently Finding of a Small Hepatic Hematoma Mimicking Small Hepatoma in a Chronic Hepatitis B Patient—Case Report

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The 64 y/o male patient was a case of chronic hepatitis B with regular following up in our clinic. Accidently finding of a small hepatic nodule about 1.5 cm with low echoic change by ultrasonography in segment 6 was noted. The data showed a-fetoprotein 3.1 ng/ml (normal range < 20ng/ml). The abdominal CT showed a hypodense nodule in segment 6 of the liver with enhancement on arterial phase and washout on delayed phase. He had underwent the hepatic nodule resection. The pathology showed hematoma with accumulation of RBCs, lymphocytes and fibrin materials. No malignancy was identified.