

Preliminary clinical results with Precision Imaging technology

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Introduction

Ultrasonography offers a wide range of highly sophisticated technological options, chief among them being sensitive vascularization methods such as power Doppler or ADF, contrast media, 3D techniques and elastography.

However, B-mode imaging remains the indispensable mainstay of ultrasound diagnostics and imaging. In most cases, tissue structures can only be differentiated reliably if they can be visualized and differentiated in B-mode.

Today's high performance ultrasound technologies provide artefact-free images with minute detail as well as advanced spatial and contrast resolution.

Toshiba's ultrasound product range already offers excellent B-mode enhancements such as Differential Tissue Harmonic Imaging (D-THI) and ApliPure frequency compounding.

Toshiba's most recent B-mode innovation, known as Precision Imaging, can improve the diagnostic value of ultrasound images.

In the following we describe a series of case studies from our ultrasound lab. To facilitate comparisons, some of the images are shown in conventional B-mode with THI and ApliPure (left) and Precision Imaging (right).

Case studies

Fig. 1 shows an image of the gall bladder wall in a healthy subject, in which the wall layer can be readily differentiated.

Fig. 2 shows the left adrenal cortex region of a person of normal weight. This image provides a considerably sharper spleen surface than is obtained with conventional B images. The adrenal cortex is readily distinguishable from the surrounding elements and the various layers can be readily discerned.

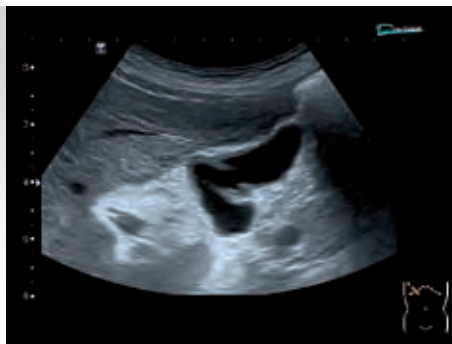


Fig. 1: Gall bladder

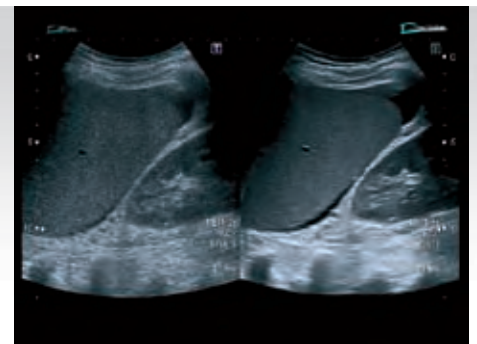


Fig. 2: Left adrenal cortex

Fig. 3 shows the partially necrotic metastasis in a patient with known hepatic metastasis accompanied by pancreatic carcinoid.

The visualization of avital and necrotic areas is crucially important in planning sonographically guided punctures. In addition to vitality detection via perfusion using contrast medium sonography, avital areas can oftentimes be identified using low-echo or echo-free fluid-filled tumor segments. Differentiated histological diagnoses can only be achieved by performing punctures of vital tissues.

Fig. 4 likewise shows a metastasized liver. The greater differentiation afforded by the enhanced contrast of Precision Imaging technology makes the large hepatic liver metastases and the two smaller metastases much easier to detect.

Although metastasis detection using contrast medium ultrasound is a far more sensitive technique than B imaging methods, ultrasound is still regarded as a highly efficient diagnostic tool (particularly for follow-ups and screening) that oftentimes yields substantial clinical benefits.

The extreme sharpness of the metastasized liver in fig. 5 is also impressive.

Fig. 6 shows a renal tumor, for which Precision Imaging technology provides considerably higher image sharpness and detail resolution.

The bile duct stent implanted in a pancreatic cancer patient (fig.7) is artefact free, as is the sludge material in the bile duct and gall bladder.

Precision Imaging of a Crohn's disease patient (fig. 8) provides an extremely precise rendering of the various intestinal layers using a high frequency linear probe. This superlative image sharpness is particularly useful for follow-up exams of patients with chronic inflammatory intestinal disorders.

Conclusion

Our experience to date with Precision Imaging technology indicates that this method significantly improves B-mode image quality, and may offer substantial diagnostic benefits. Further studies are needed.

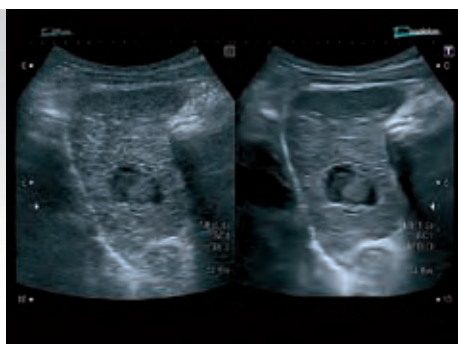


Fig. 3: Necrotic metastasis



Fig. 4: Metastasized liver



Fig. 5: Metastasized liver

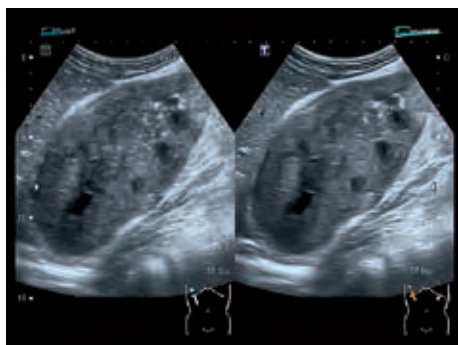


Fig. 6: Renal tumor



Fig. 7: Bile duct stent



Fig. 8: Intestinal layers in patient with Crohn's disease