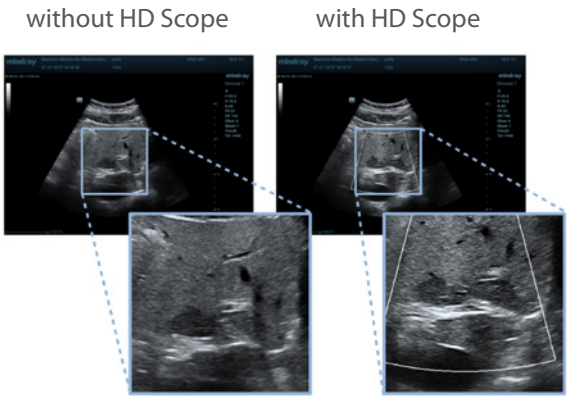
HD Scope

Physical Principles and Clinical Case Studies

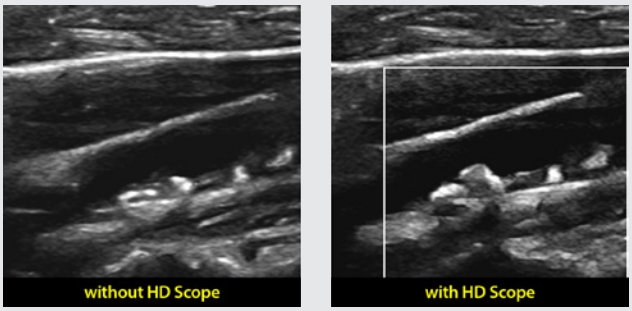
Introduction

HD Scope is an advanced image processing technology made possible by unique and proprietary ZONE Sonography Technology (ZST+) and the integration of advanced channel domain data analysis and digital signal processing algorithms. Utilizing these exclusive and proprietary capabilities, HD Scope breaks through the constrains of traditional B-mode ultrasound imaging by permitting delineation of subtle or small soft tissue lesions based on the distinct acoustic characteristics of differing tissue types. This innovative advance in diagnostic imaging is currently available only on the Mindray's flagship Resona 7 ultrasound system.

Traditional B-mode ultrasound imaging of anatomical structures relies on a limited number of echo parameters contained within the returning acoustic data set. Typically frequency, phase, and amplitude are used to create both 2-dimensional and Doppler image displays. The rapid development of alternative image creation methods, specifically the integration of ZONE Sonography Technology with high-speed and high-capacity data transfer and digital signal processing capabilities creates new opportunities for better delineation of tissue types.

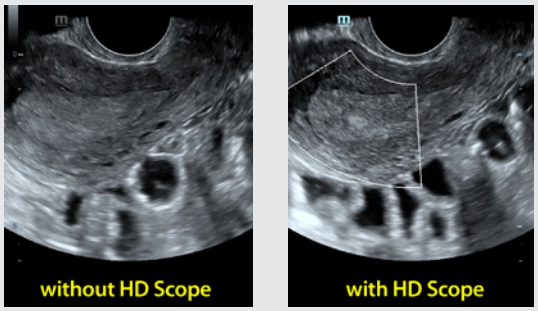


Comparative display of focal liver lesions with and without HD Scope



Case Study: Plaque Morphology

Amorphous echogenic plaque in carotid bifurcation (left). Enhanced tissue differentiation reveals complex nature of plaque and the presence of lucent cores (right).



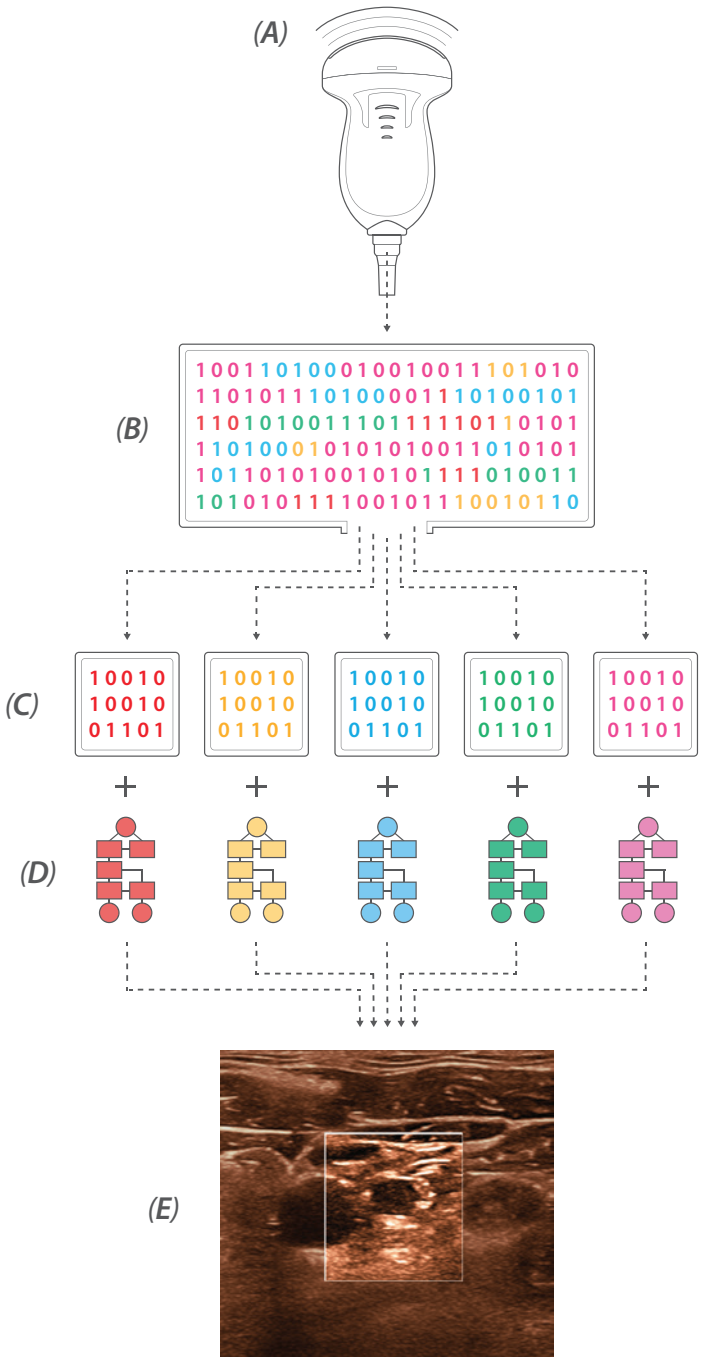
Case Study: Uterine Polyp

Heterogenous, non-distinct endometrium (left). Enhanced tissue differentiation reveals a focal, hyperechoic polyp (right).

Principles of HD Scope

Managing, applying, and integrating additional image creation resources within a defined region of interest (ROI) provides localized enhancement in that region. This process is based on two strategies: optimization of front-end transmitting and receiving capabilities and back-end classification and segmentation of signals arising from various tissue types. On the front end, additional acoustic output power is applied only within the ROI ***(A on adjacent illustration)***. A higher amplitude transmit beam provides more information within the received acoustic data set, however, in accordance with ALARA principles, this increased energy deposition must be limited to the ROI. Other potential front-end parameter alterations include increasing the number of zones, lines, localized gain and axial resolution. On the back end, alterations in dynamic range and Mindray's proprietary image processing algorithms increase contrast resolution and suppress speckle noise. As a result of this speckle reduction, unwanted noise is removed from the image resulting in improved spatial resolution and clarity. Other ZST specific, unique approaches to raw digital signal processing apply a variety of adaptive image processing techniques which enhance B-mode and color Doppler resolution.

Also on the back-end, using channel domain data that is a characteristic differentiator of ZONE Sonography Technology method of image formation, HD Scope analyzes the characteristics of various signals produced by different types of tissues in the ROI ***(B)*** and segments them in computer memory according to these tissue characteristics ***(C)***. Various filtering and processing algorithms are then applied to each segment of signals ***(D)*** to achieve optimal spatial and contrast resolution for each tissue type ***(E)***.



Cervical lymph node
adjacent to carotid artery

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