Visual Computing Forum

State-of-the-art ultrasound blood flow imaging

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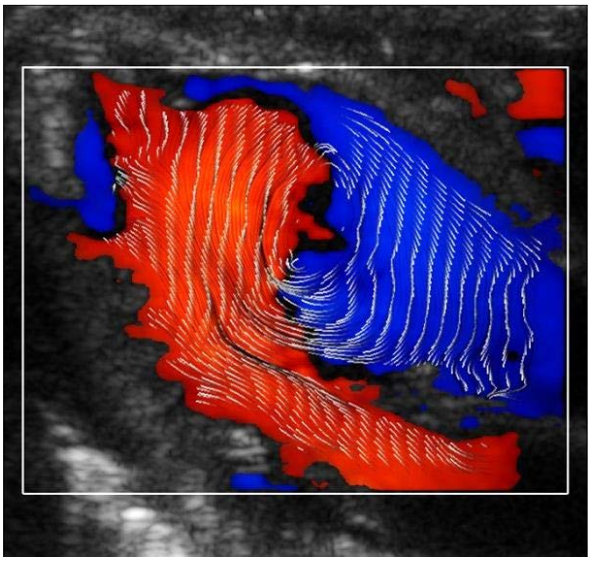
Abstract

The introduction of real-time ultrasound color-Doppler imaging in the mid-eighties was a major breakthrough for bedside diagnosis of cardiovascular disease. Currently this technique allows for real-time 2D and 3D imaging of blood flow, both for detection of blood and for the quantification of the blood velocity. The use of color-Doppler imaging in clinical practice is, however, mostly qualitative, used to localize but not quantify abnormal flow patterns. The reason is mostly related to the current limitations of color-Doppler related to low frame rates, beam-to-flow angle-dependencies, and a limited measurable velocity span. Further, the fundamental information and color visualization has not changed substantially since its introduction 30 years ago. Currently a technological leap is on the verge in medical ultrasound imaging. The possibility of real-time transfer and processing of channel data and software image formation allows for significantly improved image quality



data and software image formation allows for significantly improved image quality and frame rates in general, as well as a higher accuracy in blood flow imaging. This includes improved possibilities for imaging low flow in small vessels, and the estimation of the blood velocity vector as shown in the image above showing circular flow patterns in the left ventricle of a neonate. I will in this lecture introduce the current color-Doppler imaging modality and its limitations, and present on-going research projects on the future state of the art in ultrasound blood flow imaging.