Advanced ultrasonic arterial plaque and myocardial tissue characterization

This project is based on a substudy within the VIP-VIZA (Västerbotten Intervention Programme – VIZualization of Arterial plaque) based on the infrastructure of the VHU (Västerbotten hälsoundersökningar).

Atherosclerotic cardiovascular disease is the current leading cause of death in western countries. The vast majority of acute cardiovascular events are ascribed to thrombosis following a rupture of vulnerable plaque. However, the majority of atherosclerotic plaques remain stable and most often unnoticed. Therefore it is important to discriminate between vulnerable and stable plaques.
Techniques developed and implemented are also applied on myocardial tissue characterization (see figure 2).

The base of this research is the SonixTouch research ultrasound system (Ultrasonix Medical Corporation) which is an open-architecture ultrasound system (fully programmable system) allowing excellent image quality and specialized imaging modes (ARFI, planewave imaging, customized pulse-coding sequences, etc). 3D and 4D imaging will be considered, together with advanced signal and image processing techniques.

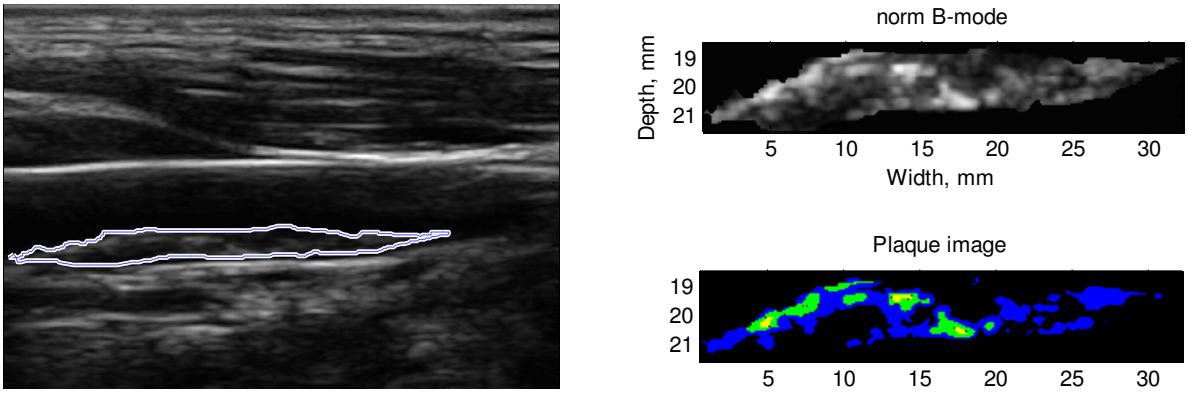

Figure 1 *– Left image: Longitudinal 2-D B-mode ultrasound image of the common carotid of a patient with plaques (lumen at center in image). The plaque was manually segmented (see contour tracing and top right)), prior to calculation of GSM, and entropy. Bottom right image is color-coded representation of the gray-scale plaque image for the modified Geroulakos classification.*

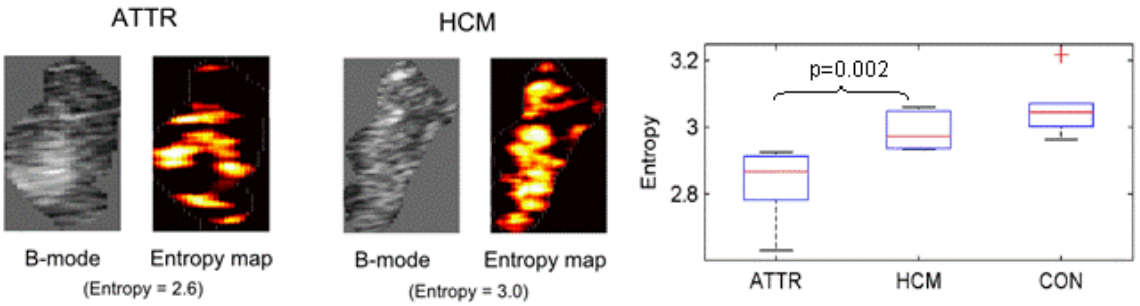

Figure 2*: Example of the methods considered in this project and their application in a clinical research project on myocardial tissue characterization (septum), in order to classify two patient groups (Grönlund et al., 2012).*