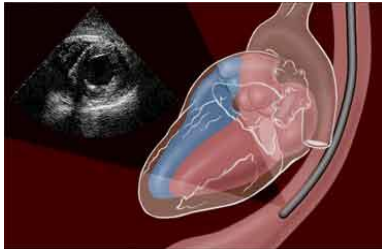


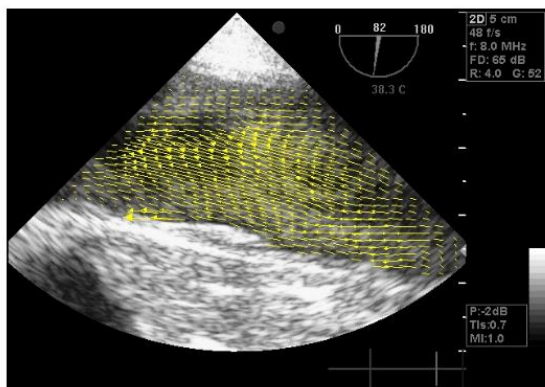
Cardiovascular diseases represent the main cause of mortality in our country. Moreover, the associated morbidity implies precocious disablement of the population, resulting in higher expenditure for health care and social security systems. Factors such as population growth and aging, along with inadequate eating habits, sedentary lifestyle and smoking, reinforce a disturbing trend in the current scenario.



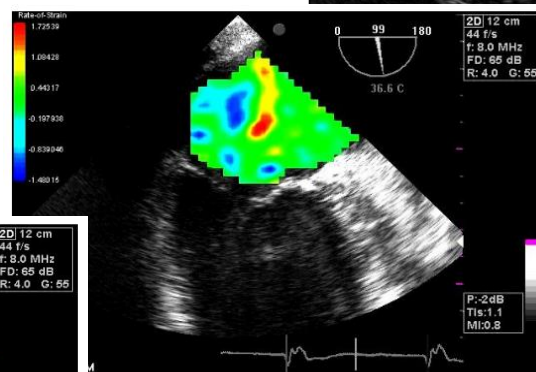
*Echocardiography image*

In order to analyze the influence of risk factors and prevention, the constant development of early diagnosis tools and the better knowledge of cardiovascular pathophysiology are needed. In this regard, in vivo experiments are conducted at LEF with the Echocardiography Particle Image Velocimetry (Echo-PIV) technique. Its goal is to measure in detail the blood flow field inside the cardiac chamber, arteries, and veins. Images of echocardiography exams from certain patients are selected, and image processing techniques are applied in order to measure velocity, vorticity, and shear rate fields in specific regions.

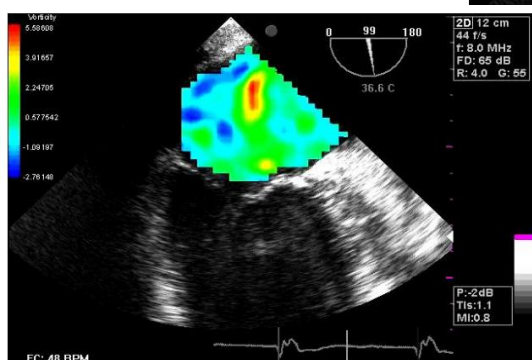
The shear stress inside the vascular endothelium is one of the predictive factors for the initiation of formation of atherosclerotic plaques. Moreover, several studies relate shear stress to arterial aneurysms. The analysis of the vorticity field in the interior of the left ventricle, the main cardiac chamber, allows a quantitative evaluation of the blood pumping efficiency, and may suggest a categorization of the levels of heart failure.



*Instantaneous velocity field in thoracic aorta.*



*From top to bottom: instantaneous velocity fields , shear rate and vorticity in left atrium.*



In order to implement the Echo-PIV technique, LEF has established a partnership with the National Cardiology Institute (Instituto Nacional de Cardiologia - INC/MS), which enabled the use of state of the art echocardiography equipment , Vivid S6® and Vivid E9® (General Electric Healthcare Inc, UK). Image processing is performed at LEF with Insight 3G software, TSI Inc., USA. The studies are accredited by the National Council on Ethics in Research (Conselho Nacional de Ética em Pesquisas – CONEP), and have been approved by the Research Ethics Committee of the National Cardiology Institute (Instituto Nacional de Cardiologia, Rio de Janeiro).

## Partnerships



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