8th. World Congress on Computational Mechanics (WCCM8)
5th. European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2008)
June 30 – July 5, 2008
Venice, Italy

AUTOMATIC IMT MEASUREMENTS FOR CAROTID ULTRASOUND IMAGES

***Anton Vernet[1], Honorio Pallas[3] and Blai Coll[3]**

[1]ECoMMFiT,
Dept. Mech. Engineering,
University Rovira i Virgili,
Avd. Països Catalans, 26, 43007 Tarragona,
Catalunya, SPAIN
anton.vernet@urv.cat

[2,3]Servei de Medicina Interna,
Dept. Vascular Medicine,
Hospital Universitari Sant Joan, Reus.
Catalunya, SPAIN
[2]hventayol@grupsagessa.com
[3]bcoll@grupsagessa.com

Key Words: *Carotid intima-media, atherosclerosis, thickness measurement, ultrasound images.*

ABSTRACT

Atherosclerosis is a disease of the arterial walls that is the major cause of heart attack and stroke in the western world. It is characterized by a progressive reduction of the arterial cross-section area, which reduces dramatically the blood flow. This process is basically a consequence of the accumulation of several components as lipid or cholesterol, among others, in the blood vessel wall. Progression of atherosclerosis depends on a large number of factors as aging, overweight or high blood pressure, and most of the cases there are no external symptoms that can help on its detection and treatment. Primary preventive strategies based in the measurement of risk factors can be used to prevent future cardiovascular events. However these strategies fail in more than the 50% of the cases [1]. Thus, there is the need to have fast, reliable, non-invasive and accurate measures of the burden and progression of atherosclerosis for each individual. On the other side, epidemiologic studies need a long-term follow-up and/or the participation of a large population to obtain valid statistical data. Thus, a large amount of data to process will be available, that has to be analyzed with high accuracy and reproducibility in order to obtain reliable results. Measurements of the intima-media thickness (IMT) from ultrasound images of the carotid artery have been validated as a surrogate marker of the cardiovascular diseases [2]. IMT measurements can provide information on apparently healthy and at-risk population and data on the efficacy of medical treatments.

Full automatic software for measuring IMT from ultrasound images will be presented in the conference. This software has been developed under MATLAB® environment and is able to process DICOM or JPEG ultrasound images (although it can be easily modified to accept other standard image formats). The algorithms implemented automatically do pixel calibration, selection of the region of interest, detection of the intima-lumen and adventitia-media interfaces, obtain the IMT value and computes the statistics of the measurement. In case of poor quality ultrasound images, the software offers the

possibility to obtain the IMT measure using a manual method. In that case the intima-lumen and adventitia-media interfaces are obtained selecting several points in the interfaces. Then, a cubic spline is used to adjust the points into a curve that represents the interfaces.

A description of the developed algorithms, a validation study of the software and some application cases will be presented in the conference.

REFERENCES

[1] Akosah K, Schaper A, Cogbill C, Schoenfeld P. “Preventing myocardial infarction in the young adult in the first place: how do the national cholesterol education panel III guidelines per-form?”, *J. Am. Coll. Cardiol.* Vol. **41**, pp.1475-1479, (2003)

[2] Lorenz SMW, Markus HS, Bots ML, Rosvall M, Sitzer M. “Prediction of clinical cardiovascular events with carotid intima-media thickness. A systematic review and meta-analysis”, *Circulation*, Vol. **115**, pp. 459-467, (2007)