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## ESCAPE Stroke: first results

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**Objective:** "ESCAPE Stroke" (Enhancement, Segmentation and Characterization of Atheroma Plaque for Stroke Prevention) is a multidisciplinary project that aims to develop a new software tool to obtain maximum information about carotid atherosclerosis, through the (semi)automatic analysis of the morphological characteristics of the carotid plaque. We present the first results for evaluating this software.

**Methods:** For the morphological analysis of the characteristics of the atheroma plaques, a database of 117 carotid ultrasound images was used. The extracted morphological features refer to the degree of echogenicity, texture and the surface of the atheroma plaque.

Regarding to echogenicity of the atheroma plaques, the implemented software algorithm divides the plaques into four classes as follows:

- Anechogenic A type, the echogenic areas representing less than 25% of the plaque. The 117 plaques subjected to computerized analysis were classified as: 54 Type E plaques, 57 Type E / 2 plaques, 6 Type A / 2 plaques and no Type A plaques
- A / 2 type: predominantly anechogenic, anechogenic areas accounting for more than 50% of the plaque but less than 75%;
- Type E / 2: predominantly echogenic, echogenic areas accounting for more than 50% of the plaque but less than 75%;
- Type E: echogenic, an-echogenic areas representing less than 25% of the plaque; (Figure 1)

On the subject of texture of atheroma plaques, the implemented software algorithm studies the homogeneity. In order to quantify the degree of homogeneity of the atheroma plaques, from the Spatial Gray Level Dependency Matrix, a number of functions have been calculated that have become the homogeneity-classification parameters. The 117 plaques were divided into three different classes (Figure 1) as follows:

- 28 plaques type 1, with uniform consistency regardless of their echogenicity;
- 51 plaques type 2, with an average non-uniform consistency, the distribution of gray levels in the atheroma plaque varies but does not go through the entire interval from hypo-echogenic zones to hyper-echogenic zones;
- 38 plaques type 3, with high non-uniform consistency, with hypo-echogenic and hyper-echogenic zones.

With regard to the surface of the atheroma plaques, it is defined as smooth and regular, slightly irregular or ulcerated (Figure 1). Using different contour parameters, the 117 atheroma plaques subjected to computerized analysis were classified as follows:

- 48 plaques with smooth and regular surface;
- 55 plaques with slightly irregular surface;
- 14 plaques with ulcerative surface; The overall agreement between software analysis and "eyeball" assessment made by 2 independent physicians was 69% for echogenicity, 58% for homogeneity and 74% for plaque surface evaluation.

**Conclusion:** Our automatic/semiautomatic method for plaque characterization could add important information in atheroma plaque assessment and further research is needed in order to confirm its value.

Abstract P832 Figure1

