Computer-aided Image Analysis to Enhance In Vivo Diagnosis of Plaque Erosion by Intravascular Optical Coherence Tomography

Poster Contributions
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Background: Recent reports show that plaque erosion can be diagnosed in vivo using optical coherence tomography (OCT) in patients with acute coronary syndromes (ACS). However, quantitative OCT image criteria for computer-aided diagnosis of plaque erosion have not been established.

Methods: A total of 28 patients with ACS caused by plaque erosion were included. Plaque erosion was identified according to previously established qualitative criteria. Both optical properties of tissue and morphological features of focal eroded fibrous plaques as well as erosion-adjacent area were analyzed using a custom designed computer algorithm. Non-eroded fibrous plaques remote from the erosion site within the same vessel were used as controls.

Results: Compared to control intact fibrous plaques, eroded plaques have significantly lower surface image intensity (p<0.001), higher optical attenuation (p<0.01), larger surface protrusion area (p<0.001) and a rougher tissue surface (p<0.001). The erosion-adjacent area also has higher optical attenuation (p<0.001). Using a logistic regression model built upon the above quantitative features, plaque erosion can be accurately classified with a sensitivity of 92.9%, specificity of 87.5% and ROC area of 0.935 evaluated in 10-fold cross validation.

Conclusions: Plaque erosion has distinctive optical properties and morphological features compared to non-eroded fibrous plaques. Quantitative image analysis may enhance diagnostic accuracy for plaque erosion in vivo.