



Conference Abstract

P.46 Assessment of Intraplaque Hemorrhage by Photoacoustics Imaging (PAI): First *in-vivo* Human Validation Study

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Keywords

Carotid-plaque
photoacoustic
validation

ABSTRACT

Aim: To validate a photoacoustic imaging (PAI) system, for the identification of intraplaque hemorrhage, comparing it with MRI and histology (gold standard).

Methods: 25 patients with carotid stenosis >70% and clinical indication to tromboendarterectomy were recruited. Angio-MRI for intraplaque hemorrhage assessment (Cube sequence) was performed. PAI clips (5 seconds, Frame rate 1000/sec, 3 to 15 per patient) were acquired. Each clip was scored for the presence of PAI signal by means of an integrated scoring system (semiquantitative, from 0 to 12). Semiquantitative grading scales were used to assess plaque histological features of hemorrhage and vulnerability.

Results: 18 patients had no missing MRI, PAI and histology data and were included in this analysis. Mean age was 73 ± 8 years, 60% men, 80% Caucasians, 92% hypertensives, 60% with a previous stroke. At histology, only 3 plaques out of 21 showed no signs of intraplaque hemorrhage, 4 showed small hemorrhage, while 14 (67%) showed large hemorrhages. PAI score (best cut-off ≥ 4) correctly classified 14 out of 18 patients (Sensitivity = 73.3%, specificity = 100%, AUC = 0.867). MRI performance was substantially similar, with 12 patients correctly classified (sensitivity = 60%, specificity = 100%, AUC = 0.800), with a non-significant difference in AUC compared to PAI ($p = 0.420$).

Conclusions: In this first *in-vivo* human study, PAI is able to identify histological intraplaque hemorrhage with an excellent specificity and acceptable sensitivity, equivalent to MRI. The very high specificity, with a low number of false positives, make PAI a good candidate for evaluation of plaques prior to surgery to i.e. reinforce the decision to perform surgery.

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