Artery Research
Vol. **26**(**S1**); 2020, *p.* S69
DOI: https://doi.org/10.2991/artres.k.201209.058; ISSN 1872-9312; eISSN 1876-4401
https://www.atlantis-press.com/journals/artres

Conference Abstract

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

Rosa Maria Bruno[1,*], Yuki Imaizumi[2], Hasan Obeid, Michael Jaeger[3], Pierre Julia[1], Patrick Bruneval[1], David Calvet[2]

[1]*Inserm U970, Université de Paris*
[2]*Hôpital Sainte - Anne*
[3]*University of Bern*

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 tromboendoarterectomy 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.

*Corresponding author. Email: rosam.bruno@gmail.com