Use Of Web-Based Platforms And Features Of The Arterial Wall For Risk Stratification Of Asymptomatic Carotid Plaques: Can These Features And Risks Be Modified By Statins

Christos D. Liapis
Professor (Em) of Vascular Surgery
Athens University Medical School
Director Vascular & Endovascular Clinic
Athens Medical Center

Acknowledgements
Part of the CAROTID platform was developed in the frame-work of the research project "GSRT-09SYN-12–1054/Carotid", which is co-funded by the Operational Program “Competitiveness and Entrepreneurship” and Regional Operational Programmes of the National Strategic Reference Framework(NSRF) 2007-2013. “SYNERGASIA”: “Collaborative projects of small and medium scale”.

A number of modalities can be used to identify the 15% of asymptomatic patients with > 70% stenosis who could benefit from intervention.

Asymptomatic carotid stenosis: The problem

90% of carotid interventions in the USA are performed for ACS vs. 0% in Denmark.

Both can not be right ! ! !

A number of modalities can be used to identify the 15% of asymptomatic patients with > 70% stenosis who could benefit from intervention.


Who needs intervention ? Risk stratification for ACS

Clinical information, family history + Imaging Biological Markers

Can the average surgeon utilize this complex information ?

Procedure for determining plaque volumes from 3D ultrasound images

Spence J. F1000Research 2016

Carotid ulcer volume

Spence J. F1000Research 2016
Rational for a web-based platform for ACS risk stratification

- Availability to all participating physicians.
- Objective selection of patients who need carotid revascularization, using a multifaceted description of the disease with ultrasound imaging, biochemical and clinical markers (low – high risk for stroke).
- Effective storage and retrieval of patient data to facilitate frequent follow-ups and direct comparisons with related cases.

CAROTID – A web-based platform
Athens Technical, National Universities, Greece

Application ontology of carotid atherosclerosis that is used to (a) integrate heterogeneous data sources on the basis of semantic representation and ontological reasoning and (b) access the critical information using SPARQL query rewriting and ontology-based data access services.

CAROTID – A web-based platform for optimal personalized management

Results of a single center study:

- In 233 patients with > 70% carotid stenosis, classification in low risk cases was 87% vs. 61% for degree of stenosis only based classification {37 (16%) fewer operations}.
- Time spent for generating the diagnosis was 5 min for 4-s U.V.
- Large datasets and future evaluation sessions in multiple institutions are necessary for validation.

AtheroCloud™-based IMT measurement
Toho Univ. Japan

- The physician uploads ultrasound scans in DICOM, JPEG, BMP, PNG, GIF or TIFF directly into the AtheroPoint from the local server in less than five seconds per image for AtheroCloud™ cIMT measurements in point-of-care settings.
- \( N = 100 \)
- The coefficient of correlation (CC) between sonographer and manual for L/R cIMT was 0.74 (P<0.0001) and 0.65 (P<0.0001), between AtheroCloud™ and manual was 0.96 (P<0.0001) and 0.97 (P<0.0001). 91.15% of the population in AtheroCloud™ had a mean cIMT error less than 0.11mm, compared to sonographer’s 68.31%.
- Framingham Risk Score stratified the population into three bins: 39% in low-risk, 70.66% in medium-risk and 10.66% in high-risk.

CAR Score (ECST-2)
Stroke Association, UK.

ECST-2 (U1RCTN 97744893) is an international randomized trial investigating the optimal treatment of patients with symptomatic or asymptomatic moderate or severe carotid stenosis at low or intermediate risk of future stroke.

- download the CAR score app to perform rapid screening of symptomatic patients on your iPhone or Android tablet (ios, Android or online versions)

Can These Features And Risks Be Modified By Statins?
N= 1121 patients with asymptomatic carotid stenosis of 50% to 99% [ECST] method underwent six monthly clinical assessments and carotid duplexes for up to 8 years (mean 4 years). Progression or regression was considered present if there was a change of at least one grade higher or lower, for at least two consecutive examinations.

Results: Regression occurred in 43 (3.8%), no change in 856 (76.4%), and progression in 222 (19.8%) patients. Younger age, high grades of stenosis, absence of discrete white areas in the plaque and lipid lowering therapy were independent baseline predictors of increased incidence of regression.

How Statins mediate plaque stabilization?
- Low galectin-3 intra-plaque levels correlate with unstable human carotid plaques
- Long vs short term statin treatment
- Elevated galectin-3 and lowered macrophages intra-plaque concentrations (p<0.005)
- Statins mediated plaque stabilization

Significantly higher intra-plaque concentration of galectin-3 in long-term (>1 month) statin-treated patients (n = 26) than in those receiving statins in the short term (7-15 preop) (n = 12) (13.1 +6.08% vs. 9.61 +4.28%, p = .046).

Aggressive vs. moderate lipid-lowering treatment and carotid plaque stabilization
- Aggressive atorvastatin use (80mg) enhanced carotid plaque echogenicity to a greater extent than respective moderate atorvastatin therapy (10-20mg)
Superior benefits of aggressive than moderate statin treatment on carotid plaque echolucency in patients with moderate carotid stenosis.

1-year follow up study of 140 pts with carotid disease not indicated for intervention

Biomarkers & Carotid Plaque stabilization

Conclusions I

By combining several imaging modalities and biological markers, the proportion of patients with severe asymptomatic carotid stenosis who could be identified as being at high enough risk to warrant intervention, might be up to ~15%.

Conclusions II

The use of web-based platforms, assist the physicians into taking the right decision, by identifying this high risk group from a large pool of patients, where the importance of each of the various tests can be statistically meaningful. At the same time the data are accumulated for future analysis.

Conclusions III

The use of statins can modify plaque composition and stability and is the cornerstone of the current best medical treatment for patients with asymptomatic carotid stenosis, in an effort to treat arteries and not just risk factors.

Thank you for your attention