Morphological Atherosclerotic Calcification Distribution (MACD) Index

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Summary

- **MACD** can be computed fully automatic and can be based on manual or automatic annotations
- The framework is scanner independent and can be based on any types of X-ray scans
- **MACD** has been evaluated on 308 subjects (308 at baseline and 256 at follow-up after 8.5 years)

Background and Methods

Aortic calcification is a major risk factor for cardiovascular disease (**CVD**) related deaths. We investigated the relation between mortality and aspects of number, size, morphology, and distribution of calcified plaques in the lumbar aorta of post menopausal women.

A schematic view of MACD.

MACD can be defined on the basis of the following makers:

- Number of Calcified Deposits (**NCD**) - The number of distinct calcified deposits.
- Morphological Atherosclerotic Distribution (**MAD**) factor - The total extent of the simulated atherosclerotic process divided by the area of the calcified plaques. A grass-fire equation implemented by iterated morphological dilations with a combined radius of 200 pixels corresponding to 8.9 mm simulated the extent of the atherosclerotic process.
- Morphological Atherosclerotic Calcification Distribution (**MACD**) index: The product of the NCD and the MAD factor.

For a given amount of calcified tissue, the markers are influenced differently by variations in calcification morphology and distribution.

Results

We have specifically investigated whether additional risk factors previously associated with CVD events would add information in combination with the MACD index. Neither the SCORE card nor the Framingham point score resulted in enhanced risk differentiation in the present cohort.

The high risk odds ratios of the 90 percent lowest vs. the 10 percent highest.

Conclusions

The recently developed MACD index provides a unique combination of morphology and distribution of aortic calcifications, factors that in a combination increase the biological relevance of the index by emphasizing that smaller plaques have a larger growth potential. Thereby, in the current cohort with a long term follow-up the MACD-index is a **strong predictor of CVD mortality**, with an odds ratio of 20, of postmenopausal death related to CVD events.

Key Publications

- M. Nielsen, F. Lauze et al., Automated X-ray Quantification of the Morphological Atherosclerosis Calcification Distribution (MACD) is a Strong Predictor of Mortality in Postmenopausal Women, 2008, In review.
- N. Barascuk, M. Ganz et al., Aortic Calcification quantified by the Morphological Atherosclerotic Calcification Distribution (MACD) index is associated with features of the metabolic syndrome, 2008, In review.