

# Quantification of lipid-rich necrotic core size in carotid atherosclerotic plaque of symptomatic and asymptomatic patients

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## Introduction

Pathological studies established that a large lipid-rich necrotic core (LRNC) is an important feature of vulnerable atherosclerotic plaque. The purpose of the present study was to investigate potential differences in size of the LRNC in carotid plaques of symptomatic patients versus asymptomatic patients with high-grade carotid stenosis.

## Materials and Methods

Thirty-seven patients with carotid stenosis >70% with (n=26) or without (n=11) symptoms were included. Three independent MR readers quantified the amount of LRNC with a previously validated T1w 3D TFE pulse sequence (in-plane resolution 0.39x0.49 mm, slice thickness 3 mm, TR/TI/TE 10.3/900/4.0, FA 15°, shot interval 3000 ms).<sup>1,2</sup> Nominal scan time was 3 minutes 38 seconds. Total investigation time was less than 15 minutes. Signal intensity was judged relatively to adjacent muscle tissue (rSI). In the present study high signal intensity in the main plaque area was considered LRNC. The relative amount of LRNC (LRNC score) was defined as sum of cross-sectional area percentages LRNC per carotid plaque.

## Results

The mean LRNC score was 116±129 and 59±62 for symptomatic and asymptomatic patients, respectively (p<0.05). An example of a symptomatic and asymptomatic T1w TFE image is shown in Figure 1. Interreader agreement for the three MR readers was high with intraclass correlation coefficient (ICC, 95% CI) of 0.75 (0.62-0.85). Symptomatic patients had a wide range in LRNC scores (0-424), while the range was much lower in the asymptomatic group (0-170).

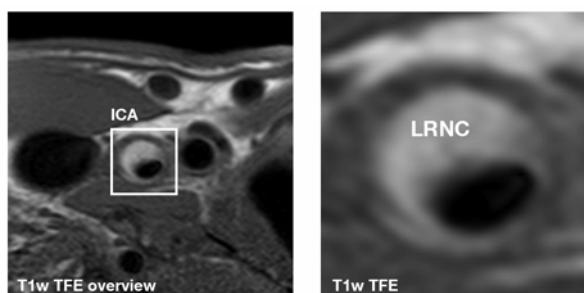


Fig 1a. T1w TFE MR image of an atherosclerotic plaque in the internal carotid artery (ICA) of a symptomatic patient. The large hyperintense region of interest within the main plaque area corresponds to LRNC.

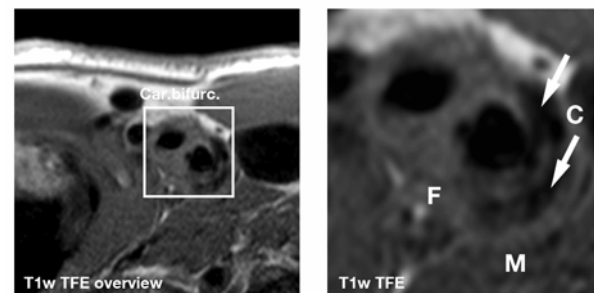


Fig 1b. T1w TFE MR image of an atherosclerotic plaque in the internal carotid artery of an asymptomatic patient. This plaque was classified as a fibro-calcific because of the multiple small hypointense areas corresponding to calcifications (C, arrows). When compared to (a) there is no hyperintense signal corresponding to LRNC. Car. Bifurc: carotid bifurcation; F: fibrous tissue; M: muscle.

## Conclusions

On average, symptomatic patients have a significantly larger LRNC compared to asymptomatic patients as quantified with T1w TFE images. Future studies are warranted to investigate whether a large LRNC as quantified with MRI can be used to identify carotid plaques with increased risk of (recurrent) stroke.

## References

- <sup>1</sup>Cappendijk et al. Assessment of human atherosclerotic carotid plaque components with multisequence MR imaging: initial experience. *Radiology* 2005;234:487-492.
- <sup>2</sup>Unpublished data, submitted.