ARTERIAL SPIN LABELING PERFUSION IMAGING OF THE THYROID GLAND

C. Schraml[1], A. Boss[1], P. Martirosian[1], N. F. Schwenzer[2], C. D. Claussen[2], and F. Schick[1]

[1]Section on Experimental Radiology, University Hospital of Tuebingen, Tuebingen, BW, Germany, [2]Department of Diagnostic Radiology, University Hospital of Tuebingen, Tuebingen, BW, Germany

Purpose

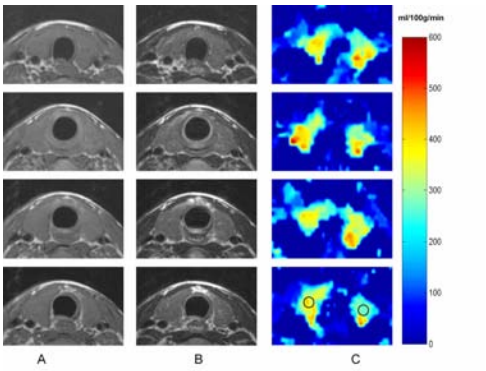
Thyroid inflammation pathologies are related to changes of blood perfusion which can not be quantified absolutely by the established imaging modalities like ultrasound or scintigraphy [1, 2]. The aim of the study was to evaluate the feasibility of quantitative MR perfusion imaging by using an arterial spin-labeling (ASL) method working without the necessity of contrast media administration [3-6].

Material and Methods

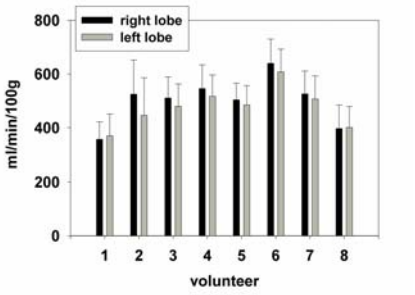
An arterial spin labeling technique with flow-sensitive alternating inversion-recovery (FAIR) spin preparation and a true fast imaging in the steady state (TrueFISP) signal read out strategy was implemented on a 1.5 Tesla whole body unit. Sequence parameters were: TR 4.02 ms, TE 2.01 ms, TI 1200 ms, bandwidth 605 Hz/pixel, SL 5 mm, excitation angle 70°. A matrix of 64 x 64 was chosen for a field of view of 160 x 160 mm. Anatomical and perfusion imaging of the thyroid gland was performed in eight healthy volunteers and one patient with functioning adenoma. Quantitative perfusion maps were calculated on a pixel-by-pixel basis using the extended Bloch equations.

Results

In all subjects perfusion images showed diagnostic image quality. Mean examination time was 24 min for multi-planar perfusion imaging of the entire thyroid gland. Individual perfusion values ranged between 341±91 and 640±90 ml/100g/min with a mean perfusion of 461±90 ml/100g/min. The functioning adenoma showed markedly reduced perfusion compared to normal thyroidal parenchyma. No perfusion was noticeable inside four detected thyroid cysts.



The figure shows anatomical transverse T1w SE (column A) and T2w FSE (B) images of the thyroid gland of a healthy volunteer. For the FAIR-TrueFISP perfusion images (C), a scale is displayed in units of ml/100g/min. Voxels with extremely high perfusion values (i.e. higher than 800ml/100g/min) corresponding to macroscopic blood vessels were set to 0. For comparison of mean perfusion values on the basis of a ROI-analysis, an example for ROI selection is given in part c of the last row in the figure.



The diagram shows the mean perfusion values of all volunteers calculated by ROI-analysis both in the right (black) and the left lobe (grey column).

Conclusion

Quantitative ASL perfusion imaging of the thyroid gland using a FAIR-TrueFISP sequence leads to perfusion maps of diagnostic image quality. Perfusion maps may provide important information in the assessment of thyroid gland pathologies and for monitoring of therapeutic treatment.

References

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