

Content: Dual Energy CT in Carotid Arteries, Phantom Study

Rut Christiani¹, Jari Kirjonen¹, Roberto Caetano Dos Santos¹, Päivi Kallio², Eero Rönkä²

¹Tampere University of Applied Sciences, Faculty of Business, Science and Engineering, Tampere University of Applied Sciences, Tampere, Finland

²Tampere University, School of Information Technology, Imaging Center, Tampere University Hospital, Tampere, Finland

christiani@student.tut.fi

Introduction

- Dual Energy Computed Tomography (DECT) applies two spectral X-ray slices (70-80 kVe and 120-140 kVe) instead of one wider spectrum applied in the conventional Single Energy CT (SECT).
- Information obtained by combining results from two different energy levels provides improvement for tissue characterization.
- Tissue characterization is important in CT Angiography (CTA) especially for atherosclerosis diagnosis.

Objectives

- Analyzing significance of DECT property in tissue characterization in CTA, especially for atherosclerosis diagnosis.

Methods & Materials

CONSTRUCTION OF NECK PHANTOM:

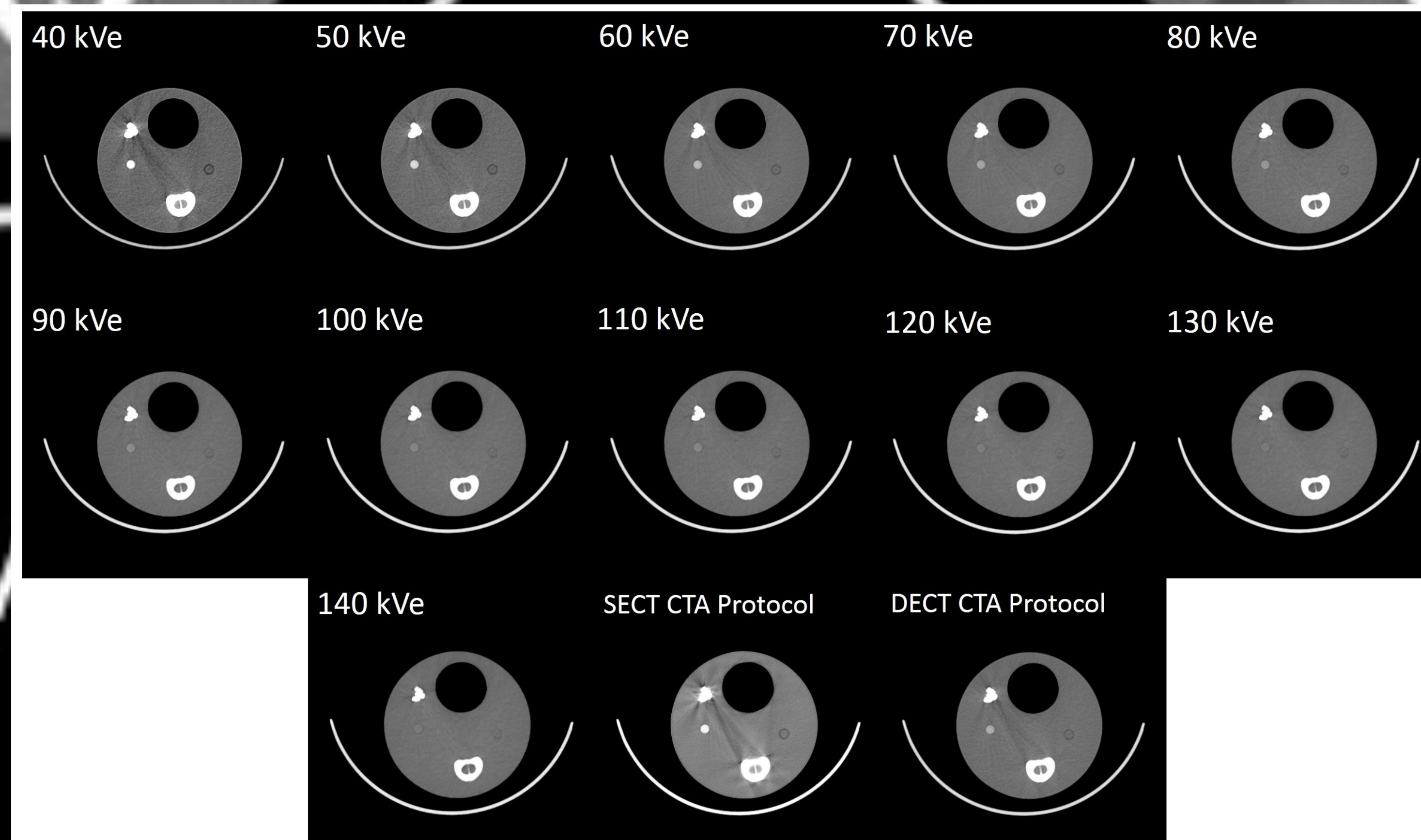
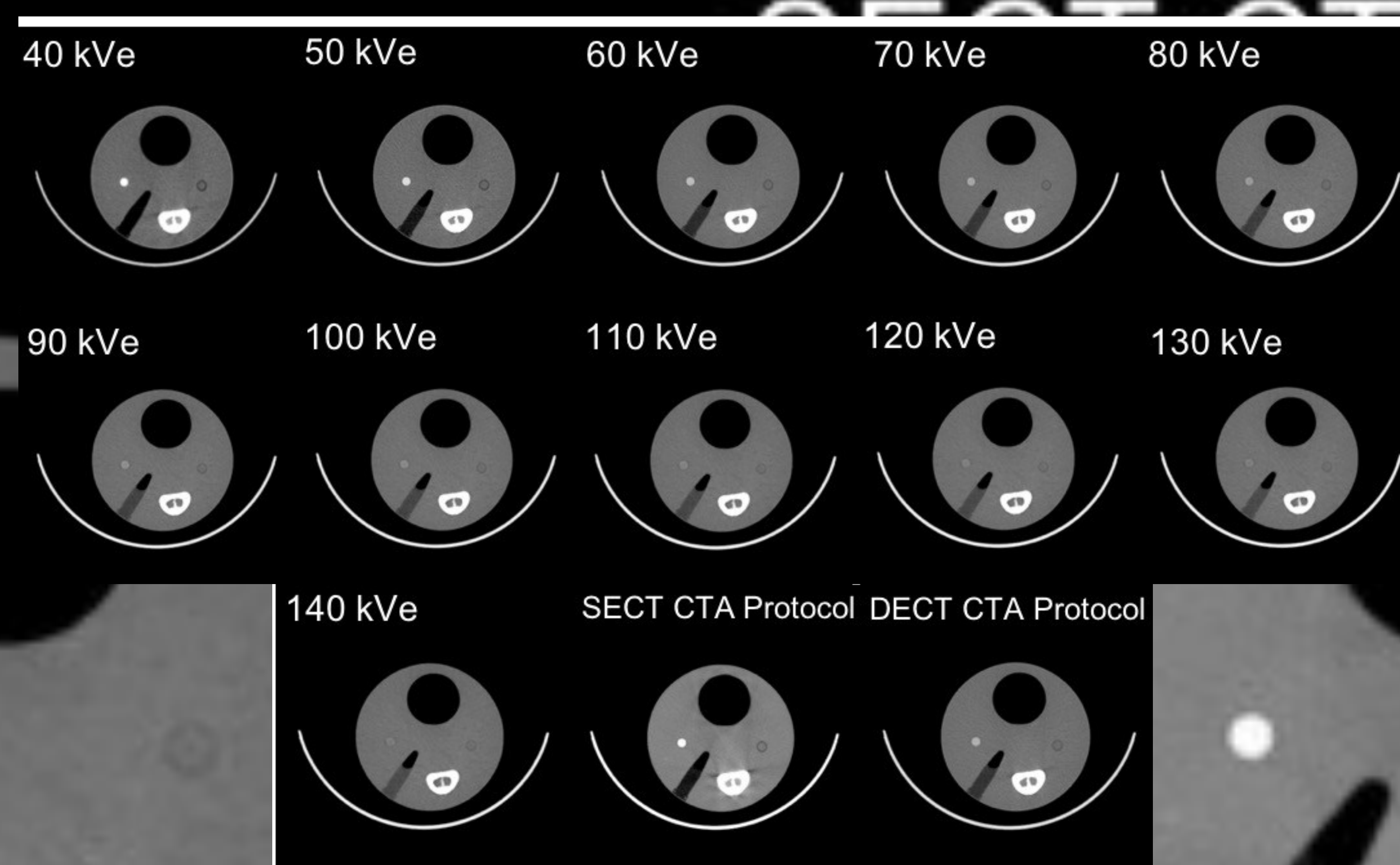
- Soft tissue: agar
- Spine: cattle bone
- Trachea: empty plastic bottle
- Lipid: oil
- Carotid arteries: two small plastic tubes, one filled with water and the other with diluted contrast agent with concentration of 6 mg/ml
- Natural artefact: Human tooth

SCANNING:

- SECT and DECT with standard CTA protocols (80 kVe/140kVe for DECT)
- All windows from 40 kVe to 140 kVe

Results

- Images show that noise level is lower in higher energy levels including 140 kVe. The image shows agar, cattle bone, water bottle, oil, and human tooth.



- Images show that noise level is lower in higher energy levels including 140 kVe. The image shows agar, cattle bone, water bottle, oil, and human tooth. The artefact due to the human tooth is less visible in higher energy level. However, contrast is lower in higher energy level. In SECT, the artefact is more visible. In DECT, the artefact is less visible. In SECT, the artefact is more visible. In DECT, the artefact is less visible.

Conclusions

DECT can be used for atherosclerosis diagnosis.

References

1. J. Kirjonen, R. Caetano Dos Santos, P. Kallio, E. Rönkä, "Dual Energy CT in Carotid Arteries, Phantom Study", *Journal of Applied Medical Research*, vol. 1, no. 1, pp. 1-10, 2019.