SEMINAR FRIDAY 14.03.2014

PLACE: MedViz Facilities, Møllendalsbakken 7, 5th floor
TIME: 12:00-13:00

SPEAKERS/TITLES

Annette Fromm, Bergen Stroke Research Group
Title: Ultrasonographic assessment of atherosclerotic carotid artery disease

Ingvild Dalehaug, Fysiker Haukeland universitetssjukehus
Title: Optimization of a CT thorax-abdomen/pelvis protocol using objective methods.

ABSTRACT

Fromm
Large-artery atherosclerosis of the brain-supplying arteries is the assumed underlying cause in 10 to 15% of patients with ischemic cerebrovascular events. However, the cause of stroke remains undetermined in a large proportion of ischemic stroke patients, and one assumes that a considerable number of these patients suffer stroke from unidentified atherosclerotic disease. The site most frequently involved in atherosclerotic stroke is the extracranial carotid artery. Carotid intima-media thickness measured by 2-dimensional (2D) B-mode ultrasonography has become a surrogate marker for atherosclerosis and is a well-established tool for vascular risk prediction. However, the overall atherosclerotic plaque burden may be even more predictive. Besides arterial wall changes, artery caliber variations, degree of stenosis and local hemodynamic alterations, certain plaque characteristics are important for the evaluation of plaque vulnerability and vascular risk stratification, and can be evaluated based on grey-scale assessment in 3-dimensional ultrasound. Further, neovascularisation of the atherosclerotic plaque is associated with intralesional haemorrhage and plaque rupture causing arterio-arterial embolism, and can be identified by contrast enhanced ultrasound (CEUS).

The combination of B-mode-, 3D carotid ultrasound and CEUS for evaluation of plaque volume and characteristics has a significant clinical potential as tools for the identification of patients with unstable atherosclerotic disease at a high risk for deriving vascular events.

Dalehaug
Background: CT scanning is a powerful tool in diagnostics giving three-dimensional images of the body using x-rays. The method is quick and can provide crucial information for the radiologists. However, x-rays are not completely harmless and can lead to radiation-induced cancer.
A thorax-abdomen/pelvis CT-protocol covers a large area of the patient containing several vital, radiation-sensitive organs such as breasts and gonads. It is a frequently used cancer follow-up protocol. As a standard cancer follow-up regime, the thorax-abdomen/pelvis CT-examination is performed every 3-4 months, generating a relatively large cumulative dose with great dose saving potential if the protocol can be optimized by reducing the radiation dose to the patient while maintaining the same image quality. When lowering the radiation dose during a CT-scan the image noise is increased. In order to establish the correct diagnosis and find small lesions in the liver, it is crucial for the radiologist to have an acceptable image quality with low image noise and proper low contrast resolution. To produce the CT-images the traditional filtered back projection reconstruction algorithm is used. During the last years improved computer power has opened up for using iterative reconstruction algorithms for clinical purposes. Iterative reconstruction algorithms remove noise mathematically generating a potential for dose reduction. According to the CT-vendors it is possible to lower the dose to the patient while keeping the image quality when using iterative reconstruction. The aim of this study was to investigate the dose saving potential for a thorax-abdomen/pelvis examination when using iterative reconstruction while maintaining the current image quality. It is known that the iterative reconstruction algorithm may cause the image noise to have a blotchy appearance which is not appreciated by the radiologists.

Materials and methods: Image quality was calculated objectively for the nominal parameters used in today’s protocol and compared to lower dose alternatives. Image quality parameters such as spatial resolution and image noise where calculated using PSF_Noise, a software program developed by physicists Arne Skretting and coworkers at the Radium Hospital in Oslo. In addition, Noise Power Spectrum curves where generated to be able to analyze the noise structure. Lower dose alternatives with objectively equal or better image quality as the nominal parameters were identified. An anthropomorphic phantom was used to further explore the lower dose alternatives. The images of the anthropomorphic phantom were evaluated by two experienced radiologists.

Results: The objective image quality analysis showed a potential for more than 50% dose reduction. However, the radiologist perceived these images as blotchy and therefore preferred the 25% dose reduction. Nevertheless, the new, lower-dose alternative settings should be further investigated on real patients before any final conclusion can be made.