sponding LSO screen the detection efficiency was found to vary from 78% down to 62%.
Conclusion: Considering the intrinsic columnar structure of CsI crystals which reduces light spreading and improves image resolution, CsI is significantly better to mammographic imaging systems although it has lower effective atomic number and density than LSO as well as than Gd2O2S, CaWO4. Acknowledgments: This work was financially supported by EPEAEK program 'Archimidis'.

C-0944

Influence of rib structure on detection of subtle lung nodules
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Purpose: To access the influence of anatomic noise on the detectablity of subtle lung nodules depicted on chest radiographs, focusing on the relationship between rib structures and nodule positions.
Methods and Materials: From the normal chest radiography images, 132 square regions were extracted, and the centers of these square images were on the upper margin of a rib, the inside of a rib, the lower margin of a rib and the central region between two adjoining ribs. Simulated nodules were digitally superimposed on the centers of these extracted square images. 12 radiologists viewed 50 softcopy images including these 792 processed images, including the noise-added images. The observer's confidence level for the nodule-added square image was used as an index of observer performance.
Results: Results indicated a statistically significant effect of the relationship between rib structures and nodule positions on the detection performance ($P < 0.001$). The nodule detectability on the images with a center located between two adjoining ribs was significantly the best, whereas it was significantly the worst on the noise-added images with a center located between two adjoining ribs. Further, the detectability of the nodules located on ribs showed a tendency to decrease in the order of the upper margin, the inside and the lower margin of a rib. However, these differences were small.
Conclusion: The rib structure overlying a subtle lung nodule on chest X-ray images will have a detrimental effect on nodule detection performance as anatomic noise, regardless of the nodule location on ribs.

C-0945

Tutorial on physical principles of MR imaging: Spin behavior study
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Learning Objectives: This tutorial shows to radiologists the spin behavior in the presence of a magnetic field and under the excitation of a RF pulse. It graphically animates and displays the precession movement of the spins and their behavior in a slice under the application of phase and frequency encoding gradients.
Background: The spin precession of the nucleus around its own axis acts as a small magnetic moment that behaves as a magnet. After applying an external main magnetic field, the small magnetic moment tends to align with it describing a precession movement. The encoding gradients generate a variation of the main field based on the position.
Procedure Details: The graphical user interface was developed under MATLAB 6.5. First, the user chooses some input parameters (main magnetic field strength, type of nucleus, applied RF excitation pulse flip angle). Then, the user will observe the precession movement of the selected nucleus and the amplitudes of the longitudinal and transverse magnetizations during the relaxation step, being able to analyze T1 and T2 relaxation times. The user will graphically evaluate the spins behavior of a slice under the application of a frequency and a phase encoding gradients.
Conclusion: The graphical study of the spin behavior under a RF pulse excitation in a magnetic field is, in general, a very useful way to explain the origin of the MR signal. This is a very important step in order to clarify how the MR image is obtained. It will be very well appreciated by radiologists.

C-0946

Performance evaluation of a clinical 64-slice spiral CT scanner
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Purpose: To evaluate a 64-slice cone-beam CT system with respect to image quality and susceptibility to cone-beam artifacts.
Methods and Materials: Our 64-slice CT scanner (Sensation 64, Siemens Medical Solutions, Forchheim, Germany) acquires 64 overlapping slices of 0.6 mm thickness. A z-flying focal spot (zFFS) switches between two z-positions and thereby allows one to acquire two slices per detector row. We used a thin wire phantom and a delta phantom (50µm gold disc) to quantify the spatial resolution. We evaluated the 0.5 s standard spiral scan mode for pitch values ranging from 0.5 to 1.5 in steps of 0.1. Further, a high contrast spatial resolution phantom consisting of rows of small holes oriented along x/y and along x/z was measured. Additionally we used a water phantom to assess image noise and an artifact phantom to search for spiral windmill artifacts.
Results: Neither image noise nor spatial resolution (0.7 mm FWHM in-plane and 0.65 mm FWHM in the z-direction) were dependent on the pitch value. The 0.4 mm holes holes were separated both along x/y and x/z, documenting an isotropic resolution. Image noise was constant in the rotation center but showed a sinusoidal dependency off-center. Spiral windmill artifacts, which predominantly appear for higher pitch values, remained low due to the zFFS even for the largest pitch value.
Conclusions: The zFFS technology provides an isotropic resolution of 0.4 mm and achieves considerable windmill artifact suppression.

C-0947

Optimising scan protocols and assessing image quality in clinical MR imaging
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Learning Objectives: 1) To illustrate the fundamentals of MR imaging through basic concepts which can be universally applied to imaging sequences, examination protocols and image interpretation. 2) To provide the basic criteria to assess image quality. 3) To provide simples criteria to optimise MR scan protocols for clinical radiology.
Background: The development of MR scanners and advanced techniques makes the scan protocol increasingly difficult to be optimised for clinical use. For this reason, the deep knowledge of the MR basis is crucial to perform a diagnostic examination within reasonable times and costs, considering the MR workflow. The clinical MR imaging can be summarised in these three aspects: 1) the generation of the signal the magnetization, 2) the signal encoding and 3) the image contrast. The knowledge of the relationships between these aspects is crucial for optimising the scan protocol.
Procedure Details: The fundamentals of the MR imaging acquisition technique are described through a simple visual based approach using graphs, phantoms and clinical cases. The algorithm for the optimisation of the scan protocol is provided. The major artifacts of MR imaging are shown using phantoms and clinical examples.
Conclusion: The basic concepts of MR imaging are crucial for the optimisation of the imaging sequence, the examination protocol and for image interpretation.

C-0948

Reliability of contrast-detail (C-D) diagrams deduced from a Markov chain and reduction in the number of observation times
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Purpose: Contrast-detail (C-D) diagrams are being used to evaluate image quality in medical diagnostics. To improve the accuracy of C-D analysis, observers must interpret many phantom images. This process in image quality evaluation requires a lot of time and labor. In this study, we devise a C-D analysis method which can reduce the number of observation times effectively using information theory called Markov chain.
Methods and Materials: A commercially available Burger phantom was employed as a test object and 20 phantom radiographs with 0.8 background densities were prepared. Examinees were 29 radiological technicians and 6 radiologists. The observers interpreted all phantom radiographs independently of each other with the room lights off. Assuming that the observer's interpretation of the phantom radiographs involve a simple Markov process, the contrast detectability for each signal diameter was calculated using data obtained from interpretations of two phantom radiographs and a C-D curve was constructed based on this result. Reproductions of the C-D curve were also investigated using some arbitrary set of two phantom radiographs. In addition, a normal C-D curve was constructed using arithmetical averages of contrast detectability obtained from interpretations of all phantom radiographs.
Results: All C-D curves deduced from the Markov chain agreed well with each other. Furthermore, these C-D curves were in excellent accord with the normal C-D curve obtained from interpretations of all phantom radiographs.
Conclusions: C-D curves deduced from the Markov chain are reliable and introduction of the Markov chain makes it possible to reduce the number of observation times.