MR elastography of the liver: techniques and clinical relevance

Kurzzusammenfassung: Many disease processes increase the tissue stiffness by edema, inflammation, or fibrosis. MR Elastography (MRE) is an MRI-based technique for quantifying tissue stiffness. The main application of MRE is non-invasive assessment of liver fibrosis. It is reported that MRE is useful for liver fibrosis staging as well as prognostic analysis of patients with liver disease. MRE is based on the physical principle that the propagation characteristics of mechanical waves within various materials are determined by their mechanical properties. The technique consists of three steps: i) generating mechanical waves in the region of interest, ii) imaging propagating mechanical waves using modified phase contrast technique, and iii) processing the information to calculate the mechanical properties. For measuring liver stiffness by MRE, mechanical waves are typically generated at 60 Hz in the upper abdomen with a flat disk-shaped vibration source that is placed against the body wall. During imaging, synchronous cyclic motion-sensitizing gradients are used with a modified phase-contrast MRI pulse sequence to acquire snapshots of the propagating waves, depicting displacements as small as fractions of microns. The acquired data are then automatically processed with an inversion algorithm to generate cross-sectional images showing shear stiffness on a color scale. The results of MRE have been validated by many researches using pathology as reference. Recent cohort study also suggested that MRE can be used not only for fibrosis staging but also for a predictor of clinical outcomes. In this talk, I will discuss; i) basics of MRE, ii) validity of MRE, and iii) clinical application of MRE.

Lernziele: To learn the basics of MR elastography (MRE)
To know the validity of MRE as a tool of staging liver fibrosis
To know the clinical application of liver MRE
With the increasing prevalence of liver disease worldwide, there is an urgent clinical need for reliable methods to diagnose and stage liver pathology. Liver biopsy, the current gold standard, is invasive and limited by sampling and observer dependent variability. Magnetic resonance protocols for liver tissue characterisation have been developed and evaluated in a variety of clinical settings. Multiparametric MRI has shown excellent diagnostic performance against liver biopsy for the staging of liver fibrosis and quantification fat and iron, and good prognostic performance for the prediction of adverse clinical outcomes. Furthermore, MR based techniques show promise as tools for monitoring the effects of therapy picking up early improvements. Lastly, MRI techniques have shown superior reproducibility compared to alternatives and have been used to study liver fat and liver iron in population level studies. Collectively, the emerging evidence suggests that liver multiparametric MR techniques can be powerful tools for the assessment of patients with liver disease, as they allow for the quantification of multiple parameters and can be applied in a variety of contexts of use.

Lernziele:
1. To become familiar with quantitative MRI techniques for liver tissue characterisation
2. To understand the concept of “iron corrected T1”
3. To gain an overview of the areas in which quantitative MR for liver tissue characterisation has been studied.

Quantitative assessment of liver function with Gd-EOB-DTPA

RöKo INT 301.3
9:55 Uhr
Referent(en): Ringe K

Kurzzusammenfassung: Gd-EOB-DTPA (gadoxetate disodium) is a liver specific contrast agent that shows an uptake by hepatocytes and subsequent biliary excretion, dependent on liver and kidney function. Based on its specific pharmacokinetic and pharmacodynamic properties, Gd-EOB-DTPA allows not only for dynamic liver imaging and morphological evaluation, but also for functional assessment of the hepatobiliary system. In this context, different approaches for quantification of liver function have been described, including the evaluation of biliary or parenchymal enhancement, the latter by means of signal intensity measurements, relative parenchymal enhancement measurements, assessment of T1 relaxation times (T1 mapping) or dynamic contrast enhanced (DCE) MRI.

Lernziele:
- To learn about the basic pharmacokinetic and pharmacodynamic properties of Gd-EOB-DTPA
- To discuss different technical approaches for quantification of liver function and potential indications

CT/MRI LI-RADS v2018 for liver nodules: how we read and report

RöKo INT 301.4
10:15 Uhr
Referent(en): Erturk S
Kurzzusammenfassung: LI-RADS (Liver Imaging Reporting and Data System) is an attempt to standardize imaging of the hepatocellular carcinoma with regard to screening and surveillance, diagnosis and follow-up of treatment. American College of Radiology released the first version of LI-RADS in 2011. The original version was updated in 2013, 2014 and 2017. The most important development in the sequence of events took place in the first months of 2018; American Association for the Study of Liver Diseases (AASLD) decided to integrate LI-RADS into its practice guidance. This development required some changes in the computerized tomography and magnetic resonance imaging of LI-RADS that are included in the newly released version 2018. In this presentation, LI-RADS version 2018 is discussed together with other guidelines such as those of the European Association for the Study of the Liver and the Japan Society of Hepatology.

Lernziele: 1. To understand the classification approach and basic algorithm of LI-RADS  
2. To understand the strengths and shortcomings of LI-RADS  
3. To obtain comparative knowledge about other guidelines

RöKo INT 301.5 Diskussion
10:35 Uhr