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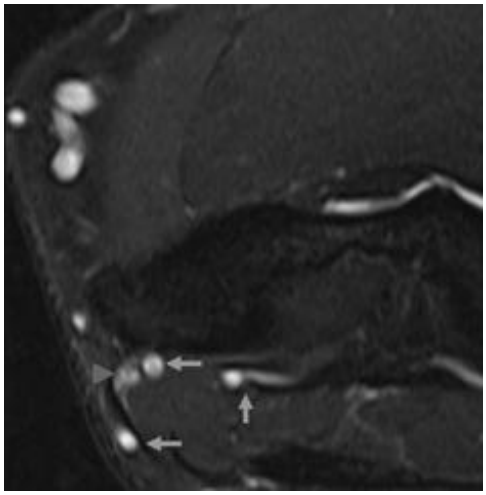

Figure: Axial fat-saturated PD image shows increased signal intensity of ulnar nerve (arrowhead), almost equal to signal intensity of adjacent vessels (arrows) in a professional baseball pitcher.

Conclusion

The results indicate that abnormal T2 hyperintensity of peripheral nerves around the elbow joint is seen commonly in professional pitchers, although the difference was not significant statistically. A larger sample with normal asymptomatic population which will serve as control cases might be helpful in examining the possible association. This finding of hyperintensity of peripheral nerves should be included in the report as early recognition and appropriate therapy may prevent further neurologic damage and permanent irreversible neuropathy.

KEYWORDS: Nerve imaging, Neurography, peripheral nerve MR imaging

P-112

Structure-Function Relationship in Healthy and Myelopathic Spinal Cord: A Combined Diffusion Tensor Imaging and Functional MR Imaging Study

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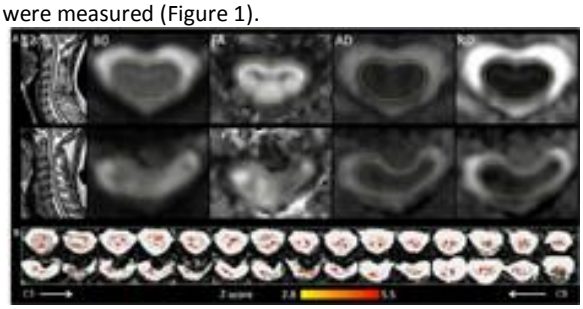
Purpose

Currently magnetic resonance imaging (MRI) plays an important role in the diagnosis of cervical spinal cord disorders [e.g., cervical spondylotic myelopathy (CSM)]. The conventional T1- and T2-weighted MRI has provided great benefits in terms of rapid, noninvasive and accurate imaging of cord morphology. However, it is reported that the morphologic and signal change do not necessarily correlate with functional behavior and clinical symptoms. Recently, diffusion tensor imaging (DTI) and blood oxygen level-dependent (BOLD) MR imaging has been developed rapidly to investigate the microstructure and functional behavior of the spinal cord. In this study, we aim to combine the anatomical, functional and diffusion tensor MRI to explore the relationship between function and structure in healthy and myelopathic cervical spinal cord.

Materials & Methods

A total of twenty subjects were recruited with written informed consent, including 14 healthy subjects (age=56±13 years) and six CSM patients (age=67±14 years). Anatomical T2-weighted, diffusion tensor and functional MRI were scanned covering the whole cervical spinal cord from C1 to C7 on a 3T MR system. Cross-sectional area, compression ratio, fractional anisotropy, axial diffusivity, radial diffusivity and BOLD signal change were measured (Figure 1).



Results

The result showed that BOLD signal change in response to somatosensory stimuli was significantly higher in myelopathic cord (7.86±0.95%) compared to healthy cord (5.52±0.21%) ($p<0.01$). Significant differences were detected between healthy and myelopathic cord for: cross-sectional area (Healthy: 81.78±15.59; CSM: 61.35±14.71, $p<0.05$), compression ratio (Healthy: 58.33±13.03%; CSM: 51.51±10.13%, $p<0.05$), fractional anisotropy (Healthy: 0.65±0.07; CSM: 0.53±0.10, $p<0.01$) and radial anisotropy (Healthy: $0.63\pm0.12\times10^{-3}$ mm^2/s; CSM: $1.05\pm0.47\times10^{-3}$ mm^2/s, $p<0.01$). There was no significant difference of axial diffusivity between healthy subjects and CSM patients (Healthy: $1.71\pm0.14\times10^{-3}$ mm^2/s; CSM: $1.73\pm0.13\times10^{-3}$ mm^2/s) ($p>0.05$). BOLD signal change indicated a much stronger correlation with FA value (Healthy: $r=0.4887$, $p=0.0764$; CSM: $r=-0.8938$, $p=0.0163$) and RD value (Healthy: $r=-0.5348$; $p=0.0488$; CSM: $r=0.8239$; $p=0.0438$) compared to that with compression ratio or cross-sectional area.

Conclusion

Our results indicate that diffusion tensor measurement provides a more accurate estimation of spinal cord functional behavior than morphometry. Moreover, greater microstructural damage was significantly and linearly correlated with enhanced activation in myelopathic cord, which implies the functional reorganization in CSM. This study demonstrates a quantitative relationship between the extent of structural integrity and functional response in healthy and myelopathic cord, which might provide a promising method to gain additional insight into the role of structural damage and functional reorganization in the spinal cord diseases.

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KEYWORDS: Diffusion tensor image, BOLD fMRI

P-113

Retrospective Validation of a Rapid Lumbar Spine MR Protocol for Assessment of Patients with Acute Atraumatic Cord Compression Presenting to the Emergency Room

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Purpose
Nontraumatic acute spinal cord injury (NT/SCI) and cauda equina syndrome are medical emergencies that if not identified and treated early can lead to permanent neurologic deficits. MR imaging is strongly recommended for diagnosis and prognosis of acute spinal cord injury and can be used to direct clinical decision-making; sagittal T2 sequences are of particular diagnostic utility. There are many etiologies of acute NT/SCI, including spinal stenosis, bulky disk herniation, compression from a mass, infection, and vascular compromise. Delay in treatment can result in permanent neurologic deficits. The ideal protocol should be both sufficiently informative, yet not time-consuming to perform or interpret. Utilization of MRI continues to increase, particularly in the ER setting. The purpose of this study is to optimize and retrospectively validate an MRI protocol for acute NT/SCI for the emergency department at Hartford Hospital, a busy tertiary care hospital that triages over 100,000 patients/year in the ED. A rapid protocol could reduce the time to patient treatment, facilitate the clinician's ability to obtain an MRI for more patients in general, as well as for patients who are medically unstable, and decrease overall cost by reducing scan time.
Materials & Methods
Sagittal T1 (noncontrast) and T2 sequences from 30 consecutive MRI examinations of the lumbar spine ordered from the emergency department for NT/SCI were pulled from the Hartford Hospital PACS, without regard to whether the studies initially had been performed with or without contrast. Four radiologists (two experienced neuroradiologists, DLZ and MMG, and two experienced radiologists with subspecialties other than neuroradiology, TF and TH) were blinded to the clinical and demographic information of the subjects as well as the previous interpretation. Their interpretations based on the sagittal T1 and T2 sequences only were compared with the original interpretations (DLB and AB).
Results
The overall accuracy of all readers was extremely high, ranging from 83-90%. There was substantial agreement between readers as well (Cohen's kappa of 0.71 between neuroradiologists and 0.77 between non-neuroradiologists). When noncontrast studies were evaluated separately, performance was significantly better, with accuracy rates ranging from 91-100%. In particular, both neuroradiologists were 100% accurate with all noncontrast exams. Accuracy on studies initially performed with contrast ranged from 74-84%.
Conclusion
A lumbar MRI protocol limited to sagittal T1- and T2-weighted sequences for assessment of acute atraumatic NT/SCI presenting to the ER is a robust technique with high interobserver agreement across radiologists in multiple subspecialties. This protocol can accurately diagnose specific etiologies of acute NT/SCI, especially for exams that are requested without gadolinium contrast. Implementation of this protocol in the ED setting has the potential to reduce the time to treatment for patients, limit patient morbidity and mortality, facilitate a clinician's ability to obtain an MRI for more patients, and decrease overall cost by reducing scan time.

KEYWORDS: Spinal imaging, MR imaging spine

P-114

Utility of CT-Guided Bone Biopsy for Vertebral Osteomyelitis

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Purpose
CT-guided bone biopsy has been advocated as a useful tool to aid in the diagnosis and treatment of suspected vertebral osteomyelitis. No large review study providing convincing evidence supporting this practice is available. This single institution retrospective study is aimed at providing concrete data to help guide the discussion and debate over the usefulness of image-guided bone biopsy for vertebral osteomyelitis.
Materials & Methods
Data pertaining to vertebral body bone biopsies performed from January 2003 to March 2011 at the University of Illinois Hospital Chicago was compiled. Antibiotic regimens/treatment plans (prebiopsy) for the patients undergoing biopsy were recorded. Alterations in treatment plan based on the results of these biopsies were analyzed. The study design was that of a retrospective chart review.
Results
Of the 109 total vertebral body biopsies performed during the study period, 72 were performed for clinically or radiologically suspected cases of vertebral osteomyelitis. Fifty of these patients with clinically diagnosed osteomyelitis had negative culture results. Of the patients with negative culture results, the biopsy changed management in one case, but that change was based on unexpected pathology rather than culture results. In seven patients the biopsies never yielded a diagnostic culture. The total number of positive culture results from these 72 biopsies was 15. Two of those patients were lost to