Comparison of STIR and T2 FAT SAT in bone bruise imaging for occult scaphoid fracture

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Comparison of STIR and T2 FAT SAT in bone bruise MRI musculoskeletal imaging of occult scaphoid fracture (1.5T)

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Introduction

Since the introduction of Magnetic resonance imaging (MRI), the use of high-field-strength MRI in musculoskeletal imaging has become more common. The benefits of MRI is shown as a desirable method in the diagnostics of occult scaphoid fracture in particular the visualization of bone bruise (1). Different fat suppression sequences with different backgrounds can detect the presence of bone bruise e.g. Short tau inversion recovery (STIR), Spectral fat saturation (FAT SAT), Hybrid, Fat – water separation and Dixon (2). However, a majority of published articles describes the standard method for musculoskeletal MRI fat suppression comprising the STIR or T2 FAT SAT sequence, but no unified guidelines is described. Sufficient choice of sequence may result in consequences for the patient as pseudoarthrosis, osteoarthrosis, avascular necrosis and chronic wrist pain, if a fracture remains undiagnosed (3,4).

The high-field-strength MRI have resulted in a higher signal to noise ratio (SNR) as well as a wider chemical shift between the fat and water signals. Theoretically a high field strength (>1T) is required when executing a T2 FAT SAT sequence, consequently causing a technique with a high SNR in relation to a short scan time, but with a sensitive field heterogeneity, vulnerable to off centered imaging and metal implants. The STIR sequence is a safe method for the diagnostic but with low SNR in relation to a longer scan time. However, it will always be possible to improve the image quality in MRI as the deterioration of e.g. a even longer scan-time, but all consequences (i.e. movement artifacts) ought to be considered before conducting a standard protocol (5,7).

Aim of the study

To investigate differences between STIR and T2 FAT SAT in detection of bone bruise in a prospective study.

Methods

In the period March 2014 until January 2015 195 patients underwent MRI examinations of the scaphoid bone. Fifty-one patients (average: 19 years; M: 40, F:11) met the inclusion criteria’s.

Inclusion criteria for acute MRI scan of scaphoid bone

- Relevant trauma less than 2 weeks
- Negative X ray of scaphoid bone
- Positive clinical finding
- Age > 10 years (> 3 mm between the scaphoid bone and the lunate bone)
- Bone bruise on coronal STIR and sagittal T2 FAT SAT
- Motion artifact free sagittal T2 FAT SAT and STIR images

The fifty-one recruited patients underwent an additional sagittal STIR Sequence scan. The sagittal T2 FAT SAT and STIR were then compared and evaluated.

Imaging Technique

The MRI scans were performed on a 1.5 T extremity scanner (GE Healthcare Systems, ©Optima MR430s, 4.02 software release, Milwaukee, WI, USA). a 123 mm quadrature coil was used.

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1. Comparison of the area
2. Comparison of CNR
3. Comparison of bone bruise image contrast

Reference