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Meincke, Louise; Radev, Dimitar; Lauridsen, Carsten Ammitzbøl

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

Louise Meincke, BA graduate from the Bachelor’s Degree Programme in Radiography (Frederiksborg hospital)
Partner University/ Collaboration Partner: Dimitar Ivanov Radev MD (Gentofte hospital), Carsten Ammitzbøl Lauridsen (Metropol).

Poster presentation: Del Sundhedsfaglige og Teknologiske Fakultet Professionshøjskolen Metropol, Tagensvej 18, 2200 København N, Denmark.

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, osteoarthritis, 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 at the detriment of e.g. a even longer scan-time, but all consequences (i.e. movement artefacts) ought to be considered before conducting a standard protocol (5-7).

Methods

Image evaluation

Bone bruise and image quality assessment included three methods:

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

The image material was continually and independently assessed by all three readers blinded to each other’s results. All measurements were performed on the same slice and the same PACS monitor, to ensure a identical and comparable image quality.

Data were subsequently analyzed by unpaired Student’s t-test and Pearson correlation analysis (PCG).

Results

There was no significant variation relative to the area of the bone bruise (p > 0.005) and the CNR (p > 0.005).

There was a significant variation relative image contrast (C) (p < 0.005).

The PCC showed that the agreement of the tendon (C = y/x) between the STIR and FAT SAT sequences was published in number 6, p. 915.


Conclusion

An interchangeably usage of the two sequences was found acceptable for the diagnostic (> 1 T) if the protocol is properly composed. However, the T2 FAT SAT sequence provides a image contrast superior to the STIR sequence.

References


7. The study was presented on the ESSR Congress 2015, York, UK. An abstract of the presentation.

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The PCC showed that the agreement of the tendon scores revealed a positive correlation. (C) was considered too positive, if was considered too correlation and +1 as total negative.


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