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MRI and MRS investigation of patients with artificial hip joints at 3 T

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Introduction

MRI is widely used as a diagnostic tool in the assessment of the musculoskeletal system, but many implants are unsafe for this method. While non-ferromagnetic materials, used in modern orthopaedic medicine, are not attracted by magnetic field excessive heating by RF absorption may damage health and magnetic field distortions may limit the diagnostic value of MRI. Nevertheless both methods would be useful to assess impairments of the muscle by surgery and to detect peri-prosthetic complications. Therefore it was investigated in this study if MRI and ^{31}P-MRS measurements to characterize muscular tissue adjacent to prosthetic materials are feasible.

Methods

Two patients with a right-sided hip joint replacement (m, 68 J; f, 60 J) were investigated using a 3 T-MR scanner and a spine matrix coil for MRI as well as a sent/receive surface coil (∅=6 cm) for ^{31}P-MRS, placed above the *M. gluteus medius*. Imaging was performed using a T1-W 2D-TSE-sequence (TR/TE=721/9.6, BW=279 s^{-1}) in coronal and transversal direction and ^{31}P-MR spectroscopy by using a FID-sequence without gradient mediated volume selection (TR=5 s, NSA=128). The magnetic homogeneity in the muscular region covered by the sensitivity range of the surface coil was manually shimmed prior to spectroscopy.

Results

No signs of magnetic attraction forces or heating around the prosthetic material were reported from both investigated subjects. Susceptibility induced signal losses and geometric distortions were observed in the region between 10 and 30 mm around the prosthetic material, without covering regions of the *M. gluteus medius*. ^{31}P-MR spectra indicate PCr line widths of 10 and 15 Hz and SNR values of 2.9 10^3 and 1.9 10^3.

Conclusion

MRI and MR spectroscopy of patients with non-ferromagnetic metallic artificial hip joints to characterize the muscle tissue of the *M. gluteus medius* is possible, if measurements were performed carefully with attention for heating and moving effects.