Validation of ‘InBody’ Bioelectrical Impedance by Whole Body MRI

E.L. Thomas¹, G. Frost², T. Harrington¹ and J.D. Bell¹

¹The Robert Steiner MR Unit and ²Nutrition and Dietetic Research Group, Imperial College of Medicine, Hammersmith Hospital, London.

MRI has been shown to be an excellent technique for measuring body fat content, with its ability to separately quantify specific fat compartments being a real advantage over other techniques. However, it is not suitable for large population studies. Bioelectrical impedance is widely used as a method for assessing body composition, however previous studies have found there is good correlation between fat measurements by MRI and impedance, but agreement was poor (Thomas et al. 1998). The advent of a new generation of impedance systems for measuring body fat content requires that the relationship between the two techniques is re-examined. The aim of this study was to compare body fat content measured by whole body MRI with that measured by the ‘InBody’ bioelectrical impedance system.

15 volunteers (6 male, 9 female), aged 24-46 years, BMI 17.7-37.0 kg/m² were studied. For whole body MRI subjects were imaged lying prone in a Picker 1.0T HPQ system with a rapid T1 weighted spin-echo sequence (TR 36 ms, TE 14 ms). Subjects were scanned from their fingertips to their toes by acquiring 10 mm thick transverse images with a 30 mm gap between slices in the arms and legs and a 10 mm gap in the torso. Images were analyzed using a software programme that employs a threshold range and a contour following algorithm with an interactive image editing facility (Barnard et al. 1997). The “InBody” system is a method of multifrequency segmental bioelectrical impedance. All subjects were measured following a standard methodology, all measurements following completely emptying their bladder. The InBody uses 8-point tactile electrodes volunteers stand on a footplate, which has 2 electrodes per foot and hold a handgrip with two electrodes per hand. The mathematical methodology is presented elsewhere (Cha et al. 1996).

The mean % body fat from MRI was 23.6 ± 1.48 and the InBody was 23.2 ± 1.85. The Bland and Altman accuracy plot below shows that there is excellent agreement between the two methodologies.
These results of this study demonstrate for the first time good agreement between a gold standard method of body composition analysis, in this case MRI, and multifrequency bioelectrical impedance. Although the multifrequency bioelectrical impedance system is unable to assess individual adipose deposits, which is one of the great strengths of MRI, it has the advantage that it is a very simple, cheap technique, which is quick and has great potential in a large epidemiological study.