

# Validation of 'InBody' Bioelectrical Impedance by Whole Body MRI

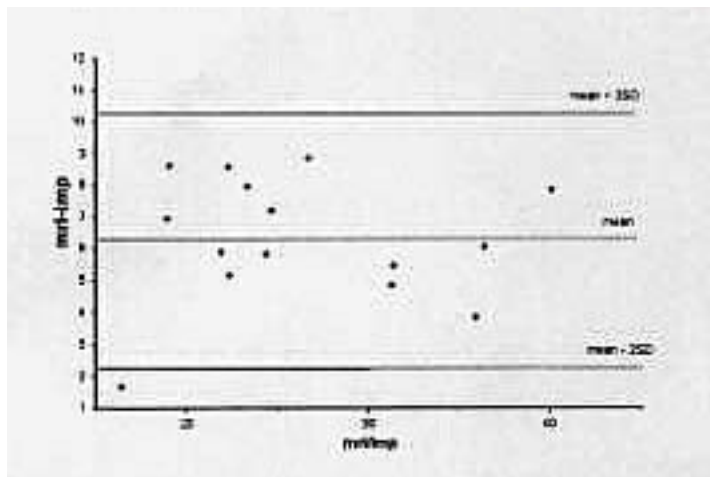
*E.L.Thomas<sup>1</sup>, G.Frost<sup>2</sup>, T.Harrington<sup>1</sup> and J.D.Bell<sup>1</sup>*

<sup>1</sup>The Robert Steiner MR Unit and <sup>2</sup>Nutrition 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/m<sup>2</sup> 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 this 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  $23.6 \pm 1.48$  and the InBody was  $23.2 \pm 1.85$ . 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.

Barnard, M.L., Schwieso, J.E., Thomas, E.L., Bell, J.D., Saeed, N., Frost, G., Bloom, S.R. and Hajnal, J.V.

(1997) Development of a rapid and efficient magnetic resonance imaging technique for analysis of body fat distribution. *NMR in Biomed.* 9,156-164.

Cha, K., Chertow, G.M., Gonzalez, J., Lazerus, J.M. and Wilmore, D.W. (1996) Multifrequency bioelectrical impedance and the distribution of body water. *J.Appl.Physiol.* 79,1316-1319.

Thomas, E.L., Brynes, A.E., Goldstone, A.P., Saeed, N., Hajnal, J.V., Hollond, A., Bloom, S.R. and Bell, J.D. (1998) Comparison of body composition analysis using whole body magnetic resonance imaging, bioimpedance and skinfold anthropometry in lean and obese healthy and Prader-Willi syndrome subjects. *Proc.Nutr.Soc.* 57,112A.

---

**Biospace Co., Ltd.**

10F, Poonglim Building, YeokSam  
1-dong, Kangnam-gu Seoul (135-  
784) REPUBLIC OF KOREA  
Phone: +82-02-501-3939  
Fax: +82-02-501-3978  
Web: www.biospace.co.kr  
E-mail: biospace@biospace.co.kr

**Biospace Co., Ltd.**

Nishiyama Bldg. 2F, Yushima  
1-2-13, Bunkyo, Tokyo JAPAN  
Phone: + 81-3-5298-7667  
Fax: + 81-3-5298-7668  
Web: www.biospace.co.jp  
E-mail: biospace@biospace.co.jp

**Biospace Inc.**

Web:  
www.biospace.co.kr  
E-mail:  
BS\_USA@biospace.co.kr

**Biospace Europe GmbH**

Bernardstrasse 112 D-63067 Offenbach  
am Main GERMANY  
Phone: +49-(0)69-8010 6969/8008  
6725  
Fax +49-(0)69-8008 6778  
Web: www.biospace-europe.de  
E-mail: chriskoo@biospace-europe.de

---

**BIOSPACE**