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Can energy expenditure estimates from bio-impedance equipment replace estimates by Harris-Benedict in patients with head and neck cancer? An exploratory study

M.J. Sealy*[1,2], M.M. Stuiver[3,4,5], C.P. van der Schans[1,5,6], J.L. Roodenburg[2], H. Jager-Wittenaar[1,2]

1. Research Group Healthy Ageing, Allied Health Care and Nursing, Hanze University of Applied Sciences, Groningen, The Netherlands.
2. Department of Maxillofacial Surgery, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands.
3. ACHIEVE Center of Applied Sciences, Faculty of Health, Amsterdam University of Applied Sciences, The Netherlands.
4. Center for Quality of Life and Department of Head and neck surgery and oncology, Netherlands Cancer Institute, Amsterdam, The Netherlands.
5. Department of Health Psychology Research, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands.
6. Department of Rehabilitation Medicine, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands.

Aim

We aimed to explore whether resting energy expenditure (REE) estimated by a bio-impedance analysis (BIA) device or by the Harris-Benedict (HB) equation, and total energy expenditure (TEE) estimated by a BIA device may provide an alternative for indirect calorimetry (IC) and physical activity level (PAL) measurements in patients with head and neck cancer (HNC) prior to surgery.

Conclusion

In this sample of HNC patients, REE estimated by HB or BIA, and estimated TEE do not adequately agree with measured REE and TEE, respectively. Estimates of REE and TEE were widely distributed, and estimated TEE overestimated measured TEE. Therefore, our results suggest that IC and accelerometer measurements cannot be replaced by BIA and HB estimates.

Background

Resting energy expenditure (REE) and total energy expenditure (TEE) may be altered in patients with head and neck cancer (HNC).

Methods

- REE was measured by IC (Cosmed k4b2).
- REE estimated by BIA (Bodystat1500) using the Brozek & Grande equation, and by adapted HB equation (Roza & Shizgal, 1984) were compared to measured REE.
- TEE estimated by BIA, i.e., from REE and reported physical activity was compared to measured TEE (REE by IC and daily PAL [MET equivalents] as measured by accelerometer [SWP3]).
- Agreement was explored with ICC (two-way mixed) and Bland Altman plots.
  ICC ≥0.80 was considered adequate, p-value <0.05 was considered significant.
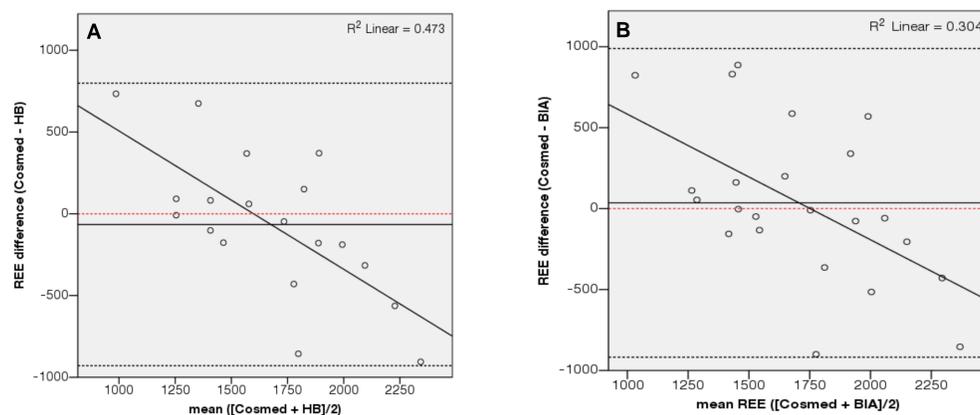

Figure 1. Bland Altman plots depicting resting energy expenditure (REE) measured with indirect calorimetry (IC; Cosmed) versus Harris-Benedict (HB) estimates (A) and REE measured with IC versus bio-impedance analysis (BIA) estimates (B)
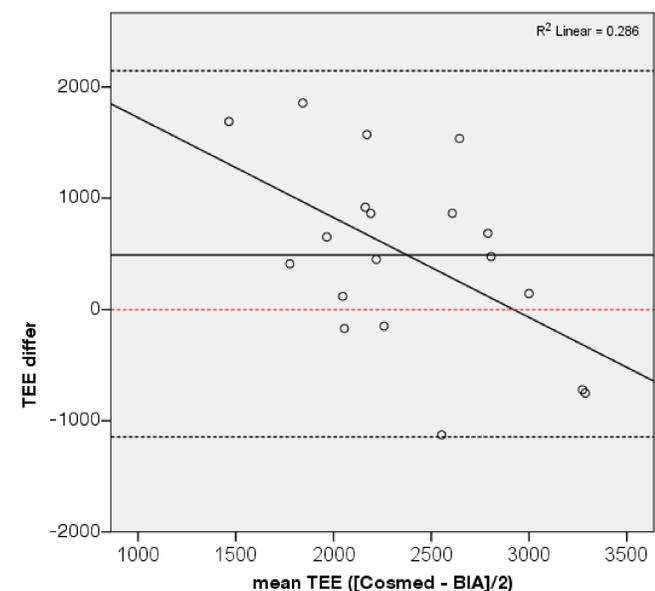

Figure 2. Bland Altman plots depicting total energy expenditure (TEE) measured with indirect calorimetry (IC; Cosmed) plus accelerometer (SWP3) versus TEE bio-impedance analysis (BIA) estimates

Results

- 19 HNC patients (61.9±6.6 y; 63% male; stage 1: n=5, stage 2: n=9, stage 4: n=5) were included.
- REE: agreement between BIA and IC (ICC=0.40, 95% CI: -0.06-0.72) and between HB and IC (ICC=0.46, 95% CI: 0.02-0.75) was not adequate.
- TEE: agreement between BIA and IC was not adequate (ICC=0.14, 95% CI: -0.21-0.51).
- Bland-Altman plots for REE: mean difference of 35 kcal (p=0.731, limits of agreement [LOA]: 989; -919 kcal) for BIA vs. IC, and -66 kcal (p=0.525, LOA: 798; -929 kcal) for HB vs. IC.
- Mean difference of TEE for BIA vs. IC was 491 kcal (p=0.02, LOA: 2146; -1164 kcal).

Contact details

Martine Sealy
E-mail: m.j.sealy@pl.hanze.nl

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