Estimating resting energy expenditure in people living with amyotrophic lateral sclerosis [Abstract only]

ROSCOE, Sarah, SKINNER, Ellie, ALLEN, Scott, CHILDS, Charmaine <http://orcid.org/0000-0002-1558-5633>, WEEKES, Elizabeth, MCDERMOTT, Christopher and STAVROULAKIS, Theocharis

Estimating resting energy expenditure in people living with Amyotrophic Lateral Sclerosis

Sarah Roscoe[1], Ellie Skinner[1], Scott Allen[1], Charmaine Childs[2], Elizabeth Weekes[3], Christopher McDermott[1]*, Theocharis Stavroulakis[1]*

[1] Sheffield Institute for Translational Neuroscience, The University of Sheffield, Sheffield, UK.

[2] College of Health, Wellbeing and Life Sciences, Sheffield Hallam University, Sheffield, UK

[3] Department of Nutrition & Dietetics, Guy's & St Thomas' NHS Foundation Trust, St Thomas' Hospital, London, UK

* Authors contributed equally

Background

Up to 70% of people living with (plw) ALS consume a sub-optimal caloric intake. When compounded by hypermetabolism, this can lead to dysregulated energy homeostasis, substrate utilisation and malnutrition; associated with a poorer prognosis.

82% of dietitians caring for plwALS use equations to predict resting energy expenditure (pREE) and estimate caloric requirements. These equations incorporate variables such as weight, which – when applied to plwALS – deviate from the assumed contributions observed in healthy individuals. Weight measurements include metabolically active (e.g., skeletal muscle) and inactive (e.g., adipose) tissues. The paradoxical reduction of skeletal muscle in plwALS therefore alters metabolic contributions to REE. pREE has been shown to underestimate REE in ≤71.4% plwALS.

ALS-specific equations have been devised to overcome these limitations. However, these include bioimpedance or Dual-Energy X-ray Absorptiometry (DEXA) measurements, which are expensive and not widely available.

A metabolic index (MI) of ≥110% determined by the difference of measured REE (mREE) against pREE ([mREE/pREE] x 100) is frequently used to determine hypermetabolism in plwMND, but yet there is no agreed method for pREE in plwALS: whilst the Henry equation

is used by 83% of dietitians; the Harris-Benedict equation is predominantly cited in published literature – despite discontinuation of this in ALS clinical practice.

Aim

We aim to demonstrate the unsuitability of comparing mREE against pREE to determine hypermetabolism in plwMND.

Methodology

mREE was determined using VO_2 and VCO_2 measurements from a GEM Nutrition indirect calorimeter (IC). In the absence of bioimpedance or DEXA assessments, pREE was estimated by HB and Henry equations. The percentage of REE variation (ΔREE) determined the accuracy of comparing pREE against mREE (ΔREE = ([pREE-mREE]/mREE) x 100), with accuracy defined as ΔREE ≤±10%. A MI threshold of ≥110% was used to classify hypermetabolism. All REE data is presented as kcal/24hrs.

Results

At time of submission, IC has been conducted for 18 plwMND. The median mREE was 1714.7, ranging between 915 and 2018.6. When analysed for the entire cohort, both equations underestimated REE, but remained within the accuracy threshold (≤±10%) (median ΔREE = HB: -2.5; Henry: -1.6). Conversely, inter-individual ΔREE within this cohort revealed both of these equations inaccurately reflected mREE for 72.2% of participants. Similarly, whilst the overall cohort was not classified as hypermetabolic (median MI = HB: 102.6; Henry: 101.7%), the MI ranges within the cohort were 70.9-145.7% for HB and 73-145.5% for Henry, indicating over- and under-estimation of REE by these equations.

Conclusion

Whilst pREE using the HB or Henry equation accurately reflects mREE for our entire cohort, the inter-individual inaccuracy leads us to argue against the classification of hypermetabolism in this manner.

Acknowledgements

This study has received funding from the Darby Rimmer MND Foundation and the NIHR Sheffield Biomedical Research Centre.