



ORIGINAL ARTICLE

Interference of heart and transcutaneous oxygen monitoring in the measurement of bioelectrical impedance analysis in preterm newborns^{☆,☆☆}



Viviane C. Comym^{a,*}, Yuri S. Macedu^a, Eduardo K.P.B. Neves^a,
Arnaldo C. Bueno^b, Herminia C. Fernandez^a, Maria E.L. Moreira^c, Alan A. Vieira^b

^a Universidade Federal Fluminense (UFF), Niterói, RJ, Brazil

^b Universidade Federal Fluminense (UFF), Departamento Materno Infantil, Niterói, RJ, Brazil

^c Fundação Oswaldo Cruz (Fiocruz), Instituto Fernandes Figueira (IFF), Rio de Janeiro, RJ, Brazil

Received 3 October 2015; accepted 13 January 2016

Available online 26 May 2016

KEYWORDS

Electrical impedance;
Neonate;
Body composition

Abstract

Objective: To verify if the connection of electrodes for heart and transcutaneous oxygen monitoring interfere with the measurement of electrical bioimpedance in preterm newborns.

Methods: This was a prospective, blinded, controlled, cross-sectional, crossover study that assessed and compared paired measures of resistance (R) and reactance (Xc) by BIA, obtained with and without monitoring wires attached to the preterm newborn. The measurements were performed in immediate sequence, after randomization to the presence or absence of electrodes. The sample size calculated was 114 measurements or tests with monitoring wires and 114 without monitoring wires, considering for a difference between the averages of 0.1 ohms, with an alpha error of 10% and beta error of 20%, with significance <0.05.

Results: No differences were observed between the R (677.37 ± 196.07 vs. 677.46 ± 194.86) and Xc (31.15 ± 9.36 vs. 31.01 ± 9.56) values obtained with and without monitoring wires, respectively, with good correlation between them (R: 0.997 and Xc: 0.968).

[☆] Please cite this article as: Comym VC, Macedu YS, Neves EK, Bueno AC, Fernandez HC, Moreira ME, et al. Interference of heart and transcutaneous oxygen monitoring in the measurement of bioelectrical impedance analysis in preterm newborns. J Pediatr (Rio J). 2016;92:528–31.

^{☆☆} Study carried out at Universidade Federal Fluminense, Niterói, RJ, Brazil.

* Corresponding author.

E-mail: viviane.comym@gmail.com (V.C. Comym).

PALAVRAS-CHAVE

Impedância elétrica;
Recém-nascido;
Composição corporal

Conclusion: The presence of heart and/or transcutaneous oxygen monitoring wires connected to the preterm newborn did not affect the values of R or Xc measured by BIA, allowing them to be carried out in this population without risks.

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Interferência da monitoração cardíaca e transcutânea de oxigênio na aferição da bioimpedância elétrica em recém-nascidos pré-termo

Resumo

Objetivo: Verificar se a conexão de eletrodos e fios de monitoração cardíaca e transcutânea de oxigênio interferem na aferição da bioimpedância elétrica em recém-nascidos pré-termo (RNPT).

Metodologia: Estudo prospectivo, cego, randomizado, transversal, *crossover*, em que foram mensuradas e comparadas medidas pareadas de resistência (R) e reatância (Xc) por meio da BIA, obtidas com e sem os fios de monitoração acoplados aos RNPT. As medidas foram feitas em sequência imediata, após aleatorização para a presença ou ausência dos eletrodos. O tamanho amostral calculado foi de 114 aferições ou exames com fios de monitoração e 114 sem fios de monitoração, considerando para uma diferença entre as médias de 0,1 ohms, com erro alfa de 10% e erro beta de 20%, com significância < 0,05.

Resultados: Não foram observadas diferenças entre os valores de resistência ($677,37 \pm 196,07$ vs $677,46 \pm 194,86$) e reatância ($31,15 \pm 9,36$ vs $31,01 \pm 9,56$) obtidos com e sem fios de monitoração respectivamente, com boa correlação entre ambos (resistência:0,997 e reatância:0,968).

Conclusão: A presença de fios de monitoração cardíaca e/ou transcutânea de oxigênio não interferiu nos valores da resistência ou da reatância aferidos pela BIA em RNPT. Recomenda-se, então, esse exame, sem riscos, para essa população.

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Introduction

Among the methods used for assessing body composition, bioelectrical impedance analysis (BIA) has been widely used, especially for being non-invasive, painless, practical, safe, low-cost, and easily performed at the bedside. Another reason for its use is the fact that it estimates, in addition to body components, the distribution of fluids in the intra- and extracellular spaces, as well as the quality, size and integrity of cell membranes.^{1,2} It can be repeated as often as necessary, thus allowing for the follow-up of patients of different ages, body weight, and health status.

It is therefore a promising tool to be incorporated into clinical research and routine evaluation of patients from different medical specialties, including neonatology.³

Currently, in addition to the limited data available on BIA in newborns, mainly preterm ones, there is no consensus on the methodological standardization of this exam for this population.⁴ For instance, it has been suggested that being attached to a monitoring wire precludes the performance of the BIA. However, the continuous monitoring of several physiological parameters is required to maintain the safety of newborns in intensive care.

The objective of this study was to verify whether, in fact, the presence of electrodes and wires for heart and transcutaneous oxygen monitoring attached to preterm newborns

interfere with the values of resistance (R) and reactance (Xc) measured by BIA.

Methods

This was a prospective, blinded, randomized, crossover study that compared measurements made by BIA for the evaluation of R and Xc in preterm infants with and without heart and transcutaneous oxygen monitoring wires.

The test was standardized as follows: the internal electrode (detector – red color) of the arm was placed on the dorsal surface of the right wrist between the ulnar and radius bones, whereas the outer electrode (emitter – black color) was placed on the third metacarpal; the internal leg electrode was placed on the anterior surface of the right ankle, between the prominent portions of the bones, whereas the external was placed on the surface of the third metatarsus.⁵

During the examinations, both the examiner and the parents/guardians were asked not to touch the newborn, who was placed on the dorsal position, with the limbs separated, without touching metal, to avoid reduction/random dispersion of electric current. The examination lasted approximately 5 min.

The collection was carried out for 1 h and 30 min after the end of the feeding, to prevent the manipulation of the newborn from causing emetic episodes or interfering with

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