



ORIGINAL ARTICLE

## Neurophysiological and functional assessment of patients with difficult-to-control asthma<sup>☆</sup>

F. Freitas Canuto<sup>a</sup>, S.M. Silva<sup>b,\*</sup>, L.M. Malosá Sampaio<sup>c</sup>, R. Stirbulov<sup>d</sup>,  
J.C. Ferrari Corrêa<sup>e</sup>

<sup>a</sup> Unidade de Ciências da Reabilitação, Programa de Pós-Graduação em Ciências da Reabilitação, Universidade Nove de Julho (UNINOVE), São Paulo, SP, Brazil

<sup>b</sup> Unidade de Ciências da Reabilitação, Programa de Pós-Graduação em Ciências da Reabilitação, Universidade Nove de Julho (UNINOVE), São Paulo, SP, Brazil

<sup>c</sup> Programa de Pós-Graduação em Ciências da Reabilitação, Universidade Nove de Julho (UNINOVE), São Paulo, SP, Brazil

<sup>d</sup> Unidade de Disciplina de Pneumologia, Faculdade de Ciências Médicas da Santa Casa de São Paulo, São Paulo, SP, Brazil

<sup>e</sup> Programa de Pós-Graduação em Ciências da Reabilitação, Universidade Nove de Julho (UNINOVE), São Paulo, SP, Brazil

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### KEYWORDS

Asthma;  
Neurophysiology;  
Functional capacity

### Abstract

**Introduction:** Due to the inadequate response to inhaled corticosteroids, patients with difficult-to-control asthma (DCA) are submitted to oral corticosteroids or use of omalizumab. Although it is necessary to treat these patients, a significant relationship between steroid usage and both peripheral and respiratory weakness muscle, results in implications, such as loss of quality of life and compromised lung function. Nonetheless, it is not known whether these patients suffer neurophysiological changes due to drug effect.

**Objective:** To investigate the neurophysiological and functional characteristics of patients with DCA in order to gain a better understanding of the condition.

**Method:** A cross-sectional study was carried out involving three groups of patients: DCA-C (use of oral corticosteroids), DCA-O (use of omalizumab) and CG (healthy controls matched for age). The assessment involved the six-minute walk test, sit-to-stand test, static balance on a pressure platform, patellar and Achilles reflexes and quadriceps strength in the dominant leg.

**Results:** The results revealed no statistically significant differences between the control group and DCA groups in relation to neurophysiological aspects. However, the DCA groups exhibited a significant reduction in functional capacity [decreased muscle strength ( $p < 0.05$ ), shorter distance covered on walk test ( $p < 0.05$ ) and lesser number of repetitions on sit-to-stand test ( $p < 0.05$ )] in comparison to the control group.

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\* Corresponding author.

E-mail address: [soraia.micaela@uninove.edu.br](mailto:soraia.micaela@uninove.edu.br) (S.M. Silva).

**PALAVRAS-CHAVE**

Asma;  
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**Conclusion:** Individuals with DCA exhibited a reduction in functional capacity. The DCA-C group also demonstrated a reduction in muscle strength when compared with control group, likely caused by the continual use of corticosteroids. However, no neurophysiological alterations were found in the studied population.

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**Avaliação neurofisiológica e funcional em pacientes com asma de difícil controlo****Resumo**

**Introdução:** Devido à inadequada resposta aos corticóides inalatórios, os pacientes com asma de difícil controlo (ADC) são submetidos a corticóides orais ou uso de omalizumabe. Embora sejam necessários para o tratamento desses pacientes, há uma relação significativa entre o uso de esteróides e fraqueza muscular periférica e respiratória, resultando em implicações como a perda da qualidade de vida e função pulmonar comprometida. No entanto, não se sabe se estes pacientes sofrem alterações neurofisiológicas devido ao efeito da droga.

**Objetivo:** Investigar as características neurofisiológicas e funcionais de pacientes com ADC, para melhor compreensão da doença.

**Método:** Foi realizado um estudo transversal em 3 grupos de pacientes: ADCC (que fazem uso de corticóide por via oral); ADCO (que fazem uso do Omalizumab) e GC (controlo saudável da mesma idade). A avaliação foi composta pela prova da marcha dos 6 minutos, teste senta-levanta, equilíbrio estático com a plataforma de pressão, reflexos monossimpáticos (patelar e aquileu) e a força do quadríceps do membro inferior dominante.

**Resultados:** Embora os resultados em relação aos aspetos neurofisiológicos mostrem não haver diferença estatisticamente significativa entre os grupos controlo e com ADC, deve ser observado que o grupo com ADC, apresentou importante redução da capacidade funcional, quando comparado ao grupo controlo (diminuição da força muscular ( $p < 0,05$ ), diminuição da distância percorrida no teste da caminhada ( $p < 0,05$ ) e diminuição do número de repetições no teste senta/levanta ( $p < 0,05$ ).

**Conclusão:** Indivíduos com ADC apresentaram redução da capacidade funcional. O grupo ADCC também demonstrou redução na força muscular quando comparado ao grupo controlo, provavelmente causado pelo uso contínuo de corticóides. No entanto, nenhuma alteração neurofisiológica foi encontrada na população estudada.

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**Introduction**

Asthma is a chronic inflammatory disease characterized by hyper-sensitivity of the lower airways and a variable degree of airflow limitation.<sup>1-3</sup> Patients generally respond to treatment with inhaled corticosteroids (with or without the addition of long-acting beta agonists or other medications), with a reduction in inflammation, obstruction and hyper-sensitivity of the airways. However, complete reversibility of the symptoms does not occur in 5–10% of patients. Severe asthma or difficult-to-control asthma (DCA) is the term employed when asthma is insufficiently controlled for more than six months despite adequate treatment tailored to the level of clinical severity, as indicated by a specialist.<sup>4-6</sup>

Due to the inadequate response to inhaled corticosteroids, patients with DCA are submitted to oral (systemic) corticosteroids, where the main action is the inhibition of recruitment of inflammatory cells and inhibition of release of pro-inflammatory mediators and cytokines from activated inflammatory and airway epithelial cells.<sup>6</sup> Another option is the use of omalizumab, an anti-IgE antibody, which

works by preventing the attachment of IgE to high affinity receptor thereby avoiding activation of mast cells and basophils, from the initial phase of the allergic response, and blocks the attachment of immunoglobulin to the existing low-affinity receptor in B lymphocytes and in several types celulares.<sup>7-12</sup>

Although it is necessary for treatment of these patients, a significant relationship between steroid usage and both peripheral and respiratory muscle weakness has been reported in chronic pulmonary disease<sup>13</sup> and cystic fibrosis,<sup>14</sup> because, in skeletal muscle, corticosteroids decrease the rate of protein synthesis and increase the rate of protein breakdown contributing to atrophy.<sup>15-18</sup>

The resulting weakness of peripheral and respiratory muscles may have major clinical implications, such as loss of quality of life, fatigue, impaired wound healing, compromised lung function, and poor immune response. However, it is not known whether these patients suffer neurophysiological changes due to drug effect, but to understand this, it is important to investigate the neurological and functional alterations in individuals with DCA with use of the

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