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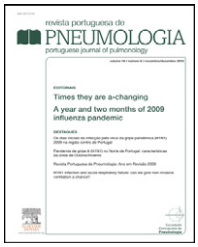

ORIGINAL ARTICLE

Association among posture, lung function and functional capacity in cystic fibrosis☆

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KEYWORDS
Cystic fibrosis;
Respiratory function tests;
Postural balance

Abstract
Aim: The purpose of this study was to evaluate the correlations within pulmonary function, functional capacity, and posture in adult patients with cystic fibrosis (CF). A secondary aim was to evaluate the correlation between patient quality of life and postural assessment variables.
Method: A cross-sectional study was conducted on fourteen patients with CF. Patients were subjected to a postural analysis (postural assessment software) and measurements of pulmonary function (spirometry, whole body plethysmography, and carbon monoxide diffusing capacity) and functional capacity (6-min walking test). All patients completed the *Cystic Fibrosis Questionnaire-Revised* (CFQ-R).
Results: Most patients were male (57%), and the median age of the patients was 24.5 (22–34). The forced expiratory volume in one second, the 6-min walking distance, total lung capacity, and airway resistance were significantly correlated with the vertical alignment of the chest ($\rho = -0.57$, $P < 0.05$; $\rho = -0.65$, $P < 0.01$; $\rho = 0.54$, $P < 0.05$; and $\rho = 0.67$, $P < 0.01$, respectively). The 'physical' domain of the CFQ-R was significantly correlated with the vertical alignment of the chest ($\rho = -0.74$, $P < 0.01$), and the 'limitations' domain of the CFQ-R was significantly correlated with the angle of the hip ($\rho = -0.55$, $P < 0.05$).
Conclusion: The present study shows that abnormalities in pulmonary function and functional capacity are associated with postural changes in adults with CF. However the severity of the postural abnormalities does not negatively influence the CFQ-R domains.

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[2] Role in the study: Analysis and interpretation of data, revising the article, and final approval of the version of manuscript.

PALAVRAS-CHAVE
Fibrose quística;
Provas de função respiratória;
Balanço postural

Associação entre postura, função pulmonar e capacidade funcional na fibrose quística

Resumo
Objetivos: Avaliar as correlações entre função pulmonar, capacidade funcional e postura em pacientes adultos portadores de fibrose quística (FQ). Como segundo objetivo, avaliar a correlação entre a qualidade de vida e as variáveis obtidas na avaliação postural destes pacientes.
Métodos: Foi realizado um estudo transversal em que 14 portadores de FQ se submeteram à avaliação da análise postural (*software* de avaliação postural) e provas de função pulmonar (espirometria, pletismografia de corpo inteiro e medição da capacidade de difusão do CO) e capacidade funcional (teste da caminhada de 6 min). Todos os pacientes responderam ao Questionário de Fibrose Quística com Versão Revisada (QFQ-R).
Resultados: A maioria dos pacientes era do sexo masculino (57%), com mediana da idade de 24,5 anos (22-34 anos). Foram observadas correlações significantes de volume expiratório máximo no primeiro segundo, distância da caminhada dos 6 min, capacidade pulmonar total e resistência de vias aéreas com o alinhamento vertical do tronco ($\rho = -0,57$, $p < 0,05$; $\rho = -0,65$, $p < 0,01$; $\rho = 0,54$, $p < 0,05$; e $\rho = 0,67$, $p < 0,01$, respetivamente). Foram observadas correlações estatisticamente significantes entre o domínio «físico» do QFQ-R e o alinhamento vertical do tórax ($\rho = -0,74$, $p < 0,01$), e entre o domínio «limitações» do QFQ-R e o ângulo do quadril ($\rho = -0,55$, $p < 0,05$).
Conclusões: O presente trabalho mostra que as anormalidades na função pulmonar e na capacidade funcional se associam às alterações posturais em adultos portadores de FQ. Entretanto, a gravidade das anormalidades posturais não influenciam negativamente os domínios do QFQ-R.

Introduction

Cystic fibrosis (CF) is an autosomal recessive disease that affects the functioning of various organ and body systems.[1] The median estimated survival age for patients with CF has increased substantially over recent decades and is currently estimated at 38 years in most developing countries.[2] Factors including early diagnosis, multidisciplinary management in specialised centres, and access to appropriate therapy have contributed to this change.[3]

The primary clinical consequences of CF are related to respiratory tract impairment, in which thick infected secretions trigger chronic inflammation. Pulmonary function decreases exponentially as patients get older, which results in significant airway obstruction leading to hyperinflation, and air trapping.[4] An estimated 90% of patients die due to the progression of pulmonary disease.[5] In addition to pulmonary impairment, CF causes significant changes in other organs and systems that can lead to major physical limitations. Compared to the paediatric population, adults with CF show a higher prevalence of skeletal muscle dysfunction, nutritional depletion, diabetes, and depression. Osteoporosis, bone fractures, and joint impairments are common in this group of patients.[3]

Posture is defined as the balanced arrangement of body structures and is determined by measuring the positioning of the body segments at a particular moment.[6] In normal postural alignment, muscles and joints are expected to be in a state of equilibrium that involves the least amount of effort and overload.[7] The postural attitude of the hyperinflated thorax can lead to a series of spinal column, shoulder, and pelvic girdle compensations. Spinal column deformities, such as increased thoracic kyphosis and lumbar lordosis, are common in adults with CF.[8,9]

The biomechanics of the rib cage influence overall body mechanics. Therefore, any respiratory imbalance will result in altered total body posture and balance.[10] As lung disease progresses in CF patients, it is possible that hyperinflation and increased effort of breathing causes a general muscle imbalance because of the altered mechanics of respiration.[11] It is therefore possible to assume that these changes culminate in a reduction of functional capacity. As this knowledge could be important for planning the most appropriate mode of therapeutic exercise in CF patients we looked to evaluate the correlations within pulmonary function, functional capacity, and posture in adult patients with CF. A secondary aim was to evaluate the correlation between patients' quality of life (QL) and postural assessment variables.

Methods

Patients

A cross-sectional study was conducted in outpatients who were diagnosed with CF. The patients originated from the Piquet Carneiro Polyclinic at the State University of Rio de Janeiro and were assessed between September 2011 and February 2012. Adult patients (aged 18 years or older) were included if they had clinical and laboratorial diagnosis of CF (sweat test and/or deoxyribonucleic acid - DNA mutation analysis). Exclusion criteria included: inability to perform the pulmonary function tests or the 6-min walking test