



Objectively measured muscle fatigue in Crohn's disease: Correlation with self-reported fatigue and associated factors for clinical application ☆



D.R. van Langenberg^{a,*}, P. Della Gatta^b, S.A. Warmington^b, D.J. Kidgell^b, P.R. Gibson^a, A.P. Russell^b

^a Department of Gastroenterology & Hepatology, Eastern Health Clinical School, Monash University, Box Hill, Victoria, Australia

^b Centre of Physical Activity and Nutrition (C-PAN) Research, School of Exercise and Nutrition Science, Deakin University, Burwood, Victoria, Australia

Received 23 May 2013; received in revised form 11 July 2013; accepted 11 July 2013

KEYWORDS:

Inflammatory bowel disease;
Fatigue;
Skeletal muscle

Abstract

Background & aims: The association of fatigue with decreased physical performance and underlying mechanisms are poorly understood in Crohn's disease (CD). We aimed to measure and compare self-reported fatigue with skeletal muscle fatigue in CD subjects and healthy controls, and to identify associated factors that may be amenable to change.

Methods: Demographic and clinical data were collected and fatigue assessed using the Fatigue Impact Scale (FIS) in 27 consecutive CD patients and 22 matched healthy controls. Circulating cytokines and growth factors were measured. The rate of quadriceps muscle fatigue was assessed using an isokinetic dynamometer as the decrement of force with 30 contractions performed over a 5-minute period.

Results: Compared with healthy controls, CD patients reported greater levels of fatigue (mean global FIS score 45.3 vs 10.5, physical dimension score 12.3 vs 2.7 respectively; each $p < 0.01$) and muscle fatigue (-5.2 vs -1.3 Nm min^{-1} ; $p < 0.05$). The two indices were correlated ($r = -0.52$ in CD; $p < 0.01$). Patients with CD had lower mean serum IGF-1 levels (16.1 vs 25.4 pmol/L , $p < 0.01$) and higher oxidative stress (TBARS assay 4.3 vs 3.9 μM , $p < 0.05$). On multivariate analysis, low serum vitamin D, IGF-1 and magnesium, and higher IL-6 levels were associated with increased muscle fatigue (all $p \leq 0.05$).

Conclusion: Subjects with CD had more muscle fatigue than matched healthy controls and this correlated well with self-reported fatigue. Of circulating factors that were independently

☆ Conference presentation: This work was presented in part at the Australian Gastroenterological Week conference Brisbane, Australia, October 2011.

* Corresponding author at: Eastern Health Department of Gastroenterology & Hepatology, Eastern Health Clinical School, Monash University, Level 2, 5 Arnold Street, Box Hill Victoria 3128 Australia. Tel.: +61 3 9094 9533; fax: +61 3 9899 9137.

E-mail address: Daniel.van-Langenberg@monash.edu (D.R. van Langenberg).

1873-9946/\$ - see front matter. Crown Copyright © 2013 Published by Elsevier B.V. on behalf of European Crohn's and Colitis Organisation. All rights reserved.

<http://dx.doi.org/10.1016/j.crohns.2013.07.006>

associated with increased muscle fatigue, vitamin D, magnesium and IGF-1 could be targeted in future studies to reduce fatigue and improve physical performance.

Crown Copyright © 2013 Published by Elsevier B.V. on behalf of European Crohn's and Colitis Organisation. All rights reserved.

1. Introduction

Fatigue is a highly prevalent and debilitating symptom in Crohn's disease (CD) resulting in impaired quality of life.^{1,2} From a patient's perspective, fatigue is reported as one of the primary disease-related concerns in inflammatory bowel disease (IBD).^{3,4} Yet despite this, the current understanding of the pathophysiology of fatigue and appropriate therapeutic strategies in chronic diseases including IBD is lacking. In CD, fatigue studies have almost universally relied on self-report surveys for data collection, yet these have methodological limitations due to their inherent subjectivity and their inability to explore putative pathogenic pathways of fatigue genesis.⁵

Fatigue research has also been typically hampered by the difficulties in defining and measuring fatigue. This complicates the ability to design robust and reproducible experiments that are critical in understanding pathogenesis and identifying potential therapeutic avenues. One way forward has been to conceptualise fatigue as a multidimensional entity, with physical, cognitive and psychosocial components (see Fig. 1).⁵ Moreover, it is uncertain how effectively self-report measures of fatigue correlate with objective functional measures of fatigue in CD.

Normal human functioning requires the consistent daily ability to maintain physical performance over time, whether at work, home or during recreational activities. In contrast, many patients with chronic diseases like CD are at risk of long term disability as a result of disease-related physical fatigue, reflected in reduced work productivity and increased absenteeism and dependence on welfare benefits.^{6,7} We hypothesised that this physical fatigue is, at least in part, explainable by alterations in muscle fatigue and performance, which in turn are modulated by the effects of CD on skeletal muscle. This should then enable an improved understanding of the underlying pathogenic mechanisms of fatigue and validate linkages between the fatigue frequently reported by patients in the clinic, and objective decrements in performance. In turn this objective, reproducible framework may elucidate clinical approaches to ameliorate fatigue.⁵

Therefore, the aim of this study was to objectively measure muscle fatigue in CD patients, to define factors associated with muscle fatigue that may be amenable to change, and to ascertain whether objectively derived muscle fatigue correlates with self-reported 'subjective' fatigue.

2. Materials & methods

2.1. Subject recruitment

Patients of the Box Hill Hospital Inflammatory Bowel Disease Clinic, with a confirmed diagnosis of CD according to standard criteria, were asked to complete a survey encompassing

fatigue and other clinical/demographic data. They were then invited consecutively in order of survey completion date to participate in further tests at two study visits. Healthy volunteers were consecutively recruited via local advertisement in hospital and university publications, and in the local newspaper in the same period. Exclusion criteria for the study included those aged less than 18 years or greater than 65 years, those with significant medical or psychiatric comorbidities likely to cause restrictions in functional performance and/or those who were pregnant. Also, healthy controls with first degree relatives with known IBD and those unable to give informed consent were excluded from the study. The study was approved by the Deakin University and Eastern Health research ethics committees (approval numbers DU-HREC 2009-134 & EH REC E103/0809 respectively). For all investigations conducted, informed consent was obtained from all participants and the study was performed in concordance with the Declaration of Helsinki (2008 version).

2.2. Initial study visit

All subjects attended one study visit with an investigator prior the muscle testing visit in order to assess for these exclusion criteria, and to ensure that they did not engage in regular high intensity exercise that may have otherwise biased the study results. At this visit, blood and faecal samples were collected, an accelerometer was fitted, and disease activity was assessed using the Harvey-Bradshaw Index (HBI) at the initial study visit.⁸ The aforementioned survey, cross-checked with data collected at this initial study visit and hospital medical records enabled retrieval of current demographic, clinical and medication data from subjects. Patients with CD were classified using the Montreal criteria.⁹

2.3. Maximal voluntary contraction torque and muscle fatigue

At the second study visit, participants were seated on an isokinetic dynamometer (Biodex System 4 Pro, Biodex Medical Systems, Shirley USA), with the right leg passively extended at angle of 60° knee extension. The upper body, waist and thigh of the right leg were strapped securely to the dynamometer using harness type restraints and so as to avoid any other body movements contributing to the force record. The right foot was also secured to the dynamometer measuring arm with a padded restraint. During the 5 minute exercise protocol, participants were required to complete 30 maximal isometric voluntary contractions (MVCs) of the knee extensors against the immovable resistance of the dynamometer measurement arm. These were completed with a 5 second on, and 5 second off duty cycle. Maximal force production was determined as the highest value

Download English Version:

<https://daneshyari.com/en/article/6099348>

Download Persian Version:

<https://daneshyari.com/article/6099348>

[Daneshyari.com](https://daneshyari.com)