209 Perception of shortness of breath and disability living allowance in adult Cystic Fibrosis

S. Bari, A. Morris, D.A. Stock, M.J. Ledson, M.J. Walshaw. *Adult Regional CF Unit, The Cardiothoracic Centre, Liverpool, UK*

Introduction: CF patients with severe disease are often limited in their exercise tolerance, and in the UK may benefit from the State Disability Living Allowance (DLA). The criteria for the mobility component of this include a virtual inability to walk, or that the exertion required would endanger life. This may not be appropriate for CF patients. To look at this further, we tested the ability to walk and the perception of breathlessness in a group of adult CF patients.
Method: 26 stable patients, (all receiving the mobility DLA benefit, mean age 24 years [range 18–42], 11 male) exercised on a treadmill: pulse oximetry, maximum walking time and speed were recorded, as was breathlessness at exercise cessation using the BORG 10 point scale.
Results: Average walking time was 22.5 minutes [range 2–30] at an average speed of 3.7 mph [1.5–6.5]. Only 2 patients walked <6 minutes (1 LTOT, 1 BIPAP). As regards breathlessness on exercise cessation, 7 patients (27%) had a BORG score of 2, 14 (54%) 3, 4 (16%) 4 and 1 (3%) 6, (overall mean 3). There was no correlation between BORG score and walking speed, but a significant relationship between BORG score and walking time ($r = -0.64$, $p < 0.001$), and BORG score and oxygen saturation at exercise cessation ($r = -0.58$, $p < 0.01$).
Conclusion: In this group perception of breathlessness depends on the length of the time walked rather than the speed of walking, and was also related to oxygen saturation. Although most patients could walk more than six minutes, all are on the highest level of DLA and all receive mobility allowance for clinical reasons. This work suggests that the usual qualifying tests for DLA are not appropriate for CF patients and this should be borne in mind when encouraging those with advanced disease to apply for this benefit.

210* Relationship between breathlessness and exercise in adult CF patients

S. Bari, A. Morris, M.J. Ledson, M.J. Walshaw. *Regional Adult CF Unit, The Cardiothoracic Centre, Liverpool, UK*

Introduction: Exercise capability is an integral part of the assessment of physical wellbeing in adult CF patients. However, the relationship between this, pulmonary function, oxygen saturation (OS) during exercise and the perception of breathlessness in this group is poorly understood. To investigate this, we looked at these parameters in CF adults undergoing a 6 minute walk test.
Methods: Following spirometry, all were exercised on a treadmill: 6 minute walking distance (6MWD) was measured and then the speed increased incrementally every 3 minutes until maximum time (TMax) and maximum sustainable speed (MSS) were reached. Minimum oxygen saturation (MOS) and breathlessness (BORG score) were recorded. Physical activity was assessed by calculating the metabolic equivalent (MET).
Results: 24 patients (mean age 23 [range18–33], mean FEV1 56% predicted [23–114], 10 male) were studied: mean 6MWD distance 572 metres [318–1046], TMax 24 minutes [6–30], MSS 3.5 mph [2–6.5], MOS 95% [91–97], BORG score 3 [2–4] and MET 4.3 [2.5–11]. Although spirometry correlated significantly with 6MWD ($P = 0.004$), MSS ($P = 0.012$), and MOS ($P = 0.004$), there was no correlation with TMax ($P = 0.85$) or BORG score ($P = 0.13$). Moreover, there was no correlation between breathlessness and the amount of physical activity achieved ($P = 0.25$), nor between MOS and energy spent as measured by MET ($P = 0.38$).
Conclusion: In adult CF patients, the relationship between breathlessness and the objective measures of exercise (pulmonary function, exercise capability, energy consumption and oxygen saturation during exercise) is complex. We have found that breathlessness scores do not depend on pulmonary function, nor do they reflect metabolic activity. Further work is necessary to elucidate the causes of breathlessness in this patient group.

211 Determinants of dyspnoea in Cystic Fibrosis: impact of inspiratory muscles endurance

S. Leroy, T. Perez, R. Nevière, B. Wallaert. *Clinique des maladies respiratoires, Hôpital Calmette, CHRU de Lille, France*

Dyspnoea is one of the main complain of patients with cystic fibrosis (CF). Lung function at rest is not sufficient to explain dyspnoea during exercise. Little information is available about the impact of respiratory muscle endurance.
Methods: Inspiratory muscle endurance (IME), expressed as a percentage of maximal inspiratory pressure (PImax), was measured according to an incremental threshold loading technique (Martyn) in eighteen stable CF patients. All of them performed a maximal exercise testing on a cycloergometer. Level of dyspnoea was recorded by Borg scale at exhaustion. Blood gases were analysed at rest and at maximal exercising.
Results: Four men and fourteen women were included with a mean age of 32 years (20–67). Mean FEV1 was 44% pred (21–82%). Mean PImax was 78% pred (24–148). No significant correlations were found between dyspnoea and age, body mass index, pulmonary function at rest, blood gases, inspiratory muscle strength (PImax) or exercise capacity. Dyspnoea was only correlated with inspiratory muscle endurance ($r = -0.69$, $p = 0.0015$) and plethysmographic airway resistance ($r = 0.53$, $p = 0.018$). When patients were grouped according to their inspiratory muscle endurance, ten patients had normal values and eight showed a decreased IME. Significant differences were observed between these two groups in dyspnoea (4.6 versus 7.6; $p < 0.001$), $PaCO_2$ at rest (36.4 versus 40.7 mmHg; $p = 0.017$) and at peak exercise (41 versus 48 mmHg; $p = 0.033$).
Conclusion: If inspiratory muscle function may be relatively preserved in chronic lung disease due to a training effect, it may be a significant a determinant of dyspnoea and hypoventilation during exercise in CF patients.

212 Working capacity and lung function in physically active patients with Cystic Fibrosis were unchanged after 6 months of training

M. Sahlberg, B. Strandvik, B.O. Eriksson. *Dept of Paediatrics, Institute of Clinical Sciences, Sahlgrenska Academy, Göteborg University, Sweden*

The aim was to investigate if cardiopulmonary functions improved during 6 m of different types of training in adult patients with CF despite no increase in muscular strength.
Methods: Twenty patients (8 females (F)) with classical CF accepted to participate in a study with endurance and/or strength training three times/week for 6 m. The intensity of endurance training was at 70–75% of achieved heart rate (HR) at VO_2max, tested on an electronically braked ergometer cycle. Strength training was performed with free weights or individuals own body as load and with increasing load. Twenty healthy subjects matched for age, sex, anthropometry and physical activity were controls. Lung function and working capacity (WC) were measured at baseline, and after 3 and 6 months.
Results: Mean (SD) FEV1 in CF F vs controls was 2.8 (0.6) litre and 3.6 (0.5) l ($p = 0.05$) and in males (M) 4.0 (1.1) l vs 4.7 (0.5) l (NS), FEV1 % of predicted were 90 (19) vs 114 (10) ($p = 0.01$) and 92 (22) vs 107 (10) ($p = 0.04$), respectively, and did not decrease during the 6 months. At baseline WC was significantly lower in CF compared to controls, in F 170 (31) vs 205 (26) watt ($p = 0.04$) and in M 273 (54) vs 319 (47) watt ($p = 0.03$), but not per kg body weight. HR and VO_2max in ml/kg × min were at baseline not significantly different from controls, but VO_2max in l/min tended to be lower in CF, in F 1.9 (0.6) vs 2.4 (0.3) ($p = 0.05$) and in M 3.1 (0.6) vs 3.5 (0.5) l/min ($p = 0.06$). WC, HR and VO_2max did not change during the 6 months of training. WC and VO_2max were significantly correlated to FEV1 in patients and controls.
Conclusion: The absence of improvement in muscular strength was not due to impairment in cardiac or pulmonary function.