

Poster sessions

In conclusion, FEV_1/FIV_1 index has a good correlation with ALSFRS-R ($n = 20$, $r = -0.71$, $p < 0.001$, $FEV_1/FIV_1 = 1.630 - [0.018 * ALSFRS-R] \pm 0.165$).

P212 PARASTERNAL INTERCOSTAL ELECTROMYOGRAPHY TO ASSESS NEURAL RESPIRATORY DRIVE IN HEALTHY ADULT SUBJECTS

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Neural respiratory drive (NRD), measured using the parasternal intercostal muscle electromyogram (EMGpara), relates to lung disease severity as quantified by conventional methods in a range of diseases. Reference data from healthy populations are required for the technique to be used as an independent measure of lung disease severity. EMGpara has previously been expressed as a percentage of that obtained during a maximal inspiratory effort (EMGpara%max), restricting the use of the technique to subjects able to reliably perform such manoeuvres. The aim of this study was to investigate variability of both raw EMGpara (rEMGpara) and EMGpara%max in healthy adults.

EMGpara was measured during tidal breathing in 43 healthy adult non-smokers (25 females, median (range) age 32 (19–79) years, mean (SD) BMI 23.4 (3.5) kg/m²), using surface electrodes positioned bilaterally over the second interchondral space. Measurements were made with and without a mouthpiece/pneumotachograph *in situ* in 20 participants. Repeated measures were obtained within the same testing session in 27 subjects, and at least seven days later in 13 individuals. Spirometry, height, weight, BMI, fat free mass (FFM) via bioelectrical impedance and measures of regional fat distribution (waist/hip ratio and neck circumference) were also recorded.

Mean (SD) EMGpara%max and rEMGpara were 5.88 (3.63)% and 5.06 (2.26) μ V respectively. Significant relationships were observed between anthropometric measures and rEMGpara and EMGpara%max (Table 1). rEMGpara and EMGpara%max were unrelated to spirometry variables. Median (range) rEMGpara and EMGpara%max increased significantly with the pneumotachograph in place (4.86 (2.11–8.19) μ V *versus* 5.62 (2.47–10.98) μ V and 4.77(1.68–17.00)% *versus* 6.78 (2.35–20.94)%, both $p < 0.0001$).

Analysis of variance by subject was used to assess within-subject variability. Measurement error was higher for EMGpara%

Abstract P212 Table 1 Relationship of rEMGpara and EMGpara %max to anthropometric characteristics in 43 healthy adult subjects

	Correlation with raw EMGpara (r (p))	Correlation with EMGpara%max (r (p))
Height	-0.38 (0.01)	-0.60 (<0.0001)
Weight	-0.47 (0.001)	-0.57 (<0.0001)
BMI	-0.46 (0.002)	-0.35 (0.02)
FFM	-0.12 (ns)	-0.28 (ns)
Neck circumference	-0.43 (0.004)	-0.68 (<0.0001)
Waist/hip ratio	-0.23 (ns)	-0.48 (0.001)

max than rEMGpara (upper 95% confidence limit of difference between repeat measures of EMGpara%max 3.14%, *versus* 2.35 μ V for rEMGpara; within-subject coefficient of variation EMGpara%max 30.8% *versus* rEMGpara 24.5%).

rEMGpara appears to be a reproducible marker of NRD. Both rEMGpara and EMGpara%max are influenced by subjects' anthropometry. Further investigation is required to determine whether these influences are technical or physiological and must be considered when the technique is applied clinically or for research, or when developing reference values.

P213 THE IMPACT OF SLEEP DISORDERED BREATHING ON PERIPHERAL MUSCLE

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Introduction Chronic obstructive pulmonary disease is characterised by peripheral muscle wasting with consequent reduction in muscle strength and function. In this cohort of patients a reduction in muscle strength correlates with morbidity and mortality. Less well known are the characteristics of muscle in patients with sleep disordered breathing (SDB), a disease state that can also be dominated by inflammation, breathlessness and hypoxia. We sought to examine the impact of sleep disordered breathing on peripheral muscle size and strength.

Method 51 subjects were recruited: 15 healthy controls (HC) with a normal body mass index (BMI, <25 kg/m²), 16 overweight and obese individuals with no SDB controls (SO), and 20 obese subjects with obstructive sleep apnoea (OSA). Subjects underwent measurements of Rectus Femoris Cross Sectional Area (RF_{CSA}) and quadriceps maximal voluntary contraction

Abstract P213 Table 1 Differences between groups in demographics, muscle size and strength

	HC n = 15	SO n = 16	OSA n = 2
Age (years)	21 (20–33)	32# (23–40)	58* (48–67)
M:F			
	16:4	6:10	9:11*
BMI (kg/m ²)	22.4 (19.0–23.6)	28.2*# (25.5–32.7)	38.5* (35.8–42.6)
FEV ₁ (L)	3.19 (2.44–3.74)	3.28 (2.84–4.72)	2.87 (2.31–3.31)
FVC(L)	4.04 (3.17–4.27)	4.20 (3.66–5.56)	3.68 (2.79–4.12)
RF _{CSA} /weight (AU)	7.6 (6.7–8.7)	8.59# (6.1–10.3)	5.6* (4.1–7.3)
QMVC/weight (AU)	0.49 (0.45–0.60)	0.56# (0.44–0.71)	0.34* (0.20–0.43)
Handgrip strength/weight (kg)	0.43 (0.36–0.48)	0.48# (0.37–0.57)	0.32* (0.21–0.40)
SMWD (metres)	560 (520–640)	565# (513–607)	420* (278–515)

*significantly different from HC ($p < 0.05$); #significantly different from OSA ($p < 0.05$)
Abbreviations: HC=Healthy Controls, SO=Simple Obesity/Overweight, OSA=Obstructive Sleep Apnoea, BMI=Body Mass Index, RF_{CSA}=Rectus Femoris Cross Sectional Area, QMVC=Quadriceps Maximal Voluntary Contraction, SMWD=Six Minute Walking Distance

(QMVC). Handgrip strength and six minute walk distance (SMWD) were also recorded.

Results As expected there were differences in BMI between the groups. There were also significant differences in muscle strength and RF_{CSA} when corrected for body weight between HC and OSA groups and between SO and OSA groups, but no differences between HC and SO groups (Table 1). The SO group demonstrated higher measurements of strength and RF_{CSA} than the HC group, however, the OSA group had lower measurements than both the HC and SO group. This translated to a functional difference as measured by the SMWD, again demonstrating the longest distance in the SO group and shortest in the OSA group.

Discussion This study has demonstrated that in those with a BMI ≥ 25 kg/m² there appears to be a beneficial effect of excess weight on peripheral muscle size, strength and function; this may be due to the extra load carried by these individuals exerting a training effect on the muscles. However, in those who are obese with SDB, the SDB seems to exert a negative effect on muscle size, strength and function which may be a result of the inflammation and hypoxia SDB can cause.

P214 UTILISATION OF CARDIO-PULMONARY EXERCISE TESTING (CPET) AT AN ENGLISH ACUTE HOSPITAL

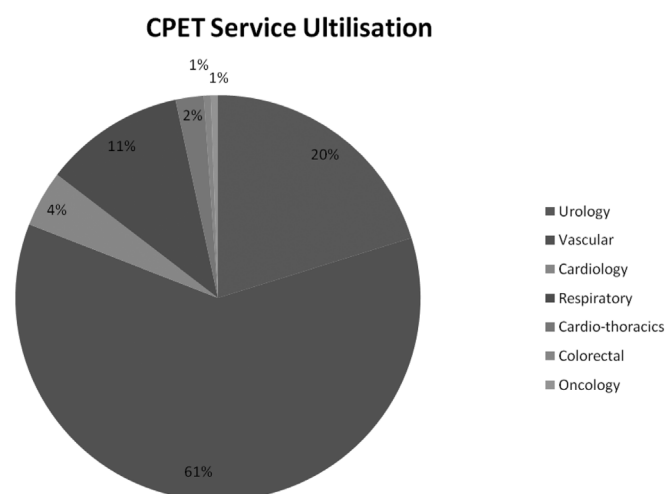
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Background CPET has been extensively used in the pre-operative (general anaesthesia) risk stratification. More recently, the utility of CPET has become more defined in the evaluation of unexplained dyspnoea and in prognosticating pulmonary hypertension in a rational manner which is also less invasive for patients. We set out to evaluate the utilisation pattern of CPET within a 709-bedded central England acute hospital Trust spread across 3 sites in the second year of the establishment of the service.

Methods The source of referral (and reason) for CPET were retrospectively recorded and analysed between 01 July 2013 and 31 May 2014 (ten months).

Results The total number of CPET referrals received was 178 out of which 150 (84%) were from surgical disciplines and 28



Abstract P214 Figure 1 CPET Service Utilisation

(16%) from medical disciplines. Vascular surgery submitted made the majority of referrals (108, 61%) followed by colorectal surgery [see Figure]. Respiratory Medicine was the source of 11% of all referrals and Cardiology the source of 4%.

Conclusions The dominant utilisation of CPET by vascular surgery is expected, given the NHS evidence adoption centre and National Institute for Health and Care Excellence (NICE) 2009 recommendations on risk-stratification for Abdominal Aortic Aneurysm surgery mortality. However, CPET offers a unique assessment tool for the investigation of patients with unexplained dyspnoea and has a potential to pre-empt invasive, unnecessary and expensive assessment without definitive diagnosis [Thing JER, Mukherjee B, Murphy K *et al.* Thorax 2011; 66 (4): A144]. It appears that a lot of work needs to be done among the UK general respiratory and cardiology/heart failure communities to promote the awareness, understanding and utilisation of CPET.

Diagnostic and therapeutic interventional procedures

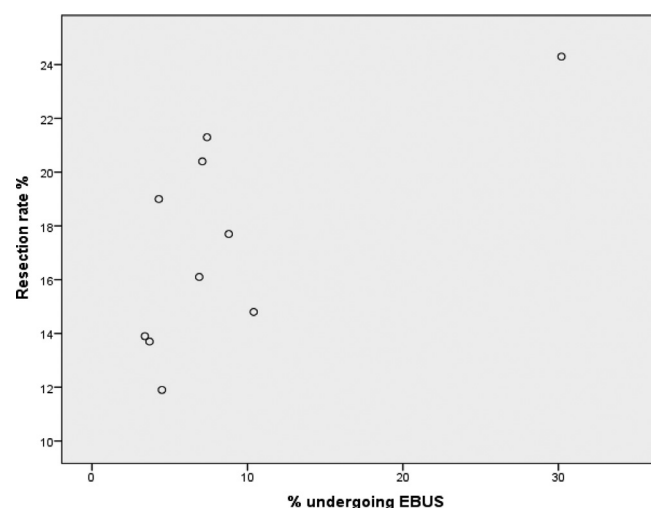
P215 REFERRAL PATTERNS FOR MEDIASTINAL STAGING WITH EBUS ACROSS A LUNG CANCER NETWORK A REPORT FROM THE MANCHESTER CANCER EBUS SUB-GROUP

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Introduction Manchester Cancer is a large Cancer Network in the North West of England, consisting of ten NHS Trusts. There is known variability in lung cancer outcomes across the ten trusts, including resection rates. We have examined the referral patterns of each individual trust for EBUS mediastinal staging and compared this with the trust's lung cancer resection rates.

Methods The Manchester Cancer EBUS sub-group has data for all EBUS referrals from each of the ten NHS trusts in our Network in 2012. The National Lung Cancer Audit Report 2013 provides the number of lung cancer patients diagnosed at each



Abstract P215 Figure 1