P17 RESPIRATORY IMPACT OF DIABETES MELLITUS IN PEOPLE WITHOUT A PRIMARY DIAGNOSIS OF CHRONIC LUNG DISEASE

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Introduction In the UK, around 3 million people currently have a diagnosis of diabetes mellitus and the prevalence is increasing rapidly. Microvascular and macrovascular complications of diabetes are widely recognised, but the respiratory impact is less well understood. In people with chronic lung disease, diabetes mellitus is associated with worse lung function, impaired health status and more frequent exacerbations (Kinney *et al*. Diabetes Care. 2014;37:389–95). The aim of our study was to determine the respiratory impact of diabetes in people without a primary diagnosis of chronic lung disease.

Abstract P17 Table 1 Comparison of clinical characteristics, prior respiratory illness, lung function and respiratory symptoms in people with and without diabetes mellitus

	No diabetes mellitus	Diabetes mellitus	P value
Clinical characteristics			
Number	175	75	
Age (years)	66 ± 11	67 ± 9	0.257
Gender (n (%) female)	56 (32%)	22 (29%)	0.677
Body mass index (kg/m^2)	28.2 ± 5.7	32.1 ± 7.7	<0.001
Waist:hip ratio	0.94 ± 0.07	0.97 ± 0.07	0.001
Blood glucose mmol/l (n)	5.9 ± 1.7 (45)	9.0 ± 3.2 (54)	<0.001
HbA_{1c} mmol/mol (n)	41 ± 6 (31)	61 ± 16 (29)	<0.001
Diabetic medication (n (%)			
None		11 (15%)	
Oral hypoglycaemics		51 (68%)	
Insulin (±oral hypoglycaemics)		13 (17%)	
Confirmed coronary artery disease (Gensini >20)	36%	42%	0.037
Charlson index (excluding diabetes)	3 (2–4)	3 (2–4)	0.026
Smoking history and respiratory illness			
Smoking status (n (%))			
Never	41%	44%	0.873
Ex-smoker	46%	45%	
Current smoker	13%	11%	
Childhood respiratory illness (n (%))	30 (17%)	18 (24%)	0.139
On respiratory medication (n (%))	40 (23%)	16 (21%)	0.474
Prior COPD diagnosis (n (%))	22 (13%)	7 (9%)	0.314
Prior diagnosis of any chronic lung disease (n (%))	28 (16%)	18 (24%)	0.092
Lung function			
FEV_1% predicted	83 ± 21	79 ± 18	0.134
FVC% predicted	91 ± 22	82 ± 17	0.002
FEV_1:FVC	0.72 ± 0.11	0.76 ± 0.09	0.008
Respiratory symptoms			
Breathlessness (mMRC)	1.7 ± 0.7	2.1 ± 0.9	0.001
Cough (/5)	0.6 ± 1.1	1.0 ± 1.3	0.005
Phlegm (/5)	0.4 ± 0.9	0.5 ± 1.0	0.813
Total CAT score	7 ± 5	9 ± 7	0.024

COPD, chronic obstructive pulmonary disease; FEV_1, forced expiratory volume in 1 s, FVC, forced vital capacity; mMRC, *modified Medical Research Council* dyspnoea scale; CAT, COPD assessment test.
Values are mean±SD (compared with independent t tests), median (interquartile range) (compared with Mann Whitney U tests) and number (%) (compared with chi squared tests).

Methods Unselected patients attending for elective coronary angiography March–July 2015 were invited to take part in a prospective observational study (primary aim to investigate the association between coronary atheroma and airflow obstruction). Participants underwent clinical assessment and spirometry prior to the procedure.

Results 250 of 294 (85%) people approached took part. Seventy five (30%) had diabetes mellitus. People with diabetes were of similar age and gender to those without diabetes, but had greater body mass index, central adiposity, blood glucose and HbA_{1c} (Table 1). Despite no differences in history of smoking or respiratory illness (Table 1), people with diabetes had significantly lower forced vital capacity (FVC) and higher forced expiratory volume (FEV_1): FVC ratio than those without diabetes. After adjustment for age, gender, body mass index, waist: hip ratio and smoking history, diabetes was an independent predictor of FEV_1: FVC (partial eta^2 0.03, p = 0.007), but not FVC. People with diabetes had more respiratory symptoms (Table 1). They were more likely to give a history of recurrent chest infections (diabetes 14(19%); no diabetes 11(6%), p = 0.004) and reported more chest infections (diabetes 0.6 ± 1.6; no diabetes 0.2 ± 0.9, p = 0.007) in the past year. After adjustment for age, waist: hip ratio, body mass index, smoking, FEV_1: FVC and co-existing respiratory disease, diabetes was an independent predictor of recurrent chest infections (odds ratio 2.81 (95% confidence intervals 1.04–7.73), p = 0.045).

Conclusions Diabetes mellitus is associated with worse lung function, increased respiratory symptoms and more frequent chest infections, independent of smoking and prior respiratory illness. The burden of diabetes-associated respiratory disease on patients and the NHS is likely to increase as diabetes becomes more prevalent.

P18 THE EFFECTS OF ACUTE AND REPEATED BOUTS OF UNILATERAL NEUROMUSCULAR ELECTRICAL STIMULATION ON QUADRICEPS MUSCLE INFLAMMATION IN COPD

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Introduction and objectives Impaired skeletal muscle function is an important systemic manifestation of COPD which can be improved by exercise training. Non-volitional training using neuromuscular electrical stimulation (NMES) may be an effective training technique in situations where voluntary exercise may be difficult or impractical (e.g. peri-exacerbation or severe ventilatory limitation). Exercise is known to result in both intramuscular and systemic inflammation. However, the cellular response to NMES, which directly depolarises the motor units, is unclear. We investigated the impact of acute and repeated bouts of unilateral NMES in COPD patients.

Methods 16 patients underwent 6 weeks of unilateral NMES 5 times a week for 30 min at 50 Hz at Glenfield Hospital, Leicester. Mean (SD) age was 65 (9) years, FEV_1: 50 (22)% predicted, BMI 26.5 (5.2) Kg/m^2). Isometric quadriceps strength, regional muscle mass (DEXA) and quadriceps thickness (ultrasound) were recorded at baseline and at the end of the intervention. Vastus lateralis muscle biopsies were obtained from both the trained and untrained limbs at baseline, 24 h after the first bout of NMES and at 6 weeks. Venous blood was taken at the same

time. Biopsies were analysed for neutrophil (neutrophil elastase) and macrophage (CD163) density using immunohistochemistry. ELISA measurements of inflammatory cytokines (IL-6 and TNFα) were performed on blood samples.

Results Quadriceps strength increased by 7.6% (p = 0.024), thigh mass by 2.8% (p = 0.185), and quadriceps thickness by 11% (p = 0.002). Muscle biopsies for 11 patients were analysed. Neutrophil density 24 h after a single bout of unilateral NMES significantly increased in both the trained and untrained limb, with larger increase in the stimulated muscle (Table 1). Neutrophil density returned to baseline in the trained limb following training. No changes were seen in muscle macrophage density, serum IL-6 or serum TNFα.

Abstract P18 Table 1 Cellular inflammation in vastus lateralis biopsies following unilateral NMES in both trained and untrained limbs at baseline, 24 hours following first stimulation and 24 hours following 6 weeks training. Data are mean ± SD

	Baseline	24 h	6 weeks
Neutrophil (Neutrophils/mm^2) Trained Leg	3.48 ± 0.87	33.40 ± 11.65*	1.57 ± 0.49**
Neutrophil (Neutrophils/mm^2) Untrained Leg	1.27 ± 1.36	13.10 ± 9.02*	10.97 ± 12.92
Macrophage (Neutrophils/mm^2) Trained Leg	4.87 ± 6.74	0.74 ± 1.41	4.22 ± 10.58
Macrophage (Neutrophils/mm^2) Untrained Leg	0.78 ± 1.39	8.02 ± 9.03	3.83 ± 5.59

*p-value < 0.05 compared with baseline, **p-value < 0.05 compared with 24 h.

Conclusion A single bout of unilateral NMES provokes an intramuscular neutrophilic inflammatory response in both the trained and untrained limb, which are not mediated by changes in circulating IL-6 or TNFα. Neutrophil infiltration returned to baseline in the stimulated leg following training.

P19 PREDICTORS OF COPD MORTALITY, 2 YEAR FOLLOW-UP DATA FROM THE ARCADE STUDY

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Background COPD is a systemic disease with associated comorbidities including cardiovascular disease which have significant impact on morbidity and mortality.[1] However, the progression of the disease is not well understood as there are few longitudinal studies of sufficient duration which include outcome data. The aim of this analysis was to evaluate predictors of mortality from the Assessment of Risk in Chronic Airways Disease Evaluation Study (ARCADE), Clinical Trials registration: NCT01656421.[2]

Methods The ARCADE study is a longitudinal observational study of cardiovascular risk and other comorbidities in patients with COPD. Patients were assessed at recruitment and after 2 years including the following outcomes: Spirometry, BMI, St Georges Respiratory Questionnaire (SGRQ), mMRC breathlessness, number of exacerbations and 6 min walk distance (6MWD). A sample of blood was analysed for the inflammatory mediator fibrinogen.

Results At baseline 524 patients with COPD, confirmed with spirometry, were recruited to the study. Thus far, at the 2 year follow up there have been 47 deaths. According to hospital records, causes of death were: respiratory n = 22 (including acute exacerbations/respiratory infections (n = 12) and pneumonia (n = 10)), cardiovascular n = 9, cancer n = 10, septicaemia n = 3 and unknown n = 4.

At baseline the subjects who did not survive were similar to survivors in age, gender and BMI, but had greater airflow limitation, worse SGRQ, more breathlessness, more exacerbations and lower 6MWD, fibrinogen was also higher (Table 1). Using logistic regression of the objective markers which differed between the groups; FEV1% predicted, number of exacerbations, 6MWD and fibrinogen were entered into the model. Of these Fibrinogen (p = 0.013) and 6MWD (p = 0.024) were significant predictors of mortality (X2 (4) = 18.678, p = 0.001).

Abstract P19 Table 1 Baseline characteristics of patients

	Survivor n = 477	Non-survivor n = 47	p =
Gender (male:female)	246:231	27:20	0.294
Age (years)	66.0 ± 7.6	67.9 ± 6.6	0.098
BMI (kg/m^2)	28 ± 6	27 ± 5	0.401
FEV_1/FVC (L)	**0.53 ± 0.11**	**0.49 ± 0.12**	**0.005**
FEV_1% predicted	**59 ± 19**	**52 ± 19**	**0.023**
Smoking pack years	40 ± 24.9	45 ± 29	0.078
SGRQ	**51 ± 2**	**58 ± 18**	**0.022**
mMRC breathlessness	**2 (1–3)**	**3 (1–3)**	**0.002**
No. Exac per year	**2 (1–3)**	**2.5 (1.5–4)**	**0.022**
6MWD (m)	**340 ± 124**	**273 ± 114**	**0.001**
Fibrinogen (g/L)	**3.6 ± 1.0**	**4.1 ± 1.3**	**0.002**

Data expressed as mean ± SD or median (range).

Conclusions The follow up mortality rate was 9%, with the majority of deaths due to respiratory causes, followed by cancer and cardiovascular events. The non-survivors had poorer objective and patient reported outcomes. Further follow-up of this cohort will provide greater power to predict outcomes.

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