# 80. Physiotherapy and rehabilitative interventions applied to different populations with respiratory impairment

### P482

The effects of eccentric and concentric exercise training on muscle strength in COPD: Preliminary results

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Since in eccentric exercise greater force is produced at a reduced oxygen cost, this modality of exercise could be attractive for pulmonary rehabilitation of severe COPD patients.

**Objective:** To estimate the extent to which eccentric compared to concentric exercise training produces greater increases in quadriceps force, and leads to better improvements in hamstring force, exercise capacity and physical activity.

Methods: Pilot randomized clinical trial in which COPD patients were randomly assigned to either a concentric (CON) or eccentric (ECC) cycling protocol, sessions/week for 10 weeks. In the CON group, target training intensity was set as 80% of peak work rate (Wmax) while in the ECC group the target intensity was set as 4-times 80% of baseline Wmax. Lung function, muscle strength (Biodex), maximal work capacity (Wmax) and physical activity (Armband) were assessed. Results: Preliminary analysis included 11 male COPD patients (69±6 years; FEV1: 41±10%pred; BMI: 27±6 kg.m-2). After 10 weeks of training, isometric quadriceps force was 14% (20Nm) [95%CI: 2-26%, p=0.03] and concentric hamstring force was 27% (14Nm) [95%CI: 2-50%, p=0.03] higher in the ECC. A trend for greater improvements in concentric quadriceps force was observed only in the ECC group (ECC=16% of change, p=0.06 vs CON=1%,p=0.6). Both ECC and CON training yielded similar improvements in Wmax (ECC 18%,p=0.01 vs CON 16%; p=0.03). Steps/day remained unchanged (p>.05) in both groups. Conclusion: Preliminary results show a trend for greater improvements in quadriceps muscle force with ECC compared to CON training in severe COPD patients. Funding:McGill Health Centre Research Institute/pilot project and Edith Strauss.

### P483

# Acute effect of chest wall muscle stretching on chest wall volumes distribuition in chronic obstructive pulmonary disease: A randomized controlled trial

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Inspiratory muscles function is compromised in COPD due to increased loads, reduced mechanical advantage, and increased ventilatory requirements. The hyperinflation of COPD reduces the flow and pressure-generating capacity of the diaphragm

Aims: To analyze the acute effects of chest wall muscle stretching on chest wall volumes distribuition in subjects with COPD.

**Methods:** It was a randomized controlled trial, involving 28 COPD patients divided into two groups: 14 subjects to treatment group (TG, mean age  $61.79\pm8.31$ years) and 14 to control group (CG,  $62.38\pm8.33$ years). TG was composed for patients that received a program of chest wall muscle stretching and patients allocated in CG remained at rest in the similar conditions as in GT. Respiratory variables were measured during quiet breathing by Opto-Electronic plethysmography (OEP) before and after one intervention. Statistical analysis was performed using independent samples t-test.

**Results:** Tidal volume (Vt) presented a significant increase immediately after the chest wall muscle stretching in rib cage pulmonary compartment (Vt,rcp, p=0.02), in rib cage abdominal compartment (Vt,rca, p=0.04) and their percentages regarding thoracic wall, Vt,rcp% (p=0.04) and Vt,rca% (p=0.022). Thus, there was

a reduction in respiratory rate (p=0.011) and minute ventilation (p=0.03), and a increase in a expiratory time p=0.026).

Conclusions: The chest wall muscle stretching has beneficial acute effects on chest wall volume distribuition in patients with COPD. For reason, this technique should be considered to treat these patients.

Supported by: CAPES-NF, CNPq, FACEPE.

### P484

### Physiological performance of patients with COPD during activities of daily living after a physical training with and without inspiratory muscle training: Preliminary results

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Background: Physical training (PT) improves performance of activities of daily living (ADL), decreases dyspnea and enhances the inspiratory muscle strength in patients with COPD. Less is known on the physiological benefits during the execution of ADL in patients treated with general PT (GPT) or GPT plus inspiratory muscle training (IMT).

Aim: To compare changes on ventilatory and metabolic responses, dyspnea, SpO2 and time during a set of ADL after two PT programs.

Methods: A set of 5 ADL (making bed (1), taking shower (2), brushing teeth (3), lifting and lowering containers above eye level (4) and below the pelvic waist (5) was performed by 28 patients before and after a 16 week: 13 GPT (aerobic training) (FEV143 $\pm$ 4%pred, 67 $\pm$ 2yrs) and 15 GPT+IMT with PowerBreathe (FEV<sub>1</sub>51 $\pm$ 3%pred, 67 $\pm$ 3yrs). A metabolic system was used during ADL.

Results: Both groups had significant reduction (p<0.05) of VE, VO<sub>2</sub>, Borg, SpO2 and time in ADL within them, although there are no difference between GPT and GPT+IMT throughout the performance of ADL (Table1).

Table 1

| GPT/GPT+IMT | ΔVE<br>(L/min)      | ΔVO <sub>2</sub><br>(ml/kg/min) | $\Delta Borg$     | $\Delta SpO_2$ (%) | $\Delta$ Time (s) |
|-------------|---------------------|---------------------------------|-------------------|--------------------|-------------------|
| 1           | -13±4/-11±3         | $-8\pm7/-6\pm4$                 | $-1\pm 1/-1\pm 1$ | +2±2/+4±4          | -90±36/-87±49     |
| 2           | $-11\pm3/-10\pm3$   | $-8\pm 6/-5\pm 6$               | $-1\pm 1/-2\pm 1$ | $+3\pm2/+3\pm3$    | -69±49/-110±57    |
| 3           | $-12\pm 3/-10\pm 3$ | $-8\pm 6/-5\pm 6$               | $-1\pm 1/-2\pm 1$ | $+3\pm2/+4\pm4$    | -98±86/-114±66    |
| 4           | $-11\pm4/-11\pm3$   | $-7\pm5/-6\pm5$                 | $-1\pm 1/-2\pm 1$ | $+3\pm2/+6\pm4$    | -97±100/-158±77   |
| 5           | $-12\pm 3/-11\pm 3$ | $-5\pm7/-4\pm5$                 | $-1\pm 1/-2\pm 1$ | $+2\pm2/+5\pm3$    | 100±12/-165±86    |
| p-value     | 0.00/0.01           | 0.05/0.01                       | 0.03/0.04         | 0.00/0.01          | 0.00/0.00         |

Conclusion: These results suggest that both groups improved their performance in the ADL. Adding IMT did not show additional benefits on physiological variables on performance of ADL.

### P485

### Effect of positive expiratory pressure on sternocleidomastoid and parasternal muscles in patients with COPD: A randomized clinical trial

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Introduction: Chronic obstructive pulmonary disease (COPD) leads to chronic airway obstruction and air trapping, affecting diaphragmatic action and placing it at a mechanical disadvantage, requiring the recruitment of accessory muscles. Objective: To investigate the effect of 10 and 15 cmH2O EPAP on the activity of sternocleidomastoid (SCM) and parasternal muscles in patients with stable COPD. Methods: A randomized clinical trial with twenty-one COPD patients. Subjects were randomly allocated to two groups: 10 cmH<sub>2</sub>O Group (n=10) and a 15 cmH<sub>2</sub>O Group (n=11). We evaluated the electromyographic (EMG) activity of SCM and parasternal muscles in spontaneous breathing (Pre-EPAP), during application of EPAP by face mask for 20 minutes, and for 10 minutes after mask removal (Post-EPAP).

Results: The application of 10 cmH<sub>2</sub>O EPAP promoted reduction EMG activity in the SCM muscle (p<0.0001) and increased parasternal muscle activity (p<0.0001). The group submitted to 15 cmH<sub>2</sub>O EPAP showed a tendency towards greater EMG activity in the SCM muscle and a significant decrease in activity of the parasternal muscle (p = 0.005).

Conclusions: In patients with stable COPD, 10 cmH<sub>2</sub>O EPAP induced a significant decreased in activity of the inspiratory accessory muscle and increased parasternal muscle activity after the application. This may be of practical benefit to reverse the extensive use of the chest wall muscles and reduce their mechanical disadvantage in patients with COPD.

#### P486

### Does tolerance of neuro-muscular electrical stimulation (NMES) relate to gender in patients with an acute exacerbation (AE) of chronic obstructive pulmonary disease (COPD)?

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Introduction: The maximum intensity tolerated using NMES is relatively unknown in patients with an AECOPD. Previous data suggest that healthy males are able to tolerate higher intensities than females. The aim of this study was to compare the tolerance of NMES in patients admitted with an AECOPD between males and females.

**Methods:** 188 patients hospitalised with an AECOPD were recruited [85 male, MRC 4 (IQR 4-5), mean (SD) age 70.7 ( $\pm$ 9.3) years, FEV<sub>1</sub> 1.38L  $\pm$ 0.71, BMI 26.7 $\pm$ 7.0]. NMES was applied daily to both quadriceps muscles (30 mins, frequency 50Hz, pulse duration 300usec) for the duration of hospital stay.

Results: 175 patients completed the NMES intervention. A statistically significant difference between genders was seen in the intensity tolerated at both baseline and at discharge (p  $\leq$  0.01) as well as change in intensity. This change remained significantly different when correcting for baseline intensity (p=0.001) There was no significant difference in the number of sessions completed during hospitalisation between genders

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|                             | Male            | Female          | Difference between groups<br>Mean (95% CI) |
|-----------------------------|-----------------|-----------------|--|
| No. of Inpatient Sessions   | 3 (IQR 1-5)     | 2 (IQR 1-4)     | z= -0.766                                  |
| Intensity at Baseline (mA)  | $18.97 \pm 6.9$ | $15.44 \pm 7.6$ | 3.53 (1.3 to 5.7)*                         |
| Intensity at Discharge (mA) | 24.3±9.3        | 18.4±7.9        | 5.93 (3.4 to 8.5)*                         |
| Change in Intensity (mA)    | 5.3±7.2         | $2.9{\pm}4.5$   | 2.49 (0.6 to 4.3) *                        |

\*p ≤ 0.01. Key: mA, milliamps; IQR, interquartile range.

Conclusion: The intensity of NMES is tolerated at significantly higher levels in males. This may have clinical implications for NMES prescription and relate to outcome measures (eg. strength).

### P487

### Responsiveness of different multidimensional severity indices to pulmonary

rehabilitation in patients with COPD <u>Rafael Mesquita<sup>1,2</sup></u>, Nidia Aparecida Hernandes<sup>1,2</sup>, Thaís Sant'Anna<sup>2</sup>, Vanessa Suziane Probst<sup>1,2</sup>, Fábio Pitta<sup>2</sup>. <sup>1</sup>Centro de Pesquisa em Ciências da Saúde (CPCS), Centro de Ciências Biológicas e da Saúde (CCBS), Universidade Norte do Paraná (UNOPAR), Londrina, Brazil; <sup>2</sup>Laboratório de Pesquisa em Fisioterapia Pulmonar (LFIP), Departamento de Fisioterapia, Universidade Estadual de Londrina (UEL), Londrina, Brazil

Background: Multidimensional indices have been used to assess disease severity in patients with COPD. The responsiveness of these indices to pulmonary rehabilitation (PR) needs to be better investigated.

Objective: To evaluate the responsiveness of five multidimensional severity indices to PR in patients with COPD.

Methods: 35 patients with COPD (17 men, 66±8 years, FEV<sub>1</sub> 43±16%pred) participated in a PR program of high-intensity endurance and strength training during 3 months. Demographic data, lung function (spirometry), exercise capacity (six-minute walking test [6MWT] and incremental shuttle walking test [ISWT]), dyspnea (Medical Research Council [MRC] scale) and quality of life (Saint George Respiratory Questionnaire [SGRQ]) were assessed before and after the program, and the following indices were calculated: BODE, SAFE, updated BODE (upBODE), ADO and i-BODE.

Results: Age, distance walked in the 6MWT and SGRQ score were the only components of the indices which changed after PR (p<0.05 for all). Table 1 summarizes the responsiveness of the indices to PR.

Table 1

|        | Pre-PR          | Post-PR         | p value | Standardized Response Mean |
|--------|-----------------|-----------------|---------|----------------------------|
| BODE   | 4.29±1.84       | 4.17±1.49       | 0.66    | -0.11                      |
| SAFE   | 4 [2-5]         | 3 [2-4]         | 0.07    | -0.41                      |
| upBODE | 3 [2-5]         | 4 [2-4]         | 0.47    | -0.22                      |
| ADO    | $4.89 \pm 1.55$ | 4.89±1.39       | 1.00    | 0                          |
| i-BODE | $4.31{\pm}1.89$ | $4.62{\pm}1.50$ | 0.34    | 0.28                       |

The percentage of subjects that decreased their score (i.e., improvement) in the BODE, SAFE, upBODE, ADO and i-BODE was 23%, 49%, 23%, 20% and 23%, respectivelly (p>0.05).

Conclusions: These preliminary findings indicate that the severity indices evaluated in patients with COPD in this study present very modest responsiveness to pulmonary rehabilitation, despite the improvement in some of its components.

### P488

### Where are they now? Four years after the completion of a maintenance exercise program in people with COPD

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Introduction: To determine if quality of life and exercise capacity had been maintained four years after the completion of a12-months maintenance exercise program (MEP) that followed an eight-week pulmonary rehabilitation program (PRP), in people with COPD.

Methods: At the completion of the 12 month MEP, participants had maintained exercise capacity and quality of life and were instructed to continue with unsupervised exercise without further follow-up. Four years later participants were invited to be reassessed with spirometry, two six-minute walk tests (6MWT), St George's Respiratory Questionnaire (SGRQ) and the Health and Activity Survey (HAAS). Daily Physical Activity (PA) was also measured using the SenseWear Pro 3 armband.

Results: Thirty-seven of the 48 (79%) who completed the MEP were reassessed at four years [mean (SD): age 70 (8); males 22; BMI 26 (6); smokers 14%]. Results compared to the end of the MEP [mean difference (95%CI)] showed a maintenance of SGRQ [2.5 (-4 to 9), p=0.43] with a decline in 6MWT [-56m (-25 to -86) p<0.001] and FEV1% predicted [-8 (-4 to -12), p<0.001]. The HAAS showed that 64% reported performing regular exercise and 71% were physically active. For 22 participants (60%) who wore the armband the daily step count and time spent at or above a moderate level of physical activity (≥ 3 METS) was mean (SD) 5,522 steps (3,603) and 65 (62) minutes per day, respectively

Conclusion: Four years following a PRP plus a12-month MEP people with COPD had maintained quality of life but showed a significant decline in exercise capacity.

### P489

### Effect of aerobic exercise training on bronchial hyperresponsiveness, airway inflammation and health related quality of life in asthmatic patients: A pilot study

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Background: Recent studies have shown that aerobic training (AT) have antiinflammatory effect in asthmatics patients; however, there is a lack of studies addressing the effect of AT in bronchial hyperresponsiviness (BHR).

Objective: To evaluate the effects of AT on BHR, airway inflammation and health related quality of life in patients with moderate and severe asthma.

Methods: This prospective, randomized, single-blind and controlled study included 25 patients with controlled asthma (41.6±10.5yrs-old; FEV1=82.0±15.1% predicted), randomly divided into Control (CG=15) or Training groups (TG=10). Patients were studied between 2 medical consultations. Both groups performed educational program and placebo treatment, but only TG performed AT twice a week, during 3 months. BHR was assessed with histamine, airway inflammation by exhaled nitric oxide (eNO) levels and health related quality of life with AQLQ questionnaire. These endpoints were evaluated before and after treatment and patients did not modify medication. Two-way ANOVA test was used and a significance level of 5% was set (p<0.05).

Results: After AT program, only the TG showed a decreased in eNO values (from  $36.0\pm20.2$  to  $25.9\pm10.7$  ppb; p<0.05) and an improvement in AQLQ (from 4.62±1.58 to 5.76±1.09 score; p<0.05). In contrast, no change in BHR was observed in both groups (p>0.05).

Conclusion: Our results suggest that aerobic conditioning reduces airway inflammation and improves the quality of life in asthmatic patients but does not modify bronchial hyperresponsiviness.

### P490

### Differences between smokers who completed or dropped out of a program to increase daily physical activity

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Background: Initiatives to increase physical activity in daily life (PADL) of smokers are important, although interventions in this population are frequently characterized by high dropout rates.

Objectives: To investigate and compare the characteristics of smokers who completed or dropped out of a program to increase PADL.

Methods: 105 smokers with normal lung function started a 5-month program

which aimed at increasing PADL by using pedometers (DigiWalker SW-200 Yamax) in order to achieve a target of 10000 steps/day. Participants responded to questionnaires concerning smoking history (cigarettes/day and pack-years index), quality of life (SF-36) and anxiety and depression symptoms (State-Trait Anxiety Inventory and Beck Depression Inventory, respectively). Lung function (spirometry) and functional exercise capacity (6-minute walking test) were also assessed, besides baseline PADL assessment with a pedometer for six days.

**Results:** When comparing smokers who completed the program (n=54; 27 male) with those who dropped out (n=51; 16 male), there were significant differences concerning age (51 [47-58] vs 48 [36-51] years, respectively; p=0.004; median [IQR]); pack-years (35 [19-47] vs 23 [13-40]), respectively; p=0.03), PADL (8746 [6059-11029] vs 7226 [4060-9120] steps/day, respectively; p=0.01) and most SF-36 dimensions, especially physical function (90 [80-100] vs 85 [64-91], respectively; p=0.005

Conclusions: Smokers who dropped out of the program were younger, physically less active and with worse quality of life than those who completed it. In protocols aiming at increasing daily physical activity of smokers, strategies must be developed to avoid these target subjects to dropout.

### P491

### Inspiratory muscle training in obstructive sleep apnea syndrome

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Aim: No information is known about the role of inspiratory muscle training in patients with obstructive sleep apnea syndrome (OSAS). The purpose of this study was to investigate the effects of inspiratory muscle training on respiratory muscle strength, polisomnographic results, snoring, and sleep quality in patients with OSAS.

Materials and methods: Twenty-seven OSAS patients were randomly assigned to one of two groups: 15 patients in the training group and 12 patients in the control group. The patients in training group underwent a 12-week inspiratory muscle training program (30-80% of their maximal inspiratory pressures, MIP) using a threshold loading device for 30 minutes per day, seven days per week. The patients in the control group underwent standart medical treatment. In all patients, respiratory muscle strength (MIP, maximal expiratory pressure, MEP) was determined. Polisomnography recordings, snoring (The Berlin Questionnaire), and quality of life (The Functional Outcomes of Sleep Questionnaire, FOSQ) were also evaluated before and after the treatment.

Results: No significant differences were found between the two groups with regard to age, gender, and body mass index (p>0.05). After 12 weeks of inspiratory muscle training program, there were significant improvements in MIP, MEP, and total score of FOSQ compared with the control group (p<0.05). The presence of snoring, snoring frequency and severity decreased significantly after inspiratory muscle training (p<0.05).

Conclusions: Inspiratory muscle training ensures significant benefits in respiratory muscle strength, quality of life, and snoring for OSAS patients. It should be taken into consideration for the management of the patients.

### P492

### Effects of oropharyngeal exercises on antropometric measures and symptoms in patients with obstructive sleep apnea syndrome

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Background and aim: Upper airway muscle function plays a major role in the maintenance of upper airway patency and contributes to the obstructive sleep apnea syndrome (OSAS). The aim of this study was to determine the impact of oropharyngeal exercises on antropometric measures and symptoms in patients with OSAS. Materials and methods: Twenty-six patients with OSAS were randomized to 3 months of a set of oropharyngeal exercises (n=14, 53.7±7.1 years), or control group as standart medical treatment (n=12, 47.3±7.3 years). Anthropometric measurements (neck and abdominal circumference) were measured. Snoring frequency (range 0-4), intensity (1-3), Epworth Daytime Sleepiness score (0-24) and Pittsburgh Sleep Quality score (0-21) were determined, and full polysomnography were performed at baseline and at the end of the intervention.

Results: No significant difference was found in baseline characteristics between the groups (p>0.05). Body mass index and abdominal circumference did not change significantly over the study period (p>0.05). Patients undergoing oropharyngeal exercises had a significant decrease in neck circumference (-1.04 $\pm$ 0.97 vs.  $0.08\pm1.18$  cm), snoring frequency (-2.3 $\pm0.7$  vs.  $0.1\pm0.3$ ), snoring intensity (-3.2±1.1 vs. 0±0), daytime sleepiness (-6.2±4.8 vs. 0.2±4.1), sleep quality score  $(-4.6\pm3.6 \text{ vs.} -1.5\pm1.3)$  as compared with the control group (p < 0.05).

**Conclusions:** Oropharyngeal exercises significantly reduce antropometric measurements and symptoms in patients with OSAS. They represent a promising treatment for OSAS.

### P493

Physical activity promotes pulmonary recovery after cardiac surgery <u>Marcus Jonsson</u><sup>1</sup>, Elisabeth Westerdahl<sup>2,3</sup>. <sup>1</sup>Department of Physiotherapy, Örebro University Hospital, Örebro, Sweden; <sup>2</sup>School of Health and Medical Sciences, Örebro University, Örebro, Sweden; <sup>3</sup>Department of Medical Sciences, Uppsala University, Uppsala, Sweden

Introduction: It is well known that physical activity has substantial impact on general health and mortality. Benefits of physical activity have been reported for patients after cardiac surgery. Patients undergoing cardiac surgery have reduced lung function postoperatively and often suffer from postoperative pulmonary complications.

No studies have been published where the relationship between physical activity and lung function after cardiac surgery has been investigated.

**Aim:** To test the hypothesis that physical activity is positively correlated with pulmonary recovery, the relationship between postoperative self-reported physical activity and lung function, two months after cardiac surgery, was investigated.

**Methods:** In a prospective cohort study, a sample of 76 patients undergoing cardiac surgery between 2007 and 2009, was followed up two months after cardiac surgery. Physical activity level was quantified using a categorical question on physical activity at work and during leisure time. Lung function was measured by spirometry. The measurements were made prooperatively and 2 months postoperatively.

**Result:** Two months postoperatively the patients had increased their self-reported level of physical activity. Patients with a higher level of physical activity showed a significantly better recovery of lung function two months after cardiac surgery (VC 95%  $\pm$  11 vs 91%  $\pm$  7 (p = 0.043) and FEV1 93%  $\pm$  8 vs 89%  $\pm$  6 (p = 0.008)) compared to patients reporting low physical activity.

**Conclusion:** A higher level of physical activity, during the first two months after cardiac surgery is associated with a better recovery of lung function, compared to being less active or sedentary.

### P494

## Cardiac autonomic responses exercise-induced during inpatient cardiac rehabilitation in patients undergoing CABG and left ventricular function different

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Introduction: Patients undergoing coronary artery bypass graft (CABG) with reduced left ventricular function (LVF) are those who experience greater cardiac autonomic adaptation at rest after inpatient cardiac rehabilitation (CR). However, the acute cardiac autonomic response (CAR) during exercise remains to be investigated.

 ${\bf Aim:}\ \bar{{\bf To}}\ assess whether physical exercises can evoke beneficial CAR in post-CABG patients with different LVF.$ 

**Method:** Forty-four patients, divided into LVF normal (LVFN, n=23) composed of patients with left ventricular ejection fraction (LVEF) $\geq$  55% and LVF reduced group (LVFR, n=21) with LVEF = 35–54% were evaluated. CAR was assessed by heart rate variability (HRV) during extremity ROM exercises and ambulation on the first postoperative day (PO1) and before discharge, respectively.

**Results:** PO1 were observed significant intragroup differences for mean heartbeats intervals and heart rate to rest and exercise in both groups. During ambulation were found lower values of HRV (STDRR, TINN, SD2, shannon entropy and correlation dimension) to LVFR as well as for the change between rest and ambulation for the total HRV indices (STDRR, RRtri, TINN and SD2), parasympathetic activity (rMSSD) and complexity of the data (correlation dimension) (P < 0.05).

**Conclusion:** In patients with normal LVF, physical exercise triggered more attenuate CAR compared with patients with reduced LVF post-CABG. Thus, prescribed intensities of physical exercises at this time should be reviewed considering the differences of ventricular function of patients involved.

Support: PNPD/Capes 23038.008208/2010-25, FAPESP 2009/54194-5.

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### **Inspiratory muscle training in patients with Parkinson's disease** <u>Silvana Loana Oliveira Sousa</u><sup>1</sup>, Martha Cecília León Garzón<sup>1</sup>,

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**Background:** Respiratory muscle weakness is a common impairment in patients with Parkinson's disease (PD). This is muscle weakness is exacerbated by increased chest wall rigidity that potentially contribute to reduced lung volumes and respira-

tory pressures and may be an important factor in the respiratory complications in this population.

**Objective:** This study investigated the effect of specific inspiratory muscle training (SIMT) on maximum inspiratory pressure in patients with PD.

**Methods:** Thirteen participants (7 males and 6 females) with PD (mean age of 69.6 years (SD=7.7 years) referred from the On-Off Parkinson's Association in Murcia, Spain, were involved in this study. Maximum inspiratory pressure (MIP) was considered the indice of inspiratory muscle strength and measured before and within one week after the training period and. All subjects trained daily at home, six times a week, each session consisting of 3 sets of the 15 times, for 8 week. The training was performed using an inspiratory muscle trainer.

**Results:** Following the training period there was a significant improvement in inspiratory muscle strength. The mean inspiratory muscle strength pre-intervention was 58.6 cmH<sub>2</sub>0 (SD=12.3) and post-intervention was 72.4 cmH<sub>2</sub>0 (SD=14.1) (p<0.01).

**Conclusions:** The results of this study demonstrate that muscle strength training has the potential to improve inspiratory muscle strength in patients with Parkinson's disease.

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### Acute effects of threshold positive expiratory pressure on chest wall volumes in Parkinson and chronic stroke patients

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**Aim:** To study the effects of different levels of Threshold positive expiratory pressure on chest wall volumes in patients with Parkinson and Chronic Stroke.

**Methods:** In eleven patients with Parkinson Disease ( $60\pm10.3$  years old;  $4.4\pm3$  years of diagnosis; BMI:  $25.5\pm2.7$  kg/m<sup>2</sup>; FEV<sub>1</sub>/FVC %:  $0.82\pm0.07$  and FVC%<sub>pred</sub>:  $82.4\pm17.9$ ) and 10 chronic stroke patients ( $53\pm5.9$  years;  $3.3\pm2.6$  years of diagnosis; BMI:  $26.9\pm4.8$  kg/m<sup>2</sup>; FEV<sub>1</sub>/FVC%:  $0.8\pm0.06$  e FVC%<sub>pred</sub>:  $100.6\pm14.1$ ) we assess the effects of three levels of Threshold PEP (10, 15 and 20 cmH<sub>2</sub>O) in random order on chest wall volumes (Optoelectronic Plethysmography, OEP) in three moments: 5 minutes during quite breathing (QB), 5 minutes breathing against PEP and 5 minutes recovery (rQB).

**Results:** Intragroup analyses showed that tidal volume of chest wall increased in all levels of PEP compared to QB in Parkinson patients (QB=0.46±0.06L vs PEP10=1.04±0.35L; vs PEP15= 1.2±0.57 L and vs PEP20=1.23±0.48 L, p<0.001) and chronic stroke patients (QB=0.41±0.05 vs PEP10=0.77±0.26L; vs PEP15=0.76±0.13L; PEP20=0.77±0.22L, p=0.0001), but no differences were found between levels of Threshold PEP. The behavior of pulmonary rib cage, abdominal rib cage and abdominal compartments were similar during all PEEP levels. End expiratory and end inspiratory lung volumes did not change significantly during different loads of PEP.

**Conclusion:** The different loads of Threshold PEP induced similar changes on chest wall and compartmental volumes in Parkinson and Chronic Stroke patients.

#### P497

**Respiratory muscle training is safe and effective in malnourished patients** <u>Adriana Lunardi</u>, Murakami Fernanda, Carol Paganini, Carvalho Celso. *Physiotherapy, School of Medicine of University of Sao Paulo, SP, Brazil* 

Malnutrition is prevalent in 50% of hospitalized patients worldwide and causes systematic damage, including the respiratory system and muscles and leading to increased predisposition to infections and respiratory muscle weakness. The safety and effectiveness of respiratory muscle training in this population are poorly studied.

Objective: To assess the effect of specific respiratory muscle training in malnourished patients.

**Methods:** This prospective, randomized and controlled study enrolled 29 malnourished patients with no previous pulmonary disease (BMI < 20kg/m<sup>2</sup> and serum albumin < 3.5g/dL). Patients were randomly divided into 3 groups: sham training (CG, n=10), inspiratory (ITG, n=10) and expiratory (ETG, n=9) training. The intensity of ITG and ETG training was at 30% of maximal inspiratory or expiratory pressure (respectively, MIP and MEP). Training sessions were conducted daily in the afternoon for 30 minutes (3 sessions of 10 min, during 7 days) using the threshold IMT<sup>®</sup> or PEP<sup>®</sup>. All patients received the same nutritional support. Maximal respiratory pressures and lung function was evaluated before and after the protocols. The evaluator was blinded to patient's group. Two way repeated measures ANOVA and post hoc Newman-Keuls test were performed and significance level was set at 5%.

**Results:** All groups were similar in gender, age, BMI and serum albumin. No patient demonstrated any signs of respiratory distress. After training period, there was increase in MIP in the ITG  $(59.9\pm25.8 \times 107.9\pm52.6 \text{cmH}_2\text{O}; p=0.02)$  and MEP in the ETG  $(46.5\pm12.9 \times 81.1\pm23.2 \text{cmH}_2\text{O}; p=0.01)$  compared to CG. **Conclusion:** The respiratory muscle training is safe in malnourished patients and promotes a specific increase in the trained muscle.

### P498

### Feasibility of neuromuscular electrical stimulation (NMES) on the intensive

**care unit (ICU): Preliminary results** Johan Segers<sup>1</sup>, Greet Hermans<sup>2</sup>, Frans Bruyninckx<sup>3</sup>, Geert Meyfroidt<sup>4</sup>, Daniel Langer<sup>1</sup>, Rik Gosselink<sup>1</sup>. <sup>1</sup>*Rehabilitation Sciences, KU Leuven, Leuven,* Belgium; <sup>2</sup>General Internal Medecine - Medical ICU, UZ Leuven, Belgium; <sup>3</sup>Physical Medicine and Rehabilitation, UZ Leuven, Belgium; <sup>4</sup>Intensive Care Medicine, UZ Leuven, Belgium

Background: Survivors of critical illness often have a prolonged ICU stay. To attenuate their reduction in muscle mass and muscle strength, NMES might be useful. Aim was to study feasibility and safety of NMES in ICU.

Methods: Patients with expected prolonged stay in ICU of 5 additional days (judged on day 3) without neurological disease were included. They received daily bilateral quadriceps NMES sessions of 25 minutes. Main outcome was to produce contraction of quadriceps. Patients with contraction in 75-100% of sessions were considered responders. Patient characteristics and stimulation parameters were compared between responders and non-responders. Safety was judged by cardiovascular and respiratory responses. Results:

### Table 1. Feasibility of NMES

|                              | Responders, N=17 (50%) | Non-responders, N=17 (50%) | p-value |
|------------------------------|------------------------|----------------------------|---------|
| Age (years)                  | 56.6 (±10.8)           | 63.2 (±11.1)               | 0.084   |
| BMI                          | 25.3 (±4.2)            | 25.1 (±6.1)                | 0.920   |
| Barthel-index (/20; premorbi | d) 17.1 (±3.5)         | 18.3 (±2.3)                | 0.331   |
| APACHE II                    | 22.5 (±8.1)            | 27.5 (±6.9)                | 0.090   |
| Glasgow coma scale           | 7.0 (±2.7)             | 8.4 (±3.4)                 | 0.192   |
| 5 questions for adequacy     | 1.5 (±1.5)             | 2.3 (±1.6)                 | 0.171   |
| Oedema                       | 5                      | 11                         | 0.084   |
| Placing of electrodes*       | 0                      | 4                          | 0.103   |
| Intensity (mA)               | 64.9 (±8.9)            | 66.1 (±13.7)               | 0.748   |

\*Different from standardised position due to catheters

### Table 2. Safety of NMES

|                                 | Pre           | Post         | p-value |
|---------------------------------|---------------|--------------|---------|
| Heart rate                      | 90.1 (±13.2)  | 91.2 (±15.3) | 0.230   |
| Systolic blood pressure (mmHg)  | 131.4 (±14.8) | 132 (±13.4)  | 0.733   |
| Diastolic blood pressure (mmHg) | 65.4 (±7.1)   | 65.0 (±7.9)  | 0.598   |
| Saturation                      | 96.5 (±2.8)   | 96.5 (±2.8)  | 0.957   |
| Respiratory rate                | 20.7 (±4.7)   | 20.1 (±4.4)  | 0.271   |

Conclusion: In this small sample a trend is observed for age, APACHE II and edema to influence efficacy of NMES. NMES is a safe intervention in ICU.

### P499

### Physiotherapy led weaning plans reduce the number of days patients require non-invasive ventilation (NIV)

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Background: Respiratory physiotherapists at ASPH assess, monitor and wean patients requiring NIV. In May 2009, as a result of previous NIV audit data, a physiotherapy led weaning proforma was implemented to improve successful weaning rates

Aims and objectives: The aim of the investigation was to establish if physiotherapy led weaning plans reduced the number of days patients spent on NIV

Methods: Data were collected prospectively from 255 consecutive patients requiring NIV over a two year period from May 2009 to April 2011 using a locally adapted version of the BTS NIV data collection tool. Number of days on NIV were collected from patients nursing notes. 84 patients had physiotherapy led weaning plans and were included in the analysis (t-test).

Results: 33% (n=84) of patients had a physiotherapy led weaning plan. The impact of physiotherapy led weaning plans is summarised

Table 1. Impact of physiotherapy weaning plans on time on NIV

| p                                    | Patients with a<br>physiotherapy weaning<br>plan (n=84) 33% |            | p value<br>(T-Test) |
|--------------------------------------|---|------------|---------------------|
| Average number of days on NIV (range | e) 3.0 (1-9)  | 8.6 (1-17) | p=0.03              |

8% (n=21) patients required referral for domiciliary NIV and therefore could not be weaned and were excluded from the analysis.

Conclusion: Physiotherapy led weaning plans reduce the length of time patients remain on NIV. A possible explanation could be faster optimisation in the first 24 hours facilitating a shortened weaning time. Further investigation is required to establish if earlier physiotherapy input can impact on NIV outcome. Thanks to Tina Thomas for data entry.