118. Respiratory physiotherapy in the intensive care unit and on the ward: breathing exercises and respiratory muscles

P1274
The inter-observer agreement of handheld dynamometry in critically ill patients
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Objective: Muscle weakness is associated with increased risk of morbidity, mortality and limiting functional outcome. To assess muscle weakness reliable measurements are required. The objective is to determine inter-observer reliability of handheld dynamometry (HHD) in awake and cooperative critically ill (CI) patients.

Patients: A cross sectional, randomly selected sample of CI patients.

Measurements: HHD was performed in CI patients, who had at least a score of 3 on the Medical Research Council scale. 3 Upper limb and 3 lower limb muscle groups were tested at the right hand side. Patients were tested twice daily by 2 independent raters.

Results: 51 test-retests were performed in 39 CI patients. Strength was considerably reduced compared to the predicted value: shoulder abduction 43% pred (IQR: 35-58); elbow flexion 38% pred (IQR: 23-58); wrist extension 51% pred (IQR: 23-58);
P1275

Effects of non-invasive mechanical ventilation on muscle strength, ambulation, and functional performance in the intensive care

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Aim: Muscle weakness is a common complication of stay in the intensive care unit (ICU). The aim of this study was to compare the effects of noninvasive mechanical ventilation (NIMV) and standard medical care on muscle strength, ambulation level and functional performance in ICU patients with acute respiratory failure.

Methods: Fifteen patients undergoing standard medical care (53.1±15.5 years) and 15 patients undergoing NIMV (59.9±14.4 years) participated in the study. Patients’ characteristics, admission findings and length of ICU stay were recorded. An Acute Physiological and Chronic Health Evaluation (APACHE II) score was calculated. Peripheric muscle strength was assessed using the Medical Research Council Scale and handgrip dynamometry. Functional performance was evaluated using the Barthel Index. Ambulation level was recorded as six levels: (1) unsupervised sitting in the bed, (2) transfer to chair, (3) sitting in the chair, (4) standing, (5) walking, (6) walking >30 m.

Results: APACHE II score was similar in both groups (p>0.05). No significant difference in hand grip force were found between the two groups (p>0.05). Length of ICU stay was significantly longer in patients undergoing NIMV (p<0.05).

Conclusion: Patients receiving NIMV had peripheral muscle weakness. These patients had more limitations in their functional performance as compared to patients undergoing standard care. Application of NIMV, similar to invasive mechanical ventilation, results in limitations in functional performance, ambulation, and muscle strength in the ICU.

P1276

Registery and conformity of endotracheal tube tip distance from carina at a large tertiary hospital

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Physiotherapists are part of the Intensive Care Unit (ICU) team, although their participation in routine ICU patient care is limited. However, there are few studies about this subject. Objectives were to find out if ICU staff registered the measured mark of ETT at the lips (ETT mark); if registry in accordance with real ETT mark; if a specific field for ETT mark registry influenced the filling of patient’s file; and if ETT tip distance from carina (ETT-carina distance) was correct according to thorax radiography. 198 cases of patients intubated for over 24 hours, from seven ICUs of Clinical Hospital of Medicine School of University of São Paulo, were included. Data observed: ETT mark, ETT-carina distance, ETT mark registry at patient’s file. We found that there was no ETT mark registry neither on medical nor nursing records. Physiotherapists registered it in 55.8% of the cases. ETT mark registry was in accordance with observed in 82 cases (73.9%). Among the cases in which ETT mark was not registered, in most of them (72%) there was not a specific field. ETT-carina distance was correct (from 2.5 to 4.0 cm) in 60.8% of the cases.

In the ICUs analyzed, only physiotherapists registered ETT mark. In an expressive percentage (44.2%) there was no registry of this important information at all. The presence of a specific field may have positively influenced the filling of patient’s file. In a significant number of cases (39.2%) ETT-carina distance was incorrect, propitiating risk for intubated ICU patients. Perhaps ETT positioning has not been given the necessary attention.

P1277

The use of oxygen concentration 50% above baseline before and after endotracheal suctioning prevents hypoxemia in stable patients

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Objective: Few are known about the use of inspired fractions of oxygen less than 100% (1) to prevent hypoxemia during endotracheal suctioning (ES). The objective was compare the repercussions of using a FiO2 50% above the baseline with a FiO2 of 100% during ES in mechanically ventilated patients.

Methods: A randomized trial in 17 patients (55.7±23.9 yrs) underwent 2 sessions of ES (break of 6 hours) with prior hyperoxegenation by two values of FiO2: 50% above the baseline and 100%. The heart rate (HR), mean arterial pressure (MAP), oxygen saturation (SpO2), and breath rate (BR) were recorded at baseline 5 minutes after adjusting the FiO2, likewise 1 and 5 minutes after the end of procedures.

Results: SpO2 within the groups increased in all phases of the two protocols, compared to baseline. There was an increase in HR at 1 min after ES in protocol with raising the FiO2 to 50%; compared to PRE time and baseline, as well as the BR in procedure with FiO2 of 100%. Alredy MAP increased only at 1 min compared to baseline in protocol with increase FiO2, to 50%. In the intergroup analysis, SpO2 and BR was higher in the procedure with FiO2 of 100% at 1 min after the ES, but without clinical relevance.

Conclusion: The use of a FiO2 50% above baseline before and after ES prevented hypoxemia and negative changes in vital signs of stable patients on mechanical ventilation.
P1280

Validation of a time-frequency wheeze detector in cystic fibrosis: A pilot study

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Background: Computerised lung-sound analysis can be used to identify and quantify wheezes which are associated with pulmonary diseases. However, this type of analysis requires further validation before it can be implemented routinely in the clinical practice across different respiratory pathologies.

Objective: This pilot study aimed to validate a time-frequency wheeze detector (TF-WD) in the cystic fibrosis disease.

Methods: Recordings were made in a clinical setting from a stable cystic fibrosis adult outpatient with a digital stethoscope following the COSRA guidelines. Several TF-WD algorithms were performed and the best performance was obtained with the Taplilou et al. (2007) algorithm, which was validated in four sound files. The number, duration and type of wheezes were blindly analysed independently by three experienced respiratory physiotherapists. Their evaluation was then compared with the automatic method. The statistics accuracy of the wheezes detection was quantified through sensitivity, specificity and performance measures using MatlabR2007b. True positives/negatives and false positives/negatives were counted by comparing each point of the sound file.

Results: Inter-rater agreement between the physiotherapists was 96.9%. The sensitivity, specificity and performance of the automated method were 77.2%, 98.4% and 87.1%, respectively.

Conclusion: The automated method tested shows sufficient reliability to continue the study and implement a future clinical validation with a larger sample. Wheezes detection through computerised analysis can provide an objective measure to assess and monitor cystic fibrosis patients, however further research is needed to validate the most robust algorithm.

P1281

Randomized clinical trial: Effects of controlled breathing exercises on respiratory muscle in the elderly

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Introduction: Respiratory muscle (RM) strength decreases with aging, and in most cases this decrease is associated with functional impairment and disabilities, particularly in the frail elderly. RM training has been shown to be an effective method to improve RM strength. The purpose of this study was to assess the effect of controlled breathing exercises on RM strength among elderly people with disabilities who are unable to engage in general exercise reconditioning. The hypothesis is that controlled breathing exercises will improve RM strength vs. a control group.

Methods: Forty-eight elderly were randomly assigned to a control group (n=24) or training group (n=24). A supervised training protocol, consisting of controlled Pranayama breathing exercises, was performed 5 times per week for 6 weeks. Maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP) were measured, and 87.1% of total expiratory time.

Results: Intergroup analyses showed a significant improvement in MIP and MEP from baseline to follow-up (p<0.001, η2=0.165). Also for MEP is statistically significant (F(3,138)=9.122, p<0.001, η2=0.165).

Conclusions: This is the first controlled study in elderly people that report a significant gain in RM strength due to the Pranayama training program.
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Hall 2-41 - 12:50-14:40
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P1287
Effect of hyperoxgenation on measurement of the maximum inspiratory pressure (MIP) in critical patients
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The assessment of the maximum inspiratory pressure (MIP) is used as an indicator of inspiratory muscle strength and may be useful in evaluating the success of weaning from mechanical ventilation. During this procedure it is common that a fall of saturation peripheral O2 (SpO2) occurs, leading to discontinuation of the maneuver, which can underestimate the value of MIP.

The objective of this study is to verify whether the implementation of hyperoxgenation prior to the assessment can mitigate this decline of SpO2, increasing the measurement support time (t) and generating a more reliable MIP. The evaluation of the MIP, occlusion time (OT), SpO2, respiratory rate (RR) and heart rate (HR) was carried out randomly on 26 patients, with or without hyperoxgenation prior, maintaining the duration of occlusion of unidirectional valve for an indefinite period. Hyperoxgenation was defined as the use of inspired oxygen fraction (FiO2) to 100%, two minutes before the maneuver. The measurement was performed with the patient in the supine position and elevated head with an angle of 30°.

The value of MIP and OT were higher with previous hyperoxgenation (53.77±22.37 cmH2O vs 43.38±20.11 cmH2O, p<0.001; and 58.69±26.09 sec vs 37.04±15.07 sec, p<0.001, respectively). In addition, there was a smaller drop in SpO2 after the measurement when the method was performed with hyperoxgenation (93.15±7.24% vs 84.58±9.73%, p<0.001). There was increase in RR and HR independently of the hyperoxgenation.

Implementation of hyperoxgenation prior to the assessment of MIP increase the values obtained, generating a more reliable MIP.

P1288
Effects of inspiratory positive airway pressure on the electromyographic activity of accessory inspiratory muscles in chronic obstructive pulmonary disease patients
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Background: Chronic obstructive pulmonary disease (COPD) affect the action of the diaphragm, placing the muscle at a mechanical disadvantage and requiring the recruitment of accessory muscles of inspiration.

Objective: To evaluate the electromyographic activity (EA) of sternocleidomas- tes (SCM) and of the scalene muscles during and after the use of EPAP (inspiratory positive airway pressure) in COPD patients.

Methods: A clinical single-blind trial involving 13 (57.1±7.1 years; 7M,6F) subjects with normal spirometry (controls) and 12 (57.2±8.3 years; 4M,8F) COPD patients (FEV1 44.0±17.1%; FVC 69.4±18.9%). At baseline, we determined EA during spontaneous respiration, lung function parameters, and respiratory muscle strength. Subsequently, 15 cmH2O EPAP was applied by face mask for 25 min, during which the EA of the SCM and scalene muscles was recorded every 5 min. A final record was obtained 10 min after the mask removal.

Results: We found that the behavior of the EA of SCM and scalene muscles was comparable between the controls and COPD patients (p=0.716 and p=0.789, respectively). However, during the use of EPAP, both muscles showed a trend toward an increase in the EA. In addition, there was a significant decrease in the EA of the SCM between the baseline and final measurements (p<0.034).

Conclusions: EPAP promotes a transient increase in EA and scalene muscle SCM, suggesting that use of this modality pressure increases the activity of these muscles. However, after removal of the EA of the SCM reduces the levels below that obtained at baseline.

P1289
Effects of preoperative inspiratory muscle training (IMT) in obese women undergoing open bariatric surgery: Diaphragmatic excursion
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Introduction: Patients undergoing open bariatric surgery (OBS) have an impaired respiratory muscle strength.

Abstract P1285 – Table 1

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<thead>
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<th>PAI etiologies</th>
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<tr>
<td>PA/SA</td>
<td>PIMAX/PEMAX</td>
<td>PA/SA</td>
<td>PIMAX/PEMAX</td>
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<td>Chronic thoracic embolic disease (n=7)</td>
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<td>21±26/84±36</td>
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<td>Idiopathic (n=7)</td>
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<td>42±16/82±24</td>
<td>46±22/94±14</td>
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<td>Other etiologies (n=8) associated with CTD, left cardiac illness, or sarcoidosis</td>
<td>56±23/74±39</td>
<td>49±47±32</td>
<td>67±22/96±39</td>
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PA, functional aspects; SA, social aspects; PIMAX, maximal inspiratory pressure; PEMAX, maximal expiratory pressure. *p<0.05

WITHDRAWN
lung function in the postoperative period. Aiming to attenuate these negative effects, the preoperative IMT may be an alternative.

Objective: To determine whether preoperative IMT is able to attenuate the impact of surgical trauma on the diaphragmatic excursion in obese women undergoing OBS.

Methods: Thirty-two obese women (35.44±8.75 years and 41.78±3.84 kg/m²), undergoing elective OBS were randomly assigned to receive preoperative IMT (IMT group) (n=15) or usual care (Control group - CG) (n=17) 2-4 weeks before the surgery. The diaphragmatic excursion was evaluated using the digitalized image of the radiograph. The area was calculated of the right and the left dome of the diaphragm. The patients were assessed before and after training, and 1 day after surgery.

Results: The diaphragmatic excursion of the right and the left dome were not altered by training. In the first postoperative day, there was a significant decrease in both groups. However, the values of diaphragmatic excursion were higher in the IMT group, even though they were not statistically significant.

Conclusion: The preoperative IMT appears to attenuate the negative postoperative effects of open bariatric surgery in diaphragmatic excursion.

P1290
Effects of preoperative inspiratory muscle training (IMT) in obese women undergoing open bariatric surgery; Respiratory muscle strength
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Introduction: Patients undergoing open bariatric surgery have an impaired lung function in the postoperative period. Aiming to attenuate these negative effects, the preoperative IMT may be an alternative.

Objective: To determine whether preoperative IMT is able to attenuate the impact of surgical trauma on the respiratory muscle strength in obese women undergoing open bariatric surgery.

Methods: This study is a randomized controlled trial. Thirty-two obese women (35.44±8.75 years and 41.78±3.84 kg/m²), undergoing elective open bariatric surgery were randomly assigned to receive preoperative inspiratory muscle training (IMT group) (n=15) or usual care (UC group) (n=17) 2-4 weeks before the surgery. The respiratory muscle strength was carried out by using measurement the Maximal Inspiratory and Expiratory Pressures – MIP and MEP. The patients were assessed before training, before surgery and 1 day after surgery.

Results: After training, there was an increase in the MIP only in the IMT group (IMT= 93.33 ± 20.35 vs UC= 92.94 ± 18.63 to 91.76 ± 20.38 cmH2O p < 0.05). The MEP was not altered by training. In the first postoperative day, there was a significant decrease in MIP in both the groups. However, the MIP was higher in the IMT group (IMT = 63.34±21.60 vs UC = 48.82±19.32 cmH2O – p<0.05). The MEP was similar between the groups (IMT= 49.66±22.71 vs UC = 49.74±23.39 cmH2O).

Conclusion: The preoperative IMT increased the inspiratory muscle strength (MIP) and attenuated the negative postoperative effects of open bariatric surgery in obese women for this variable, though not influencing the MEP.

P1291
Inspiratory muscle strength and endurance in patients with COPD: A propose outcome with manovacuometry and PowerBreathe®
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Background: Reduced respiratory muscle force and endurance are commonly observed in patients with COPD and contributes to dyspnea, oxygen desaturation and reduced exercise capacity, hence respiratory muscle assessment is clinically relevant.

Aim: To propose an assessment method of inspiratory muscle endurance in patients with COPD and to verify its relationship with maximal inspiratory pressure (MIP) and maximal voluntary ventilation (MVV).

Methods: 18 patients (GOLD I-4; 63±9years) performed the MIP and an incremental and constant respiratory muscle endurance test using the PowerBreathe® device. The incremental test started with 10cmH2O, increasing 10cmH2O each 2min, with 1min of rest between them, which determined the maximal pressure sustained (MPS). The endurance test was 80% of the MPS. The limit time (lim) was determined. Comparisons and correlations were determined using Paired t-test and Pearson correlation.

Results: The MIP was 52±20cmH2O, MVV (Spred) 44±15, MPS 48±23cmH2O, trim 10±8 min and 80%P 35±21cmH2O. The MIP and MPS were not different. Correlation was found between MIP and MPS (r=0.5; p<0.03) and MIP and MVV (r=0.6; p=0.03).

Conclusion: The MIP and MPS were similar in the endurance test and showed a relationship with MVV; suggest to be a reasonable test to assess the respiratory performance in these patients.

Funding: CAPES - Brazil

P1292
Respiratory muscle function during and after a severe exacerbation of COPD – Preliminary results
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Background: It is known that peripheral muscle function (especially the quadriceps muscle function) is markedly reduced during the course of a severe exacerbation of chronic obstructive pulmonary disease (COPD). However, the function of the respiratory muscles has not been studied in depth in the same context.

Objectives: To investigate the respiratory muscle function during and after a severe exacerbation of COPD requiring hospitalization.

Methods: Twelve patients with COPD (7 male, 8.6±14 years, forced expiratory volume in the first second [FEV1] 37±22%pred) hospitalized due to an acute exacerbation of COPD were studied. Inspiratory and expiratory muscle strength (PImax and PEmax, respectively) were assessed at day 1 and day 3 of hospitalization and at hospital discharge, as well as at 1 month after discharge (1MD). Lung function was assessed at day 1, at discharge and at 1MD.

Results: PImax was significantly reduced at day 1, day 3 and at discharge in comparison to 1MD (p<0.05 for all), although it tended to improve overtime during the hospitalization period. PEmax improved significantly overtime during the hospitalization period, while lung function was not significantly altered. Delta PImax (p<0.05) (1MD minus day 1) correlated significantly with age (r=0.72), while delta PEmax (p<0.05) (discharge minus day 1) correlated significantly with PaCO2, assessed at day 1 (r=0.75).

Conclusions: These preliminary data suggest that the respiratory muscle function is markedly reduced at the onset of a severe exacerbation of COPD. However, unlike the quadriceps muscle, respiratory muscles markedly improve their function during the hospitalization period and during the following month.

P1293
Maximal sniff nasal inspiratory pressure in Brazilian healthy subjects: A multicentre study
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Objective: To propose reference values of SNIP for Brazilian population.

Methods: This study was conducted in three centers in Brazil, Natal-RN, Recife-PE and Piracicaba-SP. Subject were evaluated in relation to anthropometrics parameters, physical activity profile and maximal sniff nasal inspiratory pressure follow recommendations of ATS/ERS Statement on Respiratory Muscle Testing. SNIP

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was measured from FRC in the sitting positions using a catheter through a plug occluding one nostril during 10 maximal sniffs through the contra-lateral nostril. For each test the largest pressure measured in cmH₂O was taken into account. Correlation and multiple linear regressions were used to predicted male and female SNIP equations. Results were compared with previous published studies.

**Results:** We studied 244 subjects (114 male and 130 female) distributed in different age grouped 20-80 years old. We found a significantly negative correlation between SNIP and age for male and female (p<0.05). In a multiple regression analysis age continued to have an independent predictive role with SNIP. The predicted equations found for male and females were respectively SNIP = −0.46×age + 135.5 and SNIP = −0.34×age + 109.6.

**Conclusions:** The results of this study provide reference equations of SNIP for health Brazilian population from 20 to 80 years old.

Financial support: CNPq.