251. New evidence in home mechanical ventilation

P2085

Hemodynamic effects of non-invasive ventilation in patients with obesity-hypoventilation syndrome

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Background: Although it was occasionally reported that pulmonary hypertension (PH) is more frequent in obesity-hypoventilation syndrome (OHS) patients than in "pure" obstructive sleep apnea syndrome (OSAS) patients, little is known about the haemodynamic repercussion of this entity. The aim of this study was to describe the hemodynamic situation -assessed by echocardiography and six-minute walking test (6MWT)- of patients newly diagnosed with the most severe form of OHS and to evaluate the impact of non-invasive ventilation (NIV) on it.
Methods: We conducted a prospective, descriptive, single-center follow-up study. At baseline, patients underwent echocardiography, spirometry, static lung volumes measurement, 6MWT, overnight pulse-oximetry and polygraphic recording. We assessed changes in echocardiographic findings and 6MWT after 6 months of NIV implementation. Right ventricular overload (RVO) was defined by the presence of right ventricular (RV) dilatation, RV hypokinesis, paradoxical septal systolic motion or/and PH.
Results: A total of 30 subjects (20 women; mean age: 69±11 years) were included. The percentage of patients with RVO did not change significantly after NIV (from 43.3% to 41.6%; p = 0.24). Pulmonary artery systolic pressure (PASP) for patients with RVO at diagnosis decreased significantly at 6 months (from 58±11 to 44±12 mmHg; p= 0.014) and the mean distance walked on the 6MWT increased from 350±110 to 426±78 m (p = 0.006) without significant changes in the body mass index.
Conclusions: PH is a frequent finding in patients with the most severe form of OHS. Treatment with NIV leads to a decrease in PASP and an increase in the distance covered during the 6MWT.

P2086

The effects of non-invasive bilevel positive airway pressure ventilation on insulin resistance in patients with obstructive sleep apnea

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Background: The effects of the noninvasive ventilation on insulin resistance in obstructive sleep apnea (OSA) patients has been elusive. Although there are a lot of trials concerning its effectiveness, data is still conflicting. There is a lack of studies dealing with the results of the bilevel positive airway pressure (BiPAP) therapy.
Materials and methods: Thirteen patients with type 2 diabetes and eighteen with insulin resistance and newly diagnosed OSA (AHI>30) received BiPAP therapy. Patients were followed up for a mean period of 3,9 months (±1,5) and had a compliance >80%. The average body mass index (BMI) was 38,17 and the mean AHI - 51,95. Baseline tests - blood glucose, HOMA-index, immunoreactive insulin (IRI), HbA1C were performed and repeated at the end of follow up.
Results: Results are given as mean (±SD). Blood glucose measurements did not change significantly in none of the groups - type 2 diabetes (5,5mmol/l±1,8 vs. 5,46mmol/l ±2,01); insulin resistance (6,46mmol/l±1,16 vs. 6,01mmol/l ± 1,38). There was a more significant decrease of IRI and HOMA – index the insulin resistance group – (IRI-21.06±11,9vs. 14.46±10,1), (HOMA-index – 5,23±1,18 vs.3,47±3,12). In comparison the group with type 2 diabetes showed a lesser effect of BiPAP therapy (IRI-26,06±11 vs. 22,5±10.09), (HOMA-index – 7,7±4,6vs.6,01±2,7).Body mass index and waist circumference remained unchanged.
Conclusions: BiPAP therapy reduced the insulin resistance in obese OSA patients. The effectiveness was better in patients with insulin resistance than those with already overt type 2 diabetes. HOMA- index seems to be the most sensitive marker for the effect of BiPAP therapy.

P2087

Prevalence of patient-ventilator asynchronies and effects on sleep quality in neuromuscular patients using long term non-invasive ventilation

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Background: There are few studies on the association between asynchronies and arousals in patients using long term noninvasive ventilation (NIV) and among them, only one has been performed on neuromuscular patients. Moreover, in the real life of home ventilated neuromuscular patients sleep fragmentation is probably far from being perfectly corrected.
Objective: The aim of this work was to investigate the prevalence of patient-ventilator asynchronies and their association with sleep quality in stable neuromuscular patients chronically ventilated after optimization of ventilator setting.
Methods: Eighteen patients were included in the study. Sleep was recorded during ventilator application using standard polysomnography. Physiologic tracings were scored for autotriggerings, patient-ventilator desynchronizations, prolonged insufflations (PI) and respiratory arousals.
Results: Most frequent asynchronies were autotriggerings and desynchronizations (83.33% and 77.77% of patients, median/h 1.11 (IQR 0.43-2.84) and 0.23 (IQR 0.12-1.00) respectively). Desynchronization was the asynchrony most frequently associated with arousal (median 73.61%, IQR 15.91-96.88) followed by autotriggering (median 60%, IQR 0-90.9). PI was not frequent and almost never associated with arousal (median 0 IQR 0-100). Asynchronies were significantly correlated with leaks (r=0.49 p= 0.035).
Conclusion: Patient-ventilator asynchronies may still occur in neuromuscular patients receiving home long term NIV and can contribute to sleep fragmentation. Monitoring of quality of ventilation should be included in long term programme of neuromuscular patients.

P2088

Evaluation of inspiratory rise time versus resistances of four home ventilators

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There is no consensus neither literature nor constructor to define inspiratory rise time (T_{mpi}) which is equally called "pressure ramp slope" or "pressurization rate". The purpose of this study was to evaluate on a test bench the T_{mpi} of four home ventilators, versus different resistances.
SMARTAIR ST (Airox), TRILOGY100 (Respironics), VIVO40 (Breas, GE) and VPAPIII (Resmed) were tested in a bilevel pressure support mode. All T_{mpi} available were tested. Simulations were performed on an ASL 5000 (Ingmar Medical, Pittsburgh, USA) which simulates normal and obstructive lung. T_{mpi} has been defined as the delay between return to EPAP (Expiratory Positive Airway Pressure) after begin of inspiratory effort and time where pressure reaches 90% of maximal pressure. For each setting versus resistance, value of T_{mpi} and slope of "pressure and flow" curves in their linear segment were calculated.
Only T_{mpi} of VPAPIII and TRILOGY100 don't vary according to resistances. However, values measured are always above than specified, particularly TRILOGY100. T_{mpi} measured for SMARTAIR ST and VIVO40 decrease when resistances increase. Pulmonary dynamics can explain this results. In order to control this T_{mpi}, four strategies are observed. Resmed uses a fixed pressure slope, whereas Breas set a fixed flow slope. SMARTAIR maintain a fixed pressure slope until a preset time (300ms), after what slope vary versus resistance. Lastly, curve's TRILOGY

is an exponential. This ventilator seems to maintain a fixed time constant on the pressure curve.
We prove that ventilators have different strategies to achieve targeted maximal pressure. This is a first step in elaboration of standardized test lung protocols to compare ventilators.

P2089
Effects of a nasal high-flow system (nHF) on tidal volume, breathing rate, minute volume and I/E-ratio in healthy volunteers and patients with COPD
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Introduction: Treatment with nHF-system is able to improve symptoms of acute and chronic respiratory insufficiency. The method uses a warmed and humified high flow of air with 20-50 liter per minute (lpm). By using these devices an increase of mean pressure, pressure amplitude and a decrease in pCO2 is observable.
Method: Healthy volunteers and patients with COPD were included in this study. For detection of volume changes, frequency variations and I/E-ratios we used two elastic impedance measure belts (thoracal/abdominal). The signal was relayed to a polysomnography device. Flows from 20 lpm up to 50 lpm with small, medium and large nasal prongs were tested. To compare the results with a closed ventilation support system, the measurements were also performed with CPAP (6 and 10 mbar) and BiPAP (14/6mbar). We compared the results with values measured during spontaneous breathing.
Results: nHF led to a significant decrease in minute volume, tidal volume and breathing rate in healthy volunteers in comparison with spontaneous breathing. The I/E-ratio results in no significant changes. In patients with COPD the breathing rates were also decreased, but the tidal volumes were increased with partial reductions in minute ventilation. The I/E-ratio was not changed in COPD. In comparison with spontaneous breathing, CPAP and BiPAP showed significant changes in patients with COPD.
Discussion: nHF resulted in significant effects on respiratory parameters of healthy volunteers and in patients with COPD. The changes deliver a possible explanation of the active manner of the breath support and the decrease in pCO2.

P2090
Validation design for a method to determine respiratory resistance and compliance in non-sedated patients
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Advantageous ventilation modes like pressure support PS require the accurate setting of parameters based on individual characteristics of the patient's respiratory system. As these change, a method for their continuous meas-urement is necessary. We tested a validation setup for the "Occlusion +Delta" method (Delta-Inst principle focused on expiratory occlusions) by estimating respiratory resistance R and compliance C using flow and pressure data gained from a software-controlled lung simulator programmed to represent four cases with increasing works of breathing and available real data from 6 volunteers and 6 patients. Using the delivered values the transdiaphragmatic pressure (Pdi) was reconstructed as repre-sentation of muscular effort.
The measured Pdi and its reconstruction were compared using the inspiratory Pressure Time Product (PTPinsp). The correlation from simulated data was high (R2 =0.90±0.05) permitting to validate the relevant analysis systems, but the correlation from real data was low (under 0.68) which was associated to difficulties at measuring Pdi without artifacts and compliances unwantedly attached to the system. We present now a test setup and methodology to investigate real data more accurately. This includes measurement of flow, airway- and transdiaphragmatic pressure from volunteers with minimized susceptibility to artifacts, improved control of mechanical problems and higher sampling rate. The integration of hardware required for occlusion to the ventilator and experienced measurement of Pdi intend to increase the ability to correctly determine the parameters using software for improved recognition of outliers including online analysis.

P2091
Adaptation of children with spinal muscolar atrophy type 1 and 2 to non invasive ventilatory support
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Spinal Muscolar Atrophy (SMA), the most common fatal inherited disease in infants. The impaired respiratory function is the main cause of the high mortality. Non Invasive Ventilation (NIV) has reduced morbidity and mortality due to respiratory insufficiency and has a favourable impact on respiratory infectious complications.
Aim: Evaluation of the necessary time and mode to achieve adaptation to this tool in SMA patients (pts) free from acute respiratory insufficiency.
We prospectively studied 28 consecutive SMA type 1 pts (11 pts) and 2 (17 pts), who were enrolled in a standardized clinical protocol of adaptation to NIV. Mean age was 19±23 months, M/F 10/18. NIV was delivered via a nasal mask in 23 pts, nasal progs in 4 pts, full face mask in one, with Pressure Support Ventilation (PSV) mode (25 pts) and Assisted Controlled Pressure Ventilation (ACPV) mode (3 pts). Mean IPAP was 12±2.7 cm H_2O, mean EPAP 3.9±0.74 cm H_2O.
Success was defined as the necessary time to accustom the SMA pts free from acute respiratory insufficiency to NIV and the mode to achieve acceptability of this tool.
According to this definition, all pts (100%) were considered as successfully ventilated, as all of them tolerated NIV with a mean adaptation time of 8±2 days. No major complications were observed.
In conclusion, our study demonstrates that NIV is well tolerated in SMA children and, probably, the high rate of success was obtained thanks to a standardized protocol of NIV initiation/administration, the proper parents education, a strict follow-up, the lack of major complications. With these assumptions, success can be expected in a high rate of pts before the onset of respiratory insufficiency.

P2092
Long term home mechanical ventilation: 9 year experience
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Aim: Home mechanical ventilation (HMV), noninvasive or invasive mechanical ventilation depending on pathology, increases life quality and survival of patients with chronic respiratory failure (CRF). We aimed to evaluate long term results of patients with HMV in order to add info for national data.
Material-method: The patients referred to respiratoy intensive care unit (RICU) outpatient clinic with noninvasive and invasive HMV with tracheostomy between 2002-2010 were retrieved in a prospective cohort study. Reasons of CRF were: COPD, kyphoscoliosis, obesity hypoventilation syndrome (OHS), bronchiectasis, motor neuron disease (MND), myopathies. Compliance and mortality of patients every 2-3 month were recorded. Distribution of COPD cases according to years was calculated and data were summarized with descriptive statistics.
Results: In 9 year period 602 patients were retrieved. CRF cases with noninvasive HMV were; COPD: 260 (43.2%), kyphoscoliosis: 48 (7.9%), OHS: 135 (22.4%), MND: 21 (3.5%), bronchiectasis: 25 (4.2%), myopathies: 16 (2.6%) and invasive HMV with tracheostomy cases were 57 (9.5%). Two hundred sixty COPD cases demonstrated increase in number between 2002, 2010; 15, 58, respectively. Patients lost to follow and dead patients were shown respectively as number (%) according to diagnosis; COPD: 133 (51.2)/31 (11.9), kyphoscoliosis: 15 (31.3)/3 (6.3), OHS: 53 (39.3)/0, MND: 0/13 (61.9), bronchiectasis: 9 (36)/2 (8), myopaties: 6 (37.5)/1 (6.3), HMV via tracheostomy: 10 (17.5)/13 (22.8).
Conclusion: Need for long term HMV in severe COPD cases will increase in following years. HMV in COPD decreases hospitalization, so it's necessary to find out precautions to facilitate use of HMV in COPD with poor compliance.

P2093
A 20 year experience of home non-invasive ventilation (NIV) in a district general hospital and the "growing" problem of obesity
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Most non-invasive ventilation services in the UK are tertiary centre based and cover many hospitals with variable referral practices. This study is from one hospital serving a population of 330,000 and therefore provides data of utilisation per 100,000 of population and changes over time.
Methods: A study was done on 191 patients who were started on home NIV between 1990 and 2010. There was complete data for 171 patients and these are included.
Results: The range of conditions, age, FEV1, FVC and survival are shown in the table below;

Diagnosis	Number of patients	Mean values when starting NIV			
		Age (years)	FEV1 (litres)	FVC (litres)	Number of patients alive by Feb 2011
COPD	50	76	0.56	1.23	24
Neuromuscular	36	50	0.85	1.07	14
Obesity Hypoventilation Syndrome	32	71	1.28	1.66	27
Thoracic cage	14	77	0.79	1.10	8
Overlap Syndrome	27	71	1.16	2.09	22
Bronchiectasis	12	70	0.51	1.05	6

The 2 year survival from Kaplan-Meier curves was 55% for bronchiectasis, 45% for COPD, 80% for thoracic cage, 35% for neuromuscular, 85% for OHS and 75% for overlap syndrome.
The current NIV prevalence per 100,000 for each condition was 1.8 for bronchiectasis, 7.3 for COPD, 2.4 for thoracic cage abnormalities, 4.2 for neuromuscular disease, 8.2 for OHS and 6.7 for overlap syndrome.
59% of patients ventilated over the last 5 years had obesity hypoventilation or overlap syndrome, compared to only 12% in the previous 15 years.

Conclusion: OHS and overlap syndrome have rapidly increased as indications for home NIV. The survival of these groups appears to be long. These factors will have profound implications for the future planning of home NIV services.

P2094

Comparing a nasal high-flow therapy with single and double sided application (TNIoxy) on breathing and gas exchange at stable hypercapnic respiratory failure COPD

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Introduction: Nasal high-flow therapy is another option of respiratory support in sleep and ventilation medicine. But the precise pathophysiological effects (reduction of dead space ventilation, development of a PEEP) remain unknown, and the patient group, that may profit of such therapy, is not defined.
Question: Compared are respiratory frequency (RF) and gas exchange under nasal high flow therapy of 20l/min (applicated through one and both meatus of the nose) with the effect oxygen therapy (LOT) of 2 l/min at 21 patients with stable hypercapnia in a prospective randomised order for always 45 minutes while awake. A capillary blood gas analysis (BGA) was made after each phase, as well as a 15 minutes break.
Results: The mean RF/min was under LOT 19.4±4.0 and was reduced to 17.8±4.7 under double sided TNI application and 17.7±4.3 under single sided TNI application (difference between LOT and single sided: p=0.043).
BGA: After LOT the PO_2 was 68.5±16.8 mmHg, TNI double: PO_2 61.6±22.9 mmHg 3, TNI single PO_2 59.0±145 mmHg (difference between LOT and TNI single: p=0.046)
Conclusion: In the course of 45 minutes at daytime the application of TNIoxy can reduce the RF and PCO_2 in COPD GOLD IV patients with stable hypercapnia significantly compared to LOT. The different effects of single sided and double sided application let us presume a reduction of dead space ventilation.

P2095

Home mechanical ventilation in chronic respiratory diseases: An experience from a pediatric semi-intensive respiratory care unit

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Mechanical, invasive and non invasive ventilation represents an important therapeutic tool for many acute and chronic respiratory diseases in childhood.
We retrospectively analyzed clinical history of children receiving home mechanical ventilation (HMV) in our Pediatric Semi-Intensive Respiratory Care Unit from 2003 to 2010.
From 2003 to 2010 we treated with HMV 153 children (M/F 80/73 girls, mean age 10.5years). Most of the patients (138) were treated with non-invasive ventilation (C-PAP or BiPAP). In this group, the most frequent diagnosis were Spinal Muscular Atrophy, followed by Prader Willi syndrome, obstructive sleep apnoea, myopathies, Cystic Fibrosis, encephalopathy, cerebral palsy, muscular dystrophy, metabolic or genetic diseases and others diseases such as congenital heart disease, brain tumors and othorinolaryngohiatric diseases. Fifteen patients were treated with invasive HMV through trachestomy. In this group the most frequent diagnoses were Cerebral Palsy, followed by Spinal Muscular Atrophy, Encephalopathies and others chronic respiratory disorders (Congenital central hypoventilation syndrome, bronchopulmonary dysplasia, etc).
Sixtyone percent of the patients are still in follow-up in our Unit, 17% stopped mechanical ventilation, 14% were lost to follow-up, while 8% is died. Of the 95 patients followed at our unit, only 53 (56%) has an adequate home care.
Home mechanical ventilation, invasive or non-invasive, is a valid tool for the management of children with chronic respiratory diseases. In our experience home care of these patients must be improved in terms of family support (nursing, technical support, psychological support).

P2096

Lung function values as predictors for outcome during non-invasive ventilation in COPD patients

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Introduction: The use of non-invasive ventilation (NIV) has markedly increased over the past two decades, and has now become an integral tool in the management of respiratory failure. Although several predictive factors have been suggested for successful NIV treatment, it is still unclear which clinical baseline variable should be used to predict the outcome of the therapy in COPD patients with respiratory failure.
Objective: The aim of the study was to determine predictive factors for COPD patients with acute exacerbation receiving NIV.
Methods: 38 patients with COPD (mean age: 64.05±11.26, GOLD III-IV) participated in our study. Lung function, blood gas test and blood sampling for CRP and white cell count measurement were performed, as well as smoking history was recorded and APACHE II score was determined at the day of admission to the respiratory care unit. We accepted NIV to be successful, if no additional invasive methods were needed. The clinical data underwent principal component analysis and receiver operating characteristic (ROC) curve was performed to determine the variables for successful NIV treatment. A principal component having an area under the curve (AUC) more than 0.7 was suggested predictive.
Results: NIV was successful in 68% of patients. We found principal component capturing the baseline FVC and FEV_1 to be the best predictive variable for failure of treatment (AUC=0.9, sensitivity 90%, specificity 80%), however the other parameters were less useful (AUC<0.7).
Conclusion: Baseline lung function may be helpful to predict which patient is susceptible to receive additional endotracheal intubation.

P2097

A pilot study of treatment compliance in home non-invasive ventilation

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Introduction: Home non-invasive ventilation (NIV) is increasingly employed to treat chronic hypercapnic respiratory failure (CHcRF). However, little is known about the patients' compliance with home NIV.
Aims and objectives: To study home NIV compliance, examine factors affecting it, and how compliance impacts on outcomes.
Methods: A cross sectional study was performed in patients with CHcRF treated by home NIV. A questionnaire on NIV adverse effects was administered. Compliance was measured by built-in time counters in the NIV machines. Outcomes including readmission, repeat acute NIV use and intubation were recorded.
Results: Sixty-five patients (60% males) with age 72.6±9.4 years were studied with the following diseases: very severe COPD (40%), COPD/OSA overlap syndrome (32.3%), thoracic restriction (10.8%), obesity hypoventilation syndrome (7.7%), neuromuscular disorders (3.1%), and others (13.8%). The mean daily use was 7.3±2.9 hours/day. Twenty-two patients (33.8%) reported adverse effects interfering wth home NIV use. Higher number of NIV adverse effects correlated with lower percentage of days with home NIV use ≥ 4 hours/day (Spearman's rho = -0.351, p = 0.004). Higher number of repeat acute NIV use during compliance study period was correlated with the lower percentage of days with home NIV use ≥ 4 hours/day (Spearman's rho = -0.257, p = 0.042) and worse overnight oximetry findings [percentage of time with SpO_2 < 90% (Spearman's rho = 0.297, p = 0.044)].
Conclusions: Home NIV compliance appeared satisfactory in this group of patients. NIV compliance correlated negatively with the number of adverse effects. Poor compliance and worse overnight SpO_2 were associated with higher risk of repeat acute NIV use.

P2098

Predictive factors for the tolerance of non-invasive ventilation in amyotrophic lateral sclerosis patients

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Noninvasive ventilation (NIV) increases the survival of amyotrophic lateral sclerosis (ALS) patients. NIV tolerance factors vary according to different studies.
Aim: To assess the predictive factors which have an impact on NIV tolerance in ALS patients.
Material and methods: Prospective study which included ALS for whom NIV was indicated between January 2004 to January 2010. Demographic, neurological function, respiratory function and night-time monitoring data (before and after the adjustment of NIV with a volume ventilator) were collected. Tolerance of NIV was defined as use > 4 hours a day.
Results: 71 patients who accepted NIV were included, of whom: 34 (47.9%) men, 62.34±8.79 years old, MIC 26.08±3.81 kg/m^2, 35.2% with bulbar onset, time from onset of disease to NIV 40.78±41.78 months, ALSFRS-R 30.25±7.15, Norris bulbar 28.08±9.70, FVC 1.60±0.96 L, FVC% 52.57±24.57%, PCF 3.75±1.98 L/s, MIC 2.11±1.05 L, PImax -48.04±24.33 cmH_2O, PEmax 73.38±44.33 cmH_2O, Tc90 34.27±30.92%, PaO_2 74.88±12.94 mmHg, $PaCO_2$ 50.33±9.10 mmHg, 74.6% of patients with symptoms of hypoventilation, Tc90 with NIV 1.98±4.05%, PaO2 with NIV 83.54±10.19 mmHg, $PaCO_2$ with NIV 42.16±4.65 mmHg, 18.3% with symptoms of hypoventilation with NIV, hours of use 9.28±4.89 h. In 7 patients (9.9%) NIV tolerance was poor (<4h). NIV tolerance factors were: Tc90 with NIV (OR 0.87, p 0.02, IC95% 0.73-0.97) and persistent symptoms of hypoventilation with NIV (OR 8.14, p 0.013, IC95% 1.55-42.62).
Conclusions: NIV tolerance in ALS patients is high. The persistence of SpO_2 <90% episodes and hypoventilation despite NIV are determinant factors in poor NIV tolerance.

P2099

Lower SNIP value is correlated to the need of intubation in amyotrophic lateral sclerosis

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Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease which usually leads to respiratory failure, requiring Noninvasive Ventilation (NIV) or tracheostomy. No data exist on predictor factors of tracheostomy at the clinical onset of disease.

A retrospective study was designed, in a population of 71 consecutive ALS patients (39 males), to evaluate anthropometric, clinical, and functional indicators of the need of tracheostomy, including age, sex, BMI, site of onset, time of diagnosis, co-morbidities, tobacco habit, traumas, sport activity, and sleep disorder breathing markers. Arterial Blood Gas analysis and respiratory functional test, including FVC, $FEV_{1,}$ as well as Sniff Nasal Inspiratory Pressure (SNIP) were also measured at first ambulatory control.

We found that SNIP test, at first control, positively correlated to the need of tracheostomy ($p<0.001$) in the entire population observed. The mean SNIP test value of the group who was admitted to tracheostomy was 25.12 (14.25) compared to a mean SNIP value of 54 (25.46) in the group who did not undergo tracheostomy. Other anthropometric, clinical, functional, and nocturnal parameters evaluated did not correlate to the different outcome in our population of ALS patients.

In conclusion, SNIP test could be a useful early indicator of tracheostomy in ALS patients.

P2100

Exploring reasons for the pattern of non-invasive ventilation (NIV) use among motor neurone disease (MND) patients: An interpretative phenomenological analysis

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Background: We have previously reported on psychological reasons for declining NIV. This study examines the psychological reasons for adherence to NIV among MND patients.

Methods: Six patients (male= 5, mean age=59) who had used NIV for more than 6 months (mean 9.5, range 6-11 months) with ventilator interaction data were studied. Repeated interviews were transcribed and qualitatively analysed, using interpretative phenomenological analysis (IPA); IPA provides rich data to explore investigative phenomenon from a small sample.

Results: Out of the six patients, four patients used NIV consistently (mean=9h22m), while two patients used it less than 4 hours (mean=3h10m) per day. IPA suggests that good compliance (>4hrs) reflects the individuals' attitude towards NIV use. Further analysis identified two influential factors: perceived essentiality and the perceived impact of NIV. The sense of need for NIV was important and this in turn was influenced by the fear of death. It was also understood that perceived control over NIV affects the person's perception of the NIV and consequently determines their use. Factors such as a concern about becoming dependent on NIV or knowledge of the benefits of NIV were not influential per se, but rather functioned as reinforcements to determine the pattern of compliance. Little change in the pattern of NIV use was observed over time, however this may change when illness progresses.

Conclusion: IPA suggests that the adherence to NIV is influenced by individuals' attitude towards the use of NIV in terms of its essentiality and impact.

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P2101

NIV for MND in the West of Scotland assisted ventilation service (WoSAVS)

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Introduction: Motor neuron disease (MND) results in respiratory muscle weakness and respiratory failure (RF), with reduced quality of life (QOL) and survival. Non-invasive ventilation (NIV) effectively palliates symptoms related to RF, improves QOL and survival (Bourke, Lancet Neurol 2006), and increasing use is reflected in recent guidelines (NICE CG105, 2010). We aimed to evaluate our current practice using NIV in MND.

Methods: MND referrals (Sept 07 – Aug 10) to the WoSAVS were identified. Data on clinical status, RF (high PCO2 or HCO3 on CBG), and progression were collected.

Results: Of 38 patients referred (12.7 per yr; 4 per yr 1999-2002), 21 were in RF at 1st AVS assessment. RF developed in 1/17 during followup (3 patients no data). Patients with RF were referred and assessed sooner after diagnosis, and died earlier. NIV was commenced within 2 weeks of assessment, although half were commenced within 48 hours (data not shown). Those accepting NIV had a similar degree of RF to those that did not, but lived longer (210 vs 33 days) with good NIV compliance (data not shown).

Table 1	No RF		RF	
		All	No NIV	NIV
TOTAL	17	21	5	16
Still alive	6	5	1	4
SEX				
Male	8	13	2	11
Female	9	8	3	5
AGE				
Mean	62.6	62.4	65	62
Range	50-80	41-83	46-74	41-83
REFERRAL				
Neurology	14	12	4	8
Respiratory	2	7	0	7
GP	1	2	1	1
BULBAR				
At 1st AVS asst	10	10	4	6
During FU	10	14	4	10
RESP FAILURE				
At presentation	0	3	0	3
At 1st AVS asst	0	22	5	16
During FU	1	22	5	16

Table 1 Patient demographics and clinical status (asst = assessment, FU = follow up)

Table 2	No RF	RF				
		All		No NIV	NIV	
	Mean ± SEM	Mean ± SEM	p value	Mean ± SEM	Mean ± SEM	p value
(A) CBG 1st ASST						
H+ (nmol/l)	35.9 ± 0.74	38.6 ± 1.16	NS	32.5 ± 2.89	40.1 ± 1.03	p<0.005
PO2 (kPa)	12 ± 0.36	11.2 ± 0.57	NS	11 ± 1.24	11.2 ± 0.68	NS
PCO2 (kPa)	5.01 ± 0.14	7.17 ± 0.33	p<0.001	6.48 ± 0.66	7.35 ± 0.38	NS
HCO3 (mmol/l)	25.3 ± 0.71	33.7 ± 1.26	P<0.001	35.4 ± 2.63	33.2 ± 1.48	NS
(B) PROGRESSION						
Diagnosis to 1st asst	532 ± 147	241 ± 54		278 ± 146	230 ± 61	
Referral to 1st asst	73 ± 32	27 ± 9		22 ± 18	29 ± 11	
1st asst to NIV	x	13 ± 8		x	13 ± 8	
Diagnosis to death	687 ± 171	379 ± 57		181 ± 55	446 ± 63	
1st asst to death	244 ± 64	166 ± 43		33 ± 6	210 ± 61	
NIV to death	x	199 ±46		x	199 ± 46	

Table 2 (A) Initial CBG at 1st AVS asst and (B) Progression through AVS

Conclusions: MND referrals have tripled in a decade of NIV use, and will increase further with recent guideline publication, so services must develop to meet this need. Early referral and assessment avoids crisis driven decision making, but the majority of our patients were in RF requiring prompt intervention. Early specialist referral must be encouraged.

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Evaluation of different patterns of high frequency spinal cord stimulation (HF-SCS) to activate the inspiratory muscles

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Background: HF-SCS is a novel method of inspiratory muscle activation and may be a useful method to support artificial ventilation. In this study, the effects of different patterns of HF-SCS on inspiratory muscle activation were compared to spontaneous breathing (SB).

Methods: In 3 anesthetized dogs, single motor unit (SMU) activity of the diaphragm (D) and parasternal muscles (P) were assessed during SB and HF-SCS at the T2 level with ramp and non-ramp stimulation by measuring a) time of onset (To) and b) time to peak firing frequency (TTP) of SMUs. To and TTP were determined relative to the onset of inspiratory flow and expressed as a percentage of inspiratory time (Ti).

Results: During SB, mean onset of D and P were8.0±1.1 and 14.2±2.0%Ti, respectively. During non-ramp HF-SCS, To was 1.7±0.7 and 2.4±0.3%Ti for D and P, respectively ($p<0.05$ for each compared to SB). During ramp HF-SCS, To was 13.2±2 and 4.6±0.8%Ti for D and P ($p<0.05$ for P for each).

Mean peak firing frequencies of D and P during both HF-SCS and SB were not different. During SB, TTP was 74.0±8.7 and 71.5±6.9%Ti for D and P. During non-ramp HF-SCS, TTP was 10.6±3.1 and 15.8±3.5%Ti, for D and P ($p<0.05$ for each). During ramp HF-SCS, TTP was 63.0±4.5 and 53.0±3.8%Ti for D and P (NS for each).

Conclusion: Activation of the inspiratory motoneuron pools via HF-SCS is responsive to different patterns of electrical stimulation. Ramp HF-SCS compared to non-ramp HF-SCS results in a more physiologic method of inspiratory muscle activation.

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P2103

Mechanically assisted cough in amyotrophic lateral sclerosis: Effect on vital capacity decline and timing of non invasive ventilation onset

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Background: Mechanically assisted cough with an insufflator-exsufflator (MAC) increases peak cough flow and improves management of secretions in patients with Amyotrophic Lateral Sclerosis (ALS).

Study objective: To evaluate the effect of MAC on VC decline in a group of patients before the onset of NIV.

Patients: Criteria for starting MAC were VC=70% of predicted value and cough insufficiency. We enrolled 43 patients not being treated with NIV during the studying time. NIV was started when VC decreased below 55% of predicted value.

Results: Our patients were divided in MAC compliant (n=21) and not compliant (n=22).The groups were similar for age at onset, sex, and body site at onset, bulbar or limb. Differences were found in time from onset to MAC starting time

(20,5 months in MAC not compliant vs 26,5 in compliant) and in VC at the first respiratory evaluation (85,59 vs 93,42), although the VC decrease was similar before the offering of MAC. VC at MAC starting time was similar in compliant and non compliant groups (70,8% of predicted value vs 71,7%). In the compliant group the VC decreased to 69,4% and 60,4% of predicted value at 4,7 and at 12,2 months after the start of MAC therapy. In the not compliant group VC decreased to 54,3% and 43,5% of predicted value after 4,0 and 8,1 months from offering MAC. The differences were significant: 69,38 vs 54,27; p=0,03 and 60,35 vs 43,5; p=0,008.

Conclusion: MAC compliant patients, in similar condition, meet the prescription criteria for MAC treatment later than the not compliant patients. Their VC decline is reduced and they need to start treatment with NIV later than the not tolerating patients.