News Release

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ATS Press Room: 504-670-6926 (May 15 to 20)

Press conference time: May 17, 4:30 p.m. in the ATS Press Room (E-1)

Poster session time: 1:30-4:00 p.m. May 18
Location: CC-Room 260-262 (Second Level), Morial Convention Center

EMS Can Prevent Limb and Respiratory Muscle Weakness in ICU Patients

ATS 2010, NEW ORLEANS— Electrical muscle stimulation (EMS) can prevent critical illness polyneuromyopathy (CIPNM), according to Greek researchers. CIPNM is an acquired limb and respiratory muscle weakness that is a common and serious problem among intensive care unit patients, and can result in prolonged ICU and hospital stay. EMS can also shorten the duration of weaning from mechanical ventilation and the length of ICU stay.

The study will be presented at the ATS*2010 International Conference in New Orleans.

"CIPNM is a very common complication of critical illness and ICU stay affecting approximately one-quarter of ICU patients and is characterized by profound muscle weakness or even paralysis. No preventive tool has been reported so far for critical illness polyneuromyopathy," said Serafim Nanas, M.D., associate professor at the National and Kapodistiran University of Athens, First Critical Care Medicine Department, and the principal investigator of the study. "ICU patients undergo long periods of immobilization due to prolonged sedation and mechanical ventilation which have been shown to have detrimental effects on skeletal muscle mass within a few days after ICU admission."

EMS has shown beneficial results in patients with end stage chronic heart failure and severe COPD in terms of exercise capacity, muscle strength and quality of life. EMS has also been used in patients with COPD under mechanical ventilation following ICU stay with beneficial results in terms of muscle strength.

“In patients with severe cardiac and/or respiratory insufficiency that prevents active exercise, EMS is an alternative form of exercise that is well tolerated and has minimal aerobic requirements,” explained Dr. Nanas. “Furthermore, EMS does not require patient cooperation and can therefore be implemented in sedated ICU patients.”

To determine whether EMS could prevent/reduce the incidence of CIPNM in critical care patients, Dr. Nanas and colleagues recruited 140 critically ill patients with an Apache II admission score of >13, indicating a relatively higher disease severity and greater risk for developing CIPNM. Patients assigned to EMS received daily 45-minute treatment sessions on both lower extremities. EMS was implemented simultaneously on the quadriceps and peroneous longus (a calf muscle). EMS sessions were continued until ICU discharge, an average of 14 days, ranging from four to 62 days.

After awaking, the patients were assessed for muscle strength by two independent examiners, and duration of ventilation weaning and ICU stay were recorded.

“We anticipated that electrical muscle stimulation implementation could reverse the detrimental effects of critical illness on skeletal muscle and preserve the muscle mass of these patients,” said Dr. Nanas.

Indeed, the EMS treatment group showed a significant reduction in the risk of developing CIPNM. Of the 68 patients in the EMS group, three were diagnosed with CIPNM (four percent), compared to 11 of the 72 patients in the control group (15 percent). Furthermore, muscle strength was significantly better in the EMS group as compared to the control group. Patients with CIPNM had both longer weaning periods and ICU stays than those who did not develop CIPNM.

“Electrical muscle stimulation is a promising preventive tool for critical illness polyneuromyopathy, a common complication of critical illness which is associated with increased duration of ICU stay, morbidity and mortality,” said Dr. Nanas. “CIPNM is a common but at the same time long-overlooked complication of critical illness, which bears serious and long term sequelae in terms of functional disability and quality of life. Data from our study suggest that if it is promptly and properly addressed, early on during ICU stay, it can significantly impact on the length of hospital stay and more importantly on the functional ability and the quality of life of these patients.”

Dr. Nanas noted that further studies will be needed to fully assess and optimize the benefits of EMS in an ICU setting. “The application of EMS in patients after they are discharged from the ICU to improve and restore the muscle function should also be

further evaluated, as should the long term effect in muscle function and quality of life of electrical muscle stimulation that has been applied during ICU stay."

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"Electrical Muscle Stimulation Prevents Critical Illness Polynueromyopathy. A Randomized Intervention Trial" (Session C94, Tuesday, May 18, 1:30-4:00 p.m., CC-Room 260-262 (Second Level), Morial Convention Center; Abstract 2806)

**Please note that numbers in this release may differ slightly from those in the abstract. Many of these investigations are ongoing; the release represents the most up-to-date data available at press time.*

Electrical muscle stimulation prevents critical illness polyneuromyopathy. A randomized intervention trial

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Rationale: Critical illness polyneuromyopathy (CIPNM) is a common complication of critical illness presenting with muscle weakness, difficult weaning from mechanical ventilation, and prolonged intensive care unit stay. No effective preventive tool has been proposed so far for CIPNM. Recent studies have shown that electrical muscle stimulation (EMS) may be an alternative to active exercise in patients with severe chronic heart failure and chronic obstructive pulmonary disease. The scope of the present study is to assess the effectiveness of EMS in preventing CIPNM in critically ill patients hospitalized in a multidisciplinary intensive care unit

Methods:140 consecutive critically ill patients with an Apache II admission score ≥ 13 were randomly assigned after stratification to the EMS group (n=68) (46men/22women) (age:61±19years)(APACHE II: 18±4)(SOFA: 9±3) or to the control group (n=72) (49men/23women) (age:58±18years)(APACHE II: 18±5)(SOFA: 9±3). Patients assigned to the EMS group received daily EMS sessions of both lower extremities. The diagnosis of CIPNM was made clinically upon awakening with the medical research council (MRC) scale for muscle strength (maximum score 60, <48/60 cut off for diagnosis) by two independent investigators. Duration of weaning and intensive care unit stay were also recorded

Measurements and Main results: CIPNM was diagnosed in 3 patients in the EMS group as compared to 11 patients in the control group (p=0.03). The MRC score was significantly higher in patients assigned to the EMS group as compared to the control group (54±7 vs 46±15, p=0.02). Patients that developed CIPNM had a longer weaning period as compared to patients that did not develop CIPNM (11±15 days vs 1±2 days, p<0.001). Patients that developed CIPNM had longer intensive care unit stay as compared to patients that did not develop CIPNM (30±23 days vs 15±12 days, p=0.004).

Conclusions: This is the first randomized controlled study to show that daily EMS sessions prevent the development of CIPNM in critically ill patients and also result in shorter duration of weaning and shorter intensive care unit stay. Further studies are needed to define which patients would benefit most from this intervention and to explore the EMS characteristics (current characteristics and muscle groups) that are most appropriate for preventing CIPNM.