Novel treatment with periodic acceleration with a horizontal motion platform for anginal patients

運用水平移動平台產生周期性加速度提供心絞痛病人一種新的治療方式

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Purpose: Whole-body periodic acceleration with a horizontal motion platform increases intravascular pulsatile shear stress with a release of nitric oxide and improves vascular endothelial function. We hypothesized that treatment with periodic acceleration alleviates myocardial ischemia as a result of increased coronary and peripheral vasodilatory reserve.

目的：運用水平移動平台所產生的全身周期性加速度，以所釋放的一氧化氮增加血管內的脈搏抗剪應力，並且改善血管內皮功能。我們假設運用周期性加速度治療，由於增加冠狀動脈及周邊血流儲存量，進而減緩心肌缺血。

Patients and methods: Twelve anginal patients [60±8 (SE) years] were randomly assigned to remain sedentary or undergo 20 passive exercise sessions with the motion platform for 4 weeks. Periodic acceleration was applied at 2 to 3 Hz and approximately ±2.2 m/sec² for 45 min. We repeated the symptom-limited exercise test using the standard Bruce protocol, adenosine sestamibi myocardial scintigraphy, and parasternal two-dimensional echocardiography.

病患與方法：12 個心絞痛的病患（60±8 歲），隨機分配維持久坐，或接受以移動平台在 4 個星期做 20 次被動的運動療程。周期性加速度是以 2-3 Hz 以及約 ±2.2 m/sec² 運作 45 分鐘。我們使用標準的布魯斯程序、腺甘酸sestamibi心肌閃爍造影術、以及胸骨旁二度空間心臟超音波，反覆作症狀限制性運動測試。
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**Results:** Treatment with periodic acceleration increased the exercise time until 0.1 mV ST depression from 5.7±1.2 to 7.2±1.5 min (p<0.05), and double product at 0.1 mV ST depression from 15,096±1678 to 16,203±1975 mmHg·beats/min (p<0.05). These findings indicate that the treatment enhances exercise capacity as a result of both central and peripheral effects. After treatment with periodic acceleration, the severity score of the scintigraphy during adenosine infusion decreased from 30±3 to 22±4 (p<0.05), resting severity score also decreased from 19±7 to 15±7 (p<0.05), indicating that size of ischemic and hibernating myocardium became smaller with treatment. Echocardiographic left ventricular end-diastolic volume index remarkably decreased from 87±25 to 62±14 ml/m² (p<0.05), with a mildly augmented left ventricular ejection fraction from 50±14 to 52±9%. All aforementioned parameters remained unchanged in 6 sedentary patients receiving only conventional medical treatment.

**Conclusions:** Novel treatment with an application of repeated periodic acceleration enhances exercise tolerance in anginal patients through central and peripheral effects. The development of such a therapeutic modality will open a new field of the treatment of anginal patients.

**結果:** 以週期性加速度治療增加運動時間，直到 0.1 mV ST depression 從 5.7±1.2 與 7.2±1.5 (p<0.05)，並且在 0.1mV ST depression 的雙重乘積從 15,096±1678 與 16,203±1975 mmHg·beats/min (p<0.05)。這些發現顯示，由於中心與周圍的作用，使得此治療提升了運動能力。以週期性加速度治療之後，在注入腺苷酸期間，閃爍造影術嚴重程度的評分從 30±3 降到 22±4 (p<0.05)，靜止時的嚴重程度評分也從 19±7 降到 15±7 (p<0.05)，顯示缺血及心肌侷限的範圍變小了。心臟超音波左心室的心舒末期容量指數明顯地從 87±25 降到 62±14 ml/m² (p<0.05)，左心室射血分率則稍微從 50±14 增加到 52±9%。上述所有參數在 6 個久坐且僅接受一般醫學治療的病人身上則保持不變。

**結論:** 運用反覆的週期性加速度治療，透過中心與周圍的作用，提升心絞痛病人的運動耐力。這種物理治療的發展將開啟對心絞痛病人治療一個新的領域。
NIMS' Acceleration Platform Technology: an Effective Non-Invasive Strategy for Cardiac Protection

NIMS 的加速度平台技術：一個對於心臟病保護有效的非侵入式策略

MIAMI--(BUSINESS WIRE)--Marvin A Sackner, M.D., Chief Executive Officer and Non-Invasive Monitoring Systems, Inc. [NIMS] (OTCBB:NIMU) announced that Drs. Jose A. Adams, Uryash, Wu and their associates at Mount Sinai Medical Center of Greater Miami presented three papers at the Annual Meeting of the American Heart Association held in New Orleans on November 8 and 9, 2008. These studies involved applications of NIMS' patented acceleration therapeutic platform technology. Dr. Sackner stated that, "In humans, this non-invasive device called Exer-Rest® has the configuration of a single or twin bed fitted with a memory foam mattress. Electrical actuation produces whole body periodic acceleration (WBPA) through repetitive head-foot movement of its incorporated platform at about 140 times per minute over a period of 45 minutes."

Dr. Adams and associates showed that WBPA applied to small and large animal models increased the activity of the enzyme responsible for production of the beneficial substance, nitric oxide, from the blood vessels and heart. They further demonstrated the importance of these benefits in a well characterized rodent model of experimental myocardial infarction. In this model, approximately 55% of the heart at risk dies with occlusion of the coronary blood supply. Daily treatments with WBPA for three days prior to the induced coronary occlusion reduced the death of heart muscle from 55% in the untreated animals to 16% in the treated animals.

Dr. Adams commented that, "the strategy we employed in our experiments is called preconditioning, and the beneficial results are similar to the gold standard for its successful outcome. This gold standard, called 'ischemic preconditioning,' involves brief, episodic occlusions of the blood supply to the heart for subsequent protection prior to a prolonged coronary occlusion leading to a potential lethal myocardial infarction. In patients, preconditioning has limited applications since it is highly invasive and cannot be used acutely to minimize damage from an unpredictable myocardial infarction. It has most often been utilized for cardiac protection at the time of cardiac surgery or in the cardiac catheterization laboratory during percutaneous coronary interventions."
Dr. Adams also stated, "Ischemic preconditioning" even though its value has been demonstrated in all animal species where it has been employed has not become a 'standard of care' owing to the highly invasive means necessary to carry it out. WBPA has the potential to become a 'standard of care' for the public since it is non-invasive, drug-free, and suitable for daily home use thereby potentially producing cardiac protection against the unpredictable, lethal myocardial infarction."