

113 - USE OF VIBRATION PLATFORM IN VARIOUS MEDICAL CONDITIONS

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INTRODUCTION

A vibrating platform was created by Soviet scientists, with the intent to avoid the rampant degradation of muscle and bone, caused by the absence of gravitational force. When is the movement of impact or resistance exercise, it caused a small deformity in the bone tissue leading to areas of polarity with positive and negative charge. This phenomenon is called piezoelectricity. The electrical pressure stimulates formation of bone mass. Such plasticity of bone tissue to mechanical stimuli, and electromagnetic fields has been investigated by physiatrists and physical therapists to treat a variety of pathological changes and injuries of the musculoskeletal system, with results still poorly understood by clinicians. Studies indicate that the cells developed from mature osteoblasts, osteocytes are responsible for the transmission of the impulse that regulates bone remodeling. When there is some impact, the osteocytes detect motion and release substances that stimulate osteoblasts to form more bone.

In young, healthy, physical exercises and impact resistance are most suitable for stimulating bone formation. However, there are situations where the individual is unable to perform physical activities, such as in children with cerebral palsy, or individuals with physical disabilities or the elderly, among others. They would benefit from new techniques for strengthening the musculoskeletal system, such as vibrating platforms, the electrical and electromagnetic fields, ultrasound and laser used in research (KOTTKE and LEHMANN, 1994).

The use of vibration, in ancient Greece, it was used to accelerate recovery from injury by a device consisting of a band of tissue surrounding the injured limb at one end and the other was connected to a flexible metal blade which caused vibration (only in one direction). In the late nineteenth century, in the sixties, Dr. John Harvey Kellogg, the German scientist W. Biermann and Russian scientist Vladimir Nazarov pioneered research using vibration for therapeutic purposes. In 1999 Gus Van de Meer, started to use vibration to train people healthy and without physical conditioning. Power Plate has developed the platform and created training programs that would meet the needs of the sectors of Health and Physical Fitness.

Among the physical methods of treatment of bone diseases, the vibrating platform is currently being used. The idea for developing the device to stimulate the bone came from studies conducted for over 15 years by the National Aeronautics and Space Administration (NASA) and Department of Biomedical Engineering, State University of New York, with the initial aim to prevent the loss bone caused by weightlessness. The results of these experimental trials encouraged the safe application of therapy, a low-intensity mechanical stimulation in humans. It was so vibrating platforms have become an alternative to produce physical stimulo-osteogenic individuals unable to perform physical activities, such as the elderly, disabled, and people with neurological disorders such as cerebral palsy, among others. The vibration generated by the platform cause the same bone deformity that exercise impact, but his movements should have high vibratory frequency and low intensity avoid the risk of injuring the tissues. According to the director of the Division of Medical Physics, Institute of Orthopaedics and Traumatology (IOC) of the Hospital of the Faculty of Medicine, University of São Paulo, Dr. Pearl Plapler, responsible for the rehabilitation group in osteoporosis, explains that, with aging, muscle fibers are destroyed fast action and end up replaced by slow-acting fibers, which causes a gradual slowing of movement and decreased reflexes in the elderly. The vibrating platform stimulates exactly the fibers of fast action, and encourages the formation of bone, which causes the muscles of the elderly improves. Sometimes osteoporosis can be accompanied by Parkinson's disease is a neurodegenerative disease most common in the elderly, with an estimated prevalence of 3.3% in Brazil according to Barbosa et al. (2006).

The chronic and progressive characterized by the absence of gaps or periods of symptom relief, causing wear and increasing strain on family members who care for the sick (PERTENELLA and MARCON, 2009). The impact of the discovery of the presence of a chronic illness creates a number of reactions and expectations, revealing a variety of feelings and behaviors. This harsh reality brings new situations, where the parkinsonian and the family are faced with things that do not understand with the instabilities of the disease and especially how does knowing that the disease is incurable. Parkinson's disease (PD) was described in 1817 by a British physician named James Parkinson, published under the title: "An essay on the shaking palsy." (QUEDAS, DUPRAT and GASPARINI, 2007). PD is a degenerative disease, chronic and progressive, which generally affects older people. It is caused by loss of neurons in the central nervous system in a region known as the substantia nigra. Neurons in this region synthesize the neurotransmitter dopamine, which causes symptoms decreased in this area mainly motor disorders. (GONÇALVES, ARRUDA and ALVAREZ, 2007).

The vitality of the muscle depends on the local tissue and trophic stimulus that come from motor cells of the spinal or cranial nerve nuclei, reaches through the nerve fibers. When the muscle no receives the trophic stimulus of the nervous system, its fibers to atrophy. This rate is seen in spinal cord injury (SCI) total (NITRINI and BACHESCHI, 1991). In individuals with spinal cord injury is common in the region of the body that receives no enervation, stay with impaired blood circulation. This fact adding to the local pressure and bony projections, over time the wheelchair has just developed the so-called bedsores. Then the vibrating platform aims to assist in improving peripheral blood circulation in order to prevent the wounds that develop mainly wheelchair users on the buttock.

According to Assis et al. (2002) in osteogenesis imperfecta is a defective biosynthesis of type I collagen resulting in brittle bones, osteoporotic and break easily. The disease is divided according to their clinical severity: I-without compromising major bone deformities;-II is the most severe, with death in the perinatal period III is more severe in children, moderate to severe, IV-group heterogeneous, varying in severity and clinical features (NEVES et al., 2004).

According to Miller et al. (2009), the increase in explosive pace of Diabetes Mellitus and other chronic diseases in intrinsic levels, follows on from the aging population, growth, physical inactivity and obesity. Physical activity acts in the prevention and treatment of diabetes, along with medications and diet.

In all the pathologies treated by the laboratory "Qualivida", the vibrating platform has been used as a means of exercise and to examine whether there is improvement in the disease.

OBJECTIVE

This research aims to strengthen the bone and muscle mass in individuals with Parkinson's disease and osteogenesis imperfecta, improve peripheral circulation of the lower limbs, wheelchairs and individuals reduce the rate of blood glucose in individuals with diabetes.

MATERIALS AND METHODS

This research comes to reports of cases of laboratory "Qualivida", using the vibrating platform, as a means of exercise in Parkinson's disease, diabetes, osteogenesis imperfecta and individuals with spinal cord injury.

The laboratory "Quality of life, preventive medicine and physical activity-Qualivida" uses vibrating platform as a means of strengthening bone and muscle mass and improve peripheral blood circulation. The laboratory primarily serves individuals with osteopenia and osteoporosis. However, one patient also has osteoporosis has also Parkinson's disease. Besides these diseases, the opportunity to provide service to two individuals wheelchair, partially independent, to improve the peripheral circulation, thus avoiding the appearance of bedsores.

The laboratory has two individuals with osteogenesis imperfecta, one with 42 years of age and another at age 19 (father and son). In both cases, the disease is type I (not severe). Thus, we aim to strengthen the bone and muscle mass of these individuals.

We still have a male person with 62 years of age with Diabetes Mellitus who has a high rate of blood glucose. The device brand "Accu-Chek Advantage" was used to analyze the rate of blood glucose during the weekly training on a vibrating platform.

Before the start of practice on the vibration platform for all volunteers underwent bone densitometry. For the analysis of bone mineral density was employed the technique of X-ray absorptiometria dual-energy, whole body, using the equipment model GE Lunar - DPX-NT.

The dynamometer test was applied initially. The voluntary bearer of Parkinson's disease was stabilized on the dynamometer seat belts by means of containment on the trunk, hip and thigh of the dominant limb assessed. Then the mechanical axis of rotation of the dynamometer was aligned with the lateral epicondyle of the femur and the leg was fixed to the dynamometer resistance arm, keeping open the ankle joint. At the verbal command "force, force to extend the leg, the subject performed knee extension three times consecutively. The results were recorded and the average was performed between measurements, for comparison, after training on the vibrating platform.

The procedure for evaluating the strength back in the dynamometer was to verify the extent of three consecutive tests with the guy on the phone, in the angle of trunk flexion at 90 degrees, measured with a goniometer, with upper and lower limbs extended, feet parallel and hands holding in a fixed grip. Before completing the test, the examiner positioned correctly in the individual apparatus, which would explain the movement to be performed and after the verbal command, which consisted of the following utterance of the phrase "force, force to extend the body", the subject performed the extension of the lumbar spine. After training in vibrating platform for 2 weeks and the other half measured using the dynamometer was performed knee extension and lumbar extension for three consecutive times and then the average of the measurements was performed. Still in the same patient was performed the balancing test that consisted of putting one foot in front of another in a line on the floor.

A vibrating platform was used as treatment in all subjects for 15 minutes, 3 times per week on alternate days. We used a frequency of 30 Hertz (Hz) and low amplitude (3 mm). Importantly, the individual remains on the platform during the entire period of training (stretching, exercise and relaxation). The exercises were performed with and without the use of accessories (dumbbells, and elastic ball Bobath).

RESULTS

The observed results are reported cases of laboratory "Qualivida", using the vibration platform in Parkinson's disease, diabetes, osteogenesis imperfecta and individuals with spinal cord injury.

Test was performed dynamometry initial training before the vibrating platform to have their beginning. The average of the lumbar extension was 20 Kgf and knee extension was 18 Kgf. However, after two and half weeks of training platform, the lumbar extension increased to 25 kgf and the knee extension increased to 22 kgf. Therefore, an improvement of the acquisition of strength, both for extension of the lumbar spine and for extension of the knee. We also noted the steady gain in the same patient with the test of putting one foot in front of another. Before training platform, the patient is unbalanced and after training on the platform began to acquire balance.

According to the report's own voluntary "to get something on top of the cabinet I needed to go first at a smaller bank and then another larger bank to attain the object, now we just need the larger bank and I am very happy with it."

Already in individuals with Diabetes Mellitus rate the day before the activity on the vibrating platform ranged from 230 to 260 mg / dl. The results were recorded during two weeks of monitoring, the rate of glucose. The same procedure was performed on the day following the training on a vibrating platform. It was found that the rate of glucose decreased after training ranging from 163 to 187 mg / dl. Then, the volunteer was instructed by the research dietitian to follow a strict regimen. Currently a person has a glucose level of 89 mg / dl, not needing to take medication for diabetes.

Osteogenesis imperfecta is a relatively rare disease. In bone densitometry, in both cases, individuals have low bone mass. However, a person aged 19 has a metal rod in his left thigh due to a fracture acquired. Importantly, the volunteers did not show any problem during the training period (2 ½ months). As the training goal is to get these individuals to strengthen bone mass is still early conduct a new bone densitometry. However, it is important that these individuals did not present any problem during training on a vibrating platform.

In individuals with spinal cord injury, all are carriers of the metal plate in the spine. However, this fact does not invalidate the vibration platform training since the board has fixed more than one year. Importantly, the frequency of training should remain at 30 Hz and low amplitude (3 mm) during the training time.

DISCUSSION

According Proença (2010) currently new handsets appeared to strengthen the musculoskeletal system based on vibrating platforms, electromagnetic fields, ultrasound and laser. These devices enable the treatment of diseases such as osteoporosis in elderly patients or those with mobility problems, contributing to fracture repair and improvement of pseudarthrosis. In this sense the vibration platform has been used by the laboratory "Qualivida" FCT / UNESP as a means to improve peripheral circulation, in individuals with spinal cord injuries, and strengthen the musculoskeletal system in individuals with Parkinson's disease, osteogenesis imperfecta and osteoporosis. The vibrating platform that uses vibration produces a small deformity in the bone tissue, leading to areas of polarity, with positive and negative charge. This phenomenon called piezoelectricity, which means electrical pressure, stimulates bone formation. According Proença (2001) developed the mature cells from osteoblasts, osteocytes, are responsible for the transmission of the impulse that regulates bone remodeling. When there is some impact, as is

the case of vibrations produced by the vibrating platform, the osteocytes detect motion and release substances that stimulate osteoblasts to provide more bone.

CONCLUSIONS

In situations where the individual is unable to exercise, as is the case of patients with physical disabilities or very old, or diseases like Parkinson's and Osteogenesis Imperfecta, a vibrating platform appears as a new hope for these people.

The platform has reduced the rate of glucose in the blood of individuals with Diabetes Mellitus. Improved strength and balance in individuals with Parkinson's disease, Diabetes Mellitus, osteogenesis imperfect and individuals with spinal cord injury.

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ABSTRACT

The vibrating platform transmits mechanical vibrations to the whole body, resulting in activation of the neuromuscular spindle. The muscles contract and relax involuntarily from 30 to 50 times per second in response to a vibration that is adjustable in frequency, duration and amplitude, causing the muscles to be activated almost 100%. This leads to muscle strength, improves blood flow, it prevents and bone turnover, among others. The device can be used by sportsmen weekend, the elderly, obese, athletes, people with Alzheimer's, Parkinson's, multiple sclerosis and other diseases, except in people with cardiac pacemakers. This research comes to reports of cases of laboratory "Qualivida" in relation to an individual with Parkinson's disease, one with diabetes, two with osteogenesis imperfecta and two patients with spinal cord injury. Initially, before the work platform is the examination of bone densitometry in all individuals. In individuals with Parkinson's disease was the examination of grip strength before the beginning of exercises on the vibrating platform. After two and half weeks was applied a second test in parkinsonian dynamometry. The survey blamed increasing strength and lumbar flexion of the leg when compared with the initial examination. We also observed increased balance according to test of putting one foot in front of another. In individuals with diabetes mellitus decreased the rate of glucose in the blood. The vibrating platform is well tolerated in osteogenesis imperfecta and wheelchair showed no decubitus ulcer during the training time.

KEY- WORDS: vibrating platform, decubitus ulcer, osteogenesis imperfecta

UTILISATION DE LA PLATEFORME DE VIBRATIONS DANS DES CONDITIONS MÉDICALES

RÉSUMÉ

La plate-forme vibrante transmet des vibrations mécaniques sur tout le corps, résultant en une activation de l'axe neuromusculaire. Les muscles se contractent involontairement et se détendent 30 à 50 fois par seconde en réponse à une vibration qui est réglable en fréquence, la durée et l'amplitude, entraînant les muscles à être activés près de 100%. Cela conduit à la force musculaire, améliore la circulation sanguine, il empêche et le remodelage osseux, entre autres. Le dispositif peut être utilisé par week-end sportifs, les personnes âgées, obèses, les athlètes, les personnes atteintes d'Alzheimer, de Parkinson, la sclérose en plaques et d'autres maladies, sauf chez les personnes portant un stimulateur cardiaque. Cette recherche vient de rapports de cas de laboratoire "Qualivida" par rapport à une personne ayant la maladie de Parkinson, l'une avec le diabète, dont deux avec l'ostéogénèse imparfaite et deux patients atteints de lésions de la moelle épinière. Initialement, avant la plate-forme de travail, est l'examen de densitométrie osseuse chez tous les individus. Chez les personnes atteintes de la maladie de Parkinson a été l'examen de la force de préhension avant le début d'exercices sur la plate-forme vibrante. Après deux semaines et demie a été appliqué un deuxième test en dynamométrie parkinsoniens. L'enquête a blâmé l'augmentation de puissance et de la flexion lombaire de la jambe par rapport à l'examen initial. Nous avons également observé solde a augmenté selon le test de mettre un pied devant l'autre. Chez les individus atteints de diabète sucré a diminué le taux de glucose dans le sang. La plate-forme vibrante est bien toléré dans l'ostéogénèse imparfaite et le fauteuil roulant n'a pas montré l'ulcère de décubitus pendant la durée de la formation.

MOTS-CLÉS: plate-forme vibrante, ulcère de décubitus, l'ostéogénèse imparfaite

USO DE LA PLATAFORMA DE LAS VIBRACIONES EN DIFERENTES CONDICIONES MÉDICAS**RESUMEN**

La plataforma de vibración transmite las vibraciones mecánicas en todo el cuerpo, resultando en la activación del huso neuromuscular. Los músculos se contraen y relajan involuntariamente de 30 a 50 veces por segundo en respuesta a una vibración que se puede ajustar la frecuencia, duración y amplitud, haciendo que los músculos se activan casi el 100%. Esto lleva a la fuerza muscular, mejora el flujo sanguíneo, previene y el recambio óseo, entre otros. El dispositivo puede ser utilizado por deportistas de fin de semana, los ancianos, obesos, deportistas, personas con Alzheimer, Parkinson, esclerosis múltiple y otras enfermedades, excepto en personas con marcapasos cardíacos. Esta investigación trata de informes de casos de laboratorio "Qualivida" en relación con un individuo con la enfermedad de Parkinson, una con la diabetes, dos con osteogénesis imperfecta y dos pacientes con lesión de la médula espinal. Inicialmente, antes de la plataforma de trabajo, es el examen de densitometría ósea en todos los individuos. En los individuos con enfermedad de Parkinson fue el examen de la fuerza de agarre antes del comienzo de los ejercicios sobre la plataforma vibratoria. Después de dos y media semanas se aplicó una segunda prueba de dinamometría parkinsonianos. La encuesta culpó aumentar la fuerza y la flexión lumbar de la pierna en comparación con el primer examen. También se observó un mayor equilibrio según la prueba de poner un pie delante de otro. En los individuos con diabetes mellitus disminuyó la tasa de glucosa en la sangre. La plataforma vibratoria es bien tolerado en la osteogénesis imperfecta y la silla de ruedas no mostró la úlcera de decúbito durante el tiempo de entrenamiento.

PALABRAS CLAVE: plataforma vibratoria, la úlcera de decúbito, la osteogénesis imperfecta

USO DA PLATAFORMA VIBRATÓRIA EM DIFERENTES PATOLOGIAS.**RESUMO**

A plataforma vibratória transmite vibrações mecânicas a todo o corpo, resultando em ativação dos fusos neuromusculares. A musculatura contrai e relaxa involuntariamente 30 a 50 vezes por segundo em resposta a uma vibração que é ajustável em frequência, duração e amplitude, fazendo com que os músculos sejam quase 100% ativados. Tal fato leva ao fortalecimento muscular, melhora o fluxo sanguíneo, atua na prevenção e reposição óssea, entre outros. O aparelho pode ser utilizado por desportistas de fim de semana, pessoas idosas, obesas, atletas, pessoas com Alzheimer, Parkinson, Esclerose Múltipla e outras patologias, exceto em pessoas com marca-passo cardíaco. Esta pesquisa trata-se de relatos de casos do laboratório "QualiVida" com relação a um indivíduo com a doença de Parkinson, um com diabetes, dois com osteogênese imperfeita e dois portadores de lesão medular. Inicialmente, antes do trabalho em plataforma, é realizado o exame de densitometria óssea em todos os indivíduos. No indivíduo com a doença de Parkinson foi realizado o exame de dinamometria antes do início dos exercícios em plataforma vibratória. Após duas semanas e meia foi aplicado um segundo exame de dinamometria na parkinsoniana. O exame acusou aumento de força lombar e de flexão da perna quando comparado com o exame inicial. Foi observado também, aumento do equilíbrio segundo o teste de colocar um pé na frente do outro. No indivíduo com Diabetes Mellitus houve diminuição da taxa de glicose no sangue. A plataforma vibratória está sendo bem tolerada na osteogênese imperfeita e os cadeirantes não apresentaram nenhuma úlcera de decúbito durante o tempo de treinamento.

PALAVRAS CHAVE: Plataforma vibratória, Úlcera de decúbito, Osteogênese imperfeita