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Research Article

Reduced Bone Density Restoration from Chronic Antiorthostatic Therapy through Fluid Shift to the Head and Low Gravity Effects

Yaroshenko YN[2], Kakuris KK[1]*, Denogratov SK[1] and Merkov PL[2]

[1]Institute of Hypokinetic Physiology, Greece

[2]Institute of Hypokinetic Biochemistry, Bulgaria

***Corresponding author:** Kostas K Kakuris, Institute of Hypokinetic Physiology, Greece

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Abstract

Objectives: Chronic Antiorthostatic Therapy (CAT) through progressive and periodic Fluid Redistribution (FR) and low gravity effects helps restore bone lost due to impaired bone mineral deposition. We hypothesize that reduced bone mineral density could be restored through CAT during diminished muscular activity (Hypokinesia; HK). We studied the potential clinical treatment for reduced bone mineral density through CAT during HK

Methods: Studies were conducted on 40 male healthy volunteers. They were divided into four-groups: Antiorthostatic Therapy Hypokinetic Subjects (ATHS), Hypokinetic Subjects (HKS), Antiorthostatic Therapy Active Subjects (ATCS) and Active Control Subjects (ACS). Bone density of the skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula were measured during 390 and 364 days pre-experimental and experimental period, respectively.

Results: Bone density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula increases ($p<0.05$) in the ATHS group compared to the HKS group. Bone density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula decreases ($p<0.05$) in the HKS group compared to the ATHS, ATCS and ACS groups and the values at the pre-experimental period. Bone density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula did not increase in the ATCS group as in the ATHS group and did not changed compared to ACS group. Bone mineral density did not change in the ACS group compared to the pre-experimental period and the ATCS group.

Conclusion: The current study shows higher bone mineral density by means of CAT suggesting a potential clinical treatment of reduced bone mineral density using CAT through progressive and periodic FR and low gravity effects.

Keywords: Bone remodeling; Mineral deposition; Fluid volume redistribution; Fluid volume expansion; Circulatory pressure gradients; Physical exercise; Therapeutic benefits.

Introduction

Chronic Antiorthostatic Therapy (CAT) counteracting gravity protects organs and systems of the human body from the detrimental effects of gravity. CAT produces progressive and periodic fluid shift to upper body, Fluid Redistribution (FR) and blood volume expansion. CAT creates lo low gravity effects that help organs and systems to relax as they no longer fighting the familiar pull of earth gravity. CAT creates a hydrostatic pressure gradient that increases venous return of blood to the heart and cardiac output by 40-50%. CAT makes body fluids move away from low into upper part of the body creating more blood volume and tissue perfusion which helps organs and systems to work better than before. CAT that moves away body fluids from the lower extremities into thoracic region, conditions the upper body part tissues to fluid volume expansion thereby reducing stress of hypervolemia on organs and systems which in turn helps overall adaptation to fluid volume expansion.

Earth gravity affects fluids inside the body by pulling blood and other body fluids to lower parts of the body. Fluid migration to lower body creates more fluid to pelvic region and lower part of the body. Retention of larger fluid volume in lower body from what is the norm for lower part of the body results to lower blood volume and lower filling with blood of the central vascular bed [1]. Fluid volume which can fit into venous system of lower part of the body determines the severity of delivering fluid to the head and thus vascular volume. Fluid volume reduction is most detrimental to the human body because it forces organs and systems to work harder than normally would. The reduced fluid volume results in electrolyte deficiency [2-8] that cannot be prevented or restored through the existing measures [9-14]. Bone density is also reduced during prolonged diminished muscular activity despite the use of different preventive measures [15-20]. CAT that counteracts Earth gravity effects and helps body fluids move away from lower into upper part of the body contributing to vascular volume is the best solution for reduced bone density

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[21,22]. Bone loss is primarily driven from the inability of the body to deposit bone minerals and the lower muscular forces as muscle strength and muscle atrophy developed [15-20]. It is the reduced bone density and deterioration of its microarchitecture that leads to premature osteoporosis. Bone loss results to age-related changes and bone fractures analogous to those seen in osteoporosis. The reduction of bone density and strength is more pronounced in some skeletal regions than others, such as pelvis region. Bone loss can increase the risk of skeletal fractures and uncoupled from bone cell reactions with remodeling could affect the healing of bone fractures. Skeletal injuries can adversely affect the ability to perform physical activities, impair physical capacity, due to further injuries or pain, and increases the risk of bone fractures because of reduced skeletal integrity. Bone loss, incomplete recovery and irreversible changes in microarchitecture and geometry of skeleton could result to premature age-related bone changes and osteoporosis and bone fractures. Studies have shown how bone loss in some skeleton areas shows the greatest benefits from reduced physical stress [15-20]. Some studies [15-20] have shown that fluid volume expansion through chronically applied fluid and salt supplementation which contribute to osteogenesis and increase bone mineral deposition could be used for therapy and/or prevention of bone loss. However, CAT that counteracts Earth gravity compression effects and creates FR and contributes to fluid volume expansion and bone remodeling could be one of the best solutions for the increase and the protection of skeletal mineral density [21,22]. Epidemiological, experimental and clinical studies have shown that CAT, via reduced gravity effects, fluid shift to upper body, fluid redistribution and fluid volume expansion, is effective in the treatment of major disorders. A spectacular aging slowing down and disappearance of aging skin and body changes were shown in people when subjected to CAT. Arterial blood pressure has been shown to reduce in hypertensive patients after undergoing CAT. Patents with back pain have shown pain relief after undertaking CAT that helps the quatratus lumborum and psoas muscles to expand. A spectacular disappearance of Alzheimer's symptoms was shown in patients after are undergoing CAT. Coronary artery patients have shown significant reduction in symptoms after undergoing CAT. The risk of stroke reduces significantly when patients subjected to CAT which increases blood oxygen and energy delivery to the brain. Patients with diabetes mellitus have shown a higher insulin production and utilization after they undergo CAT. Blood oxygenation has been shown to increase when patients with acute respiratory failure are treated with CAT. Myocardial infarction reduced or prevented when patients were subjected to CAT. The major benefits of low gravity effects are evident from the significant reduction of cot deaths ever since the no-prone position in sleeping babies was introduced.

It is surprising however that although the effects of gravity on healthy and diseased humans have been studied for many years [23] and the effects fluid volume expansion and FR on physiological and biochemical parameters have been studied extensively [2-8] and the therapeutic benefits of low gravity effects have been known from the time of Hippocrates, thus far very few studies have been published on reduced bone mineral density restoration from CAT through low gravity effects, fluid shift to the head, hypervolemia and FR [21,22]. CAT that creates progressive and periodic fluid shift to the head, FR, hypervolemia, and low gravity effects has nowadays become a recognized treatment method for major disease and symptoms of diseases. We uncover something that has been right under our nose forever. CAT is not a trip to the spa. CAT is a powerful stimulus for the treatment of bone degradation but over longer duration of time might need to endure and/or overcome the effects of symptoms mimic myasthenia gravis and old age.

Chronic antiorthostatic therapy through progressive and periodic fluid volume expansion, FR and low gravity effects helps restore reduced bone mineral density loss because of impaired bone mineral deposition. We hypothesize that reduced bone mineral density could be restored and/or prevented through CAT. To provide evidence of reduced bone mineral density restoration through CAT and to establish a potential clinical treatment for reduced bone mineral density, via progressive and periodic fluid volume expansion, FR and low gravity effects, we measured bone density of skull, lumbar vertebrae, tibia and fibula, ulna and radius, tarsal and metatarsal potentially providing rationale for using CAT clinically.

Methods and Materials

The studies had conformed to the principles of the Declaration of Helsinki. Study protocols were reviewed and approved by the Committee for the Protection of Human Subjects of the Institutional Review Board. The subjects received verbal and written explanations of the tests and experimental protocols prior to providing written informed consent. Among the subjects were no medical problems and none of the subjects were under any drug therapy that could have interfered with bone density. Financial incentives relative to average monthly earnings were used to encourage compliance with the protocol of the study. During the study were not dropouts. Forty physically healthy male volunteers of 23.4 ± 6.4, 22.7 ± 5.5, 25.6 ±6.2 and 26.1 ± 5.5 years of age for the Active Control Subjects (ACS), Hypokinetic Subjects (HKS), Antiorthostatic Therapy Control Subjects (ATCS) and Antiorthostatic Therapy Hypokinetic Subjects (ATHS) were chosen as subjects, respectively. The subjects had a body weight of 72.3 ± 8.0, 71.8 ±6.6, 74.5 ±5.5 and 73.4 ±6.6 kg for the ACS, HKS, ATCS and ATHS, respectively. The subjects had a mean peak oxygen uptake of 46.8 ± 4.4 mL. kg^{-1}. min^{-1}. Subjects were run average distances of 9.9 ± 1.4 km per day at a speed of 9.8±1.6 km.h-1 for three to five years.

An assistant blinded from the recruitment, treatment and procedures of anti-gravity measures and a concealed method used did assignment of subjects into four groups randomly.

Group 1: Ten subjects walked average distances of 3.2±0.4 km/day and were submitted to CAT. They were assigned to Antiorthostatic Therapy Hypokinetic Subjects (ATHS) group.

Group 2: Ten subjects walked average distances of 3.2±0.5 km/day. They were assigned to hypokinetic subjects (HKS) group.

Group 3: Ten subjects run average distances of 9.1±1.5 km/day and were submitted to CAT. They were assigned to Antiorthostatic Therapy Control Subjects (ATCS) group.

Group 4: Ten subjects run average distances of 9.2±1.3 km/day. They were assigned to Active Control Subjects (ACS) group.

Protocol

The investigation consisted of a 390-day pre-experimental period and a 364-day experimental period. In pre-experimental period

subjects run average distances of 9.1 ± 1.4 km/day at a speed of 9.3 ± 1.1 km.h-1. The diets were served as a 7-day menu rotation. The meals were all prepared under standard conditions in a research kitchen. Mean daily energy consumption of metabolic diet was 3610 ±550, 3105 ± 387, 3615 ± 521 and 3111 ± 373 SD kcal, and the mean daily Ca++ consumption was 44.5 ± 1.2, 44.3 ± 1.3, 43.6 ±1.5 and 44.5 ± 1.4 SD mmol for the ACS, HKS, ATCS and ATHS, respectively. Subjects were housed in a facility where humidity, temperature, activities, and dietary intakes were monitored 24-hrs per day and 7-days per week. Because of the potential of too much stress and pressure on the heart and the circulatory system and other organs and systems, care was taken with the use of CAT. The heart and circulatory system of the ATHS group and the ATCS group were check thoroughly before they were recruited to the study. The heart of the ATHS and ATCS was monitored closely during the CAT for any changes.

Simulation of hypokinetic conditions

To simulate the designated degree of HK the number of km walking per day was restricted to an average of 3.2±0.3 km.day^{-1} and was monitored daily by an accelerometer. The activities allowed were those that approximated the normal routines of hypokinetic individuals. Subjects were allowed to walk to the dining rooms, lavatories and different laboratories where the tests were administered. Climbing stairs and other activities which required greater efforts were not allowed. Subjects were mobile and were not allowed outside the experimental facility grounds so that the level of hypokinesia could remain constant and their movements could easily monitor.

Low gravity effects simulation

To create low gravity effects the subjects were asked to sleep without a pillow at an angle of -6° to -40° in Antiorthostatic Position (AOP). The level of AOP was increased progressively by -2° each time and after the adaptation period was completed. The subjects were allowed to sleep for at least 8 hours at night. The actual tests were performed at different degrees, and after the adaptability of the subjects to a particular degree was established. The level of each AOP was increased after the ability of subjects to adapt to a specific AOP degree was established. The AOP increased approximately every 34 to 45 days and after the ability of the volunteers to adapt to that AOP was determined. At each AOP the subjects were kept for the same duration of time to secure the adaptability of subjects to that AOP degree. The individual differences in metabolic, biochemical, physiological, cardiovascular, endocrine, and renal reactions of subjects to AOP and their conditions and symptoms were taken into consideration. The study schedule changed periodically to conform to the ability of volunteers to adapt to AOP. To reduce AOP stress and to ensure the comfort of subjects the intensity and duration of AOP was modified as and when required.

Bone density measurements

Samples were analyzed in duplicate, and appropriate standards were used for all measurements:

Bone density values (g/cm^2) of the lumbar vertebrae (L1-L4), on the boundary between the median and distal thirds of the tibia and fibula diaphysis, the length of the radius and ulna (calculated from the styloid process) and in the foot (tarsal and metatarsal bones) and the bone density of the skull were measured using the Lunar of dual-energy, X-ray absorptionmetry (DXA; GE-Lunar DPX-L) with DPX-L software (version 1.6; GE Lunar). (Lunar Radiation Corp., Madison, WI). The values calculated from the analyses of the whole body scan. We calibrated the machine daily and performed daily and weekly quality-assurance tests as recommended by the manufacturers. The precision errors (% CV) for whole body and radius shaft BMD measurements were 0.5% and 0.8%, respectively. The two-person interobserver error for DXA analysis was 0.1%. Daily phantom measurements on DXA indicated a steady but extremely slow machine drift; BMD was adjusted accordingly.

Table 1: Clinical symptoms in the control group of subjects and the hypokinetic group of subjects through the use of the antiorthostatic therapy.

Puffiness in the face
Tachycardia
Ventricular extrasystoles
Arrhythmias
Loud heart sounds
Heart sound in the right ear
Frequent urination
Urinary incontinence
Tinnitus in the right ear
Feeling of fullness (pressure) or stuffiness in the right ear
Right eyelid droop
Near- and far-sightedness in the right eye
Visual acuity problems in the right eye
Muscle spasms in the right leg and the right hand
Pain in the right leg and in the right hand
Cold sensation in the right food and in the right hand
Pain in the calcaneal tendon region (Achilles) in the right leg
Urticaria on the back and the upper right arm and leg
Upper body back discoloration
Upper body back skin itching
Physiological deconditioning mimic old aging symptoms

Data analyses

A 2-way interaction [treatment (4 levels) by days (6 levels)] Analysis Of Variance (ANOVA) was used to determine bone mineral density benefits from CAT and to establish a potential clinical treatment of reduced skeletal mineral density during hypokinesia. ANOVAs with repeated measures of 2-way interaction (treatment and days, pre-experimental and experimental values, the hypokinetic subjects and the antiorthostatic therapy hypokinetic subjects, the hypokinetic subjects and the control subjects groups) were used. ANOVAs for each time point measurements were used. Statistical analysis of results was made with GraphPad Prism statistical software (GraphPad Software Inc., La Jolla, California). Level of significance was set to <0.05.

Results

The subjects of the ATHS group and the ATCS group reported some clinical symptoms (Table 1). In the ATHS group and the ATCS group symptoms were shown in the right eye and ear and right arms and legs of the body. Most symptoms were shown in the upper part of

Table 2: Long Bones, Foot Bones, Arm Bones and Lumbar Vertebrae Density in the Control Group and the Hypokinetic Group of Subjects and the Antiorthostatic Therapy Control Group and the Antiorthostatic Therapy Hypokinetic Group of Subjects during the Pre-experimental and the Experimental Period.

Duration of Experimental In Days	Tibia and Fibula g/cm^2	Tarsal and Metatarsal g/cm^2	Ulna and Radius g/cm^2	Lumbar Vertebrae (L1-L4), g/cm^2
Active Control Subjects (ACS), n=10				
Pre-experimental	2.057 ± 0.11	1.14 ± 0.05	0.80 ± 0.04	1.05 ± 0.02
60th	2.057 ± 0.13	1.14 ± 0.05	0.81 ± 0.05	1.05 ± 0.03
120th	2.058 ± 0.10	1.15 ± 0.06	0.82 ± 0.03	1.06 ± 0.03
180th	2.057 ± 0.11	1.16 ± 0.05	0.83 ± 0.03	1.07 ± 0.04
240th	2.058 ± 0.12	1.16 ± 0.07	0.84 ± 0.05	1.08 ± 0.03
300th	2.060 ± 0.13	1.17 ± 0.06	0.85 ± 0.03	1.07 ± 0.04
364th	2.061 ± 0.10	1.17 ± 0.07	0.85 ± 0.05	1.08 ± 0.03
Hypokinetic Subjects (HKS), n=10				
Pre-experimental	2.058 ± 0.14	1.16 ± 0.05	0.80 ± 0.04	1.07 ± 0.03
60th	1.885 ± 0.12*†	1.06 ± 0.03*†	0.72 ± 0.01*†	0.97 ± 0.02*
120th	1.900 ± 0.13*†	1.07 ± 0.05*†	0.74 ± 0.03*†	1.00 ± 0.03*†
180th	1.835 ± 0.12*†	1.03 ± 0.04*†	0.70 ± 0.06*†	0.95 ± 0.05*†
240th	1.864 ± 0.12*†	1.05 ± 0.05*†	0.72 ± 0.05*†	0.97 ± 0.04*†
300th	1.708 ± 0.11*†	0.96 ± 0.06*†	0.63 ± 0.04*†	0.88 ± 0.03*†
364th	1.733 ± 0.14*†	0.98 ± 0.05*†	0.65 ± 0.05*†	0.90 ± 0.05*†
Antiorthostatic Therapy Control Subjects (ATCS), n=10				
Pre-experimental	2.073 ± 0.13	1.25 ± 0.04	0.88 ± 0.03	1.15 ± 0.03
60th	2.118 ± 0.10	1.26 ± 0.05	0.89 ± 0.04	1.17 ± 0.03
120th	2.130 ± 0.12	1.27 ± 0.03	0.90 ± 0.03	1.18 ± 0.04
180th	2.157 ± 0.11	1.30 ± 0.04	0.91 ± 0.05	1.20 ± 0.03
240th	2.168 ± 0.10	1.28 ± 0.03	0.92 ± 0.03	1.19 ± 0.04
300th	2.217 ± 0.13	1.33 ± 0.04	0.93 ± 0.04	1.23 ± 0.05
364th	2.211 ± 0.15	1.31 ± 0.02	0.92 ± 0.05	1.22 ± 0.03
Antiorthostatic Therapy Hypokinetic Subjects (ATHS), n=10				
Pre-experimental	2.071 ± 0.14	1.2 4 ± 0.03	0.87 ± 0.04	1.14 ± 0.03
60th	2.227 ± 0.13$^+$	1.31 ± 0.03$^+$	0.93 ± 0.03$^+$	1.22 ± 0.02$^+$
120th	2.213 ± 0.12$^+$	1.29 ± 0.04$^+$	0.92 ± 0.04$^+$	1.20 ± 0.05$^+$
180th	2.256 ± 0.13$^+$	1.34 ± 0.03$^+$	0.95 ± 0.03$^+$	1.25 ± 0.03$^+$
240th	2.245 ± 0.14$^+$	1.31 ± 0.04$^+$	0.93 ± 0.05$^+$	1.23 ± 0.04$^+$
300th	2.333 ± 0.13$^+$	1.38 ± 0.05$^+$	0.98 ± 0.03$^+$	1.30± 0.03$^+$
364th	2.321 ± 0.14$^+$	1.37 ± 0.03$^+$	0.97 ± 0.04$^+$	1.28 ± 0.04$^+$

All values were expressed as mean ± SD

†p<0.05 significant differences between the pre-experimental and the experimental period values.

*p<0.05 significant differences between the hypokinetic group and the control group of subjects.

+p<0.05 significant differences between the antiorthostatic therapy hypokinetic group and the hypokinetic group of subjects.

the body where most blood flows than in the lower part of the body. Symptoms were more pronounced in the ATCS group of subjects who were engaged in physical exercise than in the ATHS group. At latter stages of the study the subjects who have been treated with CAT have show an increase in antigravity muscle strength and skeleton stability. In the HKS group muscle strength and skeletal stability reduced. The ATHS have noticed benefits in their health and well-being and have shown lessening of tiredness and sleep duration needs. The ATHS group of subjects gained height, energy, power and strength. The ATHS group of subjects have felt that they become smarter or even have gain significant memory capabilities. The ATHS group underwent significant body changes. The ATCS group was not show the same benefits from CAT as was the ATHS group. The ATCS and the ATHS continued the treatment after the study was completed. The HKS and the ACS groups were also adapted the CAT treatment after completion of the study. With CAT treatment the body of the subjects alters because changes occur in individual cells and in whole organs. These alterations result in numerous changes of the body in function and in appearance.

Bone mineral density of skull, lumbar vertebrae (L1-L4), tibia and fibula, ulna and radius, tarsal and metatarsal reduced in the ATHS and

ATCS groups of subjects at the initial stages of the pre-experimental period; however, as the pre-experimental period increased and the subjects were adjusted to CAT bone mineral density increased (Table 2). In the HKS and ACS groups of subjects bone mineral density of skull, lumbar vertebrae, tibia and fibula, ulna and radius, metatarsal and tarsal did not change at the pre-experimental period (Table 2).

During the experimental period bone mineral density of skull, lumbar vertebrae (L1-L4), tibia and fibula, ulna and radius, metatarsal and tarsal increased ($p<0.05$) in the ATHS group compared to the HKS group (Table 2). Bone mineral density of skull, lumbar vertebrae, tibia and fibula, ulna and radius, metatarsal and tarsal reduced ($p<0.05$) in the HKS group without treatment compared to the ATHS group, the ATCS group and the ACS group and the pre-experimental period values (Table 2). In the ATCS group bone mineral density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula did not increase as in the ATHS group and bone mineral density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula did not change compared to the ACS group (Table 2). Bone mineral density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula did not change in the ACS group compared to the pre-experimental period values and the ATCS group that showed higher bone mineral density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula (Table 2). Following adaptation to CAT the ATHS group and the ATCS group of subjects did not shown any changes in arterial blood pressure and heart rate in orthostatic position.

Discussion

The symptoms did not affect the ability of the ATHS group and the ATCS groups to adapt to the CAT. The symptoms disappeared as adaptation to CAT increased. The severity of symptoms in the ATCS group from that of the ATHS group could be attributable to physical activity of the ATCS which acts more as a stressor [9,10] than a stimulus. Why most symptoms appeared in the right eye and ear and in the right arms and legs it is not know. It has been suggested that the symptoms in the right and left size of the body were probably shown because of chronic FR and low gravity effects. Why most symptoms were shown in the upper part of the body where most blood flows and not in the lower part of the body where the least blood flows is not clear. The increase of memory capability could be attributable to blood boost to the brain. The expectation is that over longer treatment with CAT some other symptoms could develop. Thus, the symptoms of the ATCS group and the ATHS group could be signs of adaptation and harmonization at the CAT conditions. The ATCS were not show the same benefits from CAT as were the ATHS. The benefits of health and wellbeing from CAT could be signs of revitalization and regeneration of the different organs and systems of the body after adaptation to CAT environment. As the body of subjects seeks a new equilibrium to the CAT environment different health and wellbeing benefits were shown on the ATCS group and the ATHS group.

Bone mineral density increases significantly in the ATHS group compared to the HKS group, while bone mineral density decreases significantly in the HKS group compared to other groups. In the ATCS group bone density did not change compared to the ACS group and did not increase as in the ATHS group. A spectacular bone density was shown in the hypokinetic subjects after undergoing treatment with CAT. Bone density in the ATHS group was characterized by higher mineral density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula. This shows that bone mineral density increases from CAT, through low gravity effects and FR. Conversely, bone density in the HKS group was characterized by lower mineral density of skull, lumbar vertebrae (L1-L4), ulna and radius, tarsal and metatarsal, tibia and fibula compared to the baseline values and the values of the ATHS group. Evidently, bone mineral density increases and bone mineral loss decreases in the ATHS group compared to the HKS group. The increase of bone mineral density and the decrease of bone mineral loss in the ATHS group could be attributable to the treatment with CAT which is sensed as stimulus [24-26] than as stressor. The higher bone density in the ATHS group is further supported by the changes in bone remodeling and bone resorption via fluid volume expansion [15-20]. The higher bone mineral density and the lower bone mineral loss were analogous to the changes with extracellular fluid volume expansion [15-20]. Thus, CAT through FR and low gravity effects contributes to higher bone mineral density and lower bone mineral loss. The higher bone mineral density and lower bone loss was as a general trend of bone mineral density from CAT, through FR and low gravity effects and could be used to increase bone mineral density. This suggests a potential clinical benefit of reduced bone mineral density from CAT through low gravity effects and chronic FR.

The most striking finding of bone mineral density was the increase of bone formation and the decrease of bone resorption. Higher bone mineral density through CAT could be attributable to higher bone mineral deposition. CAT which creates reduces gravity effects and FR is a powerful stimulus of bone mineral deposition as was shown by the significant differences between the ATHS group and HKS group. Bone minerals are taken up for deposition and used by bones which in turn protects the net bone mineral density [15-20]. CAT, through low gravity effects and FR, helps bone mineral utilization to work more efficient than normally would. CAT shifting fluid to the head conditions upper body part tissues, to fluid volume expansion that reduces stress on upper body part tissues and help overall adaptation to fluid migration to regional areas of the body. After adaptation to CAT the ATHS group continued to show a progressive increase of bone density. This shows that progressive and periodic fluid migration to the thoracic region of the body is not sensed as stressor but as stimulus [24-26]. Studies [15-20] have shown that fluid volume expansion through chronic fluid and salt supplementation contributes to bone mineral density. Some studies have shown that fluid volume expansion, through supplementation of fluid and salt could counteract electrolyte loss and electrolyte deficiency [27-32]. Thus higher bone mineral density could be attributable to CAT through low gravity effects, fluid volume expansion and FR. It is generally believed that CAT, triggers a chain of events that boosts bone mineral utilization thereby increasing bone mineral deposition and bone mineral density. Through low gravity effects and FR, the body undergoes many changes.

The higher bone mineral density in the ATHS group than in the HKS group shows that the ATHS group had a more responsive bone mineral density than the HKS group. The differences between the ATHS group and the HKS group shows that bone mineral density

was greater with than without CAT. This could be attributable to the higher bone mineral deposition in the ATHS group compared to the HKS group. This shows a common conception that CAT is very important for the treatment of reduced bone mineral density. This adds an important contribution to the treatment of reduced bone mineral density. However, the treatment of reduced bone mineral density through CAT depends on bone mineral deposition and bone mineral deposition depends on the ability of the body to regulate bone minerals and bone mineral regulation determines the ability of the body to deposit bone minerals. Thus, bone mineral density is determined by the ability of the body to deposit minerals and bone mineral deposition is determined by the ability of the body to regulate bone minerals. This is achieved when bone mineral regulation determines the ability of the body to deposit minerals into the bone. A higher bone mineral density is reached when bone mineral deposition increases more than before and bone mineral regulation is more efficient than normally would. It would appear that a therapy for reduced bone mineral density would be the treatment with CAT, through low gravity effects, fluid shift to the head, more fluid volume and FR. The higher bone mineral deposition and the higher bone mineral density through CAT is itself a significant achievement that the human body ever before has accomplice. The CAT, as it turns out, is probably as powerful as no any other kind of treatment or prevention strategy of bone mineral deposition and bone mineral density that has been assessed so far.

The higher bone mineral density through CAT and the lower bone mineral density through AOP could be attributable to the differences of fluid shift to the head, that is, periodic and progressive fluid shift to the head through CAT and acute and continuous fluid shift to the head through AOP and/or differences of gravity effects. The different mechanisms of bone mineral regulation, different bone adaptation and different blood volume and tissue oxygen delivery could have contributed to differences of bone mineral density. CAT shifting body fluids into upper body part tissues periodically and progressively, conditions upper body part tissues to hydrostatic pressure gradients, easier fluid movement to the head and fluid volume expansion making faster bone tissue adaptation to fluid volume expansion and circulatory pressure gradients contributing to higher bone mineral deposition. Moreover through CAT fluid volume is intravascular and intracellular therefore contributes to vascular volume that is vital to bone mineral deposition. Some studies have shown that fluid volume expansion through fluid and salt supplementation contributes to bone mineral deposition thereby inceasing bone mineral density [15-20]. Moving various body fluids away from lower into upper part of the body periodically determines the delivery of fluid volume into upper body part tissues progressively, while moving body fluids away from lower into upper part of the body acutely determines body fluids shift into upper body part tissues continuously. Thus the differences between periodic and progressive fluid migration to the head through CAT and acute and continuous fluid shift to the head through AOP could have led to the differences of bone mineral deposition through CAT from that of AOP.

The ATCS group did not have higher bone mineral density than the ACS group and as higher as the ATHS group. As was shown by the minor increase of bone mineral density of the ATCS group compared to the ATHS group, physical activity could have acted more as stressor than stimulus. Some studies have shown that physical exercise acts more as stressor [9,10] than as stimulus. Although physical exercise assumes to be beneficial in reality aggravates Earth gravity effects and takes a heavy toll on the human body. Physical exercise moving body fluids away from upper to the lower part of the body determines the severity in delivery of fluid into upper part of the body and therefore vascular volume. Physical exercise affects fluid redistribution inside the body by moving various body fluids to lower part of the body. Some studies [33-37] have shown that physical exercise cannot contribute to vascular volume because fluid volume is neither intravascular nor intracellular and cannot contribute to vascular volume. The ability of the body to adapt to CAT is determined by the intensity of physical exercise, that is, the higher physical exercise the lower the ability of the body to adapt to CAT. As was shown by the minor bone mineral density the differences between the ATCS group and the ATHS group and the lower adaptation to CAT could have contributed to lower bone mineral density in the ATCS group compared to the ATHS group. The CAT and physical exercise cannot play an important part in bone mineral density. Thus, one would not notice higher bone mineral density in the ATCS group as in the ATHS group. The CAT is a powerful stimulus for bone mineral density even with physical exercise when it is used over longer time than the time required without CAT. Clearly physical exercise is a stimulus for the protection of bone mineral density as was shown by the no-changes in the ACS group compared to the ATCS group. The minor increase of bone mineral density in the ATCS group compared to the ATHS shows that the ATCS group had probably not adapted to CAT and that physical exercise had impaired the effect of CAT on bone mineral density. It is clear that CAT would not contribute to bone mineral density in the ATCS group as in the ATHS group and that it is important CAT is given without physical exercise.

Conclusion

Bone mineral density increased significantly in the ATHS group compared to the HKS group, while bone mineral density decreased significantly in the HKS group compared to other groups. The increase of bone mineral density in the ATHS group compared to the HKS group suggests a potential clinical treatment for reduced bone mineral density with CAT, through FR and low gravity effects. The increase of bone mineral density in the ATHS group compared to the HKS group could be attributable to the different bone mineral regulation in the ATHS group compared to the HKS group. In conclusion, it was shown that CAT could restore reduced bone mineral density. However, the mechanisms by which CAT could recover reduced bone mineral density have not been shown. Further studies are required to determine how CAT, through progressive and periodic FR and low gravity effects helps restore reduced bone mineral density. It would probably be one of the biggest discoveries known to mankind if we found out how CAT, through progressive and periodic FR and low gravity effects, prevents or treats different diseases and/or different symptoms of diseases and recover or reverse diseased organs and systems.

Treatment of diseases and symptoms of diseases through chronic antiorthostatic therapy

Experimental, epidemiological and clinical studies by Zorbas YG, Fedorov EA, Yaroshenko YN, Deogenov VA, et al., have shown

that CAT is effective in the treatment of major disorders. CAT may help damaged organs and systems to recover from a disease or injury; enable organs and systems to work more efficiently; regulate kidney, cardiovascular, endocrine and metabolic systems; create wide-spread morphological changes with redistribution of brain tissue which improves brain functions and helps it to recover capabilities lost because of a disease or trauma; relief spinal cord injuries; provide safe relief of back pain by expanding psoas and quatratus lumborum muscles; reduce symptoms of arthritis and osteoarthritis; help immune system to become active; enable immune system recognition mechanisms to become more efficient and body's ability to defend itself against autoimmune diseases, viruses and cancer; decrease interstitial fluid pressure in diseases such as malignancies and inflammation such as osteoarthritis which increase access to nutrients, oxygen and drugs; increase heart muscle and size of heart; recover or treat heart and kidney insufficiency; reduce or prevent myocardial infarction; prevent the risk of stroke and dementia; increase venous return and cardiac output, left ventricular volume and coronary artery size; control or reduce arterial blood pressure; reduce lung infections and cardiovascular diseases; reverse or normalize liver failure; regulate diabetes mellitus through increasing the ability of the body to produce or use more insulin; affect the rate at which drugs are absorbed, distributed, bound, and metabolized or excreted which in turn affect availability and effectiveness of a drug; help bacterial cell membranes to become thinner and more permeable thereby increasing the effectiveness of antibiotics; increase of life expectancy of humans by 40% to 50%; enable the humans to live youthfully in their old years and even in very older years and increase functional ability and strength of anti-gravity muscles and orthostatic stability.

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