These research projects, undertaken in partial fulfillment of the requirements for the MD degree at Sackler Faculty of Medicine, Tel Aviv University in 2011–2012, were considered the most outstanding of the graduating class

Does gear weight reduction and design reduce the prevalence of stress fracture in border police recruits during basic training? A prospective study

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Background: Overuse injuries are responsible for two-thirds of all exercise-induced injuries. Stress fractures, the most important injury in this group, not only compromise the ability of the soldiers to function and hinder their training, but can cause long-term or permanent health disorders. These injuries also have a negative economic impact since they necessitate special medical investigations and absent the soldiers from active service. In female recruits in the Israel Border Police a high incidence of such injuries was shown. For the last 11 years female soldiers have been followed for stress fracture incidence during basic combat training in the Border Police. Both internal and external risk factors were studied and various interventions were implemented to reduce the incidence, but only partial results were achieved.

Objectives: The aim of our study was to reduce the incidence of stress fractures among female recruits in the Border Police by lowering the weight they carry and positioning it closer to the body's center of gravity.

Methods: A prospective study followed 213 female recruits of the Israel Border Police over 4 months of basic training for stress fracture incidence. They were training with modified fighting gear; the modifications included a shorter M16 rifle and a lighter and closely fitted combat vest. Follow-up included questionnaires and bimonthly assessment by the research team. Stress fractures were diagnosed by bone scintigraphy when clinically indicated. The incidence of stress fractures in the intervention group was compared to that in a historical control group of 1210 previous recruits who had trained with the traditional equipment and were followed by the same research group in previous years.

Results: Reducing the weight of the equipment and positioning it closer to the body's center of gravity decreased the incidence of stress fractures from 18.3% in the control group to 7.9% in the intervention group ($P < 0.0001$). A similar decrease was shown in long bones of the lower extremities.

Conclusions: Emphasis should be placed on external modifications to lower the prevalence of stress fractures. A significant effect was achieved by reducing equipment weight and changing its configuration.

The effect of hyperbaric oxygen therapy on amphotericin B-induced acute renal failure in rats

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Background: Acute reduction in renal function is a common and serious side effect of amphotericin B (AmB) administration. The hypothesized injury mechanism is renal vasoconstriction and direct toxic damage to the tubular cell membrane. Hyperbaric oxygen therapy (HBO) is indicated for treatment of many ischemic events but not for acute renal failure (ARF). The present study was designed to examine the effects of HBO on kidney function in rats with AmB-induced ARF.

Objectives: The aim of this study was to investigate how the use of HBO therapy after AmB-induced ARF affects kidney function.

Methods: Acute renal failure was induced in 40 Sprague-Dawley rats by a single dosage of 75 mg/kg AmB administered in a single intraperitoneal injection. The rats were randomly divided into two groups: one group was treated with daily HBO for 60 minutes at a pressure of 2 atmospheres for 3 consecutive days, while the other, control, group did not receive any HBO treatment. Parameters of renal function were measured in both groups, from urine samples on the 4th day after AmB administration and from blood samples on the 5th day after AmB administration.

Results: HBO treatment improved renal function in rats suffering from AmB-induced renal injury; this improvement was statistically significant. Serum creatinine values decreased from 0.70 ± 0.22 mg/dl to 0.49 ± 0.13 mg/dl ($P = 0.001$) and serum urea values decreased from 368.01 ± 169.35 to 200.63 ± 87.82 mg/dl ($P = 0.001$). Rat body weight loss following the administration of AmB was significantly reduced: rats treated with HBO lost 13.5 ± 14.7% body weight, compared to 24.6 ± 5.2 ($P = 0.004$) in rats

not treated with HBO .Serum magnesium levels decreased from 5.29 ± 1.47 to 3.87 ± 0.83 mg/dl ($P = 0.0001$). Serum sodium and potassium levels were not statistically different between the groups. In addition, no statistically significant differences were measured in urine biochemical studies.

Conclusions: In this model of AmB-induced ARF in rats, HBO treatment alleviated renal injury as reflected by changes in serum creatinine and urea levels. However, more studies are needed to evaluate the importance of HBO treatment in medication-induced acute renal failure.

The effect of vitamin D and FTS on hepatic stellate cell proliferation and cell cycle

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Background: Hepatic fibrosis represents a process of healing and scarring in response to liver injury for several reasons. Hepatic stellate cells (HSCs) play a key role in the formation of hepatic fibrosis. In response to liver injury, HSCs undergo an activation process in which they become highly proliferative and synthesize extracellular matrix. The active form of vitamin D, 1,25-dihydroxyvitamine D3 [1,25(OH)2D3], is an endocrine hormone whose classic role is the maintenance of calcium homeostasis. It has been established that vitamin D also has antiproliferative and pro-differentiation effects in cancer cells and an immune modulator effect. In a previous study in our lab, vitamin D inhibited the development of liver fibrosis. Another substance found to inhibit hepatic fibrosis is farnesylthiosalicylic acid (FTS). FTS inhibits the activation of Ras, a proto-oncogene that plays an important role in cell proliferation and differentiation. Several studies have shown increased Ras expression during cirrhosis in the livers of patients and animal models.

Objectives: The aim of this study was to establish what effect the combined treatment of vitamin D and FTS has on the proliferation and cell cycle of HSCs.

Methods: The experiments were performed on primary HSCs isolated from rat livers. The cells were spontaneously activated in culture growing on plates for 14 days. The cells were treated with vitamin D, FTS and platelet-derived growth factor (PDGF) in various combinations. Proliferation was tested by using the crystal violet dye and BrdU. Expression of the cell proliferation marker cyclin D1 was tested by western blotting. The influence of the various treatments on the level of activated Ras protein (Ras GTP) was also tested.

Results: Our results show that the ~50% rise in proliferation of HSCs induced by PDGF was inhibited by the combined treatment of vitamin D and FTS by ~65%. Using vitamin D as the sole treatment inhibited the proliferation by ~35%, while FTS as the sole treatment inhibited the proliferation of the HSCs but not in a significant manner. Results of the cyclin D1 measurements were in concordance with the proliferation results. PDGF induced a rise of 60% in the expression of cyclin D1. The combined treatment of vitamin D and FTS lowered the levels of cyclin D1 by ~38%. Use of vitamin D as the sole treatment lowered the levels of expression by ~25%, while FTS as the sole treatment did not inhibit the expression of cyclin D1 in a significant manner. No difference was found in the levels of Ras-GTP after 24 hours exposure to the various combinations of treatments.

Conclusions: These results imply that the combined treatment of vitamin D and FTS inhibits the proliferation of primary HSCs more than vitamin D or FTS as sole agents. The combined treatment might therefore be more effective as a treatment designed to prevent liver fibrosis.

Erratum

In the article "Radical trachelectomy: a fertility-sparing option for early invasive cervical cancer" by Mejia-Gomez et al., which appeared in the May issue (2012; 14: 324-8), a mistake occurred in the second author's name. The correct spelling is Tomer Feigenberg and not Tomer Feigenber as printed.

An important scientific innovation rarely makes its way gradually winning over and converting its opponents: it rarely happens that Saul becomes Paul. What does happen is that its opponents gradually die out and that the growing generation is familiarized with the idea from the beginning

Max Planck (1858-1947), German theoretical physicist who originated quantum theory, which won him the Nobel Prize for Physics in 1918. This theory revolutionized our understanding of atomic and subatomic processes, just as Einstein's theory of relativity revolutionized our understanding of space and time. Together they constitute the fundamental theories of 20th century physics, challenging the most cherished philosophical beliefs, and both have led to industrial and military applications that affect every aspect of modern life