

The effects of Methenolone Enanthate Supplement with Exercise on Rats' bones

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Abstract

It is known that anabolic steroids are used by athletes to increase their performance and cause many health problems. This study aims to analyze the effects of methenolone enanthate supplement with exercise on rats' bones. The study was conducted with 28 28-day-old Wistar male rats obtained from the Chair of the Experimental Medicine Research and Application Center of Selcuk University. The rats were allocated into four groups: C (control, n:6), E (exercise, n:7), M (methenolone enanthate, n:7) and ME (methenolone enanthate+exercise, n:8). The required doses were arranged weekly depending on the rats' live weight for the groups given methenolone enanthate. The rats' front and back extremity bones were dissected, and the humerus and femur bones were dried. Each bone's length, corpus thickness, cortex thickness and medullary diameter points were determined. The results were presented as mean±SD. ANOVA and Duncan's test were used for inter-group comparison of the data. The threshold for statistical significance was $p<0.05$. The femur length was 32.46 ± 0.29 in the C group, 32.60 ± 0.64 in the E group, 31.37 ± 0.50 in the ME group and 31.67 ± 0.52 in the M group. The humerus length was 26.42 ± 0.28 in the C group, 26.23 ± 0.59 in the E group, 25.31 ± 0.40 in the ME group and 25.35 ± 0.45 in the M group. The femur and humerus length was statistically significantly shorter in the groups that received methenolone enanthate supplement (M and ME) than that of the other two groups ($p<0.05$). No statistically significant difference was found between the C, E, M and ME groups in terms of the cortex and corpus thickness and medullary diameter of their femur and humerus bones ($p>0.05$). It was concluded based on the study results that methenolone enanthate supplement causes early epiphyseal closure in rats' femur and humerus bones and stops the increase in these bones' length. In addition, exercise was found not to reduce this negative effect of methenolone enanthate. Although the prohibited substances classified as anabolics are considered to increase performance by some athletes, these substances are not recommended for use due to their negative effects on athletes' health.

Keywords: anabolic steroids, methenolone enanthate, rats, femur, humerus

INTRODUCTION

Anabolic androgenic steroids (AAS) are synthetic derivatives of testosterone. These substances bind similar to the anabolic and androgenic effects of testosterone produced in the body by binding to the androgen receptor in the cells of the tissues to which it will act (15, 23, 28). AASs are often used to increase muscle strength and size (3, 5, 10, 13, 30). AASs show similar effects to the effects of testosterone or dihydrotestosterone in the body, increasing the protein synthesis in cells and helping the development of tissues (9). Anabolic agents that increase muscle mass and muscle strength lead to an increase in endurance, reduce body fat, it is reported that performs faster recovery time after exercise (11, 14, 16).

These substances; bodybuilders to have less fat mass, weightlifters to lift more weight, Athletics provides the hammer, shot, throw away more appliances such as javelin, swimmers are using in

order to withstand long-term, and competition in the high density. In addition, these substances are commonly used to correct physical appearance among young people and adults (5, 13, 24).

The strength, stamina and speed used by athletes to increase anabolic agents, cardiovascular system cardiomyopathy (4, 5, 22) and sudden heart attack (17), cerebrovascular diseases in the brain and nervous system (1), impaired immune function in the liver, early use of the epiphyses in the bones with the use of young age (17, 21, 33) impaired immune function in the liver, early use of the epiphyses in the bones with the use of young age (2, 8).

The aim of this study is; to examine the effects of exercise supplementation with methenolone enanthate on some bones of rats.

MATERIAL AND METHOD

The study was carried out on 28 rats (Wistar, Male), 28 days old from Selcuk University Experimental Medicine Research and Application Center. Rats were divided into 4 equal groups: Control (C), Exercise (E), Methenolone enanthate (M), Methenolone enanthate + Exercise (ME). The trial period lasted a total of 5 weeks. The availability of rat, care, feeding and experimental practice was held at Selcuk University Experimental Medicine Research and Application Center. The rats in the experimental animal units, plastic rat cages at 23 ± 2 ° C room temperature, $50 \pm 10\%$ relative humidity environment at, 12/12 night / day in photoperiod were housed fed *ad libitum*. The rats were provided with daily fresh water (~ 50 ml / day / rat) that they could drink at any time. The study was approved by the Ethics Committee of the Center for Experimental Medicine in Selcuk University (number of decisions: 2017-9). The rats were grouped as follows.

Group 1, (Control group, n: 6): Standard rat feeding and drinking water *ad libitum* were given during the study period.

Group 2, (Exercise group, n: 7): Standard rat feed and drinking water were given *ad libitum* during the study period. This group of rats during work 5 days a week, was floated 40 min per day.

Group 3, M (Metenolon enantat, n:7): During the study it was given standard rat chow and drinking water as *ad libitum*. Methenolone enanthate (Rimobolan ampoule 100mg / 1ml) was administered at 10 mg / kg / rat dose (20) in 100 mcl

castor oil and was administered intramuscularly for 5 days for 5 weeks.

Group 4, ME (Metenolon Enantat + Exercise group, n:8): During the study, standard rat feed and drinking water were given as *ad libitum*. Metabolic enanthate (Rimobolan ampoule 100mg / 1ml) was administered to this group at a dose of 10 mg / kg daily for 5 days. It was then incorporated into exercise programs.

Exercise Program: The rats in the swimming exercise group were given swimming training in the swimming tank for 5 weeks, 5 days a week for 40 min. The water tank temperature will be filled with 25 °C water for 1 hour and the water hot water temperature will be 22-25 °C. At the beginning of the exercise, the rats were kept free in the water for 15 minutes to adapt to the water and then the swimming exercise program was applied.

Measurements: At the end of the study, the anterior and posterior extremities of the subjects were dissected and dissected and the required length, corpus thickness, cortex-cortical bone thickness and medullary diameter-cavum medullare measurements were performed for each of the revealed humerus and femur bones with a 0-100 mm caliper.

Statistical Analysis: SPSS 18.0 (SPSS 18.0 for Windows / SPSS® Inc, Chicago, USA) package program was used for statistical evaluation of the data. The results were presented as mean \pm SD. ANOVA and Duncan test were used to compare data between groups ($p < 0.05$).

RESULTS

Table 1. Comparison of length and thickness of corpus, cortex and medullar diameters of femur bones. (Mean \pm SD)

Groups	Height	Cortex	Corpus	Medullar
M	31.67 \pm 0.52 ^a	0.51 \pm 0.03 ^a	2.45 \pm 0.12 ^a	1.58 \pm 0.93 ^a
ME	31.37 \pm 0.50 ^a	0.49 \pm 0.02 ^a	2.44 \pm 0.63 ^a	1.56 \pm 0.17 ^a
E	32.60 \pm 0.64 ^b	0.52 \pm 0.07 ^a	2.51 \pm 0.34 ^a	1.67 \pm 0.19 ^a
C	32.46 \pm 0.29 ^b	0.49 \pm 0.02 ^a	2.37 \pm 0.03 ^a	1.51 \pm 0.32 ^a
Test value, p	F=9.701 p=0.000*	F=6.476 p=0.40	F=0.456 p=0.47	F=0.014 p=0.25

Different letters in the same column (a, b) are statistically significant (Duncan test, $p < 0.05$).

In Table 1, the distribution of femoral height, cortex, corpus and medullar diameter mean of M, ME, E and C rats were investigated. When the intergroup femur height were compared, it was 31.67 ± 0.52 for M group, 31.37 ± 0.50 for ME group, 32.60 ± 0.64 for group E, and 32.46 ± 0.29 for group

C. There was a statistically significant difference between the mean of intergroup femur height. To determine which group the difference was caused by the Duncan post hoc test, it was found that the difference was caused by ME and M groups ($F = 9.701$, $p = 0.000$).

The mean femoral bone cortex thickness of the group M rats was 0.51 ± 0.03 , the mean femoral bone cortex thickness of the ME group was 0.49 ± 0.02 , the mean femoral bone cortex thickness of the group E rats was 0.52 ± 0.07 and the mean femoral bone cortex thickness of the C group was 0.49 ± 0.02 . M, ME, E and C groups were not statistically significant difference between femur cortex thickness averages ($p > 0.05$).

Femoral bone corpus thickness of femur bone in group M was 2.45 ± 0.12 , femoral bone corpus thickness mean of ME 2.44 ± 0.63 , femoral bone corpus thickness of E group was 2.51 ± 0.34 and C group femoral bone corpus thickness was calculated

as 2.37 ± 0.03 . The difference between femoral corpus averages of M, ME, E and C groups were not statistically significant ($p > 0.05$).

The mean femoral bone medullar diameter of the rats in group M group was 1.58 ± 0.93 , the medullar diameter of femoral bone was 1.56 ± 0.17 in the ME group, the medullar diameter of femoral bone in group E group was 1.67 ± 0.19 and the C group mean femoral bone medullar diameter of the rats was calculated as 1.51 ± 0.32 . M, ME, E and C groups were not statistically significant difference between the mean femur medullar diameter ($p > 0.05$).

Table 2. Comparison of length and thickness of corpus, cortex and medullar diameters of humerus bones (Mean \pm SD)

Groups	Height	Cortex	Corpus	Medullar
M	25.35 \pm 0.45 ^a	0.42 \pm 0.07 ^a	2.11 \pm 0.75 ^a	1.24 \pm 0.24 ^a
ME	25.31 \pm 0.40 ^a	0.43 \pm 0.06 ^a	2.20 \pm 0.68 ^a	1.25 \pm 0.24 ^a
E	26.23 \pm 0.59 ^b	0.47 \pm 0.04 ^a	2.23 \pm 0.07 ^a	1.27 \pm 0.33 ^a
C	26.42 \pm 0.28 ^b	0.46 \pm 0.01 ^a	2.22 \pm 0.42 ^a	1.30 \pm 0.51 ^a
Test value, p	F=11.398 p=0.000*	F=4.601 p=0.24	F=3.024 p=0.63	F=6.024 p=0.17

Different letters in the same column (a, b) are statistically significant (Duncan test, $p < 0.05$).

In Table 2, distribution of humerus height, cortex, corpus and medullar diameter mean of M, ME, E and C rats were examined. The mean height of the intergroup humerus was 25.35 ± 0.45 for M group, 25.31 ± 0.40 for ME group, 26.23 ± 0.59 for group E, and 26.42 ± 0.28 for group C. There was a statistically significant difference between the mean of intergroup humerus height. It was found that the difference was caused by ME and M groups in the Duncan post hoc test to determine which group the difference was caused. (F=11.398, $p=0.000$).

The mean thickness of the humeral bone cortex of group M rats was 0.42 ± 0.07 , the mean humeral bone cortex thickness of the ME group was 0.43 ± 0.06 , the mean humeral bone cortex thickness of the group E rats was 0.47 ± 0.04 and C group The mean humeral bone cortex thickness of the rats was 0.46 ± 0.01 . M, ME, E and C groups were not statistically significant difference between the mean thickness of humerus cortex. ($p > 0.05$).

The mean thickness of the humeral bone corpus in group M group was 2.11 ± 0.75 , the mean of humeral bone corpus thickness ME group was 2.20 ± 0.68 , the mean humeral bone corpus thickness E group was 2.23 ± 0.07 and the mean humeral bone corpus thickness of the rats was calculated C group was 2.22 ± 0.42 . M, ME, E and C groups were not

statistically significant difference between humerus cortex thickness averages ($p > 0.05$).

The mean thickness of the humeral bone medullar diameter in group M group was 1.24 ± 0.24 , the mean of humeral bone medullar diameter ME group was 1.25 ± 0.24 , the mean humeral bone medullar diameter E group was 1.27 ± 0.33 and the mean humeral bone medullar diameter of the rats was calculated C group was 1.30 ± 0.51 . M, ME, E and C groups were not statistically significant difference between humerus medullar diameter averages ($p > 0.05$).

DISCUSSION

Bonnet et al. (7) beta 2 agonists in the study on the effect of bones of female rats, femoral bone length in females in the group given a shorter length of drug administration.

Xiaodong et al. (32) in rats in the study of the effects of nandrolone on bone mass and metabolism in their study; They reported that the humerus bone of the rats given was shorter than the control group. Prakasam et al. (25) examined the effect of testosterone on the development of cortical bone and bone in rats. They reported that femur length lengths of testosterone treated rats were short.

Kılıcı and Lok (18) swimming exercise of testosterone supplementation applied in a study in

male rats examined effects on bone morphometry; reported that early growth of the femur and humerus bones of male rats resulted in an early closure of their length.

Tasgin et al. (29) in women who regularly swimming testosterone supplementation on the humerus and femoral bone morphometric effects of the study examined the humerus and femur bones of the groups in testosterone supplemented rats in the groups reported that they are shorter than the other groups.

Beck et al. (6) testosterone in their study examined the effect of femoral bone; Testosterone applied to the experimental group of femur bones were shorter than stated.

In addition, it was reported that anabolic androgenic steroid administration did not make a significant difference in the corpus thickness (12), cortex thickness (31) and medullar diameters (19, 26, 27).

CONCLUSIONS

The study revealed that methenone enanthate supplementation could stop the growth of these bones by causing early epiphyseal closure in femur and humerus bones of untreated young rats.

As a result; It is thought that athletes and sedentary individuals using anabolic steroids especially at a young age may cause negative effects on bone development.

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