

Abstract

The aim of the study was to evaluate the structure of bone tissue and body composition using the DXA method (Dual-energy X-ray Absorptiometry) in football players.

The study enrolled 60 football players of the football league first and second division – a group of sportsmen aged 20–30 years (mean age 24.68 years) who practised sport actively for at least 10 years uninterruptedly. The tests were performed in the starting season i.e. from 28/02 to 18/03/2019 – goalkeepers did not participate in them. The control group consisted of 60 healthy men (mean age 24.53 years), who neither in the past nor currently practice any sports discipline. Densitometry tests were performed using a Lunar iDXA densitometer (GE Healthcare) with enCORE software (LU43619PL) using the dual energy X-ray absorptiometry technique with image reconstruction. All measurements were conducted according to standard positioning protocols and scanning.

Three measurements of the whole body, the lumbar spine and the proximal parts of the femur were taken in each subject, and the following values were determined (separately in each group): bone mineral content (BMC) and bone mineral density (BMD), Z-score index, spine trabecular bone score (TBS) were determined in the L1-L4 vertebrae, geometric and strength parameters of the proximal parts of the femur, as well as the total composition and regional body weight: fat mass (FM), lean mass (LM) and percent body fat (% BF). Based on the obtained body composition values, the Relative Skeletal Mass Index (RSMI), appendicular lean soft tissue (ALST) and skeletal muscle mass (SMM) were calculated.

Then, the obtained results were compared between the group of athletes and the control group. Comparisons of the results of bone tissue and body composition in both groups were also made by body side.

On the basis of the analysed results for the entire skeleton and its individual segments, statistically significantly higher values of BMC and BMD in the group of athletes were found. Higher values of TBS for each vertebra from L1 to L4 and the segment L1-L4 of the lumbar spine were recorded in the group of athletes compared to the control group, but statistically significant differences were found only for L3 and L4 vertebrae.

Statistical significance was found for the differences in the Z-score of the whole skeleton and Z-scores of both proximal femoral ends between the athlete group and the control group. Statistical significance was not observed only for the difference in the Z-score of the L1-L4 segment of the lumbar spine.

In the geometry and strength analysis, statistically significant differences between the

groups were noted – higher values were found in the group of athletes. Statistical significance was not found for the difference in width and cortical bone index within the femoral neck (geometric parameters) and the bending factor (BR) (strength parameter) of the proximal ends of the femurs.

Measurements of FM in the whole body and in the assessed areas showed lower values in the group of athletes compared to the control group, but significant statistical differences were noted only for the measurements of the lower limbs and the android area. LM and % BF for the whole body as well as in individual segments showed statistically significantly higher values in the group of athletes.

Statistically significantly higher values of RSMI, ALST and SMM were found in the group of athletes.

In both groups, only one positive, statistically significant correlation was found between BMI and BMC of the whole skeleton. At the same time, no statistical significance was found in the difference in the correlation coefficients between the two groups.

Moreover, in both groups, no statistically significant relationships were found between FM and BMC of the entire skeleton, the L1-L4 segment of the lumbar spine, and both proximal femoral ends.

A statistically significant correlation was found between LM and BMC, L1-L4 and proximal femoral ends in both groups. At the same time, there was no statistically significant difference in the correlation coefficients between the two groups.

Moreover, a positive, significant correlation was found between ALST and BMD of the whole skeleton in both groups. No statistically significant difference was found in the correlation coefficients between the two groups.

A positive, statistically significant correlation was found in both groups between ALST and the strength parameters (CSA and CSMI) of both femoral necks. The test of the difference between the coefficients showed no statistically significant differences between the group of athletes and the control group.

Analysis of the relationship between ALST and the hip axis length (HAL) of the proximal femoral end revealed a positive, statistically significant correlation, but only in the group of athletes.

On the basis of the obtained results, significant statistical differences were found in the quality of bone tissue and body composition between the group of football players and the group of people who did not practice sports; better quantified results were obtained for the group of athletes. The use of the dual-energy X-ray absorptiometry (DXA) method can be useful for

sports physicians and coaches.