

Summary

Introduction

Femoroacetabular impingement is an imbalance of the deep hip joint structures. FAI symptoms appear under increased musculoskeletal loads. A group that is particularly susceptible to increased forces on the hip joint are long-distance runners. Treatment of FAI can be twofold: surgical and conservative treatment. Currently, surgical treatment uses arthroscopy of the hip joint. The effect of conservative treatment in the form of an applied therapeutic plan in the course of FAI on the hypothetical improvement of musculoskeletal biomechanics has not been thoroughly addressed in the literature to date. Properly selected exercises aimed at mobilization and centering of femoral head in the acetabulum provide an opportunity to improve the balance of soft tissue tensions of the hip joint area, thus enabling prevention and restoration of normal mechanics of the entire lower limb. In addition, optimal lower limb kinematics is an important prerequisite for being able to continue running training for many years, which can significantly affect performance and be a factor in reducing the risk of injury.

The aim of presented dissertation was to show the effect of conservative treatment on the musculoskeletal system, carried out according to the protocol of the author's therapeutic exercises, among subjects with a morphological change of the hip joints having femoroacetabular impingement, who recreationally practice long-distance running. The reference for obtained results by runners were analogous results of the control group, which was recruited from recreationally engaged in long-distance running, characterized by the lack of pathological changes in the hip joints. Results obtained in both study groups were compared using selected biomechanical variables.

Material and methods

The study included 44 men aged between 30 and 50 years old who were regular, recreational long-distance runners. Studies were conducted twice. The first measurements were taken before therapeutic intervention, and control measurements were taken after the therapeutic intervention was completed. Intervention lasted 6 months, from February to July 2020. The subjects were qualified for the project using the diagnosis of femoroacetabular impingement. The aim of primary qualification was to create two study groups. The inclusion criterion for the FAI group was an X-ray-determined alpha angle $>55^\circ$ (cam-FAI) and/or beta angle $<30^\circ$ (pincer-FAI) in one or both hip joints. Inclusion criteria for the n-FAI group was alpha angle $<55^\circ$ and/or beta angle $>30^\circ$ and $<70^\circ$ in at

least one hip joint. The subjects underwent a biomechanical and functional evaluation consisting of hip joint range-of-motion measurements, a dynamic balance test, a qualitative assessment test of movement patterns, a measurement of load distribution on the feet, and a measurement of strength capabilities, work and power of the knee extensor and flexor muscles under isokinetic conditions. The author's exercise protocol was developed based on substantive principles, allowing their influence on the hip joint structure. The analysis of results was based on an evaluation of the significance of differences in the studied variables within inter- and intra-group comparisons.

Results

Analysis of the study results indicated a number of discrepancies in musculoskeletal mechanics between the study groups (FAI and n-FAI). After the intervention, hip joint range-of-motion, test scores and lower limb strength capabilities improved. The aforementioned favorable changes were observed in all lower extremities studied, both in the FAI and n-FAI groups. In the current study, a favorable change in the distribution of foot loading was noted in FAI subjects involving compensation of the existing pressure asymmetry and relief of the transverse arch of foot. A significant effect of the applied therapy was the favorable changes in OS interval, alpha and beta angle magnitudes assessed radiologically in the hip joint of affected lower limb. After application of the intervention, the magnitudes of these variables were within normal range or clearly approximated.

Conclusions

In a comparison of runners with FAI and healthy runners, significant differences were found in biomechanical and functional evaluations both before and after application of the therapeutic plans. The values of selected biomechanical variables and functional evaluation indices between the first and control study showed greater differences in the FAI group than in the control group. This indicates a beneficial effect of the performed improvement program among FAI patients. After the therapeutic intervention, the values of analyzed variables were close to those observed in the control group. The observations carried out in the study, documented by the analysis results, allow the practical use of the proposed author's comprehensive 6-month improvement program in the conservative treatment of physically active individuals with FAI.