SUMMARY

Introduction and purpose:

Treatments for symptomatic flexible flat foot (FFF) are still being sought. Summarizing the latest publications, the more and more often described method is the suport and stabilization of the displaced talus in relation to the subtalar complex with the use of an implant inserted into the tarsal sinus (subtalar arthroerisis - STA). The main complication after STA surgery is the migration of the subtalar implant and pain, however, the described clinical studies do not allow to clearly define the causes of this phenomenon. The aim of the study is to create a subtalar implant and STA instrumentation, to carry out biomechanical studies on models of synthetic bone and to evaluate the results of treatment of patients operated with the above-mentioned implant in comparison with a commercially available implant.

Materials and methods:

The foot model is made of synthetic bones and a silicone substitute for soft tissues. Two types of titanium alloy implants of similar sizes were tested - a subtalar implant with a rectangular geometry (created for the purpose of the study) and a model of a subtalar implant with a cylindrical geometry, which represents the type of implant available on the market. The implants were placed in the tarsal sinus on the synthetic model and subjected to cyclic loading (up to 1,000,000 cycles with a frequency of 5 Hz, with a maximum load of 500 N). Comparative research on the pull-out force was performed immediately after implantation and after the dynamic test. Then, the study included a total of 120 patients treated for symptomatic FFF. STA was used in all children. The patients were divided into 2 research groups according to the type of implant used. The patients were clinically examined, medical records and pre- and postoperative radiological images were analyzed. The gait after correction of the defect was subjected to computer analysis by comparing the pressure of individual components of the operated foot.

Results:

Each of the 12 samples after the dynamic test on the synthetic model was qualified for the pull-out force test (the implant did not migrate). Implants with cylindrical geometry showed higher values of the pull-out force in relation to samples tested immediately after implantation and to samples that underwent dynamic testing. The implants with the same geometry showed no statistically significant differences in the results ($P = 0.946$ and $P = 0.856$). In a clinical trial, improvements in the appearance and function of the foot were observed in both groups. On

postoperative radiological images, in about 78% of patients, the measurement of the angles was within the normal range. In both groups, the load and pressure of individual components of the operated feet obtained a significant improvement, no statistically significant differences were found.

Conclusions:

Long-term loading does not significantly affect the migration risk of the compared implants. Correction of the symptomatic FFF in children with the use of the manufactured implant improves the cosmetics and function of the foot to the same extent as with the previously used implants.