

# KNEE BIOMECHANICS IN SOCCER PLAYERS AFTER ACL RECONSTRUCTION: TWO YEARS STUDIE

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## INTRODUCTION

In contact sports, in which the contact between the athletes and the ground prevails (such as soccer, handball, basketball and volleyball), knee injuries are rather frequent. Perhaps most of these injuries pertain to the rupture of anterior cruciate ligament (ACL). Today there exist a large number of studies that describe the various procedures in rehabilitation and many techniques of ACL reconstruction. Probably the most often used techniques are reconstruction with patellar tendon (PAT) and reconstruction with hamstring tendon graft (STG). The objective of our study was to determine the differences in knee biomechanics with respect to the used graft thus allowing more informed choice of reconstruction type.

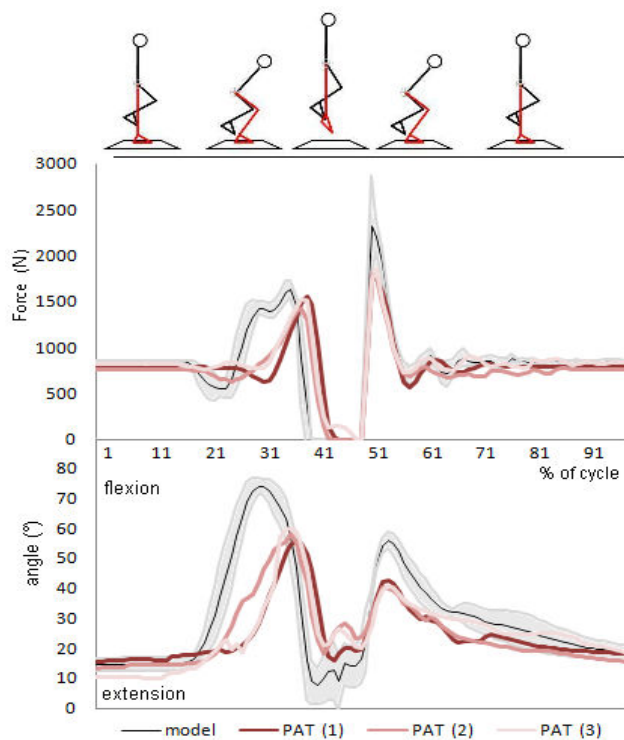
## METHODS

Subjects were divided in three groups: patellar tendon reconstruction patients (PAT), hamstring tendon reconstruction patients (STG) and a group of healthy individuals (Model). All subjects were active soccer players and members of the first and second Croatian national football leagues. Measurement protocol included measurement of kinematic and kinetic data estimated in three time points (7 days before, one year and two years after the reconstruction). Kinematic data of knee joint angulations at valgus and varus, internal and external rotation and flexion and extension, together with the ground reaction forces (GRF) in direction forward-backward, right-left and vertical, were obtained for the duration of 4 seconds. One-legged vertical jump test was chosen to simulate the knee motion in laboratory conditions. Vertical jump test (100% of the cycle) was divided into five phases: stand in place (1-16%), take-off (17-45%), flight (46-51%), landing 1 (52-61%) and landing 2 (62-100%). The Kruskal-Wallis non-parametric test was used in the statistical analysis of minimum and maximum values of each phase.

## RESULTS AND DISCUSSION

The results of the first measurement seven days before reconstruction showed a minimum difference between the groups. This was expected because it was the period before surgery and knee biomechanics was equal in both groups. The greatest differences between groups have been observed one year following the ACL reconstruction in the second measurement in phase landing 1 (52-61% of the cycle). In this phase, smaller knee flexion was observed in STG group (43°). The model has angle flexion of 55°. The same group has statistically significant differences in the knee rotation angle (min -12, max -1°). Movement of the knee is in external rotational and that is completely opposite of Model and PAT groups. Group STG has smaller forward force (149 N) compared to the Model (191 N). Besides this difference it was noticed that there is a greater possibility of hamstring muscles injury during the physical rehabilitation in STG group and that there is an increased possibility of reoccurrence of injury of the reconstructed knee. We have noted the existence of one reoccurring rupture in the same

group. Rehabilitation process was carried out in the standard way in the leading specialized orthopedic hospital. Two years following the reconstruction we did not find statistically significant differences between groups.



**Figure 1.** Signals of group PAT in all measurements and all phases.

## CONCLUSIONS

Although, there generally prevails an opinion that there is no difference between two main reconstructions techniques, in this study we found that some differences do exist. The differences appear in the critical time for athletes. This is the time when they return to competitive stress one year after injury occurred. Research has shown that this time is especially critical for STG group with hamstring tendon graft reconstruction. Such a phenomenon can probably be explained by an overload of hamstring muscles which was caused by insufficient and/or inappropriate rehabilitation for this type of technique.

## ACKNOWLEDGEMENT

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