THE INFLUENCE OF TIBIAL TUNNEL POSITIONING ON PIVOT-SHIFT MAGNITUDE AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Cecilia Signorelli[1,2], Nicola Lopomo[1,3], Tommaso Bonanzinga[1], Federico Raggi[1], Stefano Zaffagnini[1], Maurilio Marcacci[1]

[1] *Istituto Ortopedico Rizzoli, Laboratorio di Biomeccanica e Innovazione Tecnologica, Bologna, Italy;*
[2] *Politecnico di Milano, Dipartimento di Elettronica, Informazione e Bioingegneria;*
[3] *Istituto Ortopedico Rizzoli, Laboratorio di NanoBiotecnologie-NaBi, Bologna, Italy*

Introduction

The Pivot-Shift (PS) test is widely used to assess dynamic knee laxity associated to ACL injury [Markolf, 2010]. In ACL reconstruction the importance of tunnel positioning and orientation is relevant [Siebold, 2008]. The purpose of the study was to correlate PS test post-reconstruction outcome with tibial tunnel intra-articular positioning and orientation, as measured after navigated ACL reconstruction.

Methods

The study retrospectively analyzes the kinematic data during PS test of 57 patients who undergoing ACL reconstruction. For the kinematic analysis a navigation system (Orthokey LLC, USA) was used. As dynamic laxity parameters we considered the maximal anterior displacement of the lateral tibial compartment (Ant_D) and the area included by the translation during PS phenomenon with respect to flexion/extension angle (A) [Lopomo, 2010], and additionally the posterior acceleration reached by the lateral compartment during tibial reduction (Acc_P). To consider the positioning of the tibial tunnel we calculated its *Theta* tilt angle (off the vertical in the sagittal plane) and the percentage of the area of the tunnel included within the native ACL tibial insertion (*A_inc*). After that we calculated the least-squares (LS) estimators of the line slope obtained from a simple linear regression analysis between the tilt angle of the tibial tunnel performed to reconstruct the torn ligament (on the x-axis) and the post-reconstruction dynamic laxity values (on the y-axis). Moreover the line slope has been calculated also considering as independent variable the parameter (A_inc) and the post-reconstruction dynamic laxity values as the independent variable. In order to limit to 1 its maximum value, the line slope was normalized over the maximum value in our data. A slope equivalent to 1 corresponds to the condition of greatest dependence among the considered variables.

Results

Concerning the tibial tunnel positioning we found a low influence on the dynamic laxity parameters *A*, *Acc_P* and Ant_D, as well. Table 1 reports the normalized values of line slope.

	A	Acc_P	Ant_D
Theta	0.114	0.043	0.251
A_inc	0.003	0.110	0.235

Table 1:Normalized Line Slope for all the considered condition..

Figure 1 shows the linear regression obtained considering A_inc as independent variable and the dynamic laxity parameter as dependent variable.

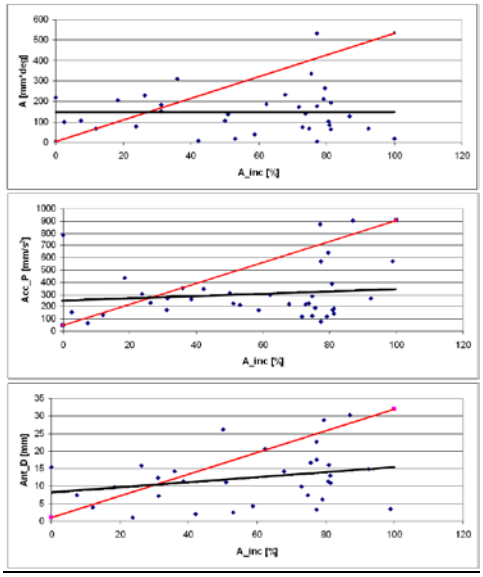

Figure 1. Figure 2. Dynamic Laxity Parameter: A, Acc_P and Ant_D. On the x-axis we report the preoperative laxity value, on the y-axis the postoperative one.

Conclusion

In conclusion we found that both the tibial tunnel intra-articular positioning and orientation in sagittal plane are not correlated to post-operative higher PS outcome.

References

Lopomo *et al*, J Orthop Res, 28(2):164-9, 2010
Markolf *et al*, Am J Sports Med, 38(5):912-7, 2010
Siebold R *et al*, Arthroscopy, 24:154-161, 2008