Knee joint laxity and kinematics after anterior cruciate ligament rupture

Roentgen stereophotogrammetric and clinical evaluation before and after treatment

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Rupture of the anterior cruciate ligament (ACL) increases anterior-posterior (AP) laxity. The treatment aims to reduce or teach the patient to control this instability. Altered kinematics due to absent ligament function may result in knee arthrosis. This study evaluated the clinical and functional results of reconstructive surgery. Roentgen stereophotogrammetry (RSA) was used to analyse the stabilising effect of knee braces, reconstructive surgery and the kinematics of the knee with and without weight-bearing.

The stability of the knees was assessed in 86 patients with ACL injuries before and/or after reconstructive surgery with the RSA technique and with the KT-1000 arthrometer. The KT-1000 (89 N) recorded smaller side to side differences than the RSA set-up without any correlation between the methods. The effect of the 3 differens braces on the AP and rotary laxity was studied on patients with ACL injuries. The ECKO and the modified Lenox Hill reduced the instability with about one third. The SKB had no significant effect. None of the braces decreased the internal rotatory laxity but the Lenox Hill reduced the external rotatory laxity.

32 patients with old ACL tears were treated with surgical reconstruction using the over the top technique (OTT) with or without augmentation. A small reduction in AP laxity was observed at the 6 month follow-up. The AP laxity was almost the same 2 years after as before surgery. No correlation was observed between the stability and knee function.

54 patients with old unilaterial anterior cruciate ligament injuries were randomised either to the over the top (OTT) or the isometric femoral tunnel position (ISO) at (ACL) reconstructive surgery. 7 of 24 (ISO) and 9 of 25 (OTT) had "normal" laxity 2 years after surgery. The patients operated with the ISO technique did not have better subjective knee function, muscle strength, functional performance or knee stability than patients operated with the OTT technique.

The knee kinematics in patients with chronic unilateral ACL ruptures were examined during active extension in the supine position (13 patients) and during extension and weight-bearing (13 patients). The tibia displaced at an average 1.9 mm more anteriorly and 0.8 mm distally in the injured than in the intact knee during active extension. During extension and weight-bearing the tibia was about 2 mm more posteriorly positioned than in the intact knee. The ACL rupture did not affect tibial rotations.

Conclusions: The RSA recorded larger side to side differences in ACL injured and reconstructed patients than the KT-1000 arthrometer. Some knee braces are able to reduce AP laxity in ACL injured knees. No correlation was observed after surgery between knee laxity and functional scoring or tests. ACL reconstructions with isometric graft position on the femoral side did not offer any advantages compared to the over the top placement. Altered knee kinematics in the ACL injured knees were observed during knee extension with and without weight-bearing.