

# History of Knee Lateral Extra-Articular Tenodesis

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## 1. Definition. Rationale

Any lateral extra-articular procedure which will control the anterolateral laxity and participate (at least in its intention) to decrease the pivot shift, after a rupture of the anterior cruciate ligament (ACL) of the knee.

Different techniques and names are currently used: Lateral tenodesis, Lateral extra-articular plasty, Lateral extra-articular tenodesis, Anterolateral Ligament (ALL) reconstruction.

The objective is similar: Controlling the internal rotation and the lateral tibial plateau translation.

## 2. The pioneers. The isolated lateral tenodesis

Marcel Lemaire (1): first one to describe the lateral tenodesis in 1967. Strip of ilio-tibial band remains attached to the Gerdy, passed deep under the fibular collateral ligament (FCL), through a femoral tunnel in the lateral femoral condyle and then back to be fixed on the Gerdy tubercule.

Other techniques with similar concepts were then described:

Losee technique, 1978 (2)

Ellison technique, 1979 (3)

MacIntosh (isolated extra-articular version), 1980 (4)

Andrews technique, 1983 (5)

## 3. Combined intra and extra-articular procedures

Following the development of intra-articular procedures, the extra-articular techniques were either abandoned by some surgeons, or still performed in combination with the intra-articular reconstruction of the ACL by others.

For the lateral tenodesis defenders, the concept of combined techniques is relying on different concepts:

Protection of the ACL graft.

Counterbalance of an imperfect intra-articular ACL reconstruction.

Treatment of anterolateral structures concomitant injuries.

MacIntosh technique using the ilio-tibial band, 1977 (6)

Marshall-MacIntosh using a quadriceps-patellar tendon graft.

KJt technique (Neyret) technique using Bone-Patellar-tendon-Bone and Gracilis, 1996 (7)

Marcacci technique using gracilis and semi-tendinous tendons (8)

Multiple techniques using combined intra-articular graft and modified Lemaire technique.

The usual indications are:

Important rotation laxity, pivot shift grade 3.

High demanding and contact athletes.

Generalized ligamentous laxity.

Some ACL revision.

#### **4. The Anterolateral ligament “years”**

Referring to the description of Segond fracture (1879), the concept of Anterolateral ligament (ALL) was recently developed (9, 10) and some surgeons have developed surgical procedures designed to reconstruct the ALL (11).

#### **5. Discussion**

There is still no consensus about the real role of the anterolateral structures in the control of tibial rotation and translation after ACL rupture. Currently, the attention seems focused on the ALL. The other anatomical structures, including the ilio-tibial band and its deep layers, seems to have a similar biomechanics role and should be explored beside the ALL (12). Further anatomical and biomechanical studies along with outcomes measurements of lateral tenodesis should give more information about the exact role and place of these surgical techniques (13).

#### **6. References**

1. Lemaire M: Ruptures anciennes du ligament croise anterieur du genou. J Chir (Paris) 93: 311-20, 1967.
2. Losee RE, Johnson TR, Southwick WO: Anterior subluxation of the lateral tibial plateau. A diagnostic test and operative repair. J Bone Joint Surg Am 60: 1015-30, 1978
3. Ellison AE: Distal iliotibial-band transfer for anterolateral rotatory instability of the knee. J Bone Joint Surg Am 61: 330-7, 1979
4. Ireland J, Trickey EL: Macintosh tenodesis for anterolateral instability of the knee. J Bone Joint Surg Br 62: 340-5, 1980.
5. Andrews JR, Sanders R: A "mini-reconstruction" technique in treating anterolateral rotatory instability (ALRI). Clin Orthop Relat Res: 93-6, 1983
6. MacIntosh DL, Tregonning RJ: A follow-up study and evaluation of "over the top" repair of acute tears of the anterior cruciate ligaments. J Bone Joint Surg Br 59: 505, 1977
7. Magnussen RA, Jacobi M, Demey G et al.: Lateral Extra-articular Augmentation of ACL Reconstruction. Techniques in Knee Surgery: 1-7, 2011
8. Marcacci M, Zaffagnini S, Giordano G et al.: Anterior cruciate ligament reconstruction associated with extra-articular tenodesis: A prospective clinical and radiographic evaluation with 10- to 13-year follow-up. Am J Sports Med 37: 707-14, 2009
9. Vincent JP, Magnussen RA, Gezmez F, Uguen A, Jacobi M, Weppe F, Al-Saati MF, Lustig S, Demey G, Servien E, Neyret P. The anterolateral ligament of the human knee: an anatomic and histologic study. Knee Surg Sports Traumatol Arthrosc. 2012 Jan;20(1): 147-52

10. Claes S, Vereecke E, Maes M et al.: Anatomy of the anterolateral ligament of the knee. *J Anat* 223: 321-8, 2013
11. Sonnery-Cottet B, Thaunat M, Freychet B et al.: Outcome of a Combined Anterior Cruciate Ligament and Anterolateral Ligament Reconstruction Technique With a Minimum 2-Year Followup. *Am J Sports Med* 43: 1598-605, 2015
12. Kittl C, El-Daou H, Athwal KK, Gupte CM, Weiler A, Williams A, Amis AA. The Role of the Anterolateral Structures and the ACL in Controlling Laxity of the Intact and ACL-Deficient Knee. *Am J Sports Med*. 2016 Feb;44(2):345-54
13. Batailler C, Wascher D, Landreau P, Neyret P. Historical Overview of Lateral Tenodeses Procedures and State of the Art in 2016. *Operative Techniques in Orthopaedics*. 2017