

## SCIENTIFIC BASES IN ACCELERATED PHYSIOTHERAPY IN THE RECONSTRUCTION OF LCA WITH PLASTIA H-T-H. SECTION IV

**AUTHOR: José Manuel Sánchez PhDs**

FC Barcelona High Performance Senior Teacher

Phone: 656935516

e-mail : [chema632@hotmail.com](mailto:chema632@hotmail.com)

### • TENSION FORCES IN BIPEDESTATION POSITION

-**Noyes** : places tensions of LCA of 445 N for ordinary activities of every day life. Fig.3

-**Lomi**,1987 :demonstrates that rotating laxity reduces in a high percentage when muscles are contracted during walk, which is at 90° of flexion. He also demonstrates that the ischio contraction produces a strong reduction of laxity in a 76%. The contraction of quadriceps reduces laxity up to a 23%.

-A 10° of flexion the Ho-contraction of quadriceps /Ischios reduces laxity up to a 30%.

-**Olney**,1985 : departing from these EMG data and from mathematical modelos, calculates the moment of force at the knee level. It is the moment of forces (M) what it is important to know, and not the muscle force applied, baring in mind the existing contractions, of the non-lineality of the relationship between Force/muscle longitude, of the variation of lineal force moments according to the angle in flexion. He demonstrates that during walk, by the time the leg which has undergone surgery touches the ground, the force moment of the extensors (quadriceps) is less than the force moment of the flexors (ischios). This difference cancels itself in the middle of the phase of support to become negative at the time the support step ends.

This fact explains that it is during the first stage of walk where the LCA is more demanded and that in the final stage the LCP failure presents.

-**Paulos**,1981 : calculates the muscle force which is needed to walk and it is equivalent to the 15% of body weight for quadriceps and of 10% of body weight for ischios (9Kg).

-**Moyen**,1996 : studies the cynematic during walk (in relationship to a fixed referral) of reference points placed on the knee with a camara system connected to a computer.

They demonstrate that slow walk in slight flexion doesn't produce any front tibial subluxation.

-**Hennings**,1985 : develops an in vivo study with 10 subjects in order to experience the deformation over LCA. He verifies that the Lachmann test produces more elongation over LCA than the front drawer or the pivot shift test.

-The ischio contraction doesn't produce any LCA elongation.

-The less harmful for LCA in increasing order and relationship percentage are:

- 1) **Lachman** test (40 Kg of force represent 100% of elongation)
- 2) Bicycle 7% elongation
- 3) Walk using sticks 14%
- 4) CCC over one leg 21%
- 5) Walk 36%
- 6) Slow jogging 61%

-On the other hand, the more harmful ones for LCA are :

- 1) Fast running 89%
- 2) Running downhill 125%
- 3) Isometric contraction of 0-20° of flexion against resistance (9Kg) of 87 to 121%.

### • CONCLUSION

-Many studies have compared the muscle work in CCA (Isocynetic,TSI,etc.) and the work in CCC (pressa,step,squat.)

-Muscle work in CCC and elevation of the leg in prone position have advantages, if they are well controlled.

-Ischios must be worked in CCA. The work of CCA is analytic. Quadriceps is the the muscle responsible for the extension of the knee and the flexion of ischios. It is the foot the one which moves in relationship to the proximal segment of the lower limb.

-In CCC the muscle work of the lower limb is global. It is an effort of oposition of the lower limb over a fixed point (press, rowing). This work is associated to the extension of the knee, extension of hips and plantar flexion of the ankle. At knee level, there is a work of Ho-contraction of quadriceps, ischios and calfs.

## • HOW CAN WE PROTECT THE FEMORO-PATELAR JOINT?

-**Steinkamp** : demonstrates that they exist important compression femoro-patellar forces in extension for the work in CCA of quadriceps (up to 3500N ), being unexistent in CCC.

-In flexion, compression forces reduce for a CCA quadriceps work. But it increases for a CCC work around 900N in 90° flexion.

-The study of **Bynun**,1995 : confirms these experimental data. He finds much less femor-patellar pain in the re-education in CCC. Likewise, he demonstrated more femor-patellar pain, in those less accelerated re-education protocols :

1) **O'brien** : 1/3 approximately of knee tendon 6 weeks of plaster = 37%

2) **Noyes** : Autolog. He allowed the complete support already at the 8th week = 19%

- Re-education in the degenerative knee medical profile must be bared in mind for muscle potentiation.

-The existence of a femor-patellar condropathy contraindicates the workout in CCA of quadriceps in extension and the workout in CCC in 90° flexion.

-You must highlight the workout in CCC in the nearby range to extension and the workout in CCA of quadriceps and ischios in flexion (in the LCA protection sector).

## • HOW TO PROTECT THE FEMOR-TIBIAL?

-The workout in CCC consists on the effort of the lower limb oposition. Therefore, it is logical to find important compression forces at the femor-tibial level by the time the extension approaches.

-Lutz : demonstrates that the workout in CCC produces more overload in the femor-tibial in a range of 0-30° flexion. In CCA, the quadriceps contraction produces greater femor-tibial overload of 90 to 60°.

-The CCC workout between 0-60° flexion regarding LCA and the extensor system. Its use will be controversial in case there is a degenerative process in the femor-tibial joint.

-The compression forces are equally reduced with the application of low resistances, but also increasing the angular speed of movement. The Bernoulli Law says that the existing compression forces between two solids in contact decrease with the speed displacement. Therefore, it is advised dynamic workou with quick speed and low resistance in cases of degenerative pathology.

## • CLINIC DATA AND CONCLUSIONS

-A good knowledge of the forces which act on the knee joint allows us to choose the correct physiotherapy protocol.

-There are meaningful differences about the clinical results between the work in CCC and in CCA. -

Bynun,1995 : in a physiotherapy prospective study after a 1/3 medium knee joint LCA reconstruction, where there was a meaningful difference on the front laxity (1 mm difference in the arthrometer KT-1000 for a re-education in CCC, against 2,2 mm for re-education in CCA).

-The subjective patient satisfaction is more important in the CCC group.

-The work of quadriceps in CCA in extension like the TSI has little interest in the knee re-education.

-The muscle work in CCC between 0-60°, is the one suggested for the LCA injury and in the medical profile of affectation of the extensor system.

-Therefore, most of the devices, according to Shelbourne, the suggested accelerated protocols with strict medical control are established.

-The clinical series which are published in these protocols do not show neither any additional strain nor meaningful increase of number of complications.

-Shelbourne : he did a prospective study, with a gathering of data bigger than 2 years over 138 patients who had done a careful re-education protocol (blocking at 10° of flexion and unload during 6 weeks, race at 7-8 months and start of sports practice with pivot and contact at 9-12 months) , and 247 patients with an accelerated protocol (no blocking, immediate support, exercises in CCC, footing at 6 weeks, but with clinical surveillance, arthometer and Cybex evaluation). He doesn't find any meaningful differences regarding laxity.

-Howell: in a 2 year tracking of a series of 41 patients who have undergone a ligament surgery of LCA through arthroscopy of 4 sections RI/ST, with an accelerated physiotherapy program (no blocking, partial discharge during 3 weeks, race after 8 weeks, high-risk sports after the 4th month). He doesn't find meaningful differences in 4 months and in 2 years in the 90% of these patients,< 3mm at 89N.

\* The primary idea is that the transplant is more solid after surgery because the vascularisation cycle has already started. To request the knee under these conditions, if the neuromuscular response is correct, is possible. This is due to the fact that every day there are more cases done through arthroscopy and, therefore, there is a minimal surgery invasion.

©www.ePhysiotherapy.net