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Posterior cruciate ligament reconstruction: the role of synthetic ligaments

J. G. TEULE

Lesions of the PCL occur certainly most often than said. James ARNOLD said that they represent almost 20% of all the traumatic lesions of the knee. It's a possibility.

However we see that kind of lesion very uncommonly in our practice. Why?

I see 3 factors:

- the difficulty of the clinical diagnosis of a PCL lesion;
- in emergency, the high frequency of associated lesions due to the violence of the traumatism (road accidents);
- in chronic cases, lesion of the PCL is asymptomatic. If not, that is on two ways:
 - instability: in that cases the PCL lesion is in association with a poster-lateral or anterior cruciate lesion;
 - pain or swelling: in that cases it's the beginning of arthritis.

However we treated 28 PCL lesions between 1993 and 1999. We will expose our technic and the results of this cases. We will close that communication with the reflection that implicates this very short series and our philosophical meaning for the future.

I) The PCL is the only structure that controls the posterior drawer of the tibia.

PCL is composed of two bundles: the most voluminous is the antero-lateral bundle that plugs anteriorly on the femur, laterally on the retro-spinal zone of the tibia, the other is posterior on the femur and medial on the tibia.

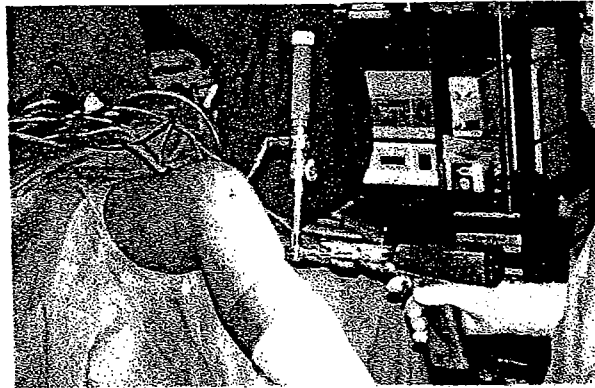
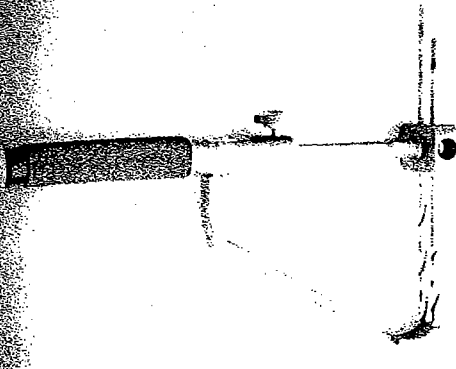
The posterior drawer is under control of the anterior bundle when the knee is in flexion, of the posterior in extension.

The other main characteristic of the PCL is its vascu-

larization that is rich and permits a good cicatrization. But the problem is in the length of the ligament after its rupture ; as we saw PCL is the only structure that controls the posterior drawer. When the PCL is broken immediately the tibia is displaced in posterior position and the healing of the tissues occurs in that wrong position, it demonstrates the necessity of using artificial tissues that permit to correct and maintain the posterior drawer during the time of healing of the natural ligament.

Today, the most of the authors say that only artificial structure is able to ensure that correction, and the techniques using natural tissues give bad results because of the recurrence of the posterior drawer. In fact, even the result of the operation using a natural transplant is fair immediately after the operation, as soon as the patient wakes up, the return to the normal contraction of the hamstrings induces the posterior positioning of the tibia under the femur that is allowed by the weakness of the transplant. Only a structure that is immediately strong and during few months, indispensable for healing of the natural tissues, can avoid that wrong position. The future of the artificial ligament in that good conditions doesn't matter, seeing that they are very well tolerated by the body. Most, in case of multiple ligamentous lesions, only using artificial ligaments permit to correct all the lesions and secure the plasties each other.

The problem is to take in place well and easy the artificial ligament. The LARS society develops an ancillary device that permits to practice securely, and through an anterior approach, the drilling of the tibial tunnels. Both techniques are possible either arthrotomy or arthroscopy. Using of the fluoroscopy facilitates and secures the operation. The tibial guide is introduced in the knee through an anterior approach, between the medial femoral condyle and the anterior



cruciate with the knee in flexion. The distal part of the guide is placed flush to the retrotibial zone, and the drilling of the tunnel is done with a 6 mm drill from front to back. The device is, in fact, a drilling guide that leads the drill in contact with its retrotibial part. In that condition the outgoing of the drill at the posterior part of the tibia is secure because the neuro-vascular popliteal axis is protected by the guide.

The drilling of the femoral tunnel is made first from in to out under control of fluoroscopy to take in place one guide pin, after from out to in with a cannulated drill. The pointing of the guide pin on the medial condyle is fixed on the OGATA's point if the choice is to repair only one bundle, each millimetres forwards of that point for the anterior bundle; 10 to 12 mm in behind for the posterior if we repair two bundles.

As soon as the tunnels are drilled, wires are introduced in the tunnels and permit to pull the artificial ligament which is fixed in the tunnels by interference screws. The reduction of the posterior drawer is made by traction on the tibial part of the artificial ligament after fixation of its femoral end when one bundle is repaired, the same if two but with the knee in flexion for the antero-lateral bundle, in extension for the postero-medial.

Neither immobilisation nor splint are necessary. Immediate weight bearing is permitted as soon as the pain allows, physiotherapy starts the day after the operation.

II) The LARS ligament is in polyethylene that is very well tolerated by the body. We have used that ligament for more than 12 years without any problems of chronic synovitis. The main characteristic of that ligament is its structure made from longitudinal fibers without crossing each other. The intra osseous part is composed of a pseudo-knitted zone who insure a good filling of the osseous tunnels. The intra articular part is composed only of free axial fibers that permit to have the best resistance in the most little volume. The absence of transversal fibers avoids the

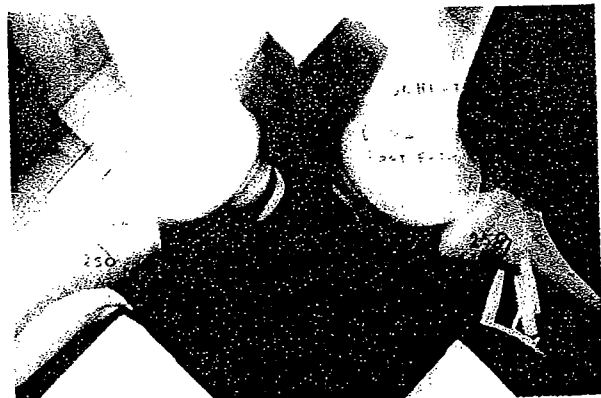
wear of the fibers and the releasing of micro particles in the joint that, through the macrophagic reaction, forbids the fibroblastic reaction and its good organization. Many microscopic studies we made, show the reality of the fibroblastic invasion in the free fibers zone.

III) We treated 28 cases of PCL ruptures between 93 and 99. All patients were operated using an artificial LARS ligament. Two bundles plasty were performed 20 times, one bundle plasty in 8 only in acute cases. Global results: Follow-up 24,8 months (3/72) That slide shows you the characteristics of our cases. Globally in the 28 cases we noted 11 failures (39%). Our criteria of failure are:

relapse of the posterior drawer more than 5 mm tested with a Telos device at 20 daN, or instability, or pain, or swelling, or non traumatic meniscal lesion.

Considering the importance of the failed cases we tried to know why. In fact we reviewed the operated cases in function of the age of the lesion considering separately acute and chronic lesions, namely patients operated in the two first months after the accident and the others.

So we acknowledge: 15 chronic cases
13 acute cases





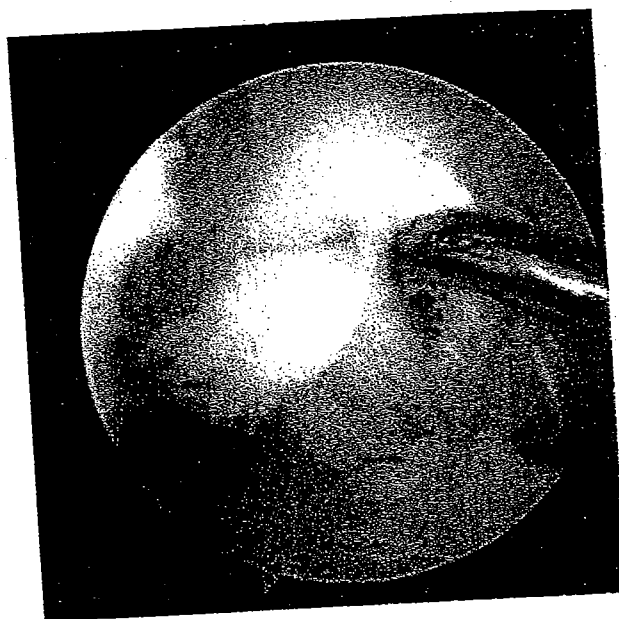
Then the results of surgery are now:
in 15 chronic 10 failures
in 13 acute 1 failure

In the 10 cases of failure in chronic patients 6 were operated again. In that cases we always found the same lesion namely rupture of the anterior bundle of the artificial ligament flush to the inlet of the femoral tunnel. I call that zone «the turning of the death». In fact, the artificial ligament can't support a long time a curve of 120°. I mean that he breaks in the 2 to 4 months after its implantation.

Considering the case of failure in the acute series exposed on that slide. Probably the cause of the failure is in the complexity of the lesions in which the differential tension of the artificial ligaments is next to impossible to adjust.

IV) It is natural to treat a sprain when we diagnose it. Especially when we all know the bad natural history of chronic ruptures of the PCL. However the treatment cannot be worse than the lesion.

The reflections we have to do are on two ways. Artificial ligament is necessary but not sufficient to treat PCL ruptures. Only synthetic ligament can cure and above all fix durably the posterior drawer. As we see, I mean that the synthetic ligament breaks in the 2 or 4 first months after implantation, that time is sufficient to obtain a cicatrization of the natural tissues



around and in the free fibers, but only if the lesion is recent. After healing of the original tissue the future of the artificial fibre doesn't matter seeing the absence of pathologic synovial reactions with that type of artificial tissue.

On the other hand, we also see the bad results of repair of the chronic lesions. In that cases the relief of natural ligament is quite not sufficient to obtain a good cicatrization. In that cases it appears that only a composite transplant have to be used. But the problem is in the volume of that type of transplant, and the harvest of tendons risks to weak the entire joint. I mean that in that cases the operation is worse than the pathology. More, in chronic cases, degenerative lesions are already present and its a little bit too late to prevent.

As a conclusion, I want to tell you that the treatment of recent lesions of PCL are possible, logic and quite hoped.

Treatment of chronic lesions not. But in PCL cases, as such in the other, using a synthetic ligament have to be considered as a ligamentosynthesis and not as a prosthetic operation.