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Arthroscopic technique of free patella tendon graft in ACL instability

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Ön çapraz bağ instabilitelerinde artroskopik teknikle serbest patellar tendon grefti

Ön çapraz bağdan yoksun dizlerde, patellar tendonun 1/3 ortasıyla kemik- tendon- kemik yapısı sağlanarak replasman diz instabilitesini yeniden kazanmanın popüler cerrahi girişimlerden biridir. Postoperatif ağrı, kas kitlesinde kayıp, proprioseptörlerde bozulma gibi problemleri en aza indirgemek için Rosenberg tarafından propülarize edilmiş endoskopik ön çapraz bağ rekonstrüksiyonunu kullanmaktayız. Burada artroskopik cerrahi girişimi anlatılacaktır.

Anahtar kelimeler: *Ön çapraz bağ yırtığı, artroskopi, patellar tendon transplant*

The replacement of the anterior cruciate ligament (ACL) deficient knee with the central third of the patellar tendon using bone- tendon- bone construct is a popular surgical procedure to regain knee stability. To minimize problems in rehabilitation like postoperative pain, muscle wasting and disturbance of the proprioreceptors we use a surgical technique for endoscopic ACL-reconstruction popularized by Rosenberg. This arthroscopic procedure will be described.

Key words: *ACL- deficient knee- arthroscopic procedure- patellar tendon transplant*

In order to normalize the stability of the knee joint on a sagittal level, the replacement of the anterior cruciate ligament with the central third of the patellar tendon by means of a bone-tendon-bone construction is a widely recognised and commonly used method (1, 2, 3, 5). At the Department of Trauma Surgery of the University Surgery Clinic in Graz, we have been applying this technique since 1980. This surgical method has been improved over the years. Recently we have further developed the endoscopic method first applied by Rosenberg (6). The advantage of an endoscopically performed cruciate ligament graft lies in minimising the incision needed for surgical intervention, and thus simultaneously reducing the possibilities for disturbances to occur during the rehabilitation period, such as post-operative pain, muscular atrophy, or long recuperation time.

Material and method

At the Depaartment of Trauma Surgery at the University Clinic for Surgery of Graz we have performed this arthroscopic procedure for the ACL-replacement in 125 cases since September 1989. The patient lies on his back, with the knee joint freely movable, and flexed to 90 degrees. The transplant is harvested in the standard way, i. e. through a skin incision of apporoximately 4 cm long on the medial side of the patellar tendon. After the transplant has been taken out only the peritendineum will be sutured to prevent shortening of the remaining patellar tendon.Subsequently, the transplant is prepared in such a way that the ligamentum is sewn into a cylindrical form by several vicryl sutures. The bone blocs are prepared in such a way that they can be easily fed through the measuring cover. One bone bloc is reinforced with a wire suture, while a K-wire is fed into the other. This is done in order to facilitate the later intra-articular implantation of the transplant.

We then start on the arthroscopic part itself, using the standard portals. After clarifying and if necessary repairing concomitant meniscus and cartilage lesions, an exact soft tissue debridement of the anterior section of the joint is carried out which will allow for sufficient visibility of the intercondylar area.

The second step is then to effect a notch plasty (4) by means of a chisel and power-burr. At this point, a very pecise view of the so called "over the top" area is absolutely crucial.

The next step is then to identify the tibial attachement of the cruciate ligament, into which the target device is inserted for the introduction of the K-wire. By means of a cannulated drill, the drilling is carried out above the wire and to the desired diameter- usually 9 mm.

The surgical steps to follow are then carried out by using this tibial canal. Now, the isometric point which would be better called the isomechanical point, has to be located and used as the femoral drilling ca-

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nal. It is here that the Isotec tension measuring device is inserted, and the tensional change on the tensiometer is checked while passive motion of the knee joint between 0 and 100 degrees. Preferably, there should only be a change in tension in the maximum range of 2-3 mm. Using the tension curve, corrections of the femoral exit point can be made, in order to optimally adjust the position of the future drilling canal (Figure I).

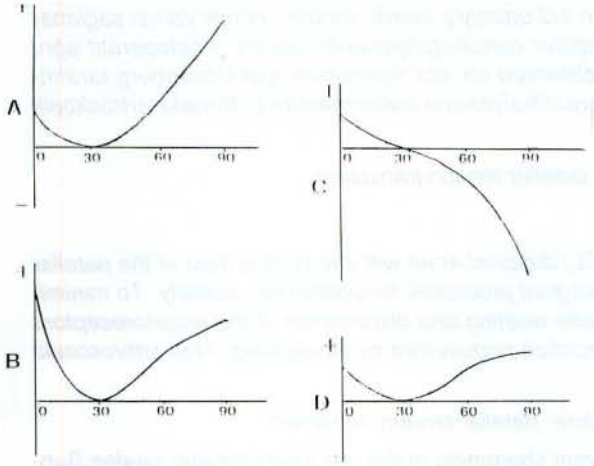

Figure I: Tension curves measured with Isotec^{R} device
A: Proximal insertion point too far anterior
B: Too low
C: Too far posterior
D: Isomechanical point

Once the isomechanical point has been identified a guide wire is inserted in this point and overdrilled. The lateral femoral cortex is not perforated. Having completed this procedure, the ends of the drilling canals are rounded off with a file accordingly.

Subsequently, a flexible K-wire is fed into the femoral drilling canal via the medial arthroscopy working channel, so the positioning of the proximal interferential screw is secured.

The next step is to feed the transplant through the tibial drilling canal into the joint and femoral canal. Here, the K-wire that was introduced into the bone bloc at an earlier stage, clearly facilitates the insertion of the transplant into the femoral canal. The bone bloc is pushed proximally so deeply into the canal that it is flush with the end of the canal.

By means of placing the bone bloc accordingly in the canal, a final positioning correction can be effected. Via the flexible K-wire, a cannulated interferential screw is inserted over the medial working channel. For this procedure, a flexible screw driver especially developed by our clinic is used. It allows for an optimised proximal fixation of the transplant, and guarantees the best possible positioning of the interferential screw in the canal (Figure II).

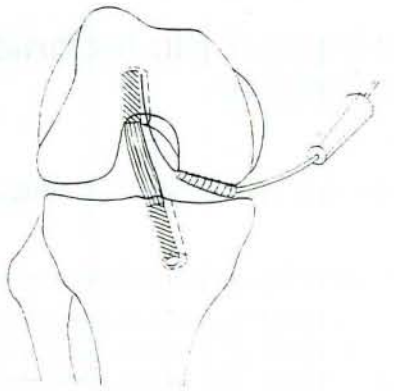

Figure II: Fixation of the proximal bone bloc using the flexible screw driver and the cannulated interference screw guided by a K-wire

The K-wires having been removed, the joint can now be moved freely while being observed arthroscopically. The main focus here is to check the extension of the joint, and to see if there is no impingement of the ligament into the roof of the intercondylar notch. If so, the notch plasty has to be extended.

The transplant is now tightened distally by means of the steel wire in extension position of about 10 degrees. It is either fixed with another interferential screw or, if the bone bloc protrudes out of the tibial drilling canal, fixed with staples on the anterior-medial tibia area after chiselling a small bony groove. An intra-articular suction-drain and skin suture complete the surgical intervention.

Results

In our series of 125 patients we had no complications due to the arthroscopic procedure. In comparison with a group of patients which underwent an ACL-replacement by an open procedure, we found that the arthroscopic group needed only half of analgetic drugs and regained the joint movement much earlier. I. e. that the arthroscopic group showed a range of motion of 0 / 4 / 120° in the 10th postoperative week, the open treated group reached this ROM in the 16th week. Therefore we could minimize the rehabilitation time and the patients were able to go back to the work earlier.

Discussion and Conclusion

The replacement of the ACL by a free patellar tendon graft is a well known procedure. To this advantage of the open procedure is, that the arthrotomy distroys the nerval supply of the joint capsule and that the side to the proximal insertion point of the ligament is not so good. The arthroscopic procedure, first described by Rosenberg (6) has given us some problems concerning the proximal transplant inserti-

Figure III: Malposition of the interference screw perforating out of the proximal canal. Arrows are marking the bony canal and the bone bloc.

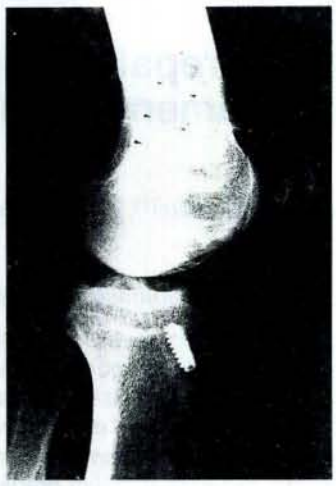

Figure IV: Correct position of the interference screw.

on and the graft fixation. So we developed a flexible and cannulated screw driver which allows the exact and secure fixation of the proximal bone block by an interferential screw. Using the cannulated screw which is guided by K-wire lying beside the bone bloc in the proximal tunnel, the surgeon can be sure that the interferential screw does not penetrate out of the canal (Figure III, IV).

The advantage of the arthroscopic cruciate ligament replacement operation is twofold: first, extensive arthrotomy can be avoided, and secondly and especially when applying the notch plasty and determining the isomechanical point, the view gained through arthroscopy is far better than by arthrotomy.

As is the case with all surgical interventions, there are, of course, certain disadvantages with the arthroscopic operation technique, too. Mainly they can be reduced to the fact that a series of special surgical instruments is needed in order to provide a sufficient knee joint surgery through the arthroscope. Furthermore arthroscopic knee joint surgery requires an experienced surgeon who would nevertheless be confronted with technical problems. Another aspect worth considering is the relatively long training required.

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