



Reconstruction of the ACL and high tibial osteotomy as a combined procedure in anterior instability and medial compartment osteoarthritis.

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Introduction:

Besides patients having an acute rupture of the ACL with a clear therapeutical strategy there are increasingly young patients with chronical anterior instability and degenerative arthritis of the medial compartment and varus malalignment. This constellation is taxing severely the operative procedure considering that there is not only the instability which has to be treated but that also an improvement of the arthritis symptomatology has to be achieved. In this paper we present a therapeutical concept of high tibial osteotomy combined with an arthroscopic assisted reconstruction of the ACL which is performed as a single procedure since the early 80-ies. The goal is to remove two severe arthrogenic factors correcting the instability and the pathological anatomical axis, to reduce the medial knee pain and to improve the use of the knee in life activities. Appropriate management is based on early diagnosis, indication and a good surgical technique. Chronic rupture of the anterior cruciate ligament in patients who persist in playing Sports puts high demands on the affected knee. The long-term result is to develop osteoarthritis.[1-9,12,13,14] Some of these patients also can develop varus malalignment, which is due either to narrowing of the medial tibiofemoral compartment or widening of the lateral compartment, or a combination of both. This Situation tends to occur in patients who have undergone a previous medial meniscectomy, or are developing medial compartment osteoarthritis.



The addition of a ruptured ACL on top of a medial meniscectomy further increases the risk of osteoarthritis when compared with ACL rupture alone [15,16].

In the majority of patients we are dealing with a “knee abuser” in which the natural history has been often the same: acute anterior cruciate ligament rupture, rehabilitation, an almost full functional recovery and an early return to sports activity. Then with time the knee abuser usually has multiple episodes of giving way, an initial arthritis and often comes to the surgeon with a locked knee due to a medial meniscus bucket handle or for a symptomatology of medial joint line pain.

Materials and methods:

To be included in this study, patients had to have varus malalignment treated by open wedge high tibial osteotomy and ACL deficiency treated by bone-patellar tendon-bone graft or hamstring tendons reconstruction. From January 1999 to September 2001, 25 active patients (age 26-56, middle 35) with an ACL deficient knee, undergoing a valgus HTO were included in this study. There were 11 females and 14 males. 15 patients had advanced medial femorotibial arthritis. The minimal Follow-up was one year.

Many authors have reported that HTO provides beneficial results when it is performed early in the course of degenerative cartilage process in young or middle age patients, especially if they have an ACL deficient knee.

Preoperative planning:

Most of the authors take as reference the femoro-tibial axis and define an angular correction [6,7,8]. based on the hip to ankle x-rays with bi or monopodal weight bearing taking in account the length of the segments, medial abrasion excluding the lateral laxity which increases the varus. The goal of this angular correction is to move the mechanical axis to the level of



the lateral tibial plateau in an area situated between 62% and 66% of the width of the knee which corresponds to a 3° to 6° valgus [7]. It is always very important to make a good quality lateral radiography to measure and to control the posterior tibial slope, in order to correct it during the HTO if necessary.

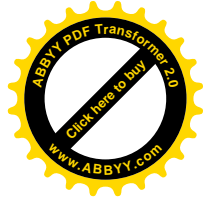
Surgical technique:

We perform in an open wedge HTO using a special plate with a spacer-tooth (ARTHREX) that corrects the alignment preventing a bone collapse when sliding into the osteotomy cut. The plate is fixed to the bone with four screws, two proximal and two distal to the osteotomy. This osteotomy if compared to the closing wedge technique is easier, more precise, does not need a fibula osteotomy and preserves the bone stock for an eventual TKR. This type of osteotomy can be easily used in association with an ACL reconstruction.

18 ACL were reconstructed with a bone-patellar tendon-bone autograft and another 7 with the hamstrings tendons.

By the ACL reconstruction with a bone-patellar tendon-bone autograft we used a modification of the Jones Operation [7]. A free graft of the middle third of the patellar ligament was taken and the bone ends anchored through a pit in the femur and a tunnel in the tibia. That graft ends were fixed to the bone by tension wire loops and screws, after performing the tibial osleolomy.

By the last 7 Patients ACL were reconstructed with a hamstrings tendons. A longitudinal incision is made on the anteromedial aspect of the proximal tibia. Then the hamstrings tendons are dissected and the superficial layer of the medial collateral ligament is divided proximal to its tibial insertion.



A Homan retractor is placed posteriorly and under fluoroscopy a guide pin is inserted obliquely from medial to lateral. The HTO is made distally to the pin preserving a hinge of intact cortical bone on the lateral side.

Then the osteotomy is open forcing the knee in abduction and a special tool (wedge opener) is advanced into the osteotomy until the desired opening angle is obtained. After a fluoroscopic control the plate is positioned and fixed with four AO screws. The osteotomy gap can be filled with autologous iliac crest graft, with allograft or with bone substitute.

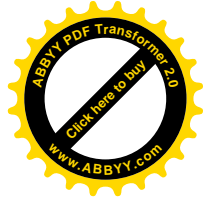
Increasing posterior tibial slope increases the tendency for anterior tibial translation. Increasing the tibial slope worsen ACL deficit but helps posterior cruciate ligament deficit.

When dealing with an HTO and an ACL deficient knee, we should open the osteotomy line more posteriorly than anteriorly to reduce the tendency of an anterior tibial translation.

Actually we prefer to use as a graft the doubled hamstrings tendons. After we have dissected and prepared the tendon graft, we perform the arthroscopic examination and we treat the intrarticular pathology (meniscal tears and /or cartilage degeneration). Then we make the femoral and tibial tunnels in the usual way. Only at this point the osteotomy cut is made, the tibial plate is introduced and fixed to the tibia. When the HTO is stabilized, the tendon graft is passed and fixed in the femoral and in the tibial tunnel with two reasorbable screws and the sutures of the doubled hamstring are fixed over one screw of the plate.

In special cases in which the arthrosis is more advanced and the notch is almost closed, we associate to the HTO a lateraplasty as proposed by Coker and Arnold.

Post-operative care:



The knee is immobilized with a ROM brace in full extension. The brace allows full range of motion when unlocked. Passive flexion-extension in a CPM machine, quadriceps setting and straight leg raising exercises are begun the day after surgery. After the isolated HTO and also if the HTO is associated to the ACL reconstruction, partial weight bearing is allowed after 30-45 days and full weight bearing after 45-60 days from surgery.

Results and discussion.

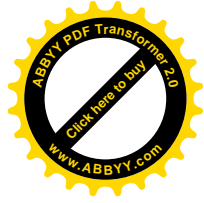
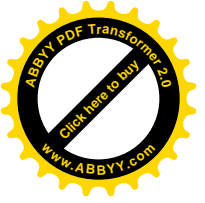
The preoperative IKDC scores were different between the groups due to the amount of pain, instability and especially to the degree of the arthritis. Before surgery 6 patients were graded B, 10 patients were graded C, 9 patients were graded D. After surgery 4 patients were graded A, 14 patients were graded B, 6 patients were graded C and 1 were graded D. No patient was made worse by surgery (table 1).

Table 1.

Results of the operations: ISDC score. (n – 25)

	Preoperative	Postoperative
A	0	4
B	6	14
C	10	6
D	9	1

The management of a patient with a ruptured ACL largely depends on how active the patient wishes to be, such that an active Sports player is best advised to undergo a re-construction.[10,14]. However, reconstruction of the ACL itself can increase the risk of osteoarthritis.[4,7,11]. One of the factors involved is acquired varus malalignment.[9]. This study has shown that performing a valgus tibial osteotomy at the same time as recon-structing the

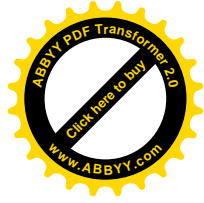
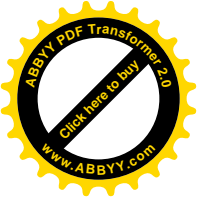


ACL is a safe Operation with a low morbidity. The results show marked symptomatic improvement, with excellent clinical stability and good overall patient satisfaction. Only 15 patients (60%) returned to regular Sports, however, and only one patient to competitive Sports. In general, a patient will perform Sports at a level where they maintain the same functional knee stability and stay pain free. Therefore, as the knee deteriorates they will drop their sporting class to a level that keeps the same functional grade. More recently, in a biomechanical study, the theoretical load on the ACL in anterior tibial translation was found to be three times greater when the posterior slope of the tibia exceeded 10° than when it was less than this during unilateral weight bearing [5]. As a result, the osteotomy has been modified to include closing the anterior portion in those patients who have a posterior tibial slope of greater than 10° , to under 10° . Great care is taken not to augment the tibial slope in any patient.

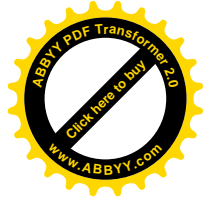
Conclusion.

The combined Operation is indicated for those symptomatic sportsmen with chronic rupture of the ACL who have developed varus malalignment of their knee either from medial tibiofemoral compartment joint narrowing especially after a medial meniscectomy, or who have lateral tibiofemoral compartment joint opening secondary to a posterolateral lesion that occurred at the time of the original injury, and where reconstruction has failed. The lateral compartment can also open up as a late sequelae of marked medial compartment narrowing. It is essential to perform a valgus tibial osteotomy in all cases where there is lateral compartment opening, whatever is decided for the ruptured anterior cruciate ligament.

Valgus tibial osteotomy combined with an intraarticular ACL reconstruction stabilizes the knee reduces pain, stops the early progression of

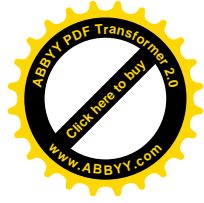


osteoarthritis, and allows most to return to leisure Sports, in those symptomatic patients with chronic rupture of the ACL and acquired varus malalignment.

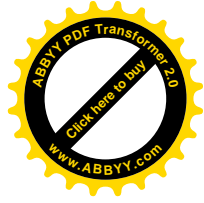


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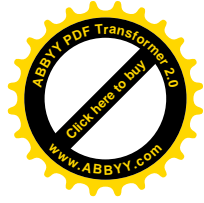


Реконструкция передней крестовидной связки и высокая остеотомия большеберцовой кости как комбинированная процедура при передней нестабильности и остеоартрозе медиального отдела коленного сустава.

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Первые 25 больных, которым проведено комбинированное лечение по восстановлению передней крестовидной связки коленного сустава и высокую проксимальную остеотомию большеберцовой кости, были обследованы через год после операции. Комбинированная операция была выполнена у больных с симптоматикой повреждения ПКС и варусной деформации коленного сустава. Операция была малотравматичной и значительно улучшила стабильность и функциональную способность коленного сустава. Не было выявлено рентгенологических признаков прогрессирования остеоартроза, 23 больных (92%) имели хороший и удовлетворительный результаты операции. Представленная высокая вальгизирующая остеотомия большеберцовой кости улучшила результат пластики ПКС у больных с варусной деформацией и расширила показания к пластике ПКС, включая больных, младшее 40 лет с остеоартрозом медиального отдела коленного сустава.

Ключевые слова: реконструкция передней крестовидной связки, вальгусная тиббиальная остеотомия, остеоартроз медиального отдела, коленный сустав.



Реконструкція передньої схрещеної зв'язки та висока остеотомія великогомілкової кістки як комбінована процедура при передній нестабільності та остеоартрозі медіального відділу колінного суглобу.

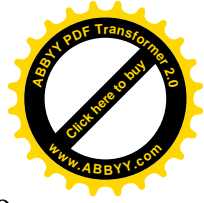
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Вступ. Кількість молодих хворих з хронічною передне-медіальною нестабільністю та остеоартрозом медіального відділу колінного суглобу з варусною деформацією збільшується. Ці хворі потребують не тільки хірургічної стабілізації суглобу, але і лікування остеоартрозу.

Метою роботи є оцінка ефективності високої проксимальної остеотомії великогомілкової кістки в поєднанні з артроскопічною пластикою передньої хрестоподібної звязки.

Матеріал і методи. Нами проведено лікування 25 хворих з остеоартрозом колінного суглобу 2 стадії (жінок було 11, чоловіків – 14), середній вік хворих склав 35 років. Першим етапом виконувався артроскопічний дебрідмент суглобу, канали в стегневій та великогомілковій кістках, забір аутоотрансплантатів. Після цього виконувалась власне остеотомія і металоостеосинтез. Потім проводився трансплантат передньої хрестовидної звязки і фіксація його інтерферентними шурупами. Після операції колінний суглоб іммобілізували шиною з шарніром на рівні суглобу в положенні розгинання. Пасивні рухи в суглобі розпочинали наступного після операції дня за допомогою моторної шини. Розвантаження кінцівки проводили до 6 тижнів, повне навантаження дозволяли через 8 тижнів.

Результати. Контрольний огляд було проведено всім хворим через 1 рік по операції. До та після операції суглоб оцінювали по системі IKDS. До



операції 6 хворих було віднесено до групи В, 10 хворих – до групи С, 9 хворих – до групи D. Після операції 4 хворих було віднесено до групи А, 14 – до групи В, 6 – до групи С, 1 – до групи D. У жодного хворого не було погіршення ортопедичного статусу.

Не було виявлено рентгенологічних ознак прогресування остеоартрозу, 23 хворих (92%) мали добрий та задовільний результат операції.

Висновки. Представлена висока вальгізуюча остеотомія великої гомілкової кістки в поєднанні з артроскопічною реконструкцією передньої хрестоподібної зв'язки стабілізує колінний суглоб, приводить до зменшення больового синдрому, сповільняє прогресування остеоартрозу і, таким чином, покращує якість життя хворого.

Ключові слова: реконструкція передньої хрестовидної зв'язки, висока вальгізуюча остеотомія великогомілкової кістки, остеоартроз медіального відділу, колінний суглоб.



Abstract.

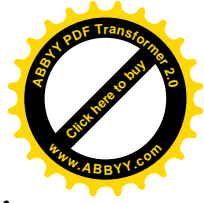
Reconstruction of the ACL and high tibial osteotomy as a combined procedure in anterior instability and medial compartment osteoarthritis.

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First 25 patients, which were treated in our clinic with anterior cruciate ligament (ACL) reconstruction combined with a valgus tibial osteotomy, were reviewed retrospectively at an average of minimal one year postoperative. The combined operation was performed on patients with symptomatic ACL rupture who also had varus malalignment on unilateral weight bearing. Seven patients originally played regular sports. The operation had a low morbidity, and significantly improved clinical symptoms, clinical stability, and functional stability. Postoperatively only 1 patient could play competitive sports, although a further 6 could play leisure sports. At review there was no radiological progression of osteoarthritis, and 23 patients (92%) were satisfied or very satisfied with the operation. Performing a valgus tibial osteotomy improved the results of ACL reconstruction in patients with acquired varus malalignment and extended the indications for ACL reconstruction to include patients younger than 40 years of age with early medial compartment osteoarthritis.

Key words: ACL reconstruction, valgus tibial osteotomy, medial compartment osteoarthritis, knee.



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