

The role of arthroscopic adhesiolysis in the treatment of the arthrofibrosis and the partial ankylosis of the knee

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Dizin parsiyel ankilozu ve artrofibrozisinin tedavisinde artroskopik adezyolizisin rolü

Travma, kırık yada distal femur cerrahi girişim ardından gelişen diz hareketi kısıtlanan 23 hastanın 27 dizi, artroskopik kontrol altında, perkutan adezyon releasei ile tedavi edildi. Diz hareketlerini kısıtlayan neden ile artroskopik adezyolizis arasındaki dönem 4 ile 24 ay (ortalama 7 ay) arasında değişiyordu. Ortalama preoperatif diz hareketi 43°, ortalama postop diz hareketi 115°ydi. Ortalama postoperatif hareket kaybı 17°ydi. Takip sonunda ortalama hareket kazancı 55°ydi.

Anahtar kelimeler: Artroskopi, artrofibrozis, adezyolizis, diz, ankiloz

The role of arthroscopic adhesiolysis in the treatment of the arthrofibrosis and the partial ankylosis of the knee

The 27 knees of 23 patients with limited range of motion that developed after trauma, fractures or open surgical procedures of the distal femur were treated by the percutaneous release of the adhesions under arthroscopic control. The interval between the cause of the limited ROM and the arthroscopic adhesiolysis ranged from 4 months to 24 months (mean: 7 months). The average preoperative ROM was 43° and the average postoperative ROM was 115°. The average loss from the postoperative ROM was 17°. At the follow-up, the average final gain of ROM was 55°.

Keywords: Arthroscopy, arthrofibrosis, adhesiolysis, knee, ankylosis.

The pathogenesis of arthrofibrosis is not a single process but there are multiple factors that play roles in this procedure. It is clearly known that the synovial joints are closely related with stresses and they need the homeostatic mechanism as well as the force and the motion for appropriate and optimal functioning conditions (3).

The rapid course of arthrofibrosis is often observed after the injuries to the synovial joints. Prevention can be achieved by early joint motion and the CPM application. Probably hemarthrosis has the major role in this procedure (8).

There are differences among the patients according to their tendency to arthrofibrosis. The reason of these differences is not clear yet. It is probably due to the effectiveness of giving response to the cytokines and growth factors. We observed the variations of scar formation after the skin injuries; there is a celoid formation at one side of the fan and a very thin scar formation at the other. Therefore, the true control of arthrofibrosis can be achieved by carefully detecting the differences among the patients (4).

In their latest study about the ACL reconstructions, Mahtudi et al. reported that with an incidence of 7%, the loss of extension was more than 10° and maximum flexion was 120°, in the period of first three months following the surgery. The incidence is high in the early periods following the surgery. Daniel and Fu also reported a similar observation. According to them there are several factors which increase the rate of the arthrofibrosis forming process (5).

Another subgroup of the post-traumatic arthrofibrosis is the Infrapatellar Contracture Syndrome (IPCS) which was defined by Paulos et al. In this syndrome, there is a pathologic fibrous hyperplasia of the soft tissues in the knee joint, especially the hyperplasia of the fat pad (1). The scar contracture process is in the tissues surrounding the patella and this pulls the patella down. The early diagnosis and the aggressive rehabilitation programs have a great importance in the successful treatment of this syndrome.

The knee joint stiffness is a common problem after the ACL reconstructions. At the postoperative second month, if the loss of extension is more than 10° and the flexion is limited under 125°, there is a problem of stiffness in the joint. The loss of extension is more important. It is characterized by quadriceps weakness, patellofemoral discordance and flexed knee gait.

The etiology of knee joint stiffness can be summarized as:

- Multifactorial
- Capsulitis (Pantos et al.)
- Extracapsular surgery
- Infection
- Reflex sympathetic dystrophy
- Defects due to intraarticular ligament surgery

There are many techniques offered for the treat-

ment of the knee stiffness. Fu, delayed the surgical operation for the patients with serious ACL problems, but accelerated the postoperative rehabilitation programs for the patients who had ACL reconstructions. In 1944, Thomson offered an extended quadriceps-plasty which released the extra-articular adhesions and contractures to increase the knee flexion. Julet advised extended soft tissue release for the knee joint stiffness caused by septic arthritis or chronic tuberculosis. These procedures have about the same risks with the etiological factors. The intra-articular adhesion formation is the real origin of the pathology. Therefore the release of the intra-articular adhesions with the arthroscopic monitorization seems to be very helpful for the knee joint stiffness.

Patients and methods

In this study, in the Orthopaedics and Traumatology Clinic of Gülhane Military Medical Academy, we evaluated retrospectively the 27 knees of the 23 patients with the problem of knee arthrofibrosis during the period between December 1991 and August 1993.

20 of the patients were males and 3 of them were females. The average age was 32.6 years (range:19-62 years). We followed the arthroscopic adhesiolysis method as advised by N. Sprague, Bae and Parisien (2, 6, 10). A pneumatic tourniquet was applied after the spinal or the general anesthesia. To regain the loss of flexion and extension, forced manipulation which is applied gently but effectively was the next step. Following this, the blunt trocars were placed through the superolateral and the supramedial portals to release the adhesions localized at the suprapatellar pouch and the patellofemoral joint. Then, the adhesions at the medial and the lateral gutters were released by the same method through anterolateral and anteromedial portals. Through the irrigation cannula placed at the superolateral portal, the joint was irrigated by the ringer solution. The remnants of the monitorization of the arthroscope placed through the anterolateral portal.

As described by Parisien, (for the right knee) the anterolaterally placed arthroscope was moved in the counterclockwise direction, whereas the superolaterally placed shaving system was moved in the clockwise direction. Thus, the complete shaving of both of the medial and the lateral gutters and the patellofemoral joint was aimed. After the forced manipulation applied to the knee, the joint space was controlled with the arthroscope. Following the irrigation, a suction drainage was placed into the joint (10). To the extremity, a Jones bandage and over it the Cryo-cuff system were applied. The tourniquet was deflated. The postoperative range of motion gained by the procedure was tried to be preserved with the early CPM application started in the day just after the surgery (Fig. 1, 2, 3, 4, 5, 6).

The initial diagnosis of the patients, the first treatment method, the interval between the first procedure and the arthroscopic adhesiolysis, the range of motion values at the preoperative, postoperative and fol-

low-up periods were recorded according to the neutral zero method. For the final follow up, the patients were evaluated by the criteria of Parisien.

Figures I-VI: The steps of the method

Criteria	Results
* Patient, pleased by the result * Full range of motion * No pain * No functional impairment	Excellent
* Patient, pleased by the result * The ROM is doubled * No pain * No functional impairment	Good
* Patient, pleased by the result * Partial improvement in ROM * Minimal pain * Minimal functional disorder/loss	Moderate
* Patient, unpleased * No change in ROM	Poor

Table 1: The criteria of Parisien

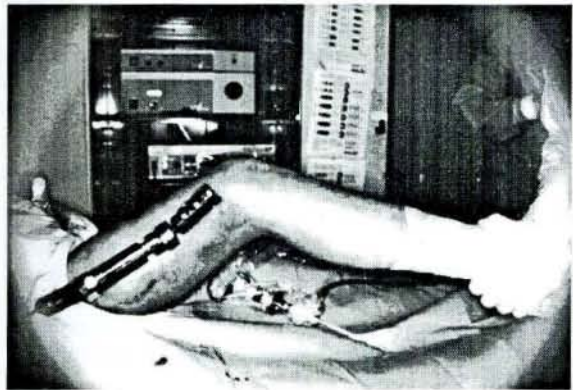


Figure 1: The preoperative view of the case



Figure 2: The arthroscopic view of the adhesions at the intercondylar notch

Results

The average interval between the arthroscopic adhesiolysis and the previously performed procedure was 7 months (range: 4-24 months). The average follow up period was 13 months (range: 2-21 months). The average preoperative ROM was 43° and the average postoperative ROM was 115°. The average

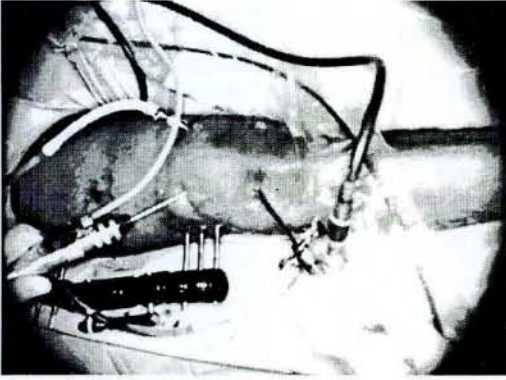


Figure 3: The shaving procedure performed as described by Parisien



Figure 5: The preoperative view of the case

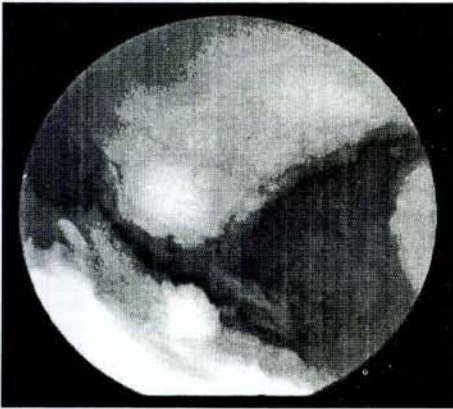


Figure 4: The arthroscopic view after the removal of the adhesions

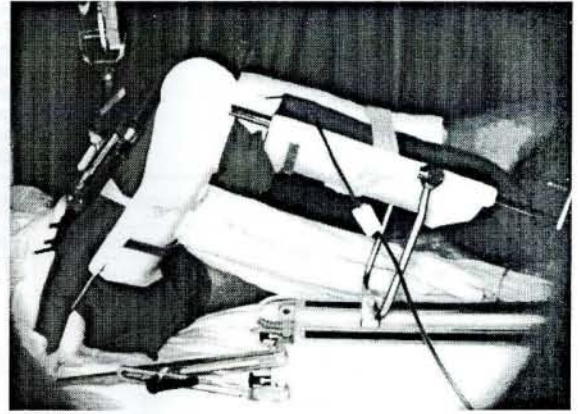


Figure 6: The view of the case during CPM application

ROM in the final control was 98°. The average postoperative loss in the ROM obtained just after the procedure was 17°. Therefore, the average gain in ROM in the final control was 55°.

All the necessary information about the patients are listed in Table II A-B. The additional procedures were the removal of the external (2 cases) and the internal (3 cases) fixators, the lateral capsular release (5 cases) and the arthrotomy and quadricepsplasty combination for the case that the arthroscopic adhesiolysis was inadequate.

Discussion

Kettlekamp et al. reported that for the normal sitting position 110° of knee flexion and for normal gait 70° of knee flexion were necessary (10). Our goal by the arthroscopic adhesiolysis in the treatment of the arthrofibrosis and the partial ankylosis of knee was to gain a knee flexion between 100° and 120°.

Long immobilization, intra-articular surgery and inadequate physiotherapy were observed to have great importance in the outcome of the problem (4, 7, 8). The result of a case gets worse as the interval between the previous procedure and the arthroscopic adhesiolysis gets longer, therefore the early diagnosis of the arthrofibrosis and the partial ankylosis of the knee is very important (6). According to Fu, the

formation period for the arthrofibrosis is about 2 months after the ACL reconstructions. In 1963, Nicoll defined four different pathologies for the postoperative partial ankylosis: 1) The fibrosis of vastus intermedius, 2) The intercapsular adhesions between patella and femoral condyle, 3) The fibrosis of vastus lateralis, 4) The shortening of rectus femoris. Nicoll reported that these pathologies should be released until the necessary flexion range was gained.

In 1973, Sudet reported that all the adhesions in the soft tissues should be released and if there was a scar formation in the fascia it should be excised. It must be kept in mind that these procedures themselves have potential risks.

Compared to the other techniques, arthroscopic adhesiolysis is a simple technique which requires less hospitalization and gives way to early exercises. As a result, if the arthroscopic adhesiolysis is performed in the suitable period it provides the suitable treatment choice for the arthrofibrosis and the partial ankylosis of the knee.

Case	Age/Sex	Previous diagnosis	Previous procedure
1	21 / M	Fracture of femur	OR + Küntscher
2	22 / M	Fracture of femur	External fixation
3	37 / M	Fracture of tibia plateau	Conservative
4	49 / M	Fracture of patella	OR + tension band
5	31 / M	Meniscopathy	Artrotomy + meniscectomy
6	35 / M	Fracture of femur + tibia	OR + IF
7	55 / M	Blt. fracture of femur + tibia	OR + IF
8	55 / M	Blt. fracture of femur + tibia	OR + IF
9	37 / M	Rupture of ppatellar tendon	OR + Primary repair
10	23 / M	Lesion of medial collat. lig.	Conservative
11	26 / F	Traumatic luxation of hip	Pelvi-Pedal cast
12	26 / M	Traumatic luxation of hip	Pelvi-Pedal cast
13	20 / M	Fracture of tibial eminentia	Conservative
14	22 / M	Fracture of femur + tibia	External fixation
15	30 / M	Femur + Fracture of patella	OR + IF
16	62 / M	Tbc.	Synoviectomy
17	58 / M	Gonarthrosis	Total knee prosthesis
18	23 / M	Fracture of femur	OR + Küntscher
19	34 / M	Fracture of patella	Conservative
20	20 / M	Fracture of femur	External fixation
21	28 / M	Congenital Pat. luxation	Roux - goldwait
22	28 / M	Congenital Pat. luxation	Roux - goldwait
23	20 / M	Septic arthritis	Arthrotomy
24	47 / M	RA. Gonarthrosis	Total knee prosthesis
25	47 / M	RA. Gonarthrosis	Total Knee prosthesis
26	32 / M	Fracture of femur supracondylar	External fixation
27	19 / M	Fracture of tibial eminentia	OR + IF

Table 2 a: Data of the 27 patients and their evaluation according to Parisien criteria

Case	Interval	Pre-op ROM	Post-op ROM	Final ROM	Criteria
1	8 month	10° - 60°	0° - 110°	0° - 95°	Good
2	5 month	0° - 45°	0° - 130°	0°-105°	Good
3	9 month	0° - 53°	0° - 133°	0°-100°	Good
4	14 month	0° - 40°	0° - 125°	0° - 95°	Good
5	6 month	30° - 80°	20° - 115°	20°-100°	Medium
6	7 month	10° - 30°	0° - 120°	0°-110°	Perfect
7	4 month	15° - 48°	5° - 105°	5° - 90°	Medium
8	4 month	10° - 63°	0° - 117°	0 - 100°	Good
9	5 month	30° - 75°	25° - 120°	25°-108°	Medium
10	4 month	10° - 57°	0° - 105°	0° - 95	Medium
11	6 month	10° - 80°	0° - 135	0°-120°	Perfect
12	6 month	25° - 60°	0° - 120°	0°-106°	Good
13	8 month	10° - 80°	0° - 135°	0°-120°	Perfect
14	7 month	0° - 35°	0° - 120°	0°-100°	Good
15	5 month	20° - 60°	0° - 110°	0°-100°	Good
16	24 month	30° - 70°	20° - 105°	25° - 90°	Good
17	8 month	10° - 35°	5° - 120°	5°-100°	Medium
18	7 month	15° - 45°	0° - 115°	5°-100°	Medium
19	5 month	0° - 40°	0° - 125°	0°-110°	Perfect
20	4 month	5° - 25°	5° - 110°	5° - 95°	Medium
21	11 month	10° - 80°	0° - 108°	0°-108°	Perfect
22	6 month	25° - 80°	10° - 130°	10°-104°	Good
23	5 month	35° - 55°	5° - 125°	5°-110°	Good
24	4 month	10° - 70°	0° - 115°	0°-100°	Good
25	5 month	15° - 80°	10° - 120°	10°-110°	Good
26	7 month	10° - 45°	5° - 105°	5° - 90°	Medium
27	6 month	20° - 35°	5° - 125°	5°-100°	Good

Table 2 b: Data of the 27 patients and their evaluation according to Parisien criteria

Result	Number of the cases	%
Excellent	5	18.5
Good	13	48.2
Moderate	8	29.6
Poor	1	3.7

Table 3: The classification of the 27 patients according to Parisien's criteria

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