Arthroscopic Surgery for Primary Traumatic Patellar Dislocation: A Prospective, Nonrandomized Study Comparing Patients Treated With and Without Acute Arthroscopic Stabilization With a Median 7-Year Follow-up

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Arthroscopic Surgery for Primary Traumatic Patellar Dislocation

A Prospective, Nonrandomized Study Comparing Patients Treated With and Without Acute Arthroscopic Stabilization With a Median 7-Year Follow-up

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Background: No data exist whether patients with primary traumatic patellar dislocation benefit from initial arthroscopic medial repair surgery.

Purpose: To compare long-term outcomes of patients treated with acute arthroscopic stabilization for patellar dislocation with those treated nonoperatively except for removal of loose bodies.

Study Design: Cohort study; Level of evidence, 2.

Methods: The study group included 76 consecutive military recruits (72 men, 4 women), with a median age of 20 years (range, 19-22) at the time of dislocation. Thirty patients (group 1) underwent initial arthroscopic medial retinacular repair, and 46 patients (group 2) were treated without stabilizing surgery, including 11 who had osteochondral fragments arthroscopically removed. Patients with previous patellar dislocations or instability were excluded. Aftercare was identical in both groups. Redislocations, subjective symptoms, and functional limitations were evaluated after a median 7-year follow-up.

Results: Sixty-one (80%) patients participated in a follow-up examination. At final follow-up, 8 (23%) redislocations occurred in group 2 and 5 (19%) in group 1 ($P = .84$). Eight (23%) patients in group 2 and 3 (12%) in group 1 reported patellar subluxations ($P = .18$). In group 1, 81% regained their preinjury activity level compared with 56% in group 2 ($P = .05$). Functional outcomes were good in both groups (Kujala scores: 87 for group 1 and 90 for group 2) ($P = .22$). Regarding the presence of osteoarthritic characteristics in the patellofemoral joint, no statistically significant differences were found between the groups.

Conclusions: Initial arthroscopic medial retinacular repair was not followed by improved patellar stability nor reduced incidence of redislocations compared with nonoperative (except for removal of loose bodies) treatment. Acute arthroscopic medial retinacular repair allowed patients to better regain preinjury activity level than in patients not undergoing retinacular repair. The decision to stabilize the patella by initial arthroscopic surgery should be made with caution.

Keywords: patella; dislocation; medial patellofemoral ligament (MPFL); arthroscopy

The treatment of acute lateral patellar dislocation has been the subject of continuing interest for decades. Open procedures are widely described in the literature.[36] Although nonoperative treatment for primary acute patellar dislocation has been suggested in the recent literature, conclusions based on results from existing studies should be made with caution due to the great diversity of the study settings.[7,27,36] Arthroscopic surgery for acute primary patellar dislocation has been poorly documented, and although the surgical techniques of arthroscopic proximal realignment procedures have been recently described, the

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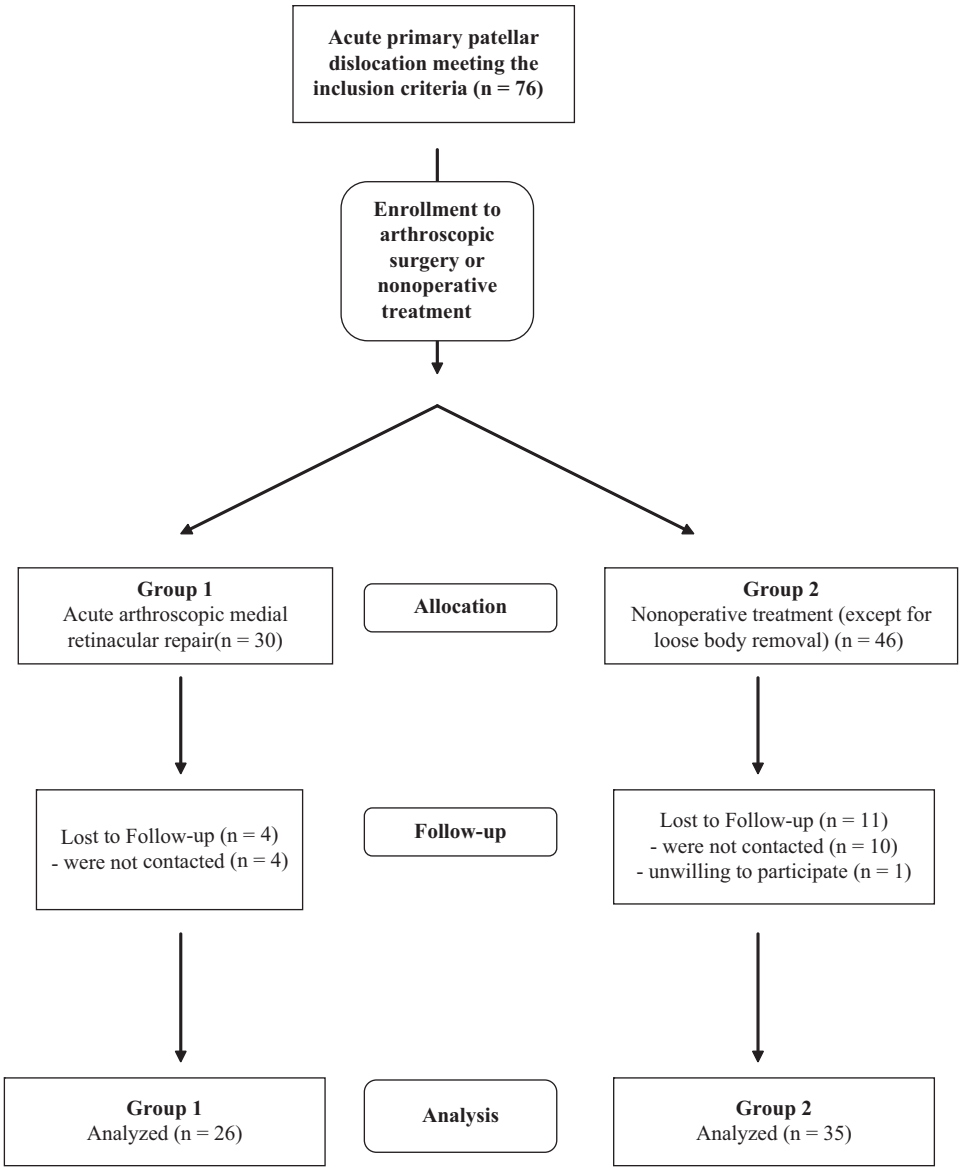

Figure 1. Patient flowchart.

results concern relatively small case series, with no controls and short follow-ups.[3,16,17,20,34,39] Because primary patellar dislocations usually occur in young adults, they may be followed by harmful sequelae, such as recurrent dislocation[8] and painful patellar instability (subluxation).[19] As certain surgical procedures might improve the relatively poor long-term outcomes of nonoperative treatment, they warrant further research.

Yamamoto[39] was the first to describe an arthroscopically assisted technique in the treatment of patellar dislocation. Transcutaneous passage of sutures was used to repair the medial restraint injury. Small et al[34] and Henry and Pflum[20] modified the technique by passing the sutures through needles after a small medial incision. Halbrecht[16] described all-arthroscopic medial reefing by percutaneous passage of the suture through a needle combined with a knot tying inside the joint. All-arthroscopic knots were also introduced by Ahmed and Lee[3] and Haspl et al[17] in their published case series. Fukushima et al[13] described anchor sutures placed near the patella. The results using these techniques have been promising.

The aim of this prospective study is to compare the long-term results of acute arthroscopic medial retinacular repair with nonoperative treatment in patients with acute traumatic primary dislocation of the patella. Additionally, the study describes the magnetic resonance imaging (MRI) findings of acute medial patellofemoral ligament (MPFL) injury and the follow-up MRI results at a median of 7 years after the dislocation, specifically regarding patellofemoral articular cartilage lesions.

TABLE 1
Patient Characteristics in Study Groups[a]

Characteristic	Group 1 Median (Range)	Group 2 Median (Range)	*P* Value
Number of patients	30	46	
Number of female patients	1/30	3/46	
Left knee	8	10	
Right knee	22	36	
Age at time of surgery (y)	20.0 (19-22)	20.0 (19-22)	
Age at follow-up (y)	27.5 (25-31)	27.0 (25-30)	.68
Follow-up time (y)	7.5 (6-11)	7.0 (6-10)	.63
Previous dislocations (n)	None	None	
Interval to MRI from trauma (d)	Not analyzed	4 (0-21)	
Articular cartilage lesions[b] at the initial event			
Patella Grade II	Not analyzed	22/46 (48%)	
Patella Grade III or IV	Not analyzed	None	
MPFL rupture detected by MRI (%)	Not analyzed	44/46 (96%)	
Osteochondral fracture (%)	9/30 (30%)	11/46 (24%)	.82
Hemarthrosis (mL)	40 (15-75)	56 (20-90)	.31
Osteoarthrosis on initial plain radiographs[c] grade I or more severe	None	None	

[a]Group 1: acute arthroscopic medial retinacular repair. Group 2: nonoperative treatment (except for loose body removal).
[b]In the patellofemoral joint, visible in arthroscopy or detected by magnetic resonance imaging (MRI), graded according to the International Cartilage Repair Society (ICRS) grading scale[6] (superficial grade I lesions were excluded due to the insensitivity of MRI detection).
[c]In the patellofemoral joint, according to the Ahlback[2] system.

MATERIALS AND METHODS

Seventy-six consecutive patients admitted to the Central Military Hospital, Helsinki, Finland, for acute traumatic primary patellar dislocation were treated either by arthroscopic medial retinacular repair or nonoperatively (except for removal of loose bodies) between 1996 and 1999. The patients were military recruits and included 72 men and 4 women. All patients with previous dislocation of the patella or symptoms of patellar instability were excluded from the study. Other exclusion criteria were nontraumatic patellar dislocation (eg, dislocation while walking or squatting without forceful knee stress, resulting in dislocation without acute knee pain), previous knee trauma (eg, fracture or ligamentous injury), large osteochondral fracture requiring fixation (as this would have required an additional incision that may have affected recovery), or patellar fracture.

To be included in the study, patients' diagnosis of acute patellar dislocation had to be based on physical examination findings by an experienced orthopaedic surgeon, a visible injury to the medial structure of the patella seen at arthroscopy (in patients treated with arthroscopic proximal realignment), or a medial patellar restraint injury detected by MRI (in patients treated nonoperatively) at the hospital. The treatment pathway depended on the availability of one specific orthopaedic surgeon who was highly experienced with the arthroscopic stabilization technique to perform the initial arthroscopic medial retinacular repair procedure.

Thirty patients underwent initial arthroscopic medial retinacular repair within 7 days from the injury (group 1), while 46 patients were treated nonoperatively (except for loose body removal) (group 2) (Figure 1). Although the patients were not randomized, the 2 study groups were nonetheless comparable in terms of age and type of acute traumatic injury (Table 1). Because of the health requirements for military service, both groups consisted of healthy young adults with no preoperative osteoarthritic characteristics or other major knee complaints. The majority of the enrolled patients had sustained traumatic dislocation during sports activities or military training. The median age of the patients at the time of surgery was 20 years (range, 19-22) in both study groups. The median follow-up period for group 1 participants was 7.5 years (range, 6-11) and 7.0 years (range, 6-10) for group 2 ($P = .63$). The Institutional Review Board accepting this study was the Medical Ethics Committee of the Central Military Hospital, Helsinki, Finland, and written consent was obtained from each participant.

The arthroscopic medial retinacular repair was started with a routine arthroscopic examination via anterolateral and anteromedial portals. The knee was irrigated, and blood clots were carefully removed, as well as osteochondral fragments (in 9 of 30 surgical cases). Aspiration and lavation of hemarthrosis (found in all patients as described later) of the joint were followed by a bloodless arthroscopic technique using a pneumatic tourniquet. The medial retinacular tear, usually located near the medial margin of the patella, was shaved and cleaned of ruptured synovial tissue to expose the more superficial medial joint capsule. For the repair, a modified inside-out arthroscopic technique previously described by Yamamoto in 1986[39] was used (Figure 2). Three incisions <10 mm were made at the upper, middle, and inferior medial side of the patella. Under direct arthroscopic visual control, slowly absorbable Maxon (Tyco Healthcare, Princeton, New Jersey) or PDS (Ethicon Inc, Somerville, New Jersey) sutures were introduced through an injection needle near the medial margin of the patella and pulled out through the posterior margin

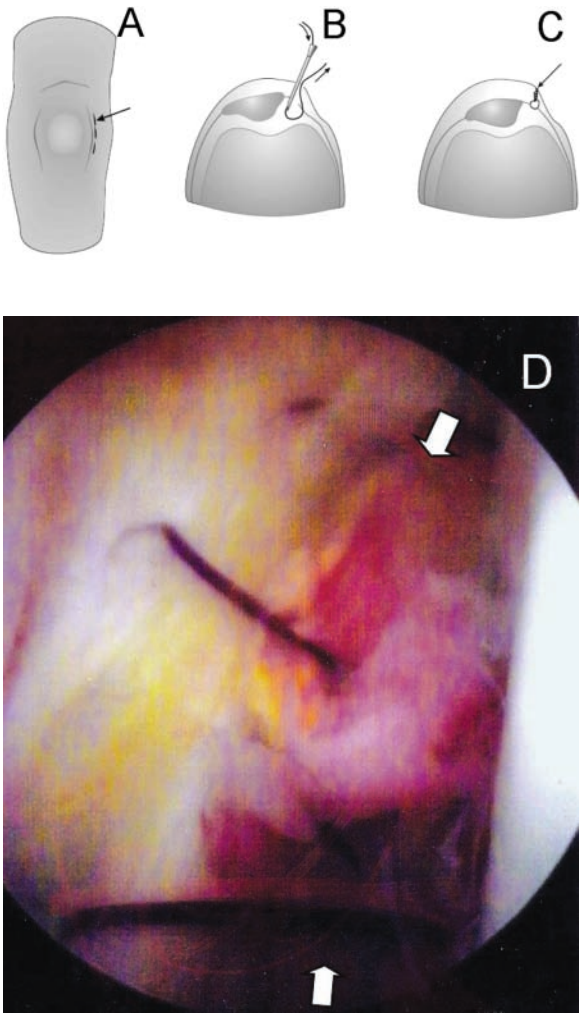

Figure 2. Arthroscopic medial patellar restraint repair technique. To repair injured medial structures, a modified outside-in arthroscopic technique previously described by Yamamoto in 1986[39] is described. (A) Three <10-mm incisions at the upper, middle, and inferior medial side of the patella are made. (B) The sutures are introduced through an injection needle near the medial margin of the patella and pulled out through the posterior margin of the tear using a suture loop at the meniscal needle. (C) Five to 6 sutures are usually required to close the defect. (D) Arthroscopic view of sutures before tying. Medial retinacular tear (arrows).

of the tear using a suture loop at the meniscal needle. Five to 6 sutures were usually required to close the defect. A lateral release with arthroscopic control was then performed through a small proximal incision using a Smillie knife. When performed correctly, the retinaculum is cut while avoiding cutting of the synovium, and the extent of the release can be controlled by means of palpating the tip of the knife through the skin. After the lateral release is complete, the sutures were tied (Figure 2). Postoperative immobilization included patellar orthosis with flexion limited to 60° in all patients for a median duration of 4 weeks (range, 3-6). No restrictions on weightbearing were set. The rehabilitation program was started the first postoperative day after arthroscopic surgery under supervision of a physiotherapist, and guided range-of-motion and quadriceps strengthening exercises were initiated after the initial immobilization period.

In all patients in the nonoperative treatment group (group 2), hemarthrosis was first aspirated to relieve pain. If necessary, more than one aspiration was performed. To ensure diagnosis and to exclude other ligamentous or intra-articular injuries, all nonoperative (group 2) subjects underwent MRI at a median of 4 days (range, 0-21) from the injury. Magnetic resonance imaging was also used to assess whether the medial restraints were injured. In 11 of the 46 (24%) patients, MRI revealed a relatively large osteochondral fragment, which was removed forthwith via arthroscopy with no additional procedures. In these 11 cases, removal was deemed necessary as the loose fragment was considered to have the potential for subsequent adverse sequelae. On the other hand, none of the 11 cases were suitable for fixation of the fragment. However, the osteochondral fractures were then treated similarly, by removal of the fragment, in both groups. Patients with large osteochondral fragments requiring fixation were excluded from the study as described earlier. Movement of the knee was restricted with the use of patellar orthosis with flexion limited to 60° in all patients for a median duration of 4 weeks (range, 3-6). No restrictions on weightbearing were set. The rehabilitation program was started on the first day after acute dislocation under supervision of a physiotherapist, and guided range-of-motion and quadriceps strengthening exercises were initiated after the initial immobilization period. The rehabilitation program was the same for both study groups, and all aftercare visits were provided by the Central Military Hospital similarly for both study groups.

Twenty-six of the 30 group 1 patients and 35 of the 46 group 2 patients were able to participate in the follow-up, at which time their median age was 27.5 years (range, 24-30) and 27.0 years (range, 24-31) ($P = .68$), respectively. The final follow-up examinations were performed at a minimum of 6 years (median, 7.5; range, 6-11). The follow-up protocol consisted of systematic interviews by the first author, uninvolved in the surgery, in which the number of subsequent redislocations and other problems were elicited and recorded. Redislocation was defined as a recurrent dislocation of the patella that required a visit to the doctor or hospital. Overall patellar instability was defined as redislocation or subjective feeling of subluxation. For subjective assessment of symptoms and functional outcomes, we used the patellofemoral scoring scale by Kujala et al[23] with a maximum possible score of 100 points (no symptoms); a score of 95 points or more is excellent, 94 to 85 is good, 84 to 65 is fair, and 64 or less is poor. The 100-mm visual analog scale (0 = no pain, 100 = most severe pain) was used to determine the patient's subjective pain in the affected knee at follow-up. Physical activity levels were assessed according to the Tegner[37] scale (0-10), with 0 denoting severe disability and 10 indicating a national- or international-level

competing athlete. Patients were also asked whether they had regained their preinjury level of activity by follow-up.

In addition, a subgroup of 29 patients, 16 of 26 (62%) in group 1 and 13 of 35 (37%) in group 2, had plain radiographs and control MRI of the operated knee at the follow-up. The remaining 10 patients in group 1 and 22 patients in group 2 were unable or unwilling to undergo the scheduled MRI or plain radiography. In the subgroup of 29 patients, posteroanterior, lateral, and patellofemoral axial radiographs were obtained at follow-up. Axial Merchant[25] views with the knee at 45° of flexion were used to analyze the medial and lateral facets of the patellofemoral joint. Plain radiographs were evaluated to assess the severity of osteoarthrosis in the patellofemoral joint using the Ahlback[2] classification: grade 0 representing normal; grade I, joint narrowing; grade II, joint obliteration; and grades III to V, more severe destructive characteristics.

At the follow-up, the subgroup of 29 patients (16/26 group 1 and 13/35 group 2) underwent MRI to determine the location and severity of cartilage defects in the patellofemoral joint. Both initial and control MRI images were obtained using a 1.0-T MRI scanner (Signa Horizon, GE Medical Systems, Milwaukee, Wisconsin). A knee coil with a field of view of 10 to 16 cm was used. Slice thickness was 3 mm with a 0.5-mm or 1.0-mm intersection gap. Sagittal proton density spin-echo (SE) sequence images with fat suppression (repetition time/echo time = 3400 milliseconds/17 milliseconds, with 2 signals averaged and a 256 × 256 [516] matrix) and sagittal T1-weighted SE sequence images (680/11, with 2 signals averaged and a 256 × 256 [512] matrix) were obtained. T2-weighted fast SE sequences with fat saturation were obtained axially (2560/85, with 2 signals averaged and a 256 × 256 [512] matrix) and coronally (4000-4600/72-90, with 2 signals averaged and a 256 × 256 [512] matrix), and the combination of the axial and coronal planes was used to achieve sufficient coverage of the articular surfaces and high sensitivity and specificity for chondral defects.[5]

All MR images were reviewed by a senior, musculoskeletally specialized radiologist who was not involved with the surgery and blinded to the type of treatment. Chondral lesions were classified according to their depth using the numeric grading system developed by the International Cartilage Repair Society (ICRS) and described by Brittberg and Winalski.[6] Grade I lesions were excluded because of the difficulties in differentiating these lesions from normal (ICRS grade 0) cartilage on MRI.[6] Because previous studies have shown MRI is unreliable in detecting superficial lesions (softening),[10,14,22] only grade II to IV lesions were documented to avoid false-positive MRI findings. The ICRS grade II describes articular cartilage defects extending down to less than 50% of cartilage depth, grade III extends deeper than 50% of cartilage depth, and grade IV are defects with full-thickness articular cartilage loss. Additionally, by reviewing the original MRIs in both the coronal and sagittal planes, the MPFL injury sites were assessed and divided into 3 groups: injury to the MPFL at the level of the patellar insertion, injury to the MPFL (and medial retinaculum) at its midsubstance, and injury to the

TABLE 2
Results and Statistical Analysis of the Follow-up MRI Examinations[a]

Study Parameter	Group 1 (Proportions)	Group 2 (Proportions)	*P* Value
Number of patients followed	26	35	
Redislocations, N (%)	5 (19%)	8 (23%)	.84
Painful subluxations (%)	3 (12%)	8 (23%)	.18
Overall patellar instability (%)	8/26 (31%)	16/35 (46%)	.34
Kujala score (maximum 100 points)	87 (range, 52-100)	89.5 (range, 59-100)	.22
Subjective result (%)			
Excellent	12/26 (46%)	16/35 (45%)	.97
Good	4/26 (15%)	9/35 (26%)	.33
Fair	9/26 (35%)	9/35 (26%)	.45
Poor	1/26 (4%)	1/35 (3%)	.83
Visual analog scale (0-100 mm)	16 (range, 0-80)	10 (range, 0-70)	.08
Tegner activity level (1-10)	4.5 (range, 3-7)	5.0 (range, 3-10)	.91
Regain preinjury level (%)	21/26 (81%)	20/35 (57%)	.048
Control plain radiographs and MRI performed (%)	16/26 (62%)	13/35 (37%)	
Patellar chondral lesions (%)[b]			
Grade II	6/16 (37%)	5/13 (38%)	.96
Grade III-IV	10/16 (63%)	8/13 (62%)	.96
Femoral chondral lesions (%)[b]			
Grade II	1/16 (6%)	1/13 (8%)	.88
Grade III-IV	2/16 (13%)	3/13 (23%)	.45
Reoperations (%)	3/26 (12%)	5/35 (14%)	.81
Osteoarthrosis on plain radiographs,[c] grade I or more severe (%)	1/16 (6%)	None	> .99

[a]Group 1: acute arthroscopic medial retinacular repair. Group 2: nonoperative treatment (except for loose body removal).
[b]In the patellofemoral joint, according to the ICRS grading system.[6]
[c]In the patellofemoral joint, according to the Ahlback[2] system.

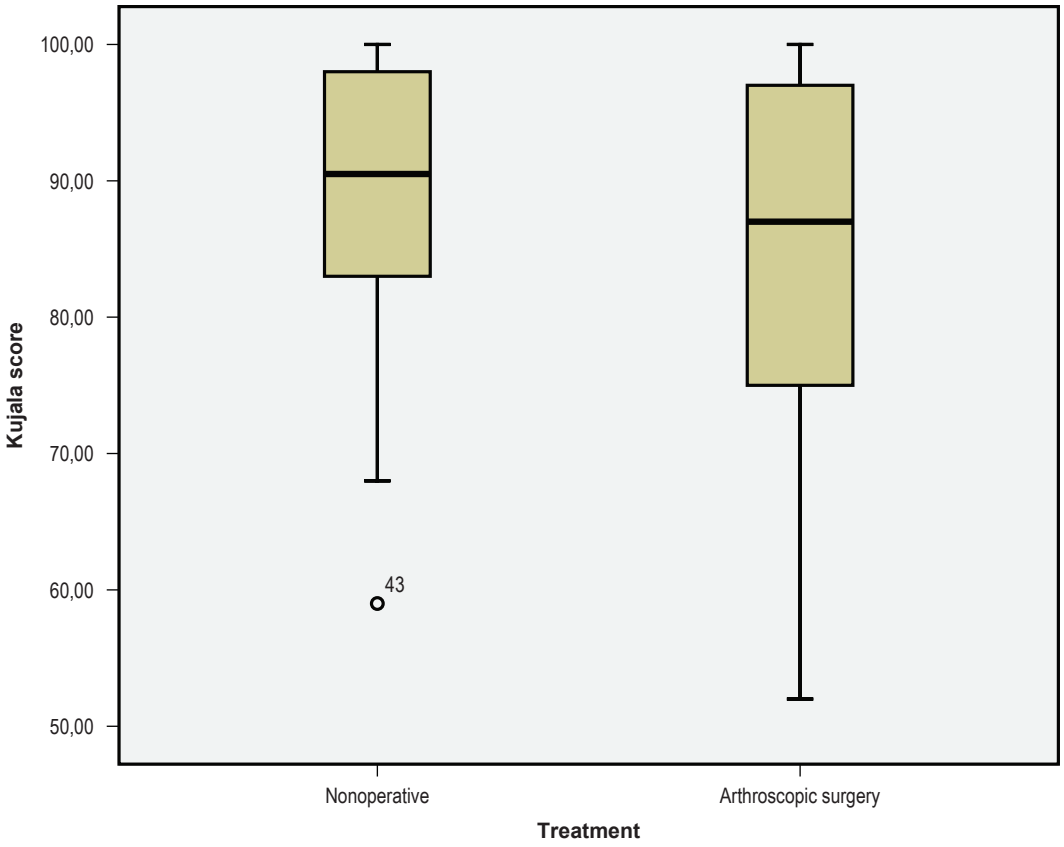

Figure 3. Subjective and functional outcomes after nonoperative treatment (except for loose body removal) and acute arthroscopic medial retinacular repair measured by the Kujala[23] patellofemoral scoring system. The boxes represent the median (horizontal line in the box), quartiles (boxes and lines), and outliers (extreme values) for the Kujala score variable with a maximum possible score of 100 points (no symptoms); a score of 95 points or more was excellent, 94 to 85 good, 84 to 65 fair, and 64 or less poor.

MPFL at its femoral origin. The classification was the same as Elias et al[11] used in their radiological study and was performed after initiation of the study because the stabilizing role of the MPFL was not fully established in the literature at the onset of this study.

In statistical analysis, the Kruskal-Wallis test was used to test differences in the continuous skewed variables and the independent samples t test in the continuous unskewed variables between the groups. Differences in the 2-way tables were determined with the Pearson χ^2 test or Fisher exact test when appropriate. Significance was set at $P \leq .05$. SPSS 14.0.1 for Windows software (SPSS Inc, Chicago, Illinois) was used for the statistical analysis.

RESULTS

During the follow-up period, 5 of the 26 patients (19%) in group 1 (arthroscopic surgery) and 8 of the 35 patients (23%) in group 2 (nonoperative) had patellar redislocation, but the difference was statistically nonsignificant ($P = .84$). Painful patellar subluxation occurred in 3 patients in group 1 and in 8 patients in group 2 ($P = .18$). Overall patellar instability was present in 8 of the 26 patients (31%) in group 1 and in 16 of the 35 patients (46%) in group 2 ($P = .34$). The subjective results are shown in Table 2. The median Kujala score was 87 points among patients in group 1 (range, 52-100) and 90 points in group 2 (range, 59-100) ($P = .22$), both indicating a good overall functional outcome (Figure 3). The median Tegner activity scores were 5 (range, 3-7) and 5 (range, 3-10) ($P = .91$), respectively. Two patients, one from each study group, had to be discharged from the military service because of the patellar complaints.

After arthroscopic medial retinacular repair (group 1), 81% (21/26) of the patients were able to regain their preinjury activity level by follow-up compared with 56% (20/35) in group 2 ($P = .05$). Three patients in group 1 and 5 patients in group 2 underwent later operations due to patellar redislocation or instability ($P = .81$).

At the time of injury, hemarthrosis was present in all patients in both groups, either confirmed by puncture of the knee joint or seen during arthroscopy (Table 1). In 44 of the 46 (96%) original nonoperative cases, MPFL rupture was detected by MRI. The most common MFPL injury was femoral attachment avulsion (Figure 4), which occurred in 25 patients (57%), followed by midsubstance MPFL tear in

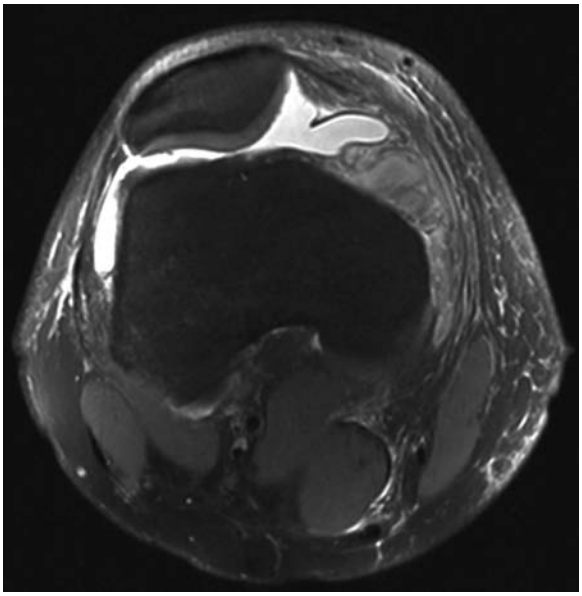

Figure 4. A T2-weighted fat-suppressed magnetic resonance image 2 days after acute patellar dislocation in a 20-year-old man who sustained a traumatic dislocation while playing soccer. Note complete avulsion of the medial patellofemoral ligament at its femoral insertion. A joint effusion is present, and a chondral lesion in the anterolateral femoral condyle is also visible.

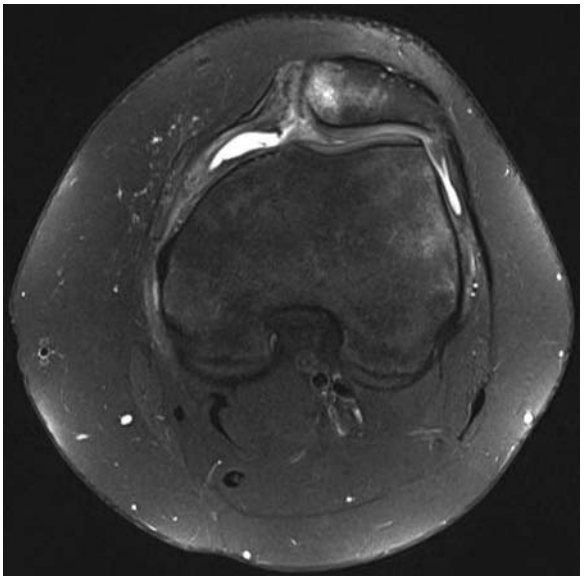

Figure 5. Transverse gradient-echo magnetic resonance image of the knee 3 days after acute patellar dislocation shows partial injury to the femoral origin of the medial patellofemoral ligament (MPFL). There is extensive surrounding edema and complete tear of the patellar insertion of the MPFL.

10 patients (23%) and patellar avulsion (Figure 5) in the remaining 9 patients (20%). Ten of the 19 MPFL tears classified as other than femoral avulsions had signs of partial disruption also on the femoral attachment, which was seen as wavy and stretched ligament fibers on MRI scans. Two MPFL structures were continuous, but wavy and stretched, and classified as partially ruptured. Because only 8 of the 30 patients (27%) in group 1 underwent initial MRI, no conclusions on specific medial structure injury pattern can be made in this group.

At follow-up, altogether 29 patients representing both study groups underwent control plain radiographs and MRI. Plain radiographs showed 1 patient (1/16, 6%) with at least grade I osteoarthrosis in group 1 and none (0/13, 0%) in group 2 ($P > .99$). All 29 patients had superficial, at least grade II chondral lesions in patellar articular cartilage detected by MRI, and over 50% of the lesions were severe grade III to IV lesions. Chondral lesions in the articular cartilage of the femoral anterolateral condyle were less common, detected in 3 patients (3/16, 19%) in group 1 and in 4 patients (4/13, 31%) in group 2 ($P = .45$). The distribution of chondral lesions is described in Table 2. Regarding the presence of osteoarthritic characteristics in the patellofemoral joint, no statistically significant differences were found between the groups.

DISCUSSION

This is the first study to compare the long-term outcomes after initial arthroscopic medial retinacular repair and nonoperative treatment (except for the removal of loose bodies) for acute primary traumatic patellar dislocation. In this prospective, controlled study of 61 young adult patients, it was possible to compare the outcomes between 2 treatments for traumatic primary patellar dislocation: patients treated with and without acute arthroscopic stabilization. The principal finding was that initial arthroscopic medial retinacular repair showed only limited efficacy for stabilizing the patella after acutely injured medial restraints of the patella because the redislocation rate in group 1 was not significantly lower compared with group 2 patients. The only statistically significant improvement achieved by arthroscopic medial retinacular repair was that these patients were able to approach their preinjury physical activity level more closely than those treated without a stabilization procedure.

Traumatic dislocation seems to result in an MPFL injury, which was detected in all patients who underwent MRI. Previous studies have revealed a high incidence (90%-100%) of MPFL injuries in connection with acute patellar dislocations.[4,15,28] The MPFL is a distinct medial structure of the patella that attaches to the superomedial margin of the patella and then courses distal and medial to the adductor tubercle to its femoral attachment.[24,30] Biomechanical investigations by Hautamaa et al[18] on cadaveric specimens showed that 50% of the lateral restraining force was provided by the MPFL alone, and they concluded that other medial retinacular tissues play only a minor role. Previous studies have revealed a high incidence of MPFL ruptures in connection with acute patellar dislocations, as well as MPFL abnormalities related to recurrent patellar dislocations.[4,15,28,31,35] It has been hypothesized that the failure to identify and correct incompetence of the MPFL at the site of disruption may contribute to recurrent instability.[18]

The potential benefit of the less traumatic arthroscopic surgery is that surgical complications are rare, for example, descending genicular artery lesions and infrapatellar nerve injuries, which are both potential risks of open surgery. Furthermore, the procedure can be easily combined with routine knee arthroscopy indicated in cases such as the removal of osteochondral fragments or the treatment of meniscal lesions. In this study, an injury to the medial restraints was seen in every case. In group 1, the medial restraint repair was aimed at the injury site to correct the defect. Because the MPFL is an extracapsular structure,[38] there might not be enough visibility to assess the MPFL injury site when viewed through the arthroscope from inside the joint in case of a fresh retinacular injury. Consequently, some sutures may be misplaced to adequately correct the whole MPFL injury. If the medial retinacular tear and midsubstance rupture of the MPFL are accompanied by MPFL avulsion off the femur, MPFL function may be inadequately restored by arthroscopic surgery only. It is known that the MPFL injury site varies significantly; the seen injury site may not be the only defect.[11,28] The follow-up MRI results at a median of 7 years after the dislocation, specifically regarding patellofemoral articular cartilage lesions, showed no significant differences between the groups. It has been proposed previously that MPFL reconstruction may prevent osteoarthritis progression[29] when compared with distal realignment surgery,[33] but this was not the case in our sample.

The main explanation for the relatively unsatisfying results of initial arthroscopic medial retinacular repair in this study may be that it is not appropriate for all the traumatic MPFL and medial retinacular injury patterns. An MPFL rupture site at its femoral attachment cannot be repaired by the arthroscopic medial repair technique of this study. However, we were unable to determine whether patients in the arthroscopic medial retinacular repair group who suffered instability at follow-up had femoral avulsion of the MPFL because the initial MRI was not performed on all group 1 patients. The significance of the stabilizing role of the MPFL was unclear at the onset of this study in 1996, and therefore we focused on confirming the diagnosis of patellar dislocation by medial restraint injury rather than assessing the specific MPFL injury sites. Despite this limitation, both groups consisted of relatively active young adults, with similar ages and follow-ups. The effect of the later operations on the clinical symptoms and scores reported at the follow-up may have been confounding but perhaps also favorable to group 2. In this study, lateral release was combined with arthroscopic medial retinacular repair technique. According to the literature, the role of lateral release is unclear when combined with surgery of the medial patellar structures.[1,21,32] It has been concluded that performing a lateral release on an unstable patella does not improve the clinical outcome, whereas this procedure may be beneficial for a painful stable patella.[12]

Since Yamamoto[39] published his article on arthroscopic repair of the medial retinaculum and capsule in acute patellar dislocations, there have been some later arthroscopic case series describing overall good or excellent results. Yamamoto[39] noted only 1 redislocation of 30 operated knees, and Small et al[34] reported 92.5% (27 knees) good or excellent results. Haspl et al[17] reported 100% good results and no redislocations in their series of 17 knees, but their follow-up was only 13 months. Halbrecht's 20-month follow-up of an arthroscopic medial duplication of 29 knees showed 93% clinical improvement.[16] In addition, some mini-open medial reefing procedures have been reported. Nam and Kartzel[26] followed 22 knees for a mean period of 4.4 years and showed an average follow-up Kujala score of 88 points. The procedure was mini-open medial reefing with arthroscopic lateral release. Henry and Pflum[20] have described arthroscopically assisted techniques of medial reefing, but no follow-up data have been published. The outcome of this study was less favorable to arthroscopic surgery than those previously published: only 59% of patients' subjective results were excellent or good as based on Kujala scores, with a median score of 87 (good). However, all cases in the present study underwent initial medial repair after primary traumatic dislocation and were mostly male as opposed to the previously published arthroscopic outcomes of recurrent dislocations. The different results might also be explained by the relatively high-demand level of sports activity among the young adults in this study. Arthroscopic techniques may be suitable and comparable with open surgery when performed for recurrent patellar dislocations. The role of lateral release has been unclear, but Desio et al[9] suggested that lateral release may even increase lateral patellar instability because their biomechanical study found that lateral retinaculum contributes 10% of the lateral restraint force. It is unknown whether the lateral release performed in this study had any effect on patellar stability. It has been hypothesized that a lateral release may cause additional instability in the hypermobile patellofemoral joint. In this study, however, the dislocations were primary traumatic injuries, and no hypermobile patellofemoral joint was found.

The strengths of the present study include the homogeneous patient population consisting of young healthy military recruits without previous patellar dislocations or symptoms of instability. The similarity of the 2 study groups was also an advantage. Our study was limited by the small number of female patients, and hence our findings mainly apply to men. A limitation of the study was that patients were not randomized; instead, the allocation depended on the availability of one particular surgeon. Also, because MRI was not performed on all of the group 1 patients, no conclusions can be drawn as to how successful the arthroscopic medial retinacular repair was in the repair of the MPFL injury site. Therefore, the possibility remains that some of the patients with medial retinacular tears and the underlying MPFL ruptures repaired by sutures had MPFL injury at or near the femoral attachment as well, potentially resulting in patellar instability.

On the basis of the results of this study with a 7-year median follow-up, initial arthroscopic patellar medial retinacular repair should be considered with caution as a treatment option for acute traumatic primary patellar dislocation in male patients when compared with nonoperative treatment. Initial arthroscopic medial retinacular repair for acute primary patellar dislocation does not reduce the

incidence of redislocations compared with patients without a stabilizing procedure. In practice, this procedure would likely be combined with the treatment of concomitant injuries, such as an osteochondral fragment or meniscal tear. On these occasions, arthroscopic surgery involves potentially less damage to the soft tissues and offers better cosmetic results than open surgery. However, patients treated with initial arthroscopic medial retinacular repair might expect to regain their preinjury activity level somewhat better than those without a stabilizing procedure. Further prospective studies are needed to investigate the proper surgical or nonoperative method to achieve good patellar stability and low redislocation rate with few symptoms.

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