

Lateral release and proximal realignment for patellofemoral malalignment

A prospective study of 40 knees in 36 adolescents followed for 1–8 years

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We performed lateral release and proximal realignment for painful patellofemoral malalignment in 36 adolescents (40 knees), with a mean age of 14 (9–16) years. The mean follow-up was 4 (1–8) years. The subjective outcome was excellent in 20 knees, good

in 13, fair in 5, and poor in 2. The mean radiographic correction of the lateral patellar shift was 75%, and of the tilting angle of the patella 27%. There was a positive association between the realignment effect and the subjective outcome.

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Submitted 97-06-10. Accepted 97-11-28

There are several reports concerning the subjective outcome of closed and surgical treatment for patellofemoral malalignment (PFM) (Merchant and Mercer 1974, Hampson and Hill 1975, Metcalf 1982, Sasaki and Yagi 1986, Fulkerson et al. 1987, Fulkerson 1991, Vähäsarja et al. 1995). Numerous operative techniques have been described (for review, see Scuderi 1992). In children and adolescents, lateral retinacular release, proximal realignment, distal realignment and combinations of these are used. Transfer of the tibial tubercle should not be used in skeletally immature patients (Scuderi 1992).

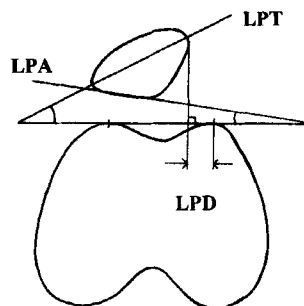
Knowledge of the radiographic realignment effect of the treatment is important, but has rarely been radiographically evaluated (Hampson and Hill 1975, Hughston and Ealsh 1979, Kettelkamp 1981, Insall 1982, Chen and Ramathan 1984, Kujala et al. 1989). We analyzed the subjective and radiographic outcomes obtained with Insall's lateral release and proximal realignment procedure in adolescents with patellofemoral malalignment.

Patients and methods

This study was performed at Oulu University Central Hospital in Finland during 1988–1996. The study group comprised 32 girls and 4 boys aged 14 (9–16) years, 4 children had bilateral surgery (Table 1). The PFM diagnosis was based on the subjective symptoms (pain originating from the patellofemoral joint, "giving way", and sometimes swelling of the knee),

physical findings (in most patients tenderness of the joint space, crepitation, hypermobility of the patella and a positive apprehension sign) and malposition of the patella on the axial plane radiograph.

Using the technique of Laurin et al. (1978), an axial radiograph was exposed with a special frame keeping the knees at 20° flexion during imaging. The x-ray tube was directed in a cephalad direction and the frame stabilized the cassette. The images were produced with the patient supine and the quadriceps muscles relaxed. The lateral patellofemoral angle (LPA), the lateral patellar displacement (LPD) and the lateral patellar tilt (LPT) were measured on the radiographs before and after treatment (Figure).



Radiographic malalignment indices: LPA the lateral patellofemoral angle (degrees), LPD the lateral patellar displacement (mm), LPT the lateral patellar tilt (degrees).

Table 1. Patient data

n	Age (y)	Sex	Preoperatively			Postoperatively			Follow-up (months)	Outcome
			lpa	lpd	lpt	lpa	lpd	lpt		
1	12.0	f	-4	15	22	0	1	18	48	E
2	11.5	f	-10	13	22	0	2	18	50	E
3	15.3	f	0	4	22	2	0	20	48	F
4	16.8	f	-14	26	42	10	-4	16	47	E
5	13.1	f	4	-2	20	8	-5	16	42	F
6	14.2	f	4	-2	20	6	-2	16	29	G
7	12.7	f	-6	9	22	4	0	18	43	G
8	15.6	f	-4	12	20	0	10	18	38	F
9	14.5	m	4	0	18	14	-8	12	31	G
10	9.5	f	0	9	20	6	0	14	31	F
11	15.0	f	-8	10	40	-6	0	34	27	G
12	15.4	f	-14	14	42	6	-2	20	24	G
13	13.8	m	0	3	16	8	0	18	25	G
14	14.5	f	8	2	18	0	7	22	12	F
15	14.5	f	6	4	19	5	8	14	44	F
16	14.8	f	9	2	17	-5	13	25	40	F
17	13.0	f	0	1	13	9	2	11	19	P
18	11.0	f	0	10	17	-1	6	25	57	G
19	14.5	f	5	0	20	5	0	20	49	G
20	12.2	f	0	8	20	5	3	14	52	P
21	13.5	f	1	1	18	9	-1	14	49	E
22	10.0	f	0	19	24	4	-3	20	83	G
23	14.5	f	4	2	14	4	2	14	89	E
24	12.2	f	-4	0	22	1	6	22	19	G
25	14.1	m	2	2	15	5	9	14	40	E
26	10.7	f	-2	2	13	-2	2	13	46	G
27	12.9	f	-12	23	31	-4	13	17	96	E
28	14.6	f	3	9	22	10	0	12	23	E
29	15.0	f	-4	11	24	4	2	19	42	E
30	15.5	f	-6	15	29	4	4	21	35	E
31	16.0	m	-1	9	17	4	2	17	40	E
32	12.9	f	1	3	18	9	4	13	22	E
33	14.1	f	0	1	16	7	0	13	40	E
34	14.5	f	0	-1	22	7	-4	14	35	F
35	13.3	f	-7	14	16	7	0	4	60	G
36	14.9	f	10	5	18	10	-5	18	66	E
37	14.4	f	0	-2	22	5	-1	16	32	E
38	15.7	f	0	1	19	10	4	14	65	E
39	14.5	f	-10	12	30	7	4	13	22	G
40	11.9	f	-14	20	34	9	2	13	57	E

All patients who did not respond to closed treatment (physical therapy with or without a brace) and who had symptoms more than 6 months underwent surgery. Arthroscopy was performed in all cases before the operation under the same anesthesia to rule out other possible intraarticular lesions of the knee and to confirm the diagnosis of malalignment of the patella.

Surgical technique

A medial parapatellar capsular incision extending from the distal end of the vastus medialis over the patella and down to the tibial tubercle, described by Insall et al. (1979), was used in all cases. A lateral retinacular release was performed before medial imbrication. Medial capsular tightening was accomplished by overlapping the medial flap on the lateral flap by approximately 1–1.5 cm. This moves the distal insertion

of the vastus medialis to a more lateral and distal position. A long cast was used postoperatively for 3–4 weeks, during and after which the patient was given physical therapy.

The mean follow-up time was 43 (12–96) months. At latest follow-up, the subjective outcome was evaluated according to the criteria described by Insall et al. (1983; Table 2). The objective outcome of the realignment procedure was evaluated on radiographs taken 6 months after surgery. The results were statistically analyzed with the paired Student's t-test and the Mann-Whitney U-test.

Results

At follow-up of the 40 knees, the subjective outcome was excellent in 20, good in 13, fair in 5, and poor in 2

Table 2. The assessment of patella function, as described by Insall (1983)

Excellent	Patients who had forgotten about the knee, had no complaints, pain, or instability, and had normal function, including return to sports
Good	Patients who had mild pain, no instability, and normal function
Fair	Patients who had moderate pain, feeling of insecurity due to occasional instability, mildly limited function, and partial improvement of preoperative condition
Poor	Patients who had moderate-to-severe pain and instability (including redislocation) that limited function significantly: the operation neither improved nor worsened the condition

Table 3. Radiographic findings before operation, outcome at follow-up and improvement expressed as mean (SD) and 95% confidence interval for the difference between pre- and postoperative values

	Preop. (mean)	Postop. (mean)	Improvement	
LPA (degrees)	–2	5	7 (7)	4–9
LPD (mm)	8	2	6 (8)	3–9
LPT (degrees)	22	17	6 (7)	3–8

Table 4. The relation between subjective results and radiographic improvement calculated as the mean (SD) difference between pre- and postoperative values

Subjective results	n	Mean radiographic improvement		
		LPA	LPD	LPT
Excellent	20	8 (7)	6 (9)	7 (7)
Good	13	8 (7)	8 (8)	6 (8)
Fair	5	0 (8)	1 (6)	2 (6)
Poor	2	7 (3)	2 (4)	4 (3)

patients. There was a good realignment effect of the operation (Table 3), and a positive association between the subjective outcome and radiographic improvement (Table 4). The radiographic improvement was better ($p = 0.05$) among patients with excellent/good subjective results than in those with fair/poor results. No reoperation has yet been required.

Discussion

The purpose of lateral release and proximal realignment is to release tight lateral structures and to reinforce the strength of the medial supporting structures, especially the vastus medialis obliquus, thereby alter-

ing the pull of the quadriceps musculature and restoring patellofemoral congruence (Scuderi 1992).

Insall et al. (1983) reported good and excellent subjective outcomes in nine tenths of the patients having lateral release and proximal realignment with a follow-up period of 2–10 years. Using the same procedure, Scuderi et al. (1988) reported four fifths of patients having a good or excellent result, regardless of whether the preoperative diagnosis was patellar subluxation or recurrent dislocation. In our series, the outcome was very similar.

Sasaki and Yagi (1986) used two different realignment procedures and found that the lateral shift of the patella decreased by approximately 32% and the tilting angle by 44%. Scuderi et al. (1988) found that the average change in congruence angle was 14 degrees in patients with excellent or good results and that centralization of the patella in the intercondylar sulcus yielded the best results. The mean correction of the lateral shift in our study was 75%, and of the tilting angle 27% so correction of subluxation of the patella was much better than correction of the tilting of the patella. Since the realignment effect measured from radiographs was significantly better among patients with better subjective results, it seems evident that the clinical outcome correlates with the better patellar congruence.

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