

Results in the treatment of recurrent dislocation of the patella after 30 years' follow-up

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Abstract. The authors compare the clinical and radiographic outcome in patients with comparable bilateral recurrent patellar dislocation treated surgically on only one side, to clarify the appropriateness of the surgical indication. Sixteen patients were evaluated at an average follow-up of 30 years (20–45); all had been treated by the Roux technique. The results on both the operated and the unoperated knee were evaluated; the Crosby and Insall schedule was used for the clinical evaluation. Anteroposterior, lateral, and Merchant's view X-rays were examined for osteoarthritis and to measure the height of the patella. The congruence angle and the distance between anterior tibial tuberosity and trochlear groove (ATT-TG) were measured by computed tomography. The results in the operated knees were: 3 excellent, 9 good, 1 fair, and 3 worse; results in the nonoperated knees were 6 excellent, 8 good, 1 fair, and 1 worse. In the operated knees arthritis was grossly marked in 8, marked in 3, moderate in 1, and light in 4; in the nonoperated ones it was grossly marked in 8, moderate in 3, and light in 5. The congruence angle was normal in 10, medially displaced in 3, and laterally displaced in 3 cases on the operated side; on the nonoperated side it was normal in 7 cases and lateralized in the remaining 9. The ATT-TG in the operated knees was negative in 9 cases, normal in 1, and positive in 6; on the nonoperated side it was positive or normal. In 7 operated cases a low patella was documented. The Roux technique yields positive results in the correction of recurrent dislocation. No clinical or radiographic differences were found between surgically and conservatively treated knees. The clinical results are generally not comparable with the radiographic features or with severity of degenerative modifications presented at long-term follow-up. The absence of a difference is due basically to the complete lack of adaptation of the surgical procedure to the variable pathogenesis of this disorder.

Key words: Knee – Surgical technique – Patellar dislocation

Abbreviation: ATT-TG = Distance between anterior tibial tuberosity and trochlear groove

Introduction

The definitive treatment for recurrent patellar dislocation has not yet been established. This is because it is one of the more complex pathology of the knee, with a pathogenesis that is multifactorial and highly variable. Various anatomical abnormalities can be responsible for the symptoms: rotational defect of the lower limb, extensor muscle dysplasia, trochlea dysplasia, and patella alta. These pathologies are often found together in the same patient, causing a wide range of clinical symptoms.

Due to this complex and variable pathogenesis it is also difficult to determine the appropriate type of treatment. Many procedures have been presented in literature, but their results are often not comparable, often because they apply a single technique to different situations [10], or because the outcome criteria differ.

The initial success of these procedures in preventing recurrent dislocation of the patella is well accepted [2], but at long-term follow-up many realignment techniques have presented conflicting results [4–7, 9, 11, 12, 14, 16, 20]. Furthermore, no significant data were found in literature supporting the value of surgery in long-term follow-up. Crosby and Insall [8] demonstrated a higher rate of osteoarthritis in operated knees at 8 years' follow-up than in nonoperated ones and therefore recommended conservative treatment since the frequency of dislocation declines with age, reducing the risk of arthritic changes. Arnbjornsson et al. [1] compared patients with bilateral pathology, treated surgically on one side and conservatively on the other; at 14 years' follow-up a better outcome and fewer arthritic changes were found in the nonoperated knees. Thus, although the medium- and short-term results are satisfactory, doubts remain about the long-term advantage of surgery compared to conservative treatment in decreas-

ing the number of dislocations and improving the clinical outcome.

This study evaluated the value of surgery by comparing the radiographic and clinical outcome in patients affected by bilateral recurrent dislocation who were treated surgically on one side and conservatively on the other.

Material and method

From the 125 patients operated on at the Rizzoli Orthopedic Institute between 1948 and 1973 we retrospectively selected 36 who were affected by bilateral recurrent patellar dislocation, and who were treated only on one side although the history and clinical findings were the same on both sides. We paid particular attention to select cases in which the reason for only one knee to be treated conservatively lay in economic or familial difficulties and not a different osteoarticular deformity or different clinical features in the two knees. Of these 36 patients we could evaluate only 16 due to the very long follow-up (20–45, mean 30). The male/female ratio in this group was 6:10; the right/left ratio was 5:11. The legs operated on were dominant in 7 cases and nondominant in 9. The mean age at surgery was 19 years (14–30). Each patient had had a capsuloplasty operation by the Roux technique [17].

Results were evaluated from the clinical, radiographic, and computed tomographic viewpoints. The study was carried out on both knees to permit a comparative analysis of the results. Clinical evaluation used the Crosby and Insall [8] schedule:

- *Excellent*: no pain; normal activity, including all sports; full range of motion; knee subjectively normal
- *Good*: occasional discomfort; feelings of stiffness or instability; no participation in contact sports; slight loss of flexion; knee considered improved or normal by the patient
- *Fair to poor*: pain most of the time; symptoms altered but including recurrent subluxation or significant loss of flexion; further surgical treatment required in some instances

The parameters considered here were: pain, range of motion, sports activity, and the feeling of instability and insecurity of the knee.

The X-ray study was made in supine position by anterior-posterior projection, lateral projection at 30° knee flexion bilaterally, and axial projection of the patella at 30°. On conventional X-rays, in addition to overall evaluation of arthritic changes, the height of the patella was evaluated in lateral projection using the Blumenfaat method [3].

Computed tomography was performed in extension and modest flexion (approx. 20°) to visualize the patellafemoral profile with the patella at maximum instability. In positioning the patient an effort was made to achieve maximum parallel between the condyle and radiological planes, and on the digital tomogram in anterior-posterior projection it was checked that both tibial planes were at the same level. Scans were perpendicular to the femoral axis at 5-mm intervals, including the entire depth of the patella and at the level of anterior tibial spine, with a view to measuring the distance between anterior tibial tuberosity and trochlear groove (ATT-TG) [18]. The "congruence" angle (normal value: $-6^\circ \pm 11^\circ$) was measured on computed tomograms following Merchant's criteria [15] for conventional axial projections. The ATT-TG was also measured (normal value: 9 ± 2 mm). On these images we also evaluated possible morphostructural changes – arthritic-degenerative phenomena such as the reduction in width of the articular interline, irregularity of the articular edge, and the presence of marginal osteophytes in the patellafemoral joint. These were judged as light, moderate, or grossly marked.

The patients were divided into two groups on the basis of the severity of the femoral and patellar osteoarticular dysplasia observed in the preoperative radiographs. We found two populations of eight patients each which were quite distinct from one other: group 1 clearly showed severe flattening of the trochlea and excessive lateralization of the patella, while in group 2 the patellofemoral

morphology appeared subject to mild alterations. Student's *t*-test was used for statistical analysis of the results.

Results

In the operated knees there was only one recurrence of the dislocation. In the contralateral nonoperated knees the dislocation episodes continued but decreased in frequency with time due to the remodeling that took place in the patella. This generally acquires a concave shape forming a new joint with the lateral condyle.

Clinically, the results were very similar: positive results in 12 of 16 operated knees and in 14 of 16 nonoperated knees (Table 1). In terms of the degree of arthritis we observed 11 of 16 severe cases among the operated knees and 8 of 16 among the nonoperated knees (Table 1).

Table 1. Clinical results

	Operated knee	Nonoperated knee
Crosby-Insall criteria		
Excellent	3	6
Good	9	8
Fair	1	1
Worse	3	1
Osteoarthritis		
Light	4	5
Moderate	1	3
Marked	3	0
Grossly marked	8	8

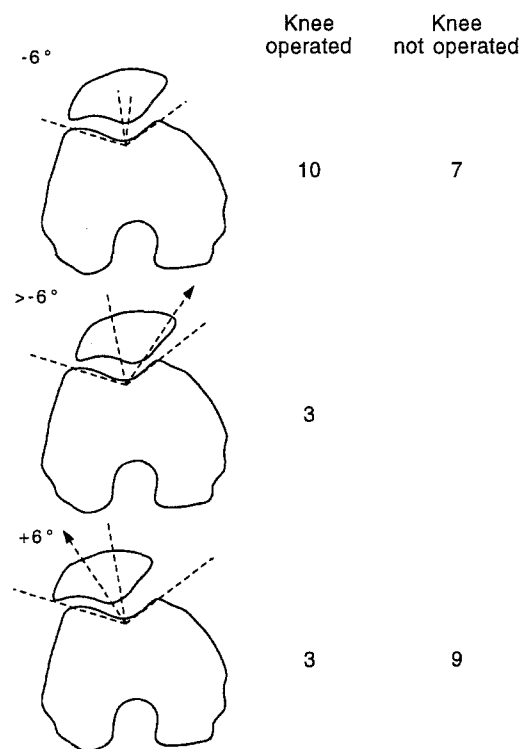


Fig. 1. Angle of congruence

	Knee operated	Knee not operated
9 mm	6	9
>9 mm	1	7
<9 mm	9	

Fig. 2. Distance between anterior tibial tuberosity and trochlear groove

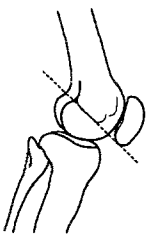
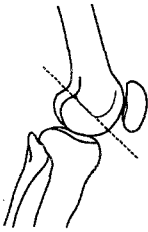
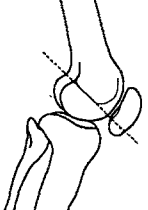
	Knee operated	Knee not operated
	2	3
	7	12
	7	1

Fig. 3. Height of the patella

The patients of group 1 had very similar clinical results in the two knees: 1 excellent, 5 good, 1 fair, and 1 worse on the operated side and 3 excellent, 3 good, 1 fair, and 1 worse on the nonoperated side. There was, however,

a difference among those in group 2 between the operated and nonoperated sides: 2 excellent, 4 good, and 2 worse results in the surgically treated side and 3 excellent and 5 good in the conservatively treated side. Arthritis in group 1 was always marked or grossly marked in both knees, while in group 2 there were 2 grossly marked, 1 marked, 1 moderate, and 4 light in the operated side and 1 grossly marked, 3 moderate, and 4 light in the conservatively treated side. There was no statistically significant difference between the two groups.

On the nonoperated side assessment of the congruence angle showed lateralization in 9 cases while it was normal on 7 cases; on the operated side the kneecap appeared normally positioned in 10 cases, medially placed in 3, and lateralized in the remaining 3, because correction was insufficient (Fig. 1). In 9 of the 16 cases operated on the ATT-TG value was negative, while in the nonoperated knees the value was normal or higher (Fig. 2). In 7 operated cases there was the onset of a low patella (Fig. 3).

Discussion

Four points of particular importance emerge from this long-term follow-up. First, there was only one case of failure after surgery. The nontreated side maintained the dislocation or subluxation of the patella, which over time became fixed with structural adaptation of the patellofemoral joint. This explains the disappearance of the feeling of instability since the joint becomes altered but stable. The fact that there was only one recurrence does not in itself verify the value of surgery since results in the nonoperated knees were very similar and sometimes even better. As described by Trillat et al. [20], we observed the disappearance of patella instability over time.

Second, the clinical result is generally not comparable with the radiographic features or the severity of the degenerative modifications. In most cases the patient expressed satisfaction despite a seriously compromised operated or nonoperated joint. Our observations are certainly affected by the length of follow-up. In analyzing the clinical outcome, for example, we must take into account the patient's age and the consequently reduced functional demands on the joint. Nevertheless, considering the equivalence of dominant and nondominant legs and the muscular strength, which was good in all patients, we can say that the functional ability in operated and nonoperated knees was completely satisfactory. Regarding the degenerative modifications, we have always found arthritic progression over time, with severe deformity of the joint in both operated and nonoperated knees, especially in long-term follow-up. Furthermore, the severity of these arthritic phenomena appear to be closely related to the severity of patellofemoral joint dysplasia, causing recurrent patellar dislocation. Patients with higher articular deformity demonstrate greater degenerative arthritis in both operated and nonoperated knees. In the present study we distinguished two groups, one with severe patellofemoral articular deformities and one with minor osteoarticular deformities associated with torsional defects of the limb or muscular unbalance. This classification is undoubtedly

inadequate because it neglects many factors contributing to patellofemoral instability; however, due to the difficulties inherent in retrospective studies we were not able to obtain the data necessary for a better assessment of the pathogenesis.

Third, over the long-term there were no significant differences in the clinical or the radiographic results between the operated and nonoperated joints. Our data thus confirm the results reported by Arnbjornsson et al. [1].

Fourth, the Roux technique, which seeks to center the patella statically in the femoral groove, cannot serve as the only solution to this complex disorder due to the complete lack of adaptation of the procedure to the physiopathological condition. The observations of Crosby and Insall [8] on cases treated by the Hauser technique can probably also be seen in this light. Even in the less severe cases which have a better outcome, the Roux operation does not sufficiently reduce the muscle equilibrium alteration and in no way influences the torsional defects of the limb. This demonstrates the importance in clearly identifying the physiopathological alteration responsible for the clinical aspect of recurrent patellar dislocation to select the most effective treatment options.

Furthermore, we must underline that 7 of the 16 cases operated on ended in a syndrome of low patella with functional disability and joint degeneration, significant in each case. This appears to be responsible for most of the clinical and radiographic failures. In 4 of these cases the arthritis was severe and the clinical results worse than in the contralateral knee. Where the medialization of tibial tuberosity was excessive (negative ATT-TG) due to the severity of the initial situation, we invariably observed poor results and severe osteoarticular degenerations.

In cases in which surgery led to a correct patellar alignment we observed that centration of the patella yields the more favorable clinical result. This finding is in accord with those of Insall et al. [13] and Scuderi et al. [19] results. Again, however, the results in the nonoperated knee showed no significant differences. Considering the results of this retrospective study we need to consider that in patients with bilateral symptoms it is usually the side with the worse symptoms that is operated on first. This may have been the case here, with the operated knees initially worse than the nonoperated ones. As we noted above, however, we paid careful attention in analyzing the patients' charts to select patients with identical bilateral pathology.

We also want to underline that in this long-term assessment we have not considered the ability of surgery to avoid recurrences, but only the question of whether it is able to reestablish a correct biomechanical onset of the extensor apparatus in order to avoid the development of arthritis. No theoretical study could have the same validity as a review of results after such a long period.

Critically considering the results of the Roux technique, we can observe that it certainly does help to correct recurrent dislocation. It produces better clinical and radio-

graphic results in cases with minor osteoarticular alteration, where it does not cause a low patella syndrome, which can be responsible for failure in the long term.

Our long-term results show that conservative treatment remains the first treatment option. When surgery is necessary, a selective realignment technique based on the severity of anatomical abnormalities is recommended.

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