

# Non-Anatomic Proximal Realignment for Recurrent Patellar Dislocation Does Not Sufficiently Prevent Redislocation

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**Abstract:** Several operative techniques have been described for recurrent patellar dislocation. Clinical results vary depending on the procedure and indication. The present study aimed to evaluate the clinical outcome of Insall's proximal realignment for recurrent patellar dislocation at mid-term follow-up. Forty-five patients were reviewed with a mean follow-up period of 49 months after having undergone Insall's procedure. Outcome measures included reports of redislocations, complications, patient-reported outcome scores (Kujala, Tegner activity scale) and subjective assessment. No statistically significant improvements ( $p < 0.05$ ) in patient-reported outcome measures were noted. Sixteen patients (35%) had poor to fair results using the Kujala score. Subjective assessment revealed that 12 patients (27%) were dissatisfied with the outcome of their surgery and would not undergo the same procedure. Ten patients (22%) had suffered from redislocation at the latest follow-up. In 4 cases (9%), intra-articular knee hematoma occurred which required arthroscopic intervention. The overall mid-term outcome of the present study shows low patient satisfaction. Non-anatomic realignment for recurrent patellar dislocation does not adequately prevent redislocation.

**Keywords:** Patellar instability, Insall, Proximal realignment, Redislocation.

## INTRODUCTION

Patellar dislocation is a common knee injury in young patients [1, 2]. Primary patellar dislocation can lead to recurrent dislocation. Maenpaa and Lehto [3] treated one hundred patients nonoperatively for primary acute patellar dislocation and found a redislocation rate of 44% with an average follow-up of 13 years. Adequate surgical treatment of patellar dislocation has thus been a focus for several decades [4]. In general, surgical approaches are divided into proximal and distal realignment or a combination. Several proximal and distal realignment techniques were popularized in the 1960's [5-7], but clinical results vary in terms of patient satisfaction [8]. An example of a proximal procedure is Insall's proximal realignment of the patella. Zeichen *et al.* [9] investigated the mid-term results of Insall's procedure for the treatment of recurrent patellar dislocation. Good clinical results were achieved with subjective satisfaction and successful prevention of redislocation. However, since the medial patellofemoral ligament (MPL) was recently recognized to be the primary soft tissue stabilizer against lateral patellar translation [10, 11], some surgeons consider Insall's proximal realignment to be non-anatomic, therefore limiting its use.

The aim of this study was to analyze mid-term clinical results of Insall's proximal realignment in patients with recurrent patellar dislocation, including its effectiveness, safety, and subjective satisfaction.

## MATERIALS AND METHODOLOGY

Between 2001 and 2007, 58 patients with recurrent patellar dislocation were treated with proximal realignment at our institution. The indication was patellofemoral instability after at least two documented lateral patellar dislocations. This study was approved by our institutional ethics committee (No. 143/09).

After a mean follow-up period of  $49 \pm 18$  (12-96) months, 45 patients (23 male and 22 female) with a mean age of  $26 \pm 6$  (17-45) years were clinically assessed. Thirteen patients were lost to follow-up (24%). The left knee was involved in 18 cases and the right in 27 cases. At latest follow-up a clinical examination and a patient interview was performed by a single orthopaedic surgeon. Physical examination included evaluation of range of motion, crepitation, painful patella palpation, and apprehension test [5]. Patients were questioned regarding number of redislocations, subsequent problems, whether they were satisfied with the procedure and if they would undergo the same surgery again. For clinical assessment, the Kujala Score [12] and the Tegner activity score [13] were used both preoperatively and at the final follow-up. Kujala's patellofemoral rating scale is a 13-item questionnaire comprising items about pain related to function and activities. The maximum score is 100 points and represents no problems; 95-100 points represents excellent results; 94-85, good; 65-84, fair; and less than 65, poor. The Tegner activity scale is a numerical scale ranking from 0 to 10 and representing specific activities. An activity level of 10 points corresponds to participation in competitive sports such as soccer, football and rugby at the elite level. An individual participating in the above-mentioned sports

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but at recreational level is awarded 6 points. Activity levels of 5-10 can be achieved only if patients participate in recreational or competitive sports. An activity level of 0 is recorded for patients on sick leave or disability pension because of knee problems.

Proximal realignment was performed as described by Insall *et al.* [14] and all surgery was performed by two surgeons (TE and MDS). After a straight midline skin incision was made centrally over the patella, the extensor mechanism was exposed. A medial parapatellar capsular incision from the upper edge of the vastus medialis in the quadriceps tendon, around the patella to the tibial tubercle was performed. Realignment of the patellar was performed by pulling the medial flap laterally and distally for at least 1 cm and securing it with sutures. The knee was extended and flexed; patellar movement and tracking in the femoral intercondylar sulcus were assessed. Realignment was considered sufficient when the patella tracked entirely within the intercondylar sulcus without lateral or medial tilt. Mean operative time was  $52.7 \pm 13.8$  (30-90) minutes. After surgery, the knee was placed in a knee immobilizer. The postoperative rehabilitation program consisted of partial loading with isometric and movement exercises up to 60° flexion for 4 weeks postoperatively. Patients were allowed to return to sporting activities at 3 months.

### Statistical Analysis

For statistical analysis, preoperative and postoperative values were compared using the Wilcoxon rank-sum test. A p-value of less than 0.05 was considered to be statistically significant. All values were given as means together with the appropriate standard deviation. Data were analyzed using SPSS software, version 14.0 (SPSS Inc., Chicago, IL, USA).

### RESULTS

The mean Kujala Score improved from  $81 \pm 17$  (32-100) points preoperatively to  $85 \pm 14$  (51-100) points ( $p = 0.26$ ). Sixteen knees (36%) had poor to fair function. No changes were observed between the preoperative and the postoperative ability to perform sports ( $5 \pm 2$  (2-8) vs  $5 \pm 2$  (2-8), respectively), according to the Tegner activity level ( $p = 0.49$ ). Based on subjective assessment, 12 patients (27%) were dissatisfied at mid-term follow-up and would not undergo the same procedure again due to persistent patellar complaints.

No major complications including infection, deep leg vein thrombosis or embolism were observed. In 4 cases (9%), intra-articular knee hematoma occurred which required arthroscopic intervention. At the latest follow-up all patients had full range of motion. Retropatellar crepitation was present in 15 (33%) cases, which did not compromise patient outcome. The apprehension sign result was positive in 8 cases (18%). Painful patellar palpation could be found in 7 cases (16%).

At follow-up examination, 10 patients (22%) had experienced redislocation. Five redislocations occurred during sporting activities and 5 occurred without trauma. In 2 cases a further operation was carried out and an MPL reconstruction was performed. The remaining 8 patients declined a subsequent operation.

### DISCUSSION

The most important finding was that the present study resulted in a 22% redislocation rate, thus the overall clinical outcome did not show significant improvement at mid term follow up.

Recurrent patellar dislocation often necessitates surgical treatment [4]. Over 100 techniques have been described to manage patellar dislocation including medialization of the tibial tubercle, as well as repair or reconstruction of the medial retinaculum and MPL [15-17]. The abundance of surgical techniques reflects the fact that an optimal procedure has not yet been found. Due to the multiple etiologies of patellar dislocation there is as yet no clear evidence regarding which procedure is superior [18]. In general, patellar realignment techniques are classified into bony surgical procedures, soft tissue approaches or a combination. Insall's proximal realignment aims to prevent dislocation by medialization and distalization of the femoral extensors proximal to the patella. Compared with other realignment techniques, Insall's procedure is less demanding and less invasive. In a prospective study, Chrisman *et al.*, [19] compared the results of bony realignment (Hauser procedure) with a soft tissue procedure (Roux-Goldthwait procedure) for the correction of recurrent dislocations of the patella. More satisfactory results were obtained using soft tissue techniques (93%) than bony procedures (72%).

There are few studies concerning the results of Insall's proximal realignment. Insall *et al.*, [20] reported the results of 48 knees following proximal realignment. The follow-up was between 6 months and 5 years without specification of the mean follow-up. The results were excellent or good in 94% of cases. In 28 patients the indication for intervention was pain. Abraham *et al.*, [21] reported 92% and 78% good-to-excellent results after a follow-up of 2 and 5-11 years, respectively. The indication for surgery was recurrent patella dislocation or chondromalacia of the patella. Scuderi *et al.*, [22] showed that 81% of patients had a very good or good result with a redislocation rate of 1.2% at an average follow-up of 3.5 years (range 2-9). Their indications for surgery were pain, effusion or recurrent patellar dislocation. Zeichen *et al.*, [9] investigated Insall's proximal realignment, and reported that 85% of patients demonstrated good-to-excellent results and 13% had satisfactory mid-term results. Only 1 patient suffered from a recurrence of patellar dislocation. In the present study 65% of the patients showed good-to-excellent results at mid-term follow up using the Kujala Score. No significant changes were noticed in the ability to perform sporting activities using the Tegner activity scale. Twenty-seven percent of the patients were dissatisfied and would not undergo the same procedure. The most frequent reason for subjective dissatisfaction was persistent instability and pain. There are obvious differences in the indication for Insall's proximal realignment technique. Applying this technique for pain or chondromalacia in addition to dislocation results in lower redislocation and higher satisfaction rates. The reduced rate of success found in the present study may largely be due to the fact that only patients with a history of recurrent patellar dislocation were included.

The current literature shows that posttraumatic patellar instability is found on average in between 15% and 50% of

patients [4]. In the present study, redislocation occurred in 27% of the patients. Patellar stability is maintained by several factors including active, passive and static stabilizers and as a result it was difficult to accurately isolate the reason for the redislocation rate in the present study. Nomura *et al.*, [23] concluded that incompetence of the MPL is a major factor in the etiology of recurrent patellar dislocation. Advocates of proximal reconstruction assume that the ruptured MPL becomes scarred, and may acquire additional tension distally and medially along with the soft tissue [24]. However, Sallay *et al.*, [2] reported that the ruptured MPL scars in a more superior and lateral position which will result in alteration of the force vector. In this case, tension on the medial soft tissue does not truly affect patellar medial placement [25]. Balcarek *et al.*, [26] investigated the distribution of MPL injury patterns. MPL injury occurred at the femoral attachment site in 50% of cases, in the midsubstance in 14% and the patellar site in 14%. Injury of the MPL on the femoral or patellar attachment side cannot be addressed by proximal reconstruction. In these cases a more specific approach would probably be more favorable than unspecific non-anatomic surgery. In the present study, all patients suffered recurrent patellar dislocation but unfortunately routine MRI at the first dislocation, which might have provided some information about the MPL, was not available in this patient group.

Ostermeier *et al.*, [27] were able to show in a biomechanical study that the combination of lateral release and medial imbrication results in a significantly medialized and internally tilted patellar movement compared to the intact knee. This may cause cartilage lesions especially on the medial patellar facet [28] resulting in pain and swelling. Sillanpää *et al.*, [29] reported in an MRI-based study that patellofemoral cartilage lesions are a significant complication of non-anatomic techniques for patellar stabilization and bias the subjective outcome.

Based on the findings of the present study, Insall's proximal realignment leads to low patient satisfaction for the treatment of recurrent patellar dislocation. At mid-term follow-up there was a redislocation rate of 22%. More anatomical techniques should be considered in cases of recurrent patellar dislocation to increase patient satisfaction and to prevent patellar redislocation.

The present study has several limitations. First, as we do not have a control group, we could only compare our results with those reported in the literature. Although there have been several studies on the surgical treatment of recurrent patellar dislocation, there is great variability in the results. Differences in patient outcome may be caused by wide heterogeneity among studies. Pooling results is a challenge, as described by White and Sherman [4] in a systematic review. Second, the present study represents mid-term results; long-term results are also needed to draw more firm conclusions. One strength of the present study is the homogeneity of the population; all were treated because of recurrent patellar dislocation. Furthermore, almost 80% of patients could be included at the latest follow-up, which is satisfactory when compared with other studies in this area [30, 31].

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## CONFLICTS OF INTEREST

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