Original article

Medial patellofemoral ligament reconstruction for patellar instability following total knee arthroplasty: A review of 6 cases

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ARTICLE INFO

Article history:
Received 22 May 2015
Accepted 15 March 2016

Keywords:
Total knee arthroplasty
Patellar instability
Patellar dislocation
Medial patellofemoral ligament reconstruction

ABSTRACT

Introduction: Patellar instability is a frequent cause of total knee arthroplasty (TKA) failure. In cases of post-arthroplasty patellar instability, the medial structures may be damaged. The objective of this study was to study the effectiveness of medial patellofemoral ligament (MPFL) reconstruction. We hypothesized that MPFL reconstruction will effectively realign the patella, making it a viable treatment option for managing post-arthroplasty patellar instability.

Material and methods: In this retrospective study of six patients treated by four different surgeons, patients were included if they had a recurring or permanent patellar dislocation after undergoing TKA. Patients were excluded if the patellar instability was painful but did not result in dislocation. Each patient underwent MPFL reconstruction using the gracilis; additional procedures could be performed depending on the diagnosis. One patient required TKA revision because of an abnormally rotated femoral implant. The main outcome measure was the non-recurrence of the dislocation. The IKDC and Kujala functional scores, joint range of motion and patellar tilt on X-rays were analyzed preoperatively and at the last follow-up.

Results: At a mean follow-up of 23 months (6–46), none of the patients experienced a recurrence of the patellar dislocation. Only one patient had no improvements in the functional outcome scores. The patellar tilt was reduced in all patients.

Conclusion: MPFL reconstruction—in isolation or with femoral component revision—is effective at treating post-arthroplasty patellar instability. It has its place in the treatment of patellar dislocation following TKA and its indications must be based on exact analysis of the reasons for the instability.

Level of evidence: IV – Retrospective cohort study.

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1. Introduction

Patellar instability is often the cause of total knee arthroplasty (TKA) failure [1,2]. The reason underlying this instability must be determined precisely before it can be treated: error in prosthetic implantation (abnormal internally rotated femoral and/or tibial component, poorly restored patellar offset; medialization of the femoral component or abnormal patellar resurfacing), alignment defect, excessively large tibial tuberosity to trochlear groove (TT-TG) distance, and/or patella alta [3,4]. After TKA, the medial patellar restraining structures may be damaged because of the use of a medial parapatellar approach or patellar dislocation; this can be the root cause, either alone or in combination with other factors, of recurring patellar dislocations.

Among the various surgical methods for treating frank patellar instability on an otherwise normal knee, medial patellofemoral ligament (MPFL) reconstruction is being used more often [5–9]. To our knowledge, few cases of this technique being used to realign the patella following TKA have been described [10–15].

The objective of this study was to evaluate the effectiveness of MPFL reconstruction in this context. We hypothesized that by effectively realigning the patella, MPFL reconstruction is effective at managing post-arthroplasty patellar instability.

2. Material and methods

2.1. Study population

Six patients (3 men, 3 women) with a mean age of 77 years (70–87) were included in this retrospective study of MPFL reconstruction cases carried out between September 2011 and September 2014 by four surgeons (Table 1).
The inclusion criterion was frank post-arthroplasty patellar instability (>2 episodes or permanent patellar dislocation) treated by MPFL reconstruction. All cases of post-arthroplasty patellar instability were treated surgically with this technique during the study period. Patients with painful instability but no dislocation were excluded from the study.

All the TKA procedures had been performed using the anterolateral approach. The patella had been resurfaced in four of the six patients.

Three patients had a permanent patellar dislocation (Fig. 1) and three had frank patellar instability. Five patients had varus alignment (less than 5°) following the TKA. The other patient had 4° valgus. One patient had a medial patella fracture that was fixed and had healed (Patient 3). The fixation hardware was removed during the MPFL procedure.

### 2.2. Clinical evaluation

The Kujala and subjective IKDC functional scores were calculated preoperatively and at the last follow-up. Clinical examination consisted of an assessment of the patella stability (Smillie test) and joint range of motion [16].

Patellar height (Caton–Deschamps index) and patellar tilt (Merchant angle, Laurin angle, Maldague classification) were determined preoperatively and at the last follow-up [17].

A CT scan was done preoperatively to look for abnormal internal rotation of the femoral component and/or pathological TT-GT distance (>20 mm). None of the patients had patella alta. The post-TKA CT scans showed that all patients had a TT-GT distance under 20 mm and that two patients had internally rotated femoral components. One of these two patients needed a complete TKA revision (patient 4) in addition to the MPFL reconstruction because of persistent intraoperative patellar instability. Since the other patient (patient 1) had a high anesthesia risk (ASA 3 with disabling heart failure), only the MPFL reconstruction was performed. The other four patients had an isolated MPFL reconstruction.

### 2.3. Surgical technique

The standardized technique involved performing MPFL reconstruction to the gracilis. The medial retinaculum was divided and then arthroscopy performed. Two anchors were used for fixation to the medial edge of the patella (Fig. 2). The femoral fixation point was based on the insertion of the native MPFL, hence 10 mm distal to the adductor tubercle and 10 mm behind the medial femoral epicondyle [18] (Fig. 3). To follow the favorable anisometry concept, the femoral tunnel was positioned anatomically and the tensionless graft was placed extra-articularly with the knee flexed 30° [9,18,19].

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Gender</th>
<th>Patellar dislocation</th>
<th>Alignment</th>
<th>ASA score</th>
<th>CD index</th>
<th>Femoral rotation,°</th>
<th>Associated procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient 1</td>
<td>81</td>
<td>Male</td>
<td>Permanent</td>
<td>3</td>
<td>3</td>
<td>0.38</td>
<td>−7</td>
<td>None</td>
</tr>
<tr>
<td>Patient 2</td>
<td>71</td>
<td>Female</td>
<td>&gt;2</td>
<td>4</td>
<td>2</td>
<td>0.76</td>
<td>1</td>
<td>None</td>
</tr>
<tr>
<td>Patient 3</td>
<td>87</td>
<td>Female</td>
<td>Permanent</td>
<td>−4</td>
<td>2</td>
<td>1.08</td>
<td>0</td>
<td>HR</td>
</tr>
<tr>
<td>Patient 4</td>
<td>80</td>
<td>Female</td>
<td>&gt;2</td>
<td>0.3</td>
<td>2</td>
<td>1</td>
<td>−8</td>
<td>TKA revision</td>
</tr>
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<td>Male</td>
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<td>5</td>
<td>1</td>
<td>0.92</td>
<td>−2</td>
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<td>75</td>
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<td>&gt;2</td>
<td>3</td>
<td>2</td>
<td>0.96</td>
<td>2</td>
<td>None</td>
</tr>
</tbody>
</table>


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Fig. 1. MPFL reconstruction provides effective patellar realignment after TKA in a patient with a permanent patellar dislocation (Patient 3).

Fig. 2. Patellar fixation.

Fig. 3. Drilling the femoral tunnel.
to avoid IT band syndrome over the medial condyle. Femoral fixation was accomplished with an interference screw (Fig. 4).

2.4. Statistical analysis

Because of the small sample size, only a descriptive analysis was carried out.

3. Results

3.1. Complications and failures

Patient 1 (isolated MPFL reconstruction without TKA revision despite 7° internal femoral rotation) fell in the early postoperative period leading to a large hematoma of the operated knee, although surgical revision was necessary. He had minimal clinical improvement and continued to experience pain with feelings of patellar instability, but not dislocation.

3.2. Clinical outcomes

None of the patients had a recurrence of the dislocation at the last follow-up. The functional scores (Kujala and subjective IKDC) improved in all patients except one (Patient 1, described above) (Table 2).

3.3. Radiological results

Patellar tilt was less in five of the six patients. Only Patient 1 had no change on the radiographs (Table 3).

4. Discussion

Given the absence of recurrence, the improvement in the functional scores and the radiological correction of patellar tilt, the results of our study demonstrate that MPFL reconstruction is effective for treating patellar instability after TKA. Our hypothesis is confirmed.

The limitations of our study are its small sample size and relatively short follow-up. In addition, no statistical analysis was performed. However, this is a rare condition, as evidenced by the small number of cases described in published studies, and our results confirm the benefits of using this technique.

Although this procedure is beneficial when performed by itself, it is important to carry out a full diagnostic work-up using CT. Any abnormally rotated prosthesis may require that the femoral component be changed. In our study, only one failure (Patient 1) occurred in a confirmed case of excessive femoral rotation that was not corrected. Isolated MPFL reconstruction helped to prevent recurrent dislocations but this patient continued to have discomfort and had little improvement in the functional scores and radiological assessments. MPFL reconstruction should not be performed by itself if one of the implant components is abnormally rotated.

Our findings are consistent with published ones. Asada et al. [13] were the first to describe a case of MPFL reconstruction for patellar dislocation after TKA. Goto et al. also published one case [12]. Both of these cases had good results (at 2 years and 1 year follow-up, respectively) and highlight the importance of the preoperative CT assessment of TKA implant positioning.

Gennip et al. [15] described nine cases of patellar dislocation or subluxation following TKA. Seven of those nine patients underwent preoperative CT scan to determine the implant positioning and TT-TG distance. Only one patient was not satisfied because of persistent subluxations. Radiological improvement was found in all of their patients. The findings of the Gennip study are consistent with ours.

All patients were operated using an anteromedial approach. In one patient (Patient 2), early release of the sutures after the index procedure was suspected because of very early instability. MPFL reconstruction is particularly useful in situations where the surgery

![Fig. 4. Femoral fixation and graft positioning.](image)

Table 2
Preoperative and postoperative functional scores.

<table>
<thead>
<tr>
<th>Dislocation recurrence</th>
<th>Subjective instability</th>
<th>Kujala score</th>
<th>Calculated IKDC score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Preoperative</td>
<td>Postoperative</td>
</tr>
<tr>
<td>Patient 1</td>
<td>No</td>
<td>Yes</td>
<td>28</td>
</tr>
<tr>
<td>Patient 2</td>
<td>No</td>
<td>No</td>
<td>11</td>
</tr>
<tr>
<td>Patient 3</td>
<td>No</td>
<td>No</td>
<td>12</td>
</tr>
<tr>
<td>Patient 4</td>
<td>No</td>
<td>No</td>
<td>51</td>
</tr>
<tr>
<td>Patient 5</td>
<td>No</td>
<td>No</td>
<td>14</td>
</tr>
<tr>
<td>Patient 6</td>
<td>No</td>
<td>No</td>
<td>37</td>
</tr>
</tbody>
</table>

Table 3
Radiological assessment of patellar tilt.

<table>
<thead>
<tr>
<th>Merchant angle</th>
<th>Laurin angle</th>
<th>Maldaughe classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>Postoperative</td>
<td>Preoperative</td>
</tr>
<tr>
<td>Patient 1</td>
<td>50</td>
<td>38</td>
</tr>
<tr>
<td>Patient 2</td>
<td>35</td>
<td>11</td>
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<tr>
<td>Patient 3</td>
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<td>8</td>
</tr>
<tr>
<td>Patient 4</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Patient 5</td>
<td>54</td>
<td>7</td>
</tr>
<tr>
<td>Patient 6</td>
<td>15</td>
<td>8</td>
</tr>
</tbody>
</table>
itself induced a risk of damage and poor healing of the medial knee restraints. Preoperative conditions also impact the risk of patellar dislocation. In fact, valgus knee alignment before the procedure leads to retraction of the lateral knee structures and an increase in the Q angle. As a consequence, the patient is more at risk. A combination of TKA with MPFL reconstruction can be considered (prosthesis revision).

5. Conclusion

MPFL reconstruction is effective at treating post-arthroplasty patellar instability. It has a role in treating patellar dislocation after TKA after a comprehensive diagnostic work-up has been done. It can be proposed either alone or in combination with other procedures, particularly prosthesis revision if one of the implants is excessively rotated.

Disclosure of interest

The authors declare that they have no competing interest.

References