Deterioration of long-term clinical results after the Elmslie-Trillat procedure for dislocation of the patella

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We examined 39 patients (45 knees) who had undergone an Elmslie-Trillat procedure for recurrent or habitual dislocation of the patella with a follow-up of more than ten years. The mean age at the time of surgery was 18.4 years; the mean follow-up was 161 months (120 to 238). Using Fulkerson's functional knee score, 41 knees (91%) had an excellent or good result at a mean follow-up of 45 months, and this was maintained in 29 (64%) at the final review.

The main cause of deterioration in the clinical results was the onset or worsening of patellofemoral joint pain, not patellar instability.

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Many surgical techniques have been described for the treatment of patellofemoral instability.\(^1\)\(^-\)\(^4\) The Elmslie-Trillat procedure\(^4\) involves a lateral soft-tissue release, medial reefing and medial displacement of the tibial tubercle without distal displacement. Several reports described good clinical results for instability with a low incidence of patellofemoral degenerative change, but the long-term results have not been evaluated. We have therefore assessed the long-term results and outlined factors which may affect the outcome.

Patients and Methods

Between 1980 and 1989 we carried out the Elmslie-Trillat procedure on 58 knees (50 patients) for recurrent or habitual dislocation of the patella. Of these, we studied 45 knees in 39 patients (eight men, 31 women) in whom the clinical outcome was assessed in 1990 and again in 1999 or 2000. There were 39 with recurrent dislocation and six in whom it was habitual; all in women. The mean age of the patients at the time of surgery was 18.4 years (13 to 30). In 1990, the mean follow-up had been 45 months (12 to 118), and at the final review it was 161 months (120 to 238).

All operations were undertaken by the senior author (HM). The tibial tubercle was osteotomised, rotated medially and secured by one or two cancellous bone screws. The lateral aponeurosis was released and the medial side reefed. The distance of medial displacement of the tibial tubercle (1 to 1.5 cm) and the degree of release and reefing were determined by the stability of the patella. If severe patellar cartilage degeneration was found at the time of surgery, shaving of the facet was undertaken. Early mobilisation was allowed within a week of surgery using a continuous passive movement machine.

At each assessment we recorded subjective (pain, instability, quadriceps wasting and redislocation) and objective findings (range of movement, crepitus of the patellofemoral joint, tenderness of the patella and tibiofemoral joint line, quadriceps atrophy, apprehension sign) and the pre- and postoperative Q angle was measured. The incidence of generalised joint laxity was assessed using the criteria of Carter and Wilkinson.\(^5\) Fulkerson’s functional knee scores were used to assess objective knee function.\(^6\) This scoring system, which gives 45 of the 100 points for pain, was designed for patellofemoral disorders. Scores of 95 and above are considered to be excellent, 90 to 94 very good, 80 to 89 good, 70 to 79 fair and less than 70, poor.

Radiographs taken before and after surgery in anteroposterior (AP), lateral and tangential projections, were used to determine the Insall index of patellar height, the patellar facet angle and the sulcus angle as indicative of the shape of the patella and the femoral groove, respectively, and the congruence angle and tilting angle as an index of subluxation. In 31 knees, radiological changes of osteoarthritis at the final evaluation were compared with the preoperative findings using the classification system of Kellgren and Lawrence.\(^7\) This assessment was incomplete because initial radiographs had been lost from the records of six patients.
and radiography was refused by eight patients at the final evaluation.

Results

Table I gives the subjective and objective findings before surgery, in 1990 and at the final evaluation (1999 or 2000).

In regard to subjective findings, the number of knees with a sensation of instability did not increase significantly with the passage of time. Patellofemoral joint pain, however, appeared or worsened with time in half of the knees. In five knees there was mild pain in the medial compartment. With regard to objective findings, there was no increase in the incidence of the apprehension sign, and postoperative limitation in the range of movement resolved quickly and did not recur. Tenderness and crepitus around the patella were seen frequently and for a long time after the initial procedure (48.7% and 64.1%, respectively). Quadriceps atrophy resolved in most knees, but recurred in others when pain developed.

Further redislocation occurred in six knees of which four were isolated episodes but two became recurrent or habitual. These two patients had generalised joint laxity with habitual dislocation before surgery. In patients who underwent reoperation, arthroscopic procedures including shaving for severe cartilage degeneration and removal of loose bodies were carried out in five knees at intervals of two, seven, eight, 14 and 19 years after the initial surgery.

In 1990, the mean Fulkerson score was 89.1 points which was improved from the preoperative value of 65.7 points and at the final evaluation, it was 85.2 points. In seven knees the Fulkerson score improved as the strength of the musculature returned. In 12 knees, however, the development or increase of pain reduced the functional grade from excellent or good, to fair.

The 45 knees were divided into two groups according to the long-term outcome; excellent or good (29) or fair or poor (16). The mean age at the time of surgery, for those patients with good results, was 17.6 years and for those with poor results, 19.7 years. The mean length of time between the first dislocation and surgery for those with a good result was 37.4 months and for those with a poor result 71.8 months. There was no significant difference in the mean preoperative Q angle between the two groups, 20.3° and 21.0°, respectively. The mean postoperative Q angle for the group with a good result was 3.8°, and those with a poor result, 8.2°. Although the difference does not reach statistical significance it was smaller for the group with a good result and this may affect the outcome. No significant differences were observed in the Insall index, patellar facet angle or sulcus angle between the two groups, in the 39 knees which were assessed radiologically. The mean sulcus angle for the six knees which had further dislocation was higher than that for the remainder (156.7° and 146.5°, respectively), which suggests that trochlear dysplasia affects the clinical results. The congruence angle and tilting angle in the group with a good result were closer to normal, compared with those with a poor result, but the difference did not reach statistical significance.

In 31 knees, the radiological osteoarthritic changes which were seen at the final evaluation were compared with the preoperative findings. Of 27 knees with grade-0 changes at the time of surgery, only seven had no osteoarthritic changes at the final evaluation. Eleven had grade-I changes, eight grade-II and five grade-III changes. Thus, in 13 knees (42%), there were changes of grade II or worse. Many of these patients with radiological changes had patellofemoral pain and poorer clinical results.

The interval of time before operation was an important factor which may have affected the clinical outcome. The long-term results were favourable in the 14 knees in which the length of time between the first dislocation and surgery was less than a year, whereas the results in the remaining 31 knees deteriorated with time. The mean Fulkerson score for those with a short duration (less than a year) was 91.8 in 1990 and 90.9 in 1999 or 2000, while for those with a long duration (more than a year) it was 88.3 in 1990 and 83.1 in 1999 or 2000 (Wilcoxon signed-rank test, p = 0.05). These

Table I. Subjective (45 knees) and objective findings (39 knees) before the Elmslie-Trillat procedure for patellar dislocation and at means of 45 and 161 months after surgery

<table>
<thead>
<tr>
<th>Number of knees (%)</th>
<th>Before surgery</th>
<th>At 45 months</th>
<th>At 161 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective findings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patellofemoral joint</td>
<td>29 (64.4)</td>
<td>10 (22.2)</td>
<td>23 (51.1)</td>
</tr>
<tr>
<td>Tibiofemoral joint line</td>
<td>0</td>
<td>1 (2.2)</td>
<td>5 (11.1)</td>
</tr>
<tr>
<td>Instability</td>
<td>43 (95.6)</td>
<td>7 (15.6)</td>
<td>8 (17.8)</td>
</tr>
<tr>
<td>Quadriceps wasting</td>
<td>15 (33.3)</td>
<td>17 (37.8)</td>
<td>19 (42.2)</td>
</tr>
<tr>
<td>Objective findings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenderness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patellofemoral joint</td>
<td>16 (41.0)</td>
<td>9 (23.1)</td>
<td>19 (48.7)</td>
</tr>
<tr>
<td>Tibiofemoral joint line</td>
<td>0</td>
<td>1 (2.6)</td>
<td>6 (15.4)</td>
</tr>
<tr>
<td>Crepitus</td>
<td>10 (25.9)</td>
<td>14 (35.9)</td>
<td>25 (64.1)</td>
</tr>
<tr>
<td>Apprehension</td>
<td>39 (100.0)</td>
<td>15 (38.5)</td>
<td>15 (38.5)</td>
</tr>
<tr>
<td>Quadriceps atrophy</td>
<td>15 (38.5)</td>
<td>17 (43.6)</td>
<td>16 (41.0)</td>
</tr>
<tr>
<td>Limited movement</td>
<td>4 (10.3)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
results suggest that articular damage resulting from recurring dislocations could affect the clinical outcome.

Discussion

Since Hauser introduced a technique in 1938 in which the tibial tubercle is moved distally and medially, it has been the standard procedure in the treatment of recurrent and habitual dislocation of the patella. However, osteoarthritic changes in the patellofemoral joint after this procedure have been reported. Hampson and Hill and Crosby and Insall reported an incidence of patellofemoral osteoarthritic changes after the Hauser procedure of about 70%. These were thought to be caused by an increase in the pressure across the patellofemoral joint secondary to tightness in the transposed tendon.

In the Elmslie-Trillat procedure, which was introduced by Trillat, Dejour and Couette in 1964, the tibial tuberosity is moved only in the medial direction. It has been reported that this is less likely to cause osteoarthritic changes in the patellofemoral joint, and the clinical outcome has been excellent or good in more than 80% of knees. The mean follow-up period of these studies was not more than five years. Naranja et al followed patients for a mean of 74.2 months and reported an excellent or good outcome in 53% of knees. In our study, the clinical outcome was excellent or good in 64% of patients followed for more than ten years after surgery.

Naranja et al suggested that good results after the Elmslie-Trillat procedure were related to young age and the absence of pain or osteoarthritic changes at the time of surgery. Our results at follow-up of 45 and 161 months, showed that the onset of pain in the patellofemoral joint was the most important factor influencing the long-term results. Better long-term results were related to shorter intervals between the first dislocation and surgery.

Radiographs showing a) the preoperative tangential and b) AP views of a 19-year-old woman with recurrent dislocation of the patella. There was no evidence of osteoarthritis. Radiographs taken 15 years after surgery in c) tangential and d) AP projections show the formation of osteophytes and narrowing of the patellofemoral joint space. The knee was classified as grade II according to Kellgren and Lawrence.
We found a few knees with recurrent instability. There was further dislocation in six knees, which became recurrent or habitual in only two, both of which had habitual dislocation with generalised joint laxity preoperatively. These findings confirm the difficulty of stabilising the patella when habitual dislocation is accompanied by a severe abnormality of bone morphology or congruency or when there is generalised joint laxity.

In our study, definite osteoarthritic changes were detected on radiographs in 13 of 31 knees (42%) (Fig. 1). Arnbjörnsson et al.\textsuperscript{14} evaluated the long-term results of the management of recurrent patellar dislocation in patients with bilateral disease, comparing surgical treatment on one side with non-operative treatment on the other. They reported that the incidence of osteoarthritis in knees which were treated surgically was significantly higher, indicating that the operation itself may be a predisposing factor for osteoarthritis, confirming earlier reports.\textsuperscript{2,3,15} Our study suggests that the Elmslie-Trillat operation will prevent recurring dislocation, but may not influence the development of long-term arthritic changes. It seems to be important that treatment should be carried out early, before significant osteochondral damage has occurred.

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References