Patellar Tendon Repair: Postoperative Treatment

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Objective: To compare results of patellar tendon repair after early and delayed postoperative mobilization.

Design: Two separate treatment groups, comparing 2 treatment alternatives at different time periods (before-after trial).

Participants: Postoperative rehabilitation of 10 men who underwent patellar tendon repair.

Intervention: Delayed mobilization group: weight-bearing in a cast and isometric lower-extremity exercises for 6 weeks; active flexion and extension exercises thereafter. Early mobilization group: weight-bearing in an extension brace, isometric lower-extremity exercises, prone active knee flexion, and passive knee extension for 6 weeks; active flexion and extension exercises thereafter. Sixteen-month minimum follow-up.

Results: Clinical (physical) findings were: 2 excellent, 1 good, 2 fair in the delayed-mobilization group; 1 excellent, 3 good, 1 fair in early-mobilization group. Functional (pain and activity level) findings were: 2 good, 2 fair, 1 poor in the delayed-mobilization group; 3 good, 1 fair, 1 poor in the early-mobilization group.

Conclusions: Clinical and functional results were similar for both treatment groups. Further study is required to determine any significant long-term differences between rehabilitation methods.

Key Words: Patellar tendon; Rupture; Surgery; Immobilization; Rehabilitation; Range of motion, articular.

This is a US government work. There are no restrictions on its use.

Isolated ruptures of the patellar tendon are rare injuries. Surgical repair is necessary to reestablish extensor function.1,2 Siweck and Rao3 published the first large series on primary repairs in 1981, grading results based on range of motion (ROM) and quadriceps strength in comparison with the uninjured knee. Using this scale, various authors have achieved 70% to 96% good and excellent results for primary repairs.4-6 Kelly and colleagues7 developed a more comprehensive evaluative scale, assessing clinical results based on physical examination, functional results based on pain and activity level, and strength using Cybex testing. Eight of 10 patients in this study achieved good or excellent functional and clinical results, but 5 of 9 patients exhibited fair or poor strength. Kuechle and Stuart8 reported on 6 athletes, all achieving good or excellent functional, clinical, and strength results.

Currently, no established standard exists on the optimal method of postoperative rehabilitation and the initiation of ROM therapy. Both early1,2,9 and delayed4-8 motion have been recommended, with successful results reported with each method. No study has directly compared immobilization with early motion following the same surgical technique. The purpose of this before-after trial is to compare the results of patellar tendon repair in a small sample of patients after early and delayed postoperative mobilization.

METHODS

Subjects

From February 1994 to October 1995, 10 consecutive patients (ages 22 to 40yrs; mean, 32yrs) underwent primary repair of a ruptured patellar tendon. All injuries were traumatic in origin, occurring while each patient was playing basketball. No patient had a history of steroid use, systemic disease, or history of preinjury inferior knee pain. All patients were men and active-duty members of a military service.

The procedures followed were in accordance with the standards of the institutional review board of our facility. All patients were surgically treated within 24 hours of presentation to our facility and within 3 weeks of injury (range, 0 to 21 days). Several orthopedic surgeons at our facility performed the repairs. Surgical repair consisted of nonabsorbable sutures woven proximally through the patellar tendon from its distal insertion, reattachment to the patella through drill holes, and reinforcement with a nonabsorbable cerclage.2,3,8

Rehabilitation Protocols

Because of a change in postoperative rehabilitation protocol at our institution, before 1995 a cylinder cast was applied postoperatively for 6 weeks before initiating motion, but since 1995 early motion has been initiated within 2 weeks of surgery. Patients were instructed by a physical therapist on how to perform their exercises during hospitalization and were not discharged from the hospital until proper understanding and technique were demonstrated. Patients were prescribed exercises to be performed for 20 to 30 minutes twice daily at home, with regular follow-up with a therapist three times a week once knee motion was begun (at 6 weeks in the delayed-mobilization group and on discharge in the early-mobilization group). Formal therapy was continued for 3 months after surgery for all patients.

The 5 patients in the delayed-mobilization group were placed in a cylinder cast in extension, and allowed weight-bearing as tolerated with standing and isometric hip exercises (eg, abduction, adduction, and extension), and ankle plantarflexion and dorsiflexion for 6 weeks. The cast was then removed, and progressive, resistive active knee flexion and extension exercises were initiated under the supervision of a therapist thereafter.

The 5 patients in the early-mobilization group were allowed weight-bearing as tolerated in an adjustable drop-lock brace4 locked in extension; isometric lower extremity exercises (quadriceps, gluteals, plantarflexors, dorsiflexors, hamstrings); prone active flexion to a maximum 90° and passive extension, including continuous-passive-motion machine; and standing hip abduction, adduction, and extension for the first 6 weeks. The brace was then discontinued, and progressive, resistive
Table 1: Classification of Clinical and Functional Results

<table>
<thead>
<tr>
<th>Result</th>
<th>Clinical</th>
<th>Functional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Atrophy &lt; 0.5 cm or more</td>
<td>No pain</td>
</tr>
<tr>
<td></td>
<td>No patellar compressive distal or</td>
<td>Full return to pre-injury level of</td>
</tr>
<tr>
<td></td>
<td>proximal pole tenderness or</td>
<td>activity</td>
</tr>
<tr>
<td></td>
<td>&lt; 5° loss of flexion</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>Atrophy 0.5-1.5 cm or more</td>
<td>Mild to moderate pain but full return</td>
</tr>
<tr>
<td></td>
<td>or severe patellar compressive</td>
<td>to pre-injury level of activity</td>
</tr>
<tr>
<td></td>
<td>distal or proximal pole</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tenderness or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5°-10° loss of flexion</td>
<td>Moderate pain or</td>
</tr>
<tr>
<td>Fair</td>
<td>Atrophy 1.5-3 cm or more</td>
<td>Minimal decrease in activity</td>
</tr>
<tr>
<td></td>
<td>or severe patellar compressive</td>
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<td></td>
<td>distal or proximal pole</td>
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<tr>
<td></td>
<td>tenderness or</td>
<td></td>
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<tr>
<td></td>
<td>10°-15° loss of flexion</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>Atrophy &gt; 3 cm or more</td>
<td>Severe pain or</td>
</tr>
<tr>
<td></td>
<td>or severe patellar compressive</td>
<td>Significant decrease in or no return to</td>
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<tr>
<td></td>
<td>distal or proximal pole</td>
<td>pre-injury activity level</td>
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<tr>
<td></td>
<td>tenderness or</td>
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<tr>
<td></td>
<td>&gt; 15° loss of flexion</td>
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</tbody>
</table>

Data from Kelly and colleagues.7

active flexion and extension exercises were initiated under the supervision of a therapist thereafter.

Evaluation

Evaluation at latest follow-up (mean, 16 months postoperatively; range, 12 to 29 mo) consisted of an interview, a questionnaire regarding symptoms and functional activities,7 and a physical examination performed by one of the authors (LLL). Circumferential thigh girth was measured bilaterally at 10 cm proximal to the tibial tuberosity in extension.4,7 Total active flexion-extension ROM was measured with a goniometer relative to the contralateral knee.4,7 Clinical and functional results were determined as excellent, good, fair, or poor as based on the criteria of Kelly and colleagues7 (table 1). Physical examination findings were used to determine clinical results. Subjective reporting of pain and level of activity regained were assessed to determine functional results.

RESULTS

Symptoms and Physical Findings

At the most recent follow-up (minimum, 12 mo), in the delayed-mobilization group 2 patients had returned to their full level of activity with mild pain, while 3 patients had some decrease in activity and/or moderate pain. In the early-mobilization group 3 patients had returned to their full level of activity with mild pain, while 2 patients had some decrease in activity and/or moderate pain. Thigh atrophy of at least 1.5 cm was present in 2 patients in each group. No patient exhibited an active flexion or extension deficit of £ 5° compared with the opposite knee.

Clinical and Functional Results

Using the criteria developed by Kelly and colleagues,7 clinical results were: 2 excellent, 1 good, and 2 fair in the delayed-mobilization group; and 1 excellent, 3 good, and 1 fair in the early-mobilization group. Functional results were: 2 good, 2 fair, and 1 poor in the delayed group; and 3 good, 1 fair, and 1 poor in the early-mobilization group. Clinical and functional results were examined with relation to age and timing of surgery and follow-up. With the numbers available, no statistically significant trends or correlations were apparent.

DISCUSSION

Previous reports on patellar tendon repairs have varied on their methods of evaluation, reporting results using the criteria of Siweck and Rao,4,6 the criteria of Kelly,7,8 using knee scores established for other knee conditions,1,3 or using clinical findings only.9,10 Siweck and Rao4 first established a graded scale based primarily on physical findings of ROM and strength.8 Of note, quadriceps atrophy was omitted as an evaluative criterion, because its presence existed in patients with adequate strength and normal function. Kelly and colleagues7 established a more comprehensive method of assessment, using separate criteria for clinical, functional, and strength results.7 Physical findings were quantified to determine clinical results. Function was graded based on pain and activity level. Strength was measured isokinetically. In their original report of 9 patellar tendon ruptures, regained strength was not predictive of clinical and functional results.

Authors who have initiated early ROM report that more than 80% of their patients have regained full knee motion compared with the uninjured knee.1,2,9 Similarly, those authors who have used initial immobilization for several weeks have reported 70% to 96% excellent or good results based on either the Siweck and Rao criteria.4,8 Levy and associates2 noted that adequate reinforcement of the repair with a Dacron graft obviated the need for postoperative immobilization. Lindy and coworkers9 made similar recommendations following successful end-to-end suture repair of the tendon reinforced with Mersilene tape in 24 patients. No study has directly compared immobilization with early motion after the same surgical technique.

The short-term results of our study are noteworthy. A comparison between postoperative immobilization and early motion is presented in this study. Based on these results, long-term immobilization may not confer an advantage over early ROM with regard to clinical and functional results. The results are to be interpreted with caution, however, because further larger studies are required before concluding that a difference in outcome truly exists between delayed- and early-mobilization treatment groups. With the small sample analyzed in this study, significant statistical analysis was not possible. As a result of these preliminary findings, some of our attending surgeons have initiated a new postoperative protocol, beginning early passive ROM postoperatively in acute, isolated injuries with uncomplicated repairs. Active strengthening is then initiated at 6 weeks postoperatively. With complex injuries, delayed repairs, or unreliable patients, long-term immobilization still precedes the initiation of motion therapy.

CONCLUSIONS

The current study sought to examine any apparent differences in results of postsurgical patients receiving either delayed- or early-mobilization exercises after patellar tendon repair. In our sample of young healthy men, clinical and functional results were similar for both treatment groups at a minimum of 16...
months follow-up. Further study is required to determine whether one form of rehabilitation results in a significant difference in long-term outcome.

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References

Supplier
a. Cybex, Division of Lumex, Ronkonkoma, NY.