Function and ultrasonographic outcomes after surgical fibular tendon stabilisation by isolated re-tensioning of the superior fibular retinaculum

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ABSTRACT

Background: Fibular tendon dislocation is a rare and usually sports-related injury. We report the functional and ultrasonographic outcomes of a simple technique for re-tensioning the superior fibular retinaculum.

Hypothesis: Our retinaculum re-tensioning technique is not followed by recurrent fibular tendon dislocation, as demonstrated by ultrasonography.

Material and method: This single-centre single-surgeon retrospective study included 17 patients who underwent surgery to treat fibular tendon dislocation between January 2008 and December 2013. The functional outcome at last follow-up was assessed based on the AOFAS score. Subjective patient satisfaction and return to sports were recorded. Dynamic comparative ultrasonography was performed at last follow-up and the results used to separate the patients into four categories: normal, recurrent dislocation, subluxation, and residual tendinopathy.

Results: The 17 patients had a mean age of 32.6 ± 9.7 years (range, 18–52 years) and a mean pre-operative AOFAS score of 59.9 ± 11.3 (range, 34–71). Mean follow-up was 36.9 ± 16.9 months (range, 12–60 months). The mean AOFAS score at last follow-up was 89 ± 9.0 (range, 68–100). Of the 17 patients, 7 (41%) returned to the same level of sports. The remaining 10 patients returned to a lower level or did not return to sports, usually (70%) for personal or work-related reasons. Follow-up ultrasonography was normal in 12 (71%) patients. Of the remaining 5 patients, 2 had clinically silent recurrent dislocation and 3 had residual tendinopathy, including 1 who was only moderately satisfied due to persistent pain. Of the 4 patients who reported pain due to the knots in the non-absorbable sutures used to tighten the retinaculum, 1 required removal of the sutures. No other complications were recorded. Finally, 16 (94%) patients were satisfied or very satisfied.

Discussion: Retinaculum re-tensioning is effective in stabilising the fibular tendons, with no true recurrences. Ultrasonography can detect clinically silent subluxation. This simple and reproducible technique is associated with a very low complication rate and with excellent functional and anatomical outcomes.

Level of evidence: Retrospective, level IV.

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1. Introduction

Fibular tendon dislocation is a rare injury that accounts for fewer than 1% of all ankle injuries. Most cases are sports-related [1]. The mechanism involves forced dorsi-flexion combined with powerful contraction of the fibular muscles and eversion of the foot [2]. The limited specificity of the acute clinical manifestations results in under-diagnosis [2]. Consequently, patients with ankle pain should be re-evaluated after the application of RICE or equivalent guidelines [3]. The diagnosis rests on the physical findings, of which the most important is reproduction of the dislocation during the Sobel manoeuvre [4], and on imaging studies, most notably ultrasonography [5].

Non-operative treatment rarely provides satisfactory functional outcomes [6] and should be reserved for patients with contra-indications to surgery, which remains the treatment of reference.

The many reported surgical techniques consistently involve re-tensioning the retinaculum [6] and sealing the detachment zone.
The best surgical method is not universally agreed on, although soft-tissue procedures are preferred [6]. The main goal of surgery is stabilisation of the fibular tendons. However, to our knowledge, no studies have used follow-up dynamic ultrasonography to assess the outcome of retinaculum re-tensioning. We use isolated re-tensioning of the superior fibular retinaculum by trans-osseous sutures [7,8].

The objective of this study was to evaluate the outcomes of this surgical technique as assessed by a functional score and dynamic ultrasonography. The main hypothesis was the absence of recurrence after surgery, confirmed by follow-up ultrasonography.

2. Material and method

2.1. Inclusion and exclusion criteria

Consecutive patients treated surgically for chronic fibular tendon dislocation at a single centre between January 2008 and December 2013 were included in a retrospective Level IV study. In all patients, before surgery, the diagnosis was confirmed by ultrasonography and the absence of trauma-related bone lesions established by standard radiographs of the ankle.

Exclusion criteria were ligament instability, a concomitant fracture, and/or a posterior retinacular tear.

2.2. Patients

Of the 19 included patients, 2 failed to respond to repeated telephone calls, leaving 17 patients for the study, 9 males and 8 females. Mean age was 32.6 ± 9.7 years (range, 18–52 years) and mean time to diagnosis was 14.2 ± 25.8 months (range, 1–96 months). Figs. 1 and 2 report the sports engaged in and levels of practice before surgery. The mean pre-operative American Orthopaedic Foot & Ankle Society (AOFAS) score was 59.9 ± 11.3 (range, 34–71). Routine pre-operative ultrasonography showed tendon splits in 4 patients.

2.3. Operative technique [7,8]

All patients were treated by a single senior surgeon (FK) who was highly experienced in ankle tendon and ligament surgery. The patient was supine with a tourniquet at the root of the lower limb. General or regional anaesthesia was used. An incision centred on the lateral malleolus was started 4 cm proximal to the tip of the malleolus, brought down towards the tip and, finally, curved gently in the anterior direction. The area was explored to confirm the diagnosis and to look for anatomical factors known to facilitate tendon dislocation such as an unusually distal myotendinous junction requiring muscle resection (9 patients, including 2 with a convex lateral malleolus), a longitudinal fibular tendon split requiring combing and suturing (2 patients), or a supernumerary tendon requiring excision (0 patients). No procedures on the bone were performed, even in the patients with a convex lateral malleolus. The retinaculum was opened over the posterior aspect of the fibula and the lateral aspect of the lateral malleolus was then freshened, taking care to preserve the fibro-cartilaginous portion of the retinaculum. Three tunnels were drilled in the lateral malleolus, in the anterior-to-posterior direction. The retinaculum was then re-reefed using a double-U technique to seal the pre-malleolar detachment while leaving a gliding space for the tendons. A drain was inserted at the end of the procedure (Figs. 3–5).

The foot and ankle were immobilised in a resin boot and prophylactic anticoagulation was given. Weight-bearing was eliminated for 6 weeks. Proprioception exercises were started during the third month.
2.4. Method

Function before surgery and at last follow-up was compared by determining the AOFAS score [9]. Return to sports with the type of sport and level of practice at last follow-up was recorded, as well as reasons for not returning to sports or for switching to a different sport. At last follow-up, the subjective level of patient satisfaction was evaluated using four categories: very satisfied, satisfied, somewhat satisfied, and dissatisfied. Finally, a visual analogue scale (VAS) for pain at rest, while walking, and during sports was completed.

In all patients, dynamic ultrasonography was performed at last follow-up by a radiologist trained in osteo-articular ultrasonography. Based on the findings, the patients were classified into four categories: normal, residual fibular tendinopathy, subluxation, and recurrent dislocation.

The data analysis was performed independently from the surgeon who treated the study patients. Shapiro’s test was applied to determine whether the study variables were normally distributed. For continuous variables, comparisons of values before surgery and at last follow-up relied on Student’s test if distribution was normal and on the Mann–Whitney test otherwise. Categorical variable values were compared using the chi-square test. Values of \( P \leq 0.05 \) were taken as evidence of significant differences.

![Fig. 4. After opening of the retinaculum, exposure of the detached portion of retinaculum and passage of the sutures through the malleolus.](image)

3. Results

Mean follow-up was 36.9 ± 16.9 months (range, 12–60).

3.1. Complications

Residual pain due to the knots in the sutures used to reef the retinaculum occurred in 4 patients. Among them, 1 required knot removal under local anaesthesia. No other complications were recorded in this study.

3.2. Subjective patient satisfaction and functional outcome

The assessment of subjective patient satisfaction at last follow-up showed no dissatisfied patients and a single somewhat satisfied patient. Of the remaining 16 patients, 7 were satisfied and 9 very satisfied.

At last follow-up, the mean AOFAS score was 89 ± 9 (range, 68–100) \( (P < 0.0001) \). No patients reported pain. The mean VAS pain scores were 0.94 ± 1.5 (range, 0–5) while walking and 1.8 ± 2 (range, 0–8) during sports.

Figs. 1 and 2 report the data on return to sports. At last follow-up, 7 (41%) patients had returned to the same level of the same sport. Of the remaining 10 patients, 7 had returned to the same sport at a lower level and 3 had changed to another sport, because of pain \( (n = 2) \), apprehension \( (n = 1) \), or personal or work-related reasons \( (n = 7) \). No patients reported instability or weakness.

3.3. Ultrasonography findings (Table 1)

At last follow-up, dynamic ultrasonography showed tendinopathy in 3 patients and asymptomatic residual subluxation in 2 patients. In the remaining 12 (71%) patients, the results were normal comparatively to the contra-lateral ankle. Neither of the patients with asymptomatic subluxation had a convex lateral malleolus.

![Fig. 5. View after closure of the retinaculum.](image)

<table>
<thead>
<tr>
<th>Patient</th>
<th>Before surgery</th>
<th>At last follow-up</th>
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<tbody>
<tr>
<td>1</td>
<td>Dislocation</td>
<td>Stable</td>
</tr>
<tr>
<td>2</td>
<td>Dislocation</td>
<td>Stable + tendinopathy</td>
</tr>
<tr>
<td>3</td>
<td>Dislocation</td>
<td>Stable + tendinopathy</td>
</tr>
<tr>
<td>4</td>
<td>Dislocation + split (peroneus longus)</td>
<td>Stable + tendinopathy</td>
</tr>
<tr>
<td>5</td>
<td>Dislocation</td>
<td>Subluxation</td>
</tr>
<tr>
<td>6</td>
<td>Dislocation + split (peroneus brevis)</td>
<td>Stable</td>
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<tr>
<td>7</td>
<td>Dislocation</td>
<td>Stable</td>
</tr>
<tr>
<td>8</td>
<td>Dislocation + tendinopathy</td>
<td>Stable + tendinopathy</td>
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<tr>
<td>9</td>
<td>Dislocation</td>
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<td>10</td>
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<tr>
<td>14</td>
<td>Dislocation</td>
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<tr>
<td>15</td>
<td>Dislocation + tendinopathy</td>
<td>Stable</td>
</tr>
<tr>
<td>16</td>
<td>Dislocation + tendinopathy + split (peroneus brevis)</td>
<td>Stable</td>
</tr>
<tr>
<td>17</td>
<td>Dislocation + fissure (peroneus brevis)</td>
<td>Stable</td>
</tr>
</tbody>
</table>
3.4. Intra-operative findings and time to surgery

In 6 (35%) patients, the intra-operative exploration identified no factors known to facilitate fibular tendon dislocation. In contrast, 9 (53%) patients had a distally located myo-tendinous junction, including 2 (12%) with a convex lateral malleolus; 2 (12%) other patients had fibular tendinopathy.

In the 6 patients who had surgery within 3 months after the injury, the AOFAS score at last follow-up was 93 ± 6.7 (range, 84–100) compared to 87 ± 9.8 (range, 68–100) in the 11 patients who had surgery after a longer interval.

4. Discussion

The main finding from this study is that our hypothesis was not confirmed: although the clinical outcomes were good and consistent with previous reports [6,7,9–14], ultrasonography was normal in only 71% of patients. The remaining 29% had clinically silent ultrasonographic abnormalities.

In our study, there was an overall reduction in sports practice, with only 41% of patients returning to their previous level of activity in the same sport. Among possible explanations are social and occupational factors related to the mean age of our population and having little relationship with the injury or surgery. The long time interval from injury to surgery resulted in the patients having no sporting activities for several months before surgery. This time interval is consistent with earlier reports [7,9–14].

We found no previous reports of data on the return to sports after fibular tendon dislocation surgery. Deconditioning during the interval from the injury to the diagnosis may diminish the likelihood of recovering the former level of sporting activity, and early management is therefore a priority. Further studies in larger samples and over longer follow-ups are needed to assess the influence of the time to diagnosis on the return to sports after fibular tendon dislocation surgery.

To our knowledge, ours is the first report of dynamic ultrasonography findings after fibular tendon dislocation surgery. The main strengths of this study are the ultrasonographic assessment of all re-evaluated patients, the standardised technique, and the treatment of all patients by the same surgeon. The main weaknesses are the small sample size, which limited the power of the statistical analysis, and the retrospective study design.

Ultrasonography is the reference standard investigation. In addition to its low cost, ultrasonography provides a dynamic, effective, and comprehensive assessment of the ankle [5]. However, ultrasonography is heavily operator-dependent [5,15,16]. Consequently, an ultrasonographer specialised in osteo-articular radiology performed all the ultrasound scans for our study. Asymptomatic subluxation was found in 2 patients. Ultrasonography provides a detailed assessment of the anatomic results and is, in our opinion, indispensable to evaluate and monitor the treatment of fibular tendon dislocation. The ultrasonography findings at last follow-up established the efficacy of the surgical technique in controlling instability.

Similar functional outcomes were found in several earlier studies (Table 2). Raikin et al. [11] combined retinaculum reeving with groove deepening and obtained a mean post-operative AOFAS score of 93/100. Similarly, Vega et al. [12] reported a mean AOFAS score of 93/100 after arthroscopic treatment. In a study by Cho et al. [13], the mean AOFAS score was 92.2/100 after repair of the superior retinaculum involving routine augmentation with a periosteal flap. This was a prospective study that compared retinaculum repair with and without groove deepening. Function and symptoms improved markedly and similarly in the two groups. Thus, groove deepening failed to provide significant additional clinical benefits. Groove deepening has been reported to diminish the recurrence rate in patients with a convex lateral malleolus but only at the cost of complications such as fracture of the malleolus or adhesion of the fibular tendons to the retinaculum over the freshened bone [6–13]. In our experience, groove deepening was never required: effective stabilisation was achieved without this procedure even in the patients with a convex lateral malleolus. A strip of biocompatible polyester has been used to stabilise the tendons [17] but constitutes a foreign body whose long-term tolerance has not been established. Another method consists in transferring the fibular tendons under the calcaneo-fibular ligament. Although good outcomes have been reported [18], this technique seems more difficult to perform. Ogawa et al. used the peroneus quartus to augment the retinaculum [19], whereas Hop-ton et al. obtained satisfactory outcomes after hamstring graft augmentation [20]. Arthroscopic techniques are being developed but require validation in larger sample sizes [12]. Many techniques of variable invasiveness have been described but no comparative studies are available to determine whether one is superior over the others [20].

No other major complications were recorded. The only minor complication was pain due to knots in the non-absorbable suture used to ree the retinaculum, which occurred in nearly one-quarter (4/17) of the patients. We have therefore switched to absorbable suture to avoid residual pain and impingement of the knots on the subcutaneous tissue.

The main unresolved issue is whether groove deepening is in order in patients with a convex lateral malleolus. In our experience,
isolated re-tensioning provided good outcomes even when the lateral malleolus was convex.

5. Conclusion

Surgical re-tensioning of the superior fibular retinaculum is effective in stabilising the fibular tendons. Ultrasonography shows asymptomatic subluxation in some patients. This simple and reproducible technique provides good functional outcomes with a low morbidity rate.

Disclosure

The authors declare that they have no competing interest.

References