Case report

The use of manipulation in a patient with an ankle sprain injury not responding to conventional management: a case report

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1. Introduction

Ankle sprains are common among physically active individuals, (Almeida et al., 1999) with a reported incidence of seven injuries per 1000 persons over a 1-year period. (Holmer et al., 1994). The primary environments in which these injuries occurred were during sports (45%), play (20%), and work (16%) activities, with inversion ankle sprains accounting for over 60% of the sprains. (Holmer et al., 1994). In a study of 547 patients with ankle sprains, Fallat et al. (1998) found that the anterior talofibular ligament (ATFL) was most frequently injured, followed by the calcaneofibular ligament (CFL) and posterior talofibular ligament (PTFL). A combination of injury to the ATFL and the CFL accounted for 34.2% of the ankle sprains, and involvement of all three ligaments was found in 31.3% of the injuries (Fallat et al., 1998).

Inversion ankle sprains are typically classified as Grades I, II, or III based on a pathoanatomical model that consists of a combination of factors detected during the physical examination. These factors include the location of tenderness, the presence of oedema/ecchymosis, reduced weight-bearing ability, ligament damage, reaction to ligamentous stability testing, and the presence of instability (Gerber et al., 1998). Grade I sprains have been reported to account for 71.3% of injuries, with Grade II and III sprains accounting for 9.5% and 2.9% of the injuries, respectively (Fallat et al., 1998).

Conventional management of Grade I ankle sprains incorporates the RICE principles (Rest, Ice, Compression, and Elevation) combined with early motion and full weight bearing (Wolfe et al., 2001). Its success in improving mobility, pain, and disability has been well documented in the literature (Linde et al., 1971; Dettori et al., 1994; Eiff et al., 1994; Dettori and Basmania, 1994; Karlsson et al., 1996). Further, this approach has been shown to lead to greater improvements in motion and decreased pain and swelling than a program that includes immobilization (Dettori et al., 1994).

The generally accepted prognosis is that a Grade I ankle sprain treated with conventional management will resolve within 7–14 days (Safran et al., 1999). However, there appears to be a subgroup of patients who continue to experience pain and functional limitations substantially longer than 2 weeks, (Dettori and Basmania, 1994; Gerber et al., 1998), with some patients remaining symptomatic even 1 year after injury (Dettori and Basmania, 1994). Perhaps one reason that some individuals continue to experience prolonged pain and
functional limitations even after completing a traditional rehabilitation program is that the conventional management approach does not adequately address the potential for underlying hypomobility in joints that are susceptible to injury during an inversion ankle sprain. Joints that may become injured and contribute to the pain, limited motion, and functional limitations associated with an inversion ankle sprain include the proximal and distal tibiofibular, talocrural, and the subtalar joints. The talocrural joint is primarily responsible for the motions of dorsiflexion and plantar flexion, and limited dorsiflexion is a common impairment in individuals with an inversion ankle sprain (Denegar et al., 2002).

It is possible that an individual with a Grade I ankle sprain may exhibit decreased passive accessory motion of this joint which may not be addressed by conventional management. Passive accessory motion is defined as movements that a patient cannot perform himself but which can be performed on the patient by someone else (Maitland, 1991). For example, gliding the talus in an anterior to posterior direction on a fixed distal tibia and fibula would be considered an accessory motion that is required for normal ankle physiologic dorsiflexion.

Restricted ankle accessory motions could contribute to a slower improvement in pain and function than that typically observed in individuals who sustain a Grade I ankle sprain. The subtalar joint, which has also been implicated in ankle sprain injuries, is primarily responsible for inversion and eversion and contributes to the tri-planar motions of supination and pronation. The subtalar joint is important for functional movement of the talus, as a restriction in this joint can restrict ankle motion, thus possibly contributing to the recalcitrant nature of some inversion ankle sprains (Beirne et al., 1984).

It seems reasonable to suggest that manipulation/mobilization techniques for joints that exhibit limited passive accessory motion may be helpful in the management of ankle sprains that do not respond to conventional management. The Guide to Physical Therapist Practice (American Physical Therapy Association (APTA), 2001) defines manipulation/mobilization as a “manual therapy technique comprising a continuum of skilled passive movements to the joints and/or related soft tissues that are applied at varying speeds and amplitudes, including a small-amplitude/high-velocity therapeutic movement.” Unfortunately, there is little evidence on the efficacy of these types of interventions for patients with ankle sprains not responding to conventional management. Thus, the purpose of this case report is to describe the use of manipulation/mobilization for a patient after an inversion ankle sprain who did not demonstrate any improvements in pain or function after 3 weeks of conventional management.

2. Methods

2.1. History

The patient was a 27-year old volleyball player who had suffered from an ankle sprain three weeks prior to her first visit to physical therapy. The patient clearly recalled and described an inversion mechanism of injury that occurred while returning to the ground after jumping to hit a volleyball. She had administered self-treatment with rest, ice, compression with self-ankle taping, and elevation. This individual also reported that she had been consistently doing strengthening exercises with resistive tubing (dorsiflexion, plantarflexion, inversion, and eversion) per instruction by a therapist after a previous ankle sprain injury. The patient noted no change in symptoms over the 3 weeks of self-treatment, although she had forced herself to stop using the crutches approximately 1 week prior to her visit to the physiotherapist.

The patient reported having a history of 6–7 inversion ankle sprains of the involved ankle over the last 10–15 years. For previous injuries, symptoms typically resolved in 1 week, occasionally in up to 2 weeks, with self-treatment of rest, ice, compression, and elevation. This patient decided to seek medical care because this injury was not responding to self-treatment using conventional management. Although very active prior to the injury, to include playing volleyball 2–3 days per week and running 6–10 miles weekly, she was currently completely unable to participate in exercise or sports.

The patient’s current symptoms included a constant ache to the medial calcaneal region that varied based on activity and an intermittent, burning pain extending along the medial leg up to approximately 10 cm below the medial tibial plateau (Fig. 1). On a numeric pain rating scale (Downie et al., 1978; Jensen et al., 1994) the patient reported a range of pain from 5 to 9 out of 10 over the last 24 h (Table 1). Interestingly, the patient’s current symptoms were not characteristic of those from previous injuries. Previous episodes involved only symptoms localized to the lateral aspect of the ankle, without any pain in the leg. The patient reported increased pain with running, squatting, going up and down steps, and prolonged weight-bearing. Non-steroidal anti-inflammatory medications and non-weight-bearing positions temporarily eased her symptoms and there were no other reported lower extremity symptoms or low back pain (LBP).

Her baseline scores for several self-report measures of function can be seen in Table 1. For the Foot and Ankle Ability Index (FAAI), higher numbers represent greater functional ability (Pugía et al., 2001). The Patient Specific Functional Scale (PSFS) was used to help quantify the patient’s specific functional limitations (Stratford et al., 1995; Chatman et al., 1997). In this
scale, patients select a score for 3–5 specific activities that they are having difficulty with as a result of their problem. The range of available scores is 0–10, with 0 representing an inability to perform the activity and 10 representing an ability to perform activity at same level as before the injury or problem. The patient identified difficulty with negotiating stairs, squatting, prolonged standing, and running. Her average score for the PSFS was 5.5 and her score on the FAAI was 68.3%. The patient’s primary goal was to quickly return to high-level physical activity, including running without pain.

2.2. Physical examination

Based on a visual observation of the patient’s gait, the patient was judged to exhibit a slightly antalgic gait, with pain primarily occurring during the late stance phase of gait when maximal talocrural dorsiflexion range of motion (ROM) is required. Active dorsiflexion ROM on the involved lower extremity, both with the knee flexed and the knee fully extended, was limited to 5° and was painless with overpressure. Active ankle ROM on the uninvolved lower extremity was normal. ROM measurements were performed with a universal goniometer, both in sitting with 90° knee flexion (as described by Norkin and White, 2003), as well as in supine with full knee extension. The patient’s strength was essentially normal and pain free. Mild laxity was present with the inversion talar tilt and anterior drawer tests. No swelling or ecchymosis was present. Specific pain scores were obtained during walking, squatting, and with a step-up at baseline (Table 2). Based on the patient’s self-report of limited oedema and ability to fully bear weight soon after the initial injury, the patient was judged to have a Grade I ankle sprain that was not responding to conventional management. The presence of slight laxity with the talar tilt and anterior drawer tests was judged to be a sequela of previous ankle sprain injuries.

Based on our clinical experience and the suggestion of others (Greenman 1996), patients with ankle sprains not responding to conventional management and those with a history of recurrent ankle sprains frequently demonstrate decreased passive accessory motion of the proximal and distal tibiofibular joint, talocrural joint, and the subtalar joint. As a result, the authors of this manuscript routinely examine these joints in the management of all ankle sprain injuries. Passive accessory motion testing revealed decreased mobility at the proximal and distal tibio-fibular joints and the talocrural and subtalar joints relative to the opposite lower extremity. All passive accessory motion testing was performed as described by Maitland (1991). Radiographs of the tibia, fibula, and foot and ankle were negative for fracture or any other abnormalities, and the dorsiflexion/external rotation and “squeeze tests” to rule out a syndesmosis injury were negative (Alonso et al., 1998).

2.3. Treatment

Based on the patient’s failure to respond with self-treatment utilizing conventional management and the presence of decreased passive accessory motion in several joints of the leg and ankle, the decision was made to utilize manipulation/mobilization techniques that targeted the underlying joint hypomobility identified in the examination. The techniques that were used

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Self-report measures of pain and function</th>
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<tbody>
<tr>
<td>Measurement</td>
<td>Baseline</td>
</tr>
<tr>
<td>Average NPRS value for past 24 h</td>
<td>7/10</td>
</tr>
<tr>
<td>Patient specific functional scale</td>
<td>5.5</td>
</tr>
<tr>
<td>Foot and ankle ability index score</td>
<td>68.30%</td>
</tr>
<tr>
<td>Running activity</td>
<td>None</td>
</tr>
</tbody>
</table>

NPRS = Numeric Pain Rating Scale (0 = no pain; 10 = worst pain imaginable).
are outlined in Table 3 with pictures that illustrate the direction of movement. The proximal tibio-fibular joint manipulation and the rearfoot distraction manipulation were performed one time each. The talocrural joint lateral glide mobilizations, subtalar joint eversion mobilizations, and the talocrural joint anterior to posterior joint mobilizations were each performed for approximately 3–4 bouts of 30 oscillations.

Immediate improvements were noted after the manipulation/mobilization interventions. The patient demonstrated increased dorsiflexion ROM and experienced an immediate decrease in pain during gait, negotiating stairs, and squatting (Table 2). Additionally, when re-tested, passive accessory joint motion appeared to be equal to the opposite ankle and foot except for some remaining limitation in mobility in the rearfoot with lateral glides.

2.4. Home exercise program

To reinforce the manipulation/mobilization techniques, the patient was taught to self-mobilize her ankle into dorsiflexion and eversion. A weight bearing on/off self-mobilization technique was used to increase dorsiflexion ROM, and a seated self-mobilization technique was used to increase eversion ROM (Table 3).

2.5. Short-term follow-up

Four days after treatment, the patient reported resolution of pain with squatting, standing, and negotiating stairs and demonstrated no pain and normal mobility with gait, squatting, and performing a step-up during the physical exam (Table 2). The patient’s score on the PSFS improved to a 10 and both subscales of the FAAI improved substantially (Table 1). Additionally, the patient returned to running up to 2 miles without pain. Based on the presence of normal passive accessory motion in the follow-up examination, no further manipulation/mobilization was performed during this visit and the patient was instructed in proprioception and agility training exercises. In a telephone follow-up call 11 days after the initial treatment, the patient reported a return to full participation in volleyball and running without limitation or pain (Tables 1 and 2).

2.6. Longer-term follow-up

All improvements in pain and function persisted 6 weeks after treatment, with a return to running 2 miles 4–6 days per week without pain. Her scores on the PSFS and the FAAI remained stable (Table 1). Based on the patient having achieved her goals and the absence of any impairments or functional limitations, the therapist reviewed the patient’s exercise program with her and discharged her from physical therapy.

3. Discussion

Most patients who sustain a Grade I ankle sprain improve rapidly with conventional management utilizing an RICE approach that emphasizes early motion and full weight bearing. However, there appears to be a subgroup of patients who continue to have symptoms even at 1 year post-injury (Dettori and Basmania, 1994). It seems reasonable to suspect that some of these individuals may have decreased passive accessory joint motion that is not addressed by conventional management and may benefit from interventions that utilize manipulation/mobilization techniques.

There is little published evidence on the efficacy of manipulation/mobilization for patients with any diagnoses involving the ankle or foot. A recent literature search revealed a total of five randomized controlled trials (Wilson, 1991; Dettori and Basmania, 1994; Green et al., 2001; Pellow and Brantingham, 2001; Coetzer et al., 2001) and a limited number of case-control studies, case series, or case reports (Marshall and Hamilton, 1992; Nield et al., 1993; Mooney and Maffey-Ward, 1994).
1994; O’Brien and Vicenzino, 1998; Menetrey and Fritschy 1999; Dananberget al., 2000). The populations in these studies included normal subjects, (Nield et al., 1993) individuals with acute (Dettori and Basmania, 1994; O’Brien and Vicenzino, 1998; Green et al., 2001; Coetzer et al., 2001) and chronic ankle sprains (Pellow...
Only one study was identified with a patient population and treatment regimen similar to ours (Pellow and Brantingham, 2001). Chronicity for this study was defined as the persistence of pain for more than 5 days after the initial injury. Patients in the experimental group received an “ankle mortise separation technique”, similar to the rearfoot distraction technique that was used in this patient. The control group received a placebo treatment. Patients in the manipulation group demonstrated a significant reduction in pain and increased function compared to the control group both immediately after treatment and at a 1-month follow-up. Although there are limitations in the study’s methodology, the results seem to support the use of manipulation in patients with persistent symptoms after an ankle sprain injury.

In our experience, many clinicians avoid manipulation in acute and subacute injuries of the periphery because of a belief that tissue damage has occurred, and the notion that manipulation will contribute to further tissue damage. In other areas, such as the lumbopelvic region, the literature generally supports the use of manipulation in the management of acute injuries (Koes et al., 2001). Perhaps the pathoanatomical model that is currently utilized to determine the severity of ankle sprains (Grade I vs. Grade II vs. Grade III) biases clinicians to inappropriately assume that manipulation/mobilization may be harmful, when in fact some individuals with recalcitrant ankle sprains may exhibit decreased passive accessory joint motion that, if inadequately addressed, will lead to dramatic improvements in pain and function. Its interesting to note that a pathoanatomical model (Waddell, 1996) based on a “tissue damage” model has been largely unsuccessful in explaining pain and disability in LBP. Because of the difficulty in sub-grouping patients with LBP based on this model, attempts have been made to subgroup, or classify, patients based on findings from the history and physical examination (Flynn et al., 2002). Perhaps the treatment of ankle sprains would benefit if clinicians and researchers explored an alternate treatment-based classification scheme that is based on an individual patient’s response to treatment rather than on a pathoanatomical model that often fails to explain the pain and functional limitations associated with recalcitrant ankle sprains.

Developing effective classification schemes or clinical prediction rules that assist clinicians in selecting appropriate interventions based on a patient’s historical and physical examination findings should improve clinical decision-making and patient outcomes. Thus, if a researcher wants to assess the efficacy of manipulation/mobilization, the identification of those patients who actually have decreased passive accessory motion of the ankle joints may be crucial. Although this may seem obvious, most studies that have assessed the efficacy of manipulation/mobilization in patients with an ankle sprain did not assess passive accessory joint motion, which is the primary impairment believed to be targeted by manipulation/mobilization techniques. Without the ability to match patients to specific treatments, clinicians are left without evidence for their decision-making in selecting treatments for a particular patient. Classification methods will also enhance the power of clinical research by permitting researchers to study more homogenous groups of patients.

Because this was a single case report, one cannot conclude that the patient’s improvement in pain and function was a result of the manipulation/mobilization. However, given the recalcitrant nature of her injury, the patient’s rapid response to manipulation/mobilization suggests that this intervention may have been effective for this patient. Despite the limited number of clinical trials that assess the efficacy of manipulation/mobilization in the management of ankle sprain injuries, this form of intervention seems to have some benefit for patients with inversion ankle sprains. We believe it may have the most benefit for patients who are not responding to conventional management, and who demonstrate limitations in passive accessory motion. However, this hypothesis has not been investigated at this time. Based on our experience with this patient and others with chronic foot and ankle disorders who have responded positively to manipulation/mobilization, it would be helpful to identify those patients who will respond to conventional management versus those who would benefit from the addition of manipulation/mobilization. Perhaps this group of patients could even be identified immediately after injury, which would provide clinicians with a powerful tool to guide treatment decisions and facilitate a more rapid improvement in pain and function in individuals who would otherwise continue to have symptoms for a prolonged period of time. Eventually, it would be useful to develop a treatment-based classification system for all foot and ankle disorders. Such a system would provide clinicians a treatment-based framework to guide the decision-making process rather than relying primarily on a pathoanatomical model.
ment for her inversion ankle sprain. Supplementing conventional management strategies with manipulation/mobilization techniques may improve treatment effectiveness by decreasing pain and improving function in shorter time periods. Although a causative relationship cannot be drawn from a case report, it is our hypothesis that utilization of manipulation/mobilization to address impairments in joint mobility in the ankle and foot may restore normal joint motion and allow for a quicker return to sporting activities. While it is not the authors’ opinion that all patients with inversion sprains need this treatment approach, perhaps there may be a subgroup of patients for whom this intervention strategy would be most effective. Future research is needed to determine the optimal role of manipulation/mobilization in the rehabilitation of patients after inversion ankle sprains.

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References


