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ORIGINAL ARTICLE

Physical Therapy Management for a Patient with Hallux Rigidus in a Baseball Player

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Hallux rigidus is a common condition affecting the foot. There is a paucity of evidence describing the management of patients with hallux rigidus with manual physical therapy consisting of hands-on manual therapy techniques and movement reinforcing exercise. This case highlights the management of a patient with hallux rigidus by a physical therapist. The patient was a 60-year-old male baseball player with pain, loss of metatarsophalangeal joint motion, and radiographically visible degenerative changes suggesting a diagnosis of hallux rigidus. Treatment involved non-thrust joint manual distraction mobilization to the 1st metatarsophalangeal joint. Improvements were noted immediately in the patient's ability to run with decreased symptoms. I carefully instructed the patient to perform the manual distraction techniques at home. After 4 clinical visits, the patient returned to baseball the following spring. Outcomes were maintained 8 years after initial evaluation.

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Hallux rigidus is the most common arthritic condition of the foot.[1] The prevalence of symptomatic hallux rigidus is roughly 10% in adults.[2] Arthritic changes can be seen on radiographs in nearly 50% in adults over the age of 40.[3]

Conservative management consisting of medications, steroid injections, shoe wear modification, and orthotics are typically first line treatments. Unfortunately, nearly 40% of patients eventually undergo surgical intervention.[4]

Manual therapy, as defined by the American Physical Therapy Association, is "the synergistic application of movement-oriented strategies integrating exercise and manually applied mobilization and manipulation procedures."[5] Manual therapy has historically been used by many health care practitioners throughout the globe to provide therapeutic benefit. Some forms of manual therapy, known as thrust and non-thrust joint mobilization/manipulation, are specifically targeted to improve joint mobility and range of motion.[5] Thrust techniques involve high velocity, low amplitude therapeutic movements, while non-thrust techniques comprise a continuum of skilled passive oscillatory movements commonly divided into four "grades" (I-IV).[6,7] These grades are defined by the percentage of movement into total tissue resistance at various speeds and amplitudes. For instance, a grade III is a large amplitude technique moving into 50% of resistance and out of resistance. This can be progressed further into resistance and demarcated with a "+" sign. For instance, a grade III++ goes 90% into resistance.[6]

My comprehensive review of the literature found no evidence regarding the management of hallux rigidus with manual physical therapy techniques and reinforcing

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exercise.[8] Manual physical therapy strategies are effective for degenerative changes in other synovial changes joints such as the foot/ankle[9-11] and knee.[12] Such interventions targeting the 1st metatarsophalangeal (MTP) joint were previously described for patients with turf toe by Shamus et al.[13] This population, however, was young with symptoms for less than 11 months.

The purpose of this case report is to describe the management of a patient-athlete with hallux rigidus.

Case Description:

Subjective Examination:

The patient was a 60 year old male with a 4 year history of left 1st MTP joint pain of gradual onset. The patient had his initial appointment with a physical therapist in November after baseball season. His stated goal was to return to play the following April. While obtaining the patient's past history, he reported an initial injury to the great toe while sprinting during a game at the age of 38 while playing baseball. Aside from rest and ice, there was no additional treatment provided and symptoms resolved. His current symptoms were worse in the morning. He rated his pain at 0/10 at rest, as high as 6/10 with walking, running, sprinting, and cutting. Radiographs demonstrated hallux rigidus, hallux valgus, decreased joint space, and osteophyte formation (Figure 1). He had seen multiple orthopedic surgeons and podiatrists who provided multiple interventions, including two corticosteroid Injections that helped initially but his symptoms gradually returned. The patient also related that shoes with a wider toe box were helpful. Custom made orthotics (trilaminate full length) with a carbon plate extension along the

great toe and metatarsal pad were not tolerated. He was considering surgery but wanted to see a physical therapist before moving forward with surgical intervention.

The outcome measure chosen was the Patient-Specific Functional Scale.[14] The patient reported a 4/10 for running, sprinting, and playing baseball.

Objective Examination:

Observable effusion was noted in the left 1st MTP joint. Palpation surrounding the 1st MTP joint reproduced the patient's symptoms. Talocrural dorsiflexion (DF) range of motion was limited to 12° on the left compared to 15° on the right with the knee bent. 1st MTP DF was limited to 28° on the left compared to 50 °on the right. There was hypomobility with plantar and dorsal joint mobility testing on the left 1st MTP joint. Pain increased to 6/10 with running on a treadmill at 5.0 miles per hour (mph) for 1 minute.

Diagnosis:

With 1st MTP DF between 10-30° and the presence of osteophytes, sclerosis, and joint space narrowing, it was concluded that the patient had hallux rigidus.[15]

Management:

After the evaluation was completed, the patient was treated with 1st MTP grade III non-thrust distraction in a neutral position, progressing to 3++.[6] This technique is demonstrated in Figure 2. The patient lies supine with the knee extended and toes over the edge of the table. Standing at the end of the table, the clinician stabilizes the 1st metatarsal. The 1st proximal phalanx is grasped by the clinician's thumb and index finger. The 1st MTP was distracted by

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moving the proximal phalanx away from the first metatarsal to near end range resistance (stiffness). Oscillating distraction mobilization was performed in and out of resistance for four minutes at a frequency of about 1 Hertz.[16]

Upon reassessment, the patient's pain reduced to 2/10 with 1 minute of running on a treadmill at 5.0 mph. The same manual treatment was then repeated for four minutes. Pain was reduced to 0/10 with 1 minute of running on a treadmill at 5.0 mph.

I recommended that the patient perform a home exercise program consisting of calf stretching with the knee bent and 1st MTP self-distraction into end range MTP DF carefully avoiding pain. The self-distraction was performed with the involved leg crossed over the non-involved leg in a seated position with the hands stabilizing and mobilizing in a similar fashion to the technique performed by the physical therapist. I prescribed that this be done for 4 minutes, 5 times per day (morning, mid-day, mid-afternoon, evening, and before bed).

Outcomes:

The patient was seen six times over eight years. Outcomes can be seen in Table 1. He was able to return to baseball play with nearly no limitations the following season. This ability to continue playing baseball was maintained up to 8 years. He continued to do his exercises and did not require surgery, additional injections, or pain medication specifically for his great toe pain.

Discussion:

This is the first case to the authors knowledge that describes a physical therapist evaluation and management of a patient with hallux rigidus. Rehabilitation consisting of non-thrust joint distraction techniques reinforced with a manual self-mobilization program attempting to replicate the clinically applied manual therapy technique was successful in returning this patient to playing baseball with minimal limitation for up to 8 years after the initial encounter.

The mechanisms behind the therapeutic effect of manual therapy have been investigated previously. It has been postulated that manual therapy techniques such as the one described in this case report can restore normal movement of joint and connective tissue while improving joint stiffness.[17] Recent evidence suggests that both peripheral[18] and central[19,20] neurophysiologic analgesic mechanisms are activated with manual therapy.

Importantly, this patient was able to avoid additional medication, corticosteroid injection, and surgical intervention. While these interventions can provide pain relief and improve function, they are not free of side effects. For instance, the chondrotoxic effects of corticosteroids have been described.[21,22] Manual therapy targeting the lower extremity also poses risk for adverse events. These effects can include increase stiffness, pain, and discomfort at the site of intervention.[23] However, manual therapy produces fewer adverse events than drug therapy.[23] Moreover, when added to exercise, manual therapy does not seem to increase risk for an adverse event.[24] Thus, rehabilitation including manual therapy and exercise could be a plausible intervention for those with hallux rigidus.

Conclusion:

Clinicians should consider physical therapy referral when managing patients with hallux rigidus. Physical therapists should also consider techniques that attempt to regain 1st MTP ROM, particularly MTP DF. Interestingly, a previously prescribed rigid orthotic that limited motion in his symptomatic MTP joint was not well tolerated and manual physical therapy that targeted improving MTP motion was helpful for this patient.

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Table 1. Outcomes.

	Evaluation	1 week	1 month	6 months	1 year	4 years	8 years
Patient-Specific Functional Scale							
Run 1 mile	5/10	7/10	8/10	9/10	9/10	9/10	9/10
Sprint	4/10	n/a	7/10	8/10	9/10	9/10	9/10
Baseball	4/10	n/a	n/a	8/10	9/10	9/10	9/10
Range of motion							
Ankle Dorsiflexion knee bent	12°	13°	15°			17°	15°
1st metatarso-phalangeal dorsiflexion	28°	40°	45°			49°	45°

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Figure 1a. Dorsal plantar view of the left foot demonstrating osteoarthritis changes in the first metatarsophalangeal joint.

Figure 1b. Lateral view demonstrating dorsal bone spur and osteoarthritic changes in the first metatarsophalangeal joint.

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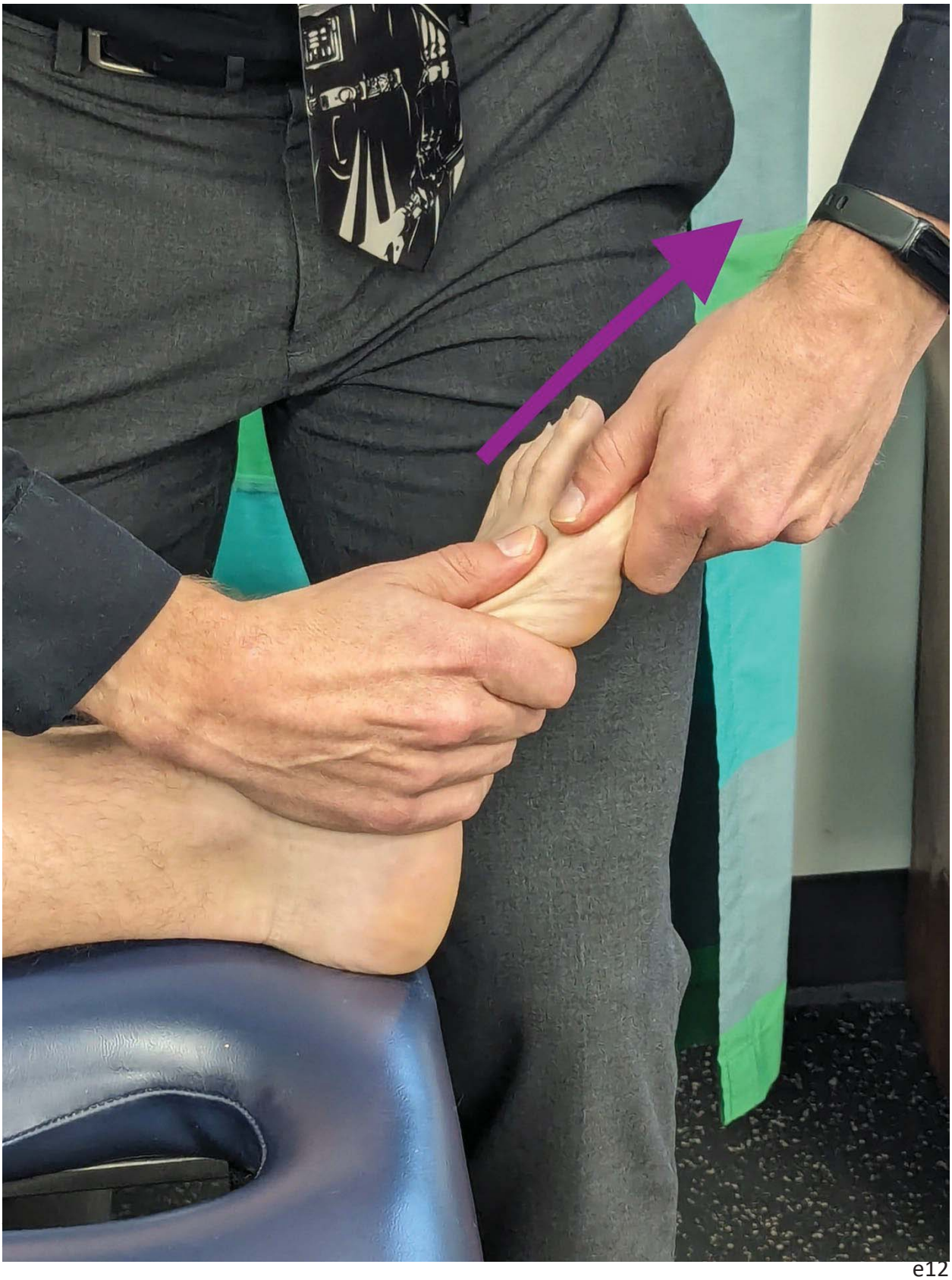

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Figure 2. Manual therapy technique targeting mobility of the first metatarsophalangeal joint.

While the patient lies supine, the first metatarsophalangeal joint is placed in a neutral position. The clinician stabilizes the first metatarsal. While grasping the 1st proximal phalanx with the clinician's thumb and index finger, the clinician then distracts the proximal phalanx away from the first metatarsal in the direction of the arrow.