

## Use of the Fascial Distortion Model to Evaluate a Limp in a Child

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**Pediatric limp is a relatively common condition in primary care and can be challenging to diagnose and manage. Common causes of painful pediatric limp include transient synovitis, septic arthritis, osteomyelitis, and trauma. The authors present the case of an 11-year-old girl with a painful limp and anterior ankle pain of unclear origin. Osteopathic structural examination revealed a somatic dysfunction known as *continuum distortion*, 1 of 6 fascial alterations identified in the fascial distortion model. Myofascial release was applied, providing rapid, complete resolution of symptoms. This case demonstrates that osteopathic physicians may consider the fascial distortion model framework when identifying causes of pain in patients.**

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The incidence of limping in children is 1.5 to 3.6 cases per 1000 children, with some variation between countries.<sup>1</sup> A European study<sup>2</sup> reported that acute onset of limp in a child accounts for approximately 4% of all emergency department visits. To differentiate the cause of a painful limp, the age of the child and severity of pain caused by the limp should be considered, as well as physical examination findings and the results of imaging and laboratory tests, including complete blood cell count, erythrocyte sedimentation rate, blood culture, and urinalysis.<sup>3</sup>

These means of conventional evaluation do not always yield a clear diagnosis or treatment plan. In these cases, a fascial dysfunction should be considered. The body's fascial network is extensive, and alterations in the tissue are among the many potential somatic dysfunctions that could contribute to a painful limp in a child.<sup>4</sup> Osteopathic manipulative medicine is aimed at improving the body's physiologic and homeostatic processes inhibited by somatic dysfunction, and it can be useful in the evaluation of a patient with a limp.<sup>5</sup> One approach includes considering the fascial distortion model (FDM), a biomechanical framework through which fascial change can be understood, and its 6 principal types of fascial distortions.<sup>4,6</sup> Each dysfunction can be managed with a myofascial release technique. The FDM can help to evaluate the type of fascial dysfunction present, directing the physician to the specific osteopathic manipulative treatment (OMT) technique to use. Although these myofascial techniques have been described,<sup>4,6,7</sup> to our knowledge, the benefits of their clinical use have not. In the following case, we present the clinical use of the FDM in a child with a painful limp.

## Report of Case

An 11-year-old athlete participating in volleyball and synchronized swimming presented to her primary care physician in September 2013 with atraumatic left ankle pain and a limp for the past 2 weeks. Physical examination showed bilateral hypermobility of both ankles, full range of motion, normal strength, and tenderness over the left anterior and lateral ankle joint line. A radiograph taken 5 months previously, during evaluation of an inversion ankle injury, did not show bony abnormalities. Patient self-management included at-home exercise, stretches, and ankle bracing during physical education, at the instruction of her primary care physician. The patient was referred to a physical therapist for evaluation and treatment of suspected chronic joint instability due to ligamentous laxity. She underwent iontophoresis during physical therapy.

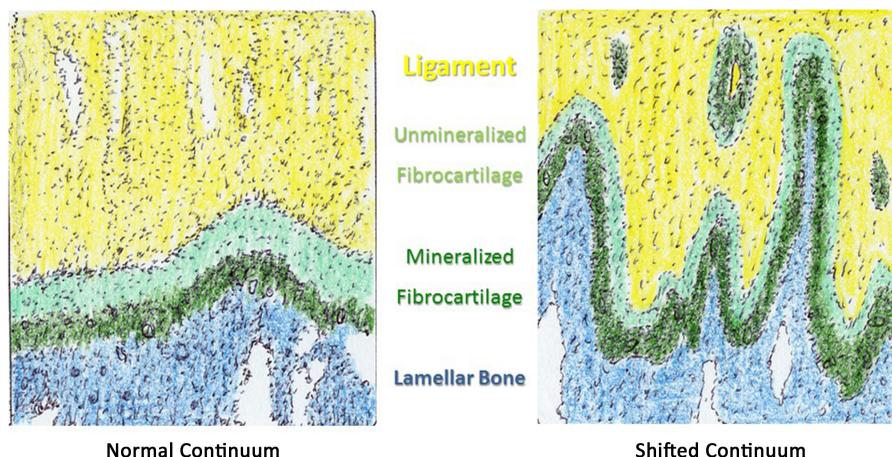
Five months later, in February 2014, she returned to her primary care physician because her ankle pain and limp had worsened. She had completed her physical therapy and was still wearing the brace during physical education and other high-intensity activities, such as playing volleyball. She reported anterior ankle pain with dorsiflexion. A magnetic resonance image showed no bony, muscular, or ligamentous abnormality. She was given a walking immobilization boot to wear when participating in weight-bearing activities and it was recommended that she undergo an osteopathic evaluation. She was also referred to a sports medicine physician, whom she saw in April 2014.

Two weeks after seeing the sports medicine physician, at the patient's first OMT session in April 2014, the patient reported that her ankle felt comfortable when she was wearing the immobilization boot, but she had severe pain when she was not. Her parent provided a more detailed medical history, which revealed that the patient had recurrent ankle injuries and ankle pain with acute sprains for the past 7 years. Osteopathic structural examination findings revealed

some cranial and pelvic/sacral dysfunction as well as ankle hypermobility and a left posterior fibular head. Cranial, soft tissue, muscle energy, myofascial release, and facilitated positional release techniques were applied, and the patient reported a slight decrease in pain after the session. Two weeks later, at the sports medicine clinic, the patient reported that the pain had decreased, but she was still sore at the end of the day, so she was given crutches to use at all times.

At the second OMT session, in May 2014, the patient was still wearing the immobilization boot and using crutches for all weight-bearing activities. She identified a discrete area of pain along her anterolateral tibial-talar joint line. An osteopathic structural examination was performed, and the findings revealed increased atrophy of her lower leg muscles compared with the contralateral limb. The physician conducted the examination with attention to the possibility of a continuum distortion. Two were located on the anterior talofibular ligament, and a FDM myofascial release technique was applied. The patient reported immediate resolution of pain and was able to bear weight without difficulty. She still limped, but it appeared to be caused by weakness rather than pain. The patient was advised to discontinue wearing the immobilization boot and using the crutches and to only wear the ankle brace for activities other than walking. One week later, at a follow-up appointment with the OMT provider, the patient reported a mild gastrocnemius ache, no ankle pain, and resolution of limp. She continued to wear the brace during vigorous activities.

In August 2014 the patient reported to her primary care physician that her pain had resolved. She was approved to participate in volleyball with the use of the ankle brace. In July 2015 the patient continued to be without pain and was regularly participating in desired activities, including volleyball and synchronized swimming. She continued to wear an ankle brace for sports because of her perceived instability.



**Figure.**

An artist's rendering of a normal continuum (left) compared with a shifted continuum (right), in which an alteration between tissues has occurred.

## Discussion

The most common diagnosis of a painful limp in children is transient synovitis, followed by septic arthritis, osteomyelitis, and trauma.<sup>3</sup> Among children aged 1 to 3 years presenting with a painful limp, intervertebral discitis should be considered.<sup>3,8</sup> For children aged 3 to 10 years, Legg-Calve-Perthes disease or rheumatologic disorders, such as juvenile rheumatoid arthritis, should be considered. For children aged 11 years or older, a painful limp may be a symptom of slipped capital femoral epiphysis.<sup>3,8,9</sup> Depending on the underlying cause, management of a limp can include splinting, analgesics, glucocorticoids, antibiotics, or surgical intervention.<sup>3</sup> If conventional evaluation does not yield a clear diagnosis or management plan, a fascial disorder should be considered.

The FDM comprises 6 possible fascial dysfunctions: triggerbands, herniated triggerpoints, continuum distortions, folding distortions, cylinder distortions, and tectonic fixations.<sup>4,6,10</sup> The model is supported by the American Fascial Distortion Model Association, used by osteopathic physicians, and taught in some osteopathic medical schools, residency programs, and continuing medical education activities. However, little research has been published regarding the FDM. Although some studies<sup>7,11</sup> have reported effective use

of OMT to manage chronic pain, to our knowledge, this is the first reported case demonstrating the use of the FDM to help diagnose and manage, through the use of myofascial release technique, a painful limp in a child.

Continuum distortion is best described as an alteration of the transition zone between tissues theorized to be in a constant state of physiologic flux presenting at the origin or insertion of ligaments or tendons and corresponding bone (Figure). Continuum distortions, which are thought to appear after trauma, can resolve over time or be present chronically after initial injury.<sup>4,6,7,10</sup> A sprained ankle is one of the most common causes of continuum distortions.<sup>4,6,10</sup> The dysfunctional shifting of osseous or cartilaginous components leads to pain, as well as a less compliant and possibly shortened ligament or tendon.<sup>4,6</sup> Management of continuum disorders is similar to that of other myofascial dysfunctions, focusing on correcting fascial alterations, and techniques can be either direct or indirect.<sup>5</sup> Using one's thumb tip to direct the osseous components in the transition zone back toward the bone, the physician needs to apply significant force to effect change. Therefore, this technique can be more painful than other myofascial techniques. The technique requires 1 to 5 seconds, and, if completed correctly, the tissue

should return to its preinjured state. Potential adverse effects include pain during the technique, erythema, and bruising due to the pressure required.<sup>4,6</sup>

In the present case, the prolonged duration of symptoms, lack of improvement with physical therapy, and rapid resolution after OMT sessions suggest that myofascial release was helpful in resolving the patient's symptoms. Further studies are needed to explore the nature of continuum distortions in the FDM and the mechanism of action and clinical utility of myofascial release in this context. Basic science assessment of continuum distortions and management options, including ultrasonography and objective functional assessment, would be appropriate.

## Conclusion

This case suggests that use of the FDM to detect continuum distortions and the use of myofascial release to correct the distortion can be beneficial in cases in which conventional evaluation does not reveal the underlying cause of the limp. The release can be performed rapidly in the outpatient setting and requires minimal after-care.

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