CHAPTER 4

MRI and Tibialis Posterior Tendon Pathology

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Tibialis posterior dysfunction is an important yet often unrecognized clinical entity. Literature on this subject dates back to around the early 1950s, however the last ten to fifteen years has brought about a significant increase in the number of articles published on this subject. Some aspects of the disorder are commonly agreed upon by a number of different authors. The progressive nature of this disorder is an element that makes tibialis posterior pathology quite important. Delay in diagnosis may result in complete collapse of the foot. Collapse of the foot is usually of a slow and progressive nature. Thus, end stage tibialis posterior dysfunction is difficult to manage without significantly compromising the foot through the use of fusion type procedures.

Another important aspect of the disorder is the subtlety of the tendon tear and the subsequent delay in diagnosis that may occur. Because there may not be an acute or dramatic incident, patients occasionally do not seek treatment for minor symptoms around the arch and medial malleolus. Therefore, patients often do not seek medical care until significant pathology has occurred. It is clearly important that an early diagnosis be made of tibialis posterior pathology. If physical examination and clinical suspicions are high for posterior tibial tendon dysfunction, special studies may be considered. Techniques such as MRI and CT can be important adjunctive aids to diagnosis and treatment plans. However, manual muscle testing often can be misleading when evaluating the function of tibialis posterior. The deep flexor muscle group has been shown to partially compensate for some of the function of the weakened tibialis posterior muscle. Moreover, tibialis anterior may provide a degree of inversion function to the foot in patients with posterior tibial dysfunction.

PATHOLOGY

Myerson et al. have identified two groups of patients who are especially susceptible to developing posterior tibial tendon dysfunction. The first group was composed of a younger group of patients with a mean age of thirty-nine. These individuals were shown to have associated inflammatory processes at other ligamentous sites and tendon attachments along with involvement of the posterior tibial tendon. Other features of systemic inflammatory disorders were of higher incidence in this patient group. The second group of patients was largely composed of elderly patients with a mean age of sixty-four. These patients had isolated dysfunction of the tibialis posterior tendon. The majority of patients treated for this disorder fall into the latter group. Holmes and Mann identified a variety of other conditions associated with tibialis posterior dysfunction.

Kannus and Jozsa (1991) performed a controlled study evaluating the histo-pathologic changes that preceded spontaneous tendon rupture. Biopsies of spontaneously ruptured tendons including the achilles, biceps, and a variety of other tendons in 891 patients were studied. Age and sex-matched control specimens were harvested from 445 tendons of previously healthy individuals who suffered accidental deaths. The findings indicated that degenerative changes were common in the tendons of patients older than age thirty-five. These changes have been implicated in spontaneous tendon rupture. No healthy tendon structures were found in any of the spontaneously ruptured tendons, However, two thirds of the tendons in the control group were shown to be structurally healthy.

In the older patients with tibialis posterior dysfunction, bilateral flatfoot deformity is a common finding. In addition, may of these patients have a history of chronic inflammatory tenosynovitis which precedes the actual tendon rupture. Therefore, early diagnosis and aggressive treatment is essential in the management of posterior tibial tendon dysfunction.

In 1990, Frey et al. studied the vascular supply

to the tibialis posterior and flexor digitorum longus tendons using cadaveric specimens. It was demonstrated that the vascular supply to the tibialis posterior tendon is abundant at the osseous insertion and musculo-tendinous junction. However, it was demonstrated that a relative hypo-vascular zone of the tibialis posterior tendon exists posterior and inferior to the medial malleolus. This finding was consistent in all specimens. In contrast, the midportion of the flexor digitorum longus tendon was shown to lack this hypovascular zone, perhaps explaining why this tendon rarely ruptures. Therefore, hypovascularity and degeneration of the tendon may represent important co-existing factors which predispose the tendon to ultimate rupture.

CLASSIFICATION

A variety of classification and staging systems have been described. Mueller proposed a classification system based upon four categories: direct injury, pathologic rupture, idiopathic rupture, and functional rupture. Mahan, in 1992, described an etiologic classification system with three categories: direct injury, pathologic rupture associated with inflammatory arthropathies, and a mechanical vascular mechanism. The third category is based upon spontaneous rupture secondary to pre-existing hypo-vascularity and mechanical degeneration of the tendon. The mechanics and evaluation of tibialis posterior dysfunction have been thoroughly described by Mueller in 1984 and 1991. Banks and McGlamry also provided a comprehensive description of posterior tibial tendon rupture in 1987.

In 1989, Johnson and Strohm proposed a staging system for tibialis posterior dysfunction. Stage I, demonstrates peritendinitis and/or tendon elongation, normal alignment of the rearfoot, mild weakness on single heel rise, and mild to moderate focal pain. Stage II is characterized by elongation of the tendon, flexible valgus position of the hindfoot, moderate pain along the tibialis posterior tendon, marked weakness on single heel rise, and the "too many toes sign." Stage III demonstrates elongation of the tendon, fixed valgus position of the heel, medial and lateral pain, marked weakness on single heel toe raise, and the "too many toes sign." The following treatment regimen was suggested. Stage I injures were treated with conservative care for three months, followed by synovectomy and tendon debridement if necessary. Transfer of the flexor digitorum longus to the navicular was suggested for Stage II injuries. However, subtalar arthrodesis was proposed for a Stage II tibialis posterior dysfunction.

In 1986, Funk et al. reported the results of surgical exploration of nineteen patients with TP dysfunction. Four types of lesions were identified: avulsion at the insertion, mid-substance tendon ruptures, incontinuity tears of the tendon and tenosynovitis only. The patients with Type 1 lesions were treated with surgical re-insertion of the tendon. These patients overall had a poor outcome at follow-up. Patients with type two, three, and four lesions showed both subjective and objective improvement. Patients with mid-substance tendon ruptures were treated by transfer of the flexor digitorum longus tendon. Patients with type three and four lesions were treated with tendon sheath synovectomy.

IMAGING TECHNIQUES

In 1988, Rosenberg et al. described the usefulness of computed tomography (CT) and Magnetic Resonance (MR) imaging in the surgical management of tibialis posterior dysfunction. MR imaging was noted to provide superior definition of tendon outline, longitudinal splits, synovial fluid, edema, and degenerative tissue. CT was superior to MR imaging in the evaluation of associated osseous abnormalities. They classified the ruptures into three morphologic types: Type I, a partially torn bulbous tendon; Type II, a more severe partial rupture with attenuation of the tendon; and Type III, complete rupture of the tendon with an interposing gap. They indicated that "MR imaging is the method of choice for evaluating ruptures of the posterior tibial tendon." Rosenberg et al. in 1988, reported on the correlation between CT and surgical findings in rupture of the posterior tibial tendon. Although the CT findings were accurate in 96% of the patients who underwent surgery, 14% of the tendon ruptures were under-estimated in terms of the extent of the injury. This resulted in mis-classification of certain tendon ruptures.

MRI AND TIBIALIS POSTERIOR STUDY

The authors have completed a review of twenty-six patients with tibialis posterior tendon dysfunction, in whom an MRI was performed. Each patient's

medical record, MRI scan, and diagnostic imaging report were extensively reviewed. This study demonstrated an overwhelming frequency of Type I hypertrophic lesions as the most common pathology. In addition, the MRI scans demonstrated significant pathology in various other anatomical structures. Findings included tendinitis of the flexor digitorum longus, flexor hallucis longus, and the peroneals, as well as ankle ligament tears. Other associated findings included pathology of the tendo Achillis and various subchondral cysts.

SIGNIFICANCE OF MRI AND TREATMENT OF TIBIALIS POSTERIOR DYSFUNCTION

The majority of patients with tibialis posterior dysfunction can be identified using clinical examination techniques. Standard radiographs are rarely helpful in diagnosing tibialis posterior dysfunction. However, routine x-rays may demonstrate coexisting pathology. Tenograms have been shown to be of limited usefulness, due to technical difficulties in performing the study, as well as the high incidence of false negatives. Therefore, the diagnosis of tibialis posterior dysfunction depends upon the physician's ability to isolate the tibialis posterior when performing manual muscle testing. It is important to determine any asymmetry between the two extremities. However, a bilateral posterior tibial tendon rupture may exist, emphasizing the importance of a careful physical examination. Therefore, the clinician must be familiar with the exam findings associated with tibialis posterior dysfunction.

Although the diagnosis of posterior tendon dysfunction is formulated primarily from the physical examination, MRI has shown to be a helpful adjunct. Localization of longitudinal tendon splits can be identified using MI imaging. A difficulty for surgeons is that intraoperative examination of the tendon occasionally fails to reveal these longitudinal splits. This may result in failure to repair the tendon adequately.

SUMMARY

Posterior tibial dysfunction is an important clinical disorder which often goes undiagnosed. Emphasis should be placed on a careful physical examination when evaluating this condition. However, if posterior tibial dysfunction is suspected, an MRI is strongly recommended in order to further delineate associated pathology and to help form a surgical plan if indicated.

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