An Uncommon Presentation of Acquired Equinovarus Deformity

Jonathan Shalot B.S.[1], Throy Austero B.S.[1], Grant Yonemoto B.A.[1], Rahim Lakhani B.S.[1], Michael Rutkowski B.S.[2]

1. Third year medical student, New York College of Podiatric Medicine, New York, NY
2. Second year medical student, New York College of Podiatric Medicine, New York, NY

Student Club @ NYCPM — ACFAS

Statement of Purpose

The treatment of Acquired Neurologic Foot Deformities typically requires both medical and surgical management, with participation from various medical specialties. This case report is unique in that the patient initially presented as an over supinator with pain along the left styloid process that eventually progressed to a bilateral equinovarus deformity (left > right) with a left foot drop due to degenerative disc disease in the lumbosacral region. We present a protocol for early identification of acquired neurological lower extremity deformities and when it is appropriate to consult with other medical specialties to provide the best care for the patient.

Literature Review

According to the literature, the most common cause of spontaneous foot drop is neuropathy of the common peroneal nerve. Foot drop presents as an inability or difficulty in ankle dorsiflexion. Even less commonly reported with foot drop is a concomitant equinovarus contracture of the ipsilateral limb, which is most often seen following a stroke. Central causes of foot drop such as cauda equina compression or lumbar degenerative disease (LDD) including disc herniation and lumbar spinal stenosis typically present with other symptoms [1,2].

Lumbar degenerative disease resulting in damage to the lumbar and sacral nerve roots can impair gait and lead to radiculopathy that presents with symptoms including pain, numbness, paresthesia, and weakness [3]. Foot drop secondary to LDD is most commonly seen at the L4/L5 or L5/S1 level [4]. Clinically, degenerative lumbar spinal disease due to disc herniation and spinal stenosis causes insidious weakness to the extensor group: tibialis anterior, extensor hallucis longus, extensor digitorum longus, with or without lower back pain or paresthesia [5]. Objective extensor muscle weakness in patients with degenerative lumbar stenosis can be seen in approximately 44% of patients. In patients undergoing lumbar discectomy, 53.3% of patients had muscle weakness while 39% of patients had abnormal deep tendon reflexes [4,6].

In the ever-growing population of diabetic patients with neuropathy, differentiating foot drop due to peripheral neuropathy or lumbar degenerative disease can be challenging [4]. Assessment of tibialis anterior and extensor digitorum longus function and strength is achieved through manual muscle testing (MMT) grading [7]. Often electromyography and nerve conduction tests are used to determine the presence and cause of the neuropathy [7,8]. Preservation of the ankle jerk reflex can also be used to differentiate between isolated peroneal neuropathy and more proximal L5 radiculopathies [7]. The recognition of symptoms and diagnosis is of upmost importance as the duration of foot drop will impact likelihood of recovery [2].

Case Study

A case is presented of a 64-year-old diabetic male who initially presented in June of 2014 complaining of a painful left styloid process. The patient originally presented to another podiatrist, a year after sustaining a left ankle fracture, treated with immobilization. Radiographs taken at that time showed no evidence of fracture or dislocation, only soft tissue edema. The patient was subsequently referred to Physical Therapy to reduce soft tissue edema and scar tissue formation. Custom orthotics were also manufactured and he was prescribed a lace up ankle brace.

Case Study Continued

In 2017, the patient presented to us, but with progression of symptoms. He reported a feeling of instability and frequent falls. Physical exam revealed a loss of vibratory sensation in the left 1st MTPJ, +1 reflexes and (-) Babinski on the left. Manual muscle examination revealed muscle strength of left extensor hallucis longus 4/5, extensor digitorum brevis extensor digitorum longus 3/5, tibialis anterior 4/5, tibialis posterior 5/5, Achilles -2/5, peroneus longus 5/5, and peroneus brevis 4/5. On stance, he demonstrated varus resting calcaneal stance position, left > right. He could not come up to his toes or heels. Calcaneal varus on the right was reducible with the Coleman block test, however, could not be assessed on the left due to patient feeling weak and unstable. With subtalar joint neutral, the 1st ray was noted to be plantarflexed, left > right. Gait exam **photos (Figures 1a, 2a, 3a)** before spinal surgery demonstrated a widened base and stance of gait, increased knee flexion (left), decreased ankle dorsiflexion with inverted attitude of foot (left). About 12 months post neurosurgery, slight improvement in gait is noted. **(Figures 1b, 2b, 3b),** Scan QR code to see pre- and post-op gait. Weight bearing x-rays of the left foot (**Figures 4, 5**), ankle (**Figure 6**), and calcaneus (**Figure 7**) were also obtained. **Figure 8** is a lumbosacral MRI. EMG/NCV study demonstrated axonal peripheral polyneuropathy.

QR code. Pre- and post-op gait

Figure 1a (left) and **Figure 1b (right)** at double leg-stance preop and postop, respectively.

Figure 2a (left) and **Figure 2b (right)** at swing phase of gait, preop and postop, respectively.

Figure 3a (left) and **3b (right)** at terminal stance stance of gait with left lower extremity at terminal stance pre-op and post-op, respectively.

Case Study Continued

Figure 4. Lateral view showing posterior displacement of cyma line and convex upward Meary's line.
Figure 5. DP view demonstrating decreased calcaneal cuboid angle and stacking of metatarsals.

Figure 6. Ankle view showing congruous ankle mortise.

Figure 7. Calcaneal axial demonstrating varus heel.

Figure 8. T2-weighted MRI in patient with left foot drop, L5 disc herniation and stenosis.

Lumbosacral MRI showed disc degeneration and mild retrolisthesis of L5-S1, significant spinal stenosis with an L3-L4 posterior disc bulge and mild broad posterior disc extrusion of L5-S1. Patient underwent L3-L4 bilateral laminectomies, L5-S1 left hemilaminotomy discectomy per neurosurgery 5 days after MRI was done. Intraoperative findings included completely calcified L5-S1 disc with elevation and severe compression of the S1 root. At 9 months post-op, neurosurgery discharged the patient. In December of 2018, plantarflexion strength was noted to be 4/5, no significant changes in dorsiflexion were appreciated, and gait was more stable with an increased cadence. Patient continues to ambulate in a Posterior Leafspring AFO.

Analysis & Discussion

The equinovarus foot, regardless of origin, is a challenging condition. It is imperative to have a firm understanding of the cause before implementing surgical treatment. This case study emphasizes the importance of Podiatric care in early identification and treatment of systemic neurologic diseases. With recognition and proper referral, severe disability was mitigated, however, not fully reversed.

Analysis & Discussion Continued

This case is unique in that the patient had LDD due to both spinal stenosis and disk herniation. Early recognition of LDD due to spinal stenosis and disk herniation has been shown to affect the extent of recovery and reversal of neurologic deficits. The most recent neurosurgery evaluation reported excellent surgical result with no need for further follow up. Upon personal evaluation of the patient, though improved cadence speed and balance was noted, no perceivable changes in dorsiflexor manual muscle strength were appreciated. Studies have shown that by 6 month follow-up, improvement has stabilized [2].

In regards to treating a patient that presents with significant changes to the muscular balances of the foot, and ankle and gait performance, it is essential to understand the history of the presentation and the etiology of the deformity. There are a wide range of treatment modalities from nonsurgical to surgical treatments described in the literature for this pathology. Nonsurgical treatment options can include orthotic devices, serial casting, muscle relaxants, and phenol nerve blocks [9,10,11]. By the time the patient presented to us, custom orthotics and physical therapy had been attempted but significant time had also passed since the onset of the palsy. The patient's symptoms progressed at a disapproving rate. In order to better stabilize the patient and improve function, a Posterior Leafspring AFO was prescribed and patient was taken to the operating room by neurosurgery.

Rather than having tunnel vision and simply putting a "bandaid" on a symptom, it is essential to adequately work up the patient. Systemic problems often present with lower extremity manifestations and the astute clinician can help mitigate severe disability. Unfortunately, our patient presented to us several years after symptoms started and complete reversal from nerve damage could not be achieved. Research has shown that weaker muscle power before surgery and longer duration of neurologic injury before treatment often result in decreased likelihood of return to function [12,13]. In an acute presentation, the patient should be referred to neurosurgery for an MRI, and if warranted, emergent/urgent surgical intervention should follow. In these instances, muscle function can return in approximately 70-80% of patients [2]. If delayed or ignored, paralysis can ensue. In a chronic presentation, work up can include EMG/NCV studies and advanced imaging such as MRI. The goal of this case study was to highlight the importance of remembering that the foot and ankle are part of a whole, and tunnel vision when treating patients should be avoided. Communication among different medical specialties is vital, highlighting that Podiatry is an integral part of the patient's medical care team.

References & Acknowledgements

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