A CASE OF A POST-TRAUMATIC FOOT DROP TREATED BY TIBIALIS POSTERIOR TENDON TRANSFER – A CASE REPORT

Plastic Surgery

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ABSTRACT

Foot drop can be defined as a significant weakness of ankle and toe dorsiflexion. The foot and ankle dorsiflexors include the tibialis anterior, the extensor hallucis longus, and the extensor digitorum longus. These muscles help the body clear the foot during swing phase and control plantar flexion of the foot on heel strike. Weakness in this group of muscles results in an equinovarus deformity. Here we report a case of a post traumatic foot drop which was evaluated and treated with a tibialis posterior tendon transfer.

KEYWORDS

Common peroneal nerve, Foot drop, Trauma, Tendon transfer

INTRODUCTION

Foot drop can be associated with a variety of conditions, including dorsiflexor injuries, peripheral nerve injuries, stroke, neuropathies, drug toxicities, or diabetes. The causes of foot drop may be divided into 3 general categories: neurologic, muscular, and anatomic. These causes may overlap. Treatment is variable and is directed at the specific cause. Peroneal nerve injuries are the most common peripheral nerve injuries of the lower limb resulting from multiple traumatic injuries such as those suffered in motor vehicle accidents.[1]

Case Report

A 24 year old male presented to us with difficulty in walking past 4 months. He was apparently normal 4 months back when he sustained an accidental sickle injury to the left leg for which primary suturing was done elsewhere. Since the injury, he has been having difficulty in walking with paresthesia along the lower leg and foot. There was no history of co-morbid illnesses. On examination, there was wasting of the extensor and lateral aspects of the left leg with a foot drop.(Fig. 1)

Fig. 1 – Pre-op photograph showing left foot drop

On walking, he had a high stepping gait. There was sutured scar over the upper 3rd of left leg near the neck of the fibula. Nerve conduction study showed that the common peroneal nerve trunk was injured. We planned for a tibialis posterior tendon transfer. We put him on a foot drop splint (Fig. 2) and started him on physiotherapy to strengthen the tibialis posterior muscle and to retrain the muscle to perform dorsiflexion of ankle and toes and also inversion.

Fig. 2 – Picture of a foot drop splint

Under spinal anaesthesia and tourniquet control, four incisions were made. First incision was at navicular bone at the insertion of the tibialis posterior tendon, about 5cm below medial malleolus.(Fig. 3)

Fig. 3 – First incision at navicular bone to disconnect insertion of tibialis posterior tendon

The tendon was disconnected from its insertion through this incision. The second incision was made about 10cm above the medial malleolus, just medial to the tendoachilles. The tibialis posterior tendon was pulled up through this incision.(Fig. 4)

Fig. 4 – Second incision to pull out the tibialis posterior tendon

A third incisions were made on the dorsum of the ankle to expose the tibialis anterior, extensor hallucis and extensor digitorum longus tendons. With the help of a tendon tunneller, the tibialis posterior tendon was brought into the ankle incisions by the circumtibial route. The tendon end was split into two. The medial slip was anchored to the tibialis anterior and extensor hallucis tendons, whereas the lateral slip was fixed to the extensor digitorum longus tendons of the four toes by the pulvertaft technique using 3-0 nylon sutures, with ankle in neutral position.(Fig. 5)
The hip and knee to prevent the toes from catching on the ground during gait, because the patient tends to walk with an exaggerated flexion of equinovarus deformity. This is sometimes referred to as high stepping anesthesia. Weakness in this group of muscles results in an against a bed railing or hard mattress in debilitated patients, or compression from habitual leg crossing, compression of the nerve knee dislocations, tibial osteotomies, total knee and hip arthroplasties, head include ankle sprains with associated proximal fibular fractures, area. Common peroneal nerve injuries at the region of the fibular fibula renders it susceptible to injury during surgical procedures in this more superficial course than the tibial nerve does, especially at the sensory patch at the first dorsal web space. The peroneal nerve runs a supplies the tibialis anterior, and the remaining branches supply the branch divides just after rounding the fibular neck. Its initial branch over the posterior rim of the fibular neck to the anterior compartment of the lower leg, dividing into superficial and deep branches. The superficial branch travels between the two heads of the peronei and continues down the lower leg to lie between the peroneal tendon and the lateral edge of the gastrocnemius. It then branches to the ankle anterolaterally to supply sensation to the dorsum of the foot. The deep branch divides just after rounding the fibular neck. Its initial branch supplies the tibialis anterior, and the remaining branches supply the extensor digitorum longus, the extensor hallucis longus, and a small sensory patch at the first dorsal web space. The peroneal nerve runs a more superficial course than the tibial nerve does, especially at the fibular neck, and this relatively exposed position makes it vulnerable to direct insult. Its close adherence to the periosteum of the proximal fibula renders it susceptible to injury during surgical procedures in this area. Common peroneal nerve injuries, at the region of the fibular head include ankle sprains with associated proximal fibular fractures, knee dislocations, tibial osteotomies, total knee and hip arthroplasties, and arthroscopies. As Kaminsky reported, the most common form of neural compromise in the region of the fibular head is due to direct compression from habitual leg crossing, compression of the nerve against a bed railing or hard mattress in debilitated patients, or prolonged immobility such as that observed in patients under anesthesia. Weakness in this group of muscles results in an equinovarus deformity. This is sometimes referred to as high stepping gait, because the patient tends to walk with an exaggerated flexion of the hip and knee to prevent the toes from catching on the ground during swing phase. During gait, the force of heel strike exceeds body weight, and the direction of the ground reaction vector passes behind the ankle and knee centre. This causes the foot to plantar-flex and, if uncontrolled, to slap the ground. Ordinarily, the strength of the tibialis anterior, which controls plantar flexion, absorbs the shock of heel strike. Foot drop can result if there is injury to the dorsiflexors or to any point along the neural pathways that supply them. MRI with a MR Neurography provides an accurate picture of the nerve and its fascicles. Electromyography with nerve conduction studies aids us in diagnosing and confirming a foot drop. A review of surgical management of peroneal nerve lesions demonstrated that nerve repair is the first priority in selected patients with peroneal nerve palsy. This may be accomplished by means of nerve decompression (either central or peripheral) or nerve grafting or repair. For foot drop from deep peroneal nerve injuries of less than 1 year's duration, some study reported success in transferring functional fascicles to deep peroneal innervated muscle groups, with either the superficial peroneal or tibial nerve used as a donor. If sufficient recovery is not achieved, those measures, tendon transfer procedures may be considered. It has been suggested that a tendon transfer may be considered if there is no significant neural recovery at 1 year. If a foot drop is chronic and accompanied by contracture, lengthening of the Achilles tendon may be necessary to achieve adequate dorsiflexion. For sharp laceration with suspected nerve transection, early repair is warranted. Blunt lacerations are repaired 2-4 weeks after injury. Lesions in continuity usually are monitored for several months by clinical examination and electromyography (EMG) for signs of early regeneration. If spontaneous regeneration does not occur, surgical exploration and intraoperative nerve action potential (NAP) recordings are used to determine the need for repair, either with end-to-end sutures or with nerve grafts. With a tendon transfer, retraining of the transferred tendon and stretching exercises for the Achilles tendon are advocated. Retraining may be avoided with a neurotendinous transposition of the gastrocnemius and the proximal end of the deep peroneal nerve. This procedure requires very specific patient selection in the subgroup with persistent traumatic peroneal nerve palsy. The common peroneal nerve lesion must be at or distal to the branching from the tibial nerve (to guarantee that intact motor fibers proximal to the lesion are available for transposition). Paralysis must be permanent. Specifically, there must be no recovery of function for at least 18 months after injury or after the most recent attempt at exploration or repair. Electrodiagnostic changes indicative of permanent damage must be present. Also, there must be a good passive range of motion, with at least 90° of dorsiflexion. The muscles innervated by the tibial nerve must be normal. Finally, soft-tissue coverage must be adequate.

A common method of tendon transfer moves the posterior tibial tendon, with or without complementary lengthening of the Achilles tendon. This procedure is accomplished via an open Z-lengthening of the tendons to allow a minimum of 15° of passive dorsiflexion. The route by which the posterior tibial tendon is transferred may be either through the intramuscular membrane or circumtibial. One series that included patients with leprosy concluded that the circumtibial route had an unacceptably high rate of recurrent inversion, leading to ulceration of the lateral border of the foot. Other series have found either method to be acceptable, but a 2009 study argued that the interosseus membrane route is preferred because of patient population. The circumtibial route is technically easier, but it may be less appealing cosmetically. The interosseous membrane route can be prone to adhesions if the window in the membrane is too narrow. In addition to discouraging adhesions, a generous window produces a straight line of pull of the posterior tibial muscle tendon unit from its origin to its new insertion on the dorsum of the foot. Once a transfer route is selected, the point of fixation of the split posterior tibial tendon may be either tendon-to-tendon or tendon-to-bone. In tendon-to-tendon fixation, the points of attachment are the lateral slip to peroneus brevis, peroneus tertius, or extensor digitorum longus tendon and the medial slip to tibialis anterior or extensor hallucis longus. In tendon-to-bone fixation, an osseous tunnel in the tarsal or metatarsal bones serves as the point of attachment. After a tendon transfer procedure, the patient is placed in a cast and restricted to non-weight-bearing ambulation for 6 weeks. Subsequently, the patient receives physical therapy for gait training.

CONCLUSION
A thorough clinical and physical examination along with appropriate investigations like electromyography and nerve conduction studies are required to make a diagnosis of foot drop and to evaluate its cause. As
most cases present to us after 1 year, the common procedure of a circumtibial tibialis posterior tendon transfer is a standard protocol in most cases.

REFERENCES