



Foot Drop: Comparison of two Surgical Techniques for a Neglected Clinical Entity

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Abstract

Foot Drop is a quite common clinical entity. Various causes are responsible for the foot drop. The common peroneal nerve is the most commonly injured nerve in the lower limb. There is a long list of causes for the foot drop from central causes like stroke to Leprosy to isolated lesion of common peroneal nerve. The various treatment modalities like conservative splint management, steroid therapy, nerve repair or decompression, arthrodesis and others. Outcome of these and in particular of nerve repair is very uncertain. Also these cases come very late after roaming here and there to Plastic Surgeons when only tendon transfer is the treatment option. Here I describe surgical technique of Tibialis tendon transfer with two methods and their outcome comparison. From Jan. 2012 to June 2019, a total of 18 reluctant chronic neglected cases of foot drop were operated. Main reason for foot drop was traumatic peroneal in RTA. Proper pre operative evaluation was very important. All cases were operated under unilateral spinal anesthesia. Only two incisions were given, one to retrieve Tibialis posterior tendon and one for tendonorrhaphy. First 6 cases were operated with easy circum tibial subcutaneous route. In later 12 cases trans interosseous membrane route was preferred as it is more anatomically and physiologically near to normal force vectors. Operation usually took 60-80 min. Posterior slab is must for minimum 6 weeks and for next 6 weeks foot drop splint was given. This followed by proper physiotherapy and gait training. Results were almost same in both groups but patient satisfaction and foot position was better in trans interosseous group.

Keywords: Foot drop, tendon transfer, tibialis posterior, tibialis anterior, extensor hallucis longus.

Introduction

Foot Drop is a quite common clinical entity. Actually foot drop is a clinical presentation of an underlying pathology. Various causes are responsible for the foot drop¹. Usually this occurs after post RTA trauma to common peroneal nerve. Often it presents more commonly on one side. Patient walks with hyper flexion of thigh to clear the foot off the ground. Even then toes touch ground first than heel. This gait is very frustrating

to patient and family. In routine patient and doctors do not know in which domain or specialty this is being treated. Normally patients first go to Neurophysicians, they refer to Orthopedicians and they refer to get rid of seeing such non rewarding cases to Physiotherapists. Physiotherapist themselves do not know the proper treatment and patients get frustrated. As many complicated rejected cases from other specialties come in Plastic Surgery, so is this. For this skillfully done

tendon transfer is the result oriented procedure giving immediate result. Main aim was to compare results of two commonly done procedures.

Material and Methods

From Jan. 2012 to June 2019, a total of 18 reluctant neglected cases of Foot Drop were treated. Age ranged from 12 yrs. to 58 yrs. with mean age of 42 yrs., out of 18 patients 6 were female. Main reason for foot drop was traumatic peroneal nerve injury in RTA. I have seen cases of foot drop as a result of cerebral hemiparesis (residual lesion) to iatrogenic after surgery for right hip dislocation. All eighteen cases were exhausted of multiple consultants' visits and number of various scans etc. without any benefit.

Pre operative evaluation for tendon transfer is very important. The success depends upon this examination. Other than routine investigations CT, MRI, EMG, NCV tests were done as per indications. The accepted passive dorsiflexion of foot must be minimum 80 degree. Less than this indicates Achillis tendon tightness and it has to be released. Muscle power of Tibialis Posterior to be checked. If it is weak then preoperative strengthening exercise must be advised for 4-6 weeks. Transferring a weak Tibialis posterior muscle tendon will not give good results. Patients were followed up for minimum 18-24months to reach the conclusion.

Surgical Technique

All cases were operated under unilateral spinal anesthesia. Only two incisions were given, one to retrieve Tibialis posterior tendon and one for tendonorrhaphy. In initial 6 cases tendon was transferred subcutaneously² as trans interosseous route is difficult. In rest 12 cases trans interosseous membrane route was preferred as it is more anatomically and physiologically near to normal force vectors³. First we have to palpate navicular tuberosity where Tibialis posterior tendon inserts. A small incision given and TP tendon confirmed and cut from insertion. Tendon

is withdrawn above ankle. As muscle fibers are present very low these have to be excised to bare the tendon. A vertical lazy S or horizontal parallel to ankle crease an anterior incision given from above ankle to proximal foot. Here Tibialis Anterior and Extensor Hallucis Longus tendons identified and looped. When we have to pass the TP tendon below the skin (this is simple procedure) a space is created subcutaneously in oblique direction and tendon is brought anteriorly. To pass TP tendon through interosseous membrane then a blunt tip scissors is used to create passage adjoining to lateral surface of tibia. Here one has to take extreme care in dissection not to injure anterior tibial neurovascular bundle. Then TP tendon is passed through interosseous membrane and brought anteriorly. Now tendon is split in two half. Medial slip is sutured (tendonorrhaphy) to Tibialis Anterior tendon with 2-0 Prolene. The lateral slip is sutured with extensor Hallucis longus and extensor digitorum tendons⁴. The foot must be in full dorsiflexion during suturing with knee slightly flexed. Surgical wounds are closed in layers. A strong posterior slab is given below knee to just beyond the toes. This is kept for 6 -8 weeks. For next 6 weeks foot drop splint is given for day time along with proper physiotherapy. After 12 weeks patient is allowed for weight bearing. Patient has to learn reeducation of muscle use to improve gait. Post operative rehabilitation is the very important aspect.

Results

Out of 18 cases initial 6 cases were operated by more easy subcutaneous route and rest 12 cases with trans interosseous route after mastering this. The results were classified according to the classification developed by Carayon et al⁵ as excellent, good, moderate and poor (Table 1). Results were assessed at 12 and finally at 18 months minimum.

Table 1: The evaluation criteria of Carayon et al for the evaluation of patients who underwent Tibialis posterior tendon transfer for foot drop.

| | Excellent | Good | Moderate | Poor |
|------------------------|------------|-------|---|-----------------------------|
| Active dorsiflexion | +15 degree | 5-15 | No active dorsiflexion | Presence of planter flexion |
| Active planter flexion | +30degree | 15-20 | Drop foot totally corrected | Prevent ankle motion, |
| Active ROM | +40 degree | 20-30 | Planter flexion is possible up to 10 degree | Minimal dorsiflexion |

Table 2. Out come on the basis of Carayan criteria.

| No.of cases | Carayan criteria result | Excellent | Good | Moderate | Poor |
|-------------|--------------------------|-----------|------|----------|------|
| 6 | Sub cutaneous route | 2 | 3 | 1 | - |
| 12 | Trans interosseous route | 5 | 6 | 1 | - |
| Total= 18 | | 7 | 9 | 2 | - |

The most controversial aspect of Tibialis posterior tendon transfer is the route by which the tendon be carried to the dorsum of the foot. Although the interosseous route is more physiologic from the force vector point of view but the greatest disadvantage of this method is the risk of adhesion especially if the window is kept narrow and high risk of injuries to anterior tibial neurovascular bundle. The cicumtibial subcutaneous route has a longer movement arm, which increases the mechanical advantage with respect to power, however the movement range decreases. Clinical studies comparing both methods have remained inconclusive. In their biochemical study, Goh et al⁶ found that the interosseous route was more effective in dorsiflexion. On the other hand Soares⁷ study shows that both methods yield above neutral dorsiflexion in 80% of the patients and from the viewpoint of dorsiflexion both methods are equally successful. In our series study we found that patients with subcutaneous route were little concerned with the visibility of tendon when they compared results with those of trans interosseous route, but happy as they got rid of the curse of foot drop. In follow up we have not seen complications in trans interosseous group.

As per Carayan⁵ evaluation out of 18 cases 7 were having excellent results, 9 had good, 2 had moderate and no one had poor results. It was possible due to right selection of cases, proper operation and post operative physiotherapy. All patients were satisfied as they got rid of stigma

and curse of foot drop, can mix up with others well in society with confidence.



Pic.1 No dorsiflexion



Pic.2 Retrieval of TP tendon



Pic. 3 TP tendon brought anteriorly through interosseous route



Pic.4 TP slips rrhaphied with TA, EHL and EDL tendons



Pic.5 Dorsiflexion after TP tendon transfer

Discussion

Foot drop is just a symptom of an underlying wide range of causes for it. Ranging from central nervous system motor cortex contusion, neuropathic demyelination, stroke, a complication of disc surgery, following epidural or spinal anesthesia, chronic lead poisoning, hip or knee joint surgery, poorly administered injections, gluteal hematoma, fractures of femur, upper end tibia-fibula, Leprosy, compartment syndrome, tight compression bandage, direct peroneal nerve injury and so on the list is long⁸. But one thing is common that right patient will be benefitted by proper surgery. Tibialis posterior tendon transfer is the key point. This may be through subcutaneous or interosseous route Carayan et al⁵ evaluated double tendon transfer adding flexor digitorum longus too. Fixation of TP tendon is also very important. Arthrodesis, fixation in bones with anchors⁹ etc give poor

results compared to tendonorrhaphy. Trans interosseous route is more physiologic and in the force vector, so results are good. In gross evaluation good ground clearance of foot and dorsiflexion muscle power 3/5 is good result.

The first tendon transfers were described by Codivilla¹⁰ in 1899. In 1933 Ober¹¹ described the Tibialis posterior tendon transfer on to the anterior tarsus. Brand¹² (1960) and Fritsch¹³ (1957) have used this extensively for leprosy patients.

Conclusion

Foot drop corrective surgery is normally avoided by other specialties surgeons. But a correctly done simple procedure changes life of a patient. He gets much improved walking and more so in climbing stairs. Gain self confidence. Trans interosseous route is more near to normal physiologic-mechanical vector. It is cosmetically good also. Generally Plastic Surgeons do trans subcutaneous transfer as inter osseous route requires good surgical dissection to avoid injuries to anterior tibial neurovascular bundle. Arthrodesis and tendon fixation to bones are associated with poor results. Proper selection of cases is very important. Overall this a very rewarding operation if executed very well.

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