Patients with foot drop find it difficult to lift the front part of their foot and toes. It is a debilitating condition, yet current treatments are limited. Pioneering a new surgical technique involving nerve transfer, Dr Rahul Nath, Director of the Texas Nerve & Paralysis Institute is set to change this. Through the successful treatment of over a hundred patients, Dr Nath shows that this is a feasible and effective management option for foot drop.

Foot drop is a deceptively simple name for what is often a complex problem. It is a general term describing the loss of ability to raise the foot at the ankle, leading to difficulty in walking and a floppy-appearing foot. There are many causes of foot drop, but one important reason is damage to the nerves controlling the leg muscles that are responsible for bending and lifting the front part of the foot and toes. This causes a person to either drag the foot and toes or, to compensate, use a high-stepping walk called ‘steppage’ gait. This way of walking requires more effort and in time may lead to further problems, such as back or hip pain. Foot drop often causes pain or uncomfortable neurological symptoms, such as tingling or burning. The combination of decreased mobility and pain limits daily activities and has a devastating impact on the patients’ quality of life.

Foot drop is commonly caused by injury to the peroneal nerve. The peroneal nerve wraps from the back of the knee around to the front of the shin, and supplies movement (motor control) and sensation to groups of muscles within the lower leg, foot and toes. As this nerve supplies the tibialis anterior muscle (TAM), which is responsible for lifting the foot, any damage which disrupts the motor control pathway between the peroneal nerve and TAM can result in foot drop. The peroneal nerve is susceptible to damage since it lies very close to the surface of the skin. Consequently, it is commonly compressed or damaged through sports injuries, gunshot wound, hip or knee replacement surgery, children’s, or diabetes. Pathologies such as multiple sclerosis, stroke, spinal cord injury or cerebral palsy may also cause foot drop.

**MANAGING THE UPS AND DOWNS OF FOOT DROP**

There are limited treatment options for foot drop, and these vary according to the cause and level of nerve injury. A brace (ankle-foot orthosis) can be fitted to help support the foot and improve walking ability, however many users find them uncomfortable and unhygienic. For some, nerve stimulators (which apply small electrical charges to the leg) may help improve mobility. In patients where the nerve does not recover, surgery is then considered. Peroneal nerve decompression is an option for compressed nerves, or surgery to transfer tendons from stronger muscles may improve ankle mobility but provides only a small improvement in gait and ankle movement and comes with the risk of long-term complications. Nerve graft is a limited treatment option, carried out only when a small length of the nerve is affected (less than 6cm). Generally, however, foot drop is difficult to manage successfully. This is where the work of Dr Rahul Nath, Director of the Texas Nerve & Paralysis Institute comes in. Pioneering the use of a new surgical procedure involving nerve transfer, Dr Nath has successfully treated over a hundred foot drop patients.

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**Cutting Edge Medicine**

Nerve transfers involve taking nerves with less important roles (or branches of a nerve that perform redundant functions to other nerves), and ‘transferring’ them to restore the function of a more crucial damaged nerve. Dr Nath describes it as ‘converting a high-nerve injury to a low-nerve injury’. This type of surgery has been successfully used to treat upper arm nerve injuries and facial paralysis. Dr Nath is spearheading the technique for damaged deep peroneal nerves – offering relief to patients with foot drop.

After surgery, patients did not lose their sense of touch in the region where the nerve was cut and, following physiotherapy, the patients were able to move the foot in a similar manner to those who had not undergone surgery.

**Covering New Ground for Foot Drop Treatment**

In a ground-breaking study, Dr Nath treated 14 patients who had suffered foot drop resulting from deep peroneal nerve damage. For each patient, Dr Nath’s first task was to find a suitable donor nerve – a healthy, functioning motor nerve (controlling movement), ideally located as close as possible to the target muscle (the shorter distance over which a nerve has to regenerate, the better the chances that it will reinnervate its new muscle). Dr Nath found two nerves that could serve as suitable donors, and careful assessment of nerve function guided the choice of donor nerve. A branch of the peroneal nerve (named ‘superficial peroneal’) was favoured if found to be functional, however, if the injury had affected superficial branches of the peroneal nerve as well as the deep peroneal nerve, then the tibial nerve was selected as donor. Once the suitable donor nerve was found, it was then transferred or ‘plugged in’ to the injured nerve, with the aim of controlling movement of the tibialis anterior muscle.

After surgery, patients did not lose function in their donor muscles. In time and following physiotherapy, the patients were assessed to see whether they had regained function in their TAM after nerve transfer. Dr Nath measured muscle strength of the foot before and several months after surgery. On follow-up, 11 of the 14 patients showed significant improvements in their control of foot movement. The internationally recognised Modified British Medical Research Council Motor Scale (BMRC) was used to assess muscle strength – where zero indicates no movement, and five is normal function. Before surgery, all 14 patients scored zero for ankle dorsiflexion (the movement that...
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Patient outcomes were assessed between six to 50 months post-surgery. A significant improvement in ankle dorsiflexion and eversion movement was achieved in 80% of patients. Their foot drop had been corrected and they no longer had a steppage gait. In the other 20%, there was good improvement in ankle eversion but not in dorsiflexion. Dr Nath believes that successful treatment is attributed to careful selection of the donor nerve (tested by electrical stimulation) and optimal timing of the operation after injury (injuries of less than one year of duration).

Given the success of Dr Nath’s treatment for foot drop patients, it is no wonder that he has been elected one of America’s Top Doctors for three years in a row, a prestigious award bestowed on less than 1% of American doctors. His new surgical approach is a feasible and effective management option for patients with foot drop.