

## Robotic Exoskeleton Training for Stroke Rehabilitation

Dr Gaurav sanyasi



Locomotor disability is one of the significant barriers to community function in stroke survivors, manifested as reduced gait speed, recurrent falls, balance issues, and ability to perform activities of daily living.

Conventional rehabilitation methods for stroke patients involve stretching and exercise routines targeted to restore the patient's lost strength and mobility. The usefulness of these rehabilitation methods is not long-lasting, and many healthcare institutions lack specialized programs for continuing treatment for chronic stroke patients.

In recent years, stroke rehabilitation programs have integrated the use of several robotic devices, which provide more intensive and repetitive therapy compared to conventional gait rehabilitation. Robotic devices can facilitate the early mobilization of non-ambulatory/bedridden patients, improving outcomes in the early phase. The advantage of robotic devices is that they deliver high repetitions of intensive walking training with reduced therapist effort, less energy-consuming, and greater cardiorespiratory efficiency. Treadmill-based robotics includes an exoskeleton system, which executes standing and

walking training on a treadmill with body weight support. The exoskeleton system moves joints, such as the hip, knee, and ankle, in a controlled manner during the walking training.

Robots are suitable for all types of stroke patients. Those who will benefit the most are patients with moderate limb paralysis and are in the sub-acute phase, i.e. three to six months after stroke. According to the concept of neuro-plasticity, people suffering from a stroke can re-learn part of their lost motor skills. From Training exoskeletons, patients can go on to wearable battery powered Robots which allow them independent outdoor mobility. After a certain period of gait training, it's possible that the patient can walk on the ground without using a robotic exoskeleton.



### Employee of the month



**UTPAL SAHA**, our youngest physiotherapist from Tripura joined us last, but has made himself indispensable to the therapy team with his enthusiasm and hard work. More importantly, he is always at the heart of the team whatever they do in the after hours and in free time. Over the last few months, he has brought in new vigour and warmth in the therapy program and has made centre his second home



Dedicated Neuro Rehab Centre  
For STROKE, SPINE INJURY, PARALYSIS, NEURO DISEASES

### Doctor's Desk



The main idea for the writeup is to explain that Neurorehab is not merely Physiotherapy. It comprises of evidence based multiple interventional procedures like botulinum toxin injections for spasticity, nerve blocks for pain management, medications to improve speech, cognition, motor recovery, neurogenic bowel and bladder along with physical therapy, occupational therapy, speech therapy, swallow training, psychological counselling and others. All this has to be guided and performed under the supervision of a Rehab Physician who leads Neurorehab program.



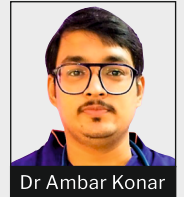
The various conditions that can be improved/benefitted with Neurorehab include 1) vascular disorders like ischemic or hemorrhagic strokes, 2) traumatic conditions like traumatic brain injuries, spinal cord injuries, 3) Degenerative diseases like Parkinson's disease, motor neuron disease, 4) neuromuscular diseases like Bell's palsy, GB syndrome (AIDP), CIDP, muscular dystrophies, peripheral neuropathy and many many more.

The NeuroRehab team essentially comprises of a Rehab Physician/Physiatrist (Team Leader), Neurologist, Orthopaedic Surgeon, physical therapists,



## Upper & Lower limb rehab robot

Robots have recently been clinically standardized for use in Neurorehab. However, they have not been put to use much due to prohibitive pricing. We are glad to pioneer the use of Rehab Robots in Eastern India. We have installed both Upper and Lower limb non-exoskeleton robot that provides a new dimension in rehabilitation and will enhance the speed of recovery of our patients.



The Rehab Robot technology is able to assess as well as gives therapeutic feedback. Assessment can be done regarding motor power, motor control, precision, sensory feedback as well as cognitive status. For therapeutic intervention, there are numerous options with special focus on specific joint, particular muscle group and definite function. The range of motion, resistance, assistance and precision all can be adjusted depending on the status of paralysis, spasticity and functionality of the patient. This Rehab Robotics has also a segment of gamification of exercise where activities of daily living are taught. ADLs and games are also much helpful in Cognitive improvement and improving functionality.

With this technologically most advanced member of our Rehabana family, we are now more motivated and confident in treating our patients.



**Patient Testimonial**



**Traumatic brain injury**

Mr S M



Traumatic brain injury (TBI) is an acute damage to the brain. From an external mechanical force possibly leading to permanent or temporary impairment of cognitive, physical and psychological functions.

A 31 year old young man from a middle class family on 1st October 2021 suffered a road traffic accident which led to TBI, got admitted in a local hospital and was in an ICU for 24 days.

The patient's family almost lost hope for his life but the doctors and nurses did their best to keep him alive and after 1 and half month of struggle he was finally out of danger and got released from hospital.

But he lost his mobility, and became completely

dependent on others to do the smallest work of daily life.

The family made the smartest decision to consult a Rehab physician instead of going to a physiotherapist. This PMR doctor referred him to our center for comprehensive Neurorehabilitation.

After a thorough and detailed assessment our PMR doctors planned the rehab program by setting goals, and medication, and with the expert team of PT, OT, speech therapist, psychologist and rehab nurses we executed all the plan.

His therapy started with strengthening of all 4 limbs, balance and coordination exercises. Then we moved him to a neuro walker after 3 days. Alongside the OT started walking on his ADL training within 10 days, he was able to walk with walker. Gradually he was mobilized to his dependent devices and vocational training. On the 15th day, he started walking independently. He was sent home on 16th day with a prescription of home therapy which was also taught to his mother. Monthly visits were scheduled to monitor progress.

Eight months after his original accident, he rejoined his job as an office supervisor and made us proud with his recovery.



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occupational therapists, speech and language therapist, social worker, rehab nurses, psychologists.

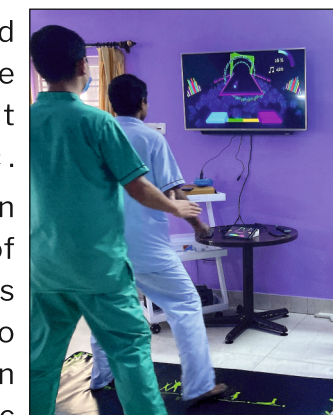
The entire rehab plan is chalked out by the rehab physician which includes medications, interventions like nerve blocks, botulinum toxin injections, laying down therapy protocols and manipulating treatment protocols as required daily.

The NeuroRehab program is supposed to be holistic, customised and community focused. To reach the necessary goals, a program should include 1) training of activities of daily living like eating, grooming, dressing etc 2) speech and language training 3) bladder and bowel retraining 4) mobility, and balance training 5) cognitive therapy 6) psychologist vocational counselling 7)

**Doctor's Desk**

medications and interventions to reduce symptoms, prevent complications etc.

The latest Trend in Neurorehab is the use of virtual reality and robotics based rehab programs to help patients to remain engaged in task specific activities based on the concept of neuroplasticity. Rehabilitation techniques that are supported by evidence which suggest cortical reorganization as the mechanism of change include constraint-induced movement therapy, functional electrical stimulation, treadmill training with body-weight support, virtual reality therapy and robot assisted therapy.



**Employee Talk**



**Subhadip Dhara**

Rehab Nurse



I am Subhadip Dhara, a friendly. Rehabana has provided me the opportunity to earn and gain expertise of handling various Neurological patients like SCI, TBI, Parkinson's, motor neuron disease, diabetic neuropathy and a group of paralysis patient following CVA.

A rehabilitation nurse is specialized in the care of dependent individuals, direct patient care, educates patients and their families, provides care and coordination. I try to explore the patients needs and his family condition and provide necessary feedback to the Doctors and Therapists.

I joined Rehabana 6 months back, immediately after passing out from Southern Institute of Medical Science.

I find this place extremely happy and warm. I also find my work as a Rehab Nurse extremely rewarding. Rehabana promotes talent, enthusiasm and most importantly Eagerness.

The management, Doctors and Therapists are very

friendly. Rehabana has provided me the opportunity to earn and gain expertise of handling various Neurological patients like SCI, TBI, Parkinson's, motor neuron disease, diabetic neuropathy and a group of paralysis patient following CVA.

As a part of the rehab team, my most rewarding experience has been of caring for Mr S H who came with quadriplegia due to SCI following RTA. He was completely bed bound over a period of 3 months of intensive Rehab he started walking with minimum support and supervision of the rehab team. Whenever I see Mr Hossain, makes me proud to be a Rehab nurse.

