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Effects of Robotic Rehablitation in the Gait Training Among Neck of Femur Fracture

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Abstract :

Recent technical developments have made it possible to create sophisticated prosthetic limbs for people with disabilities. This study reviews eight currently created (either experimentally or commercially) rehabilitation robots after providing a brief history of the Robotic devices made to help individuals who have lost limbs or need skeletal-muscular support. This paper describes each device's use and operation before rating it according to eight different factors: cost, accessibility, maintainability, training, adaptability, safety, environmental issues, and technological viability.

Key words : Rehabilitation robotics, neck of femur fracture, gait traning.

Robotic Rehabilitation -

Any robotic device that is automatically controlled and intended to enhance movement in people with physical impairments. Robotics developments based on clinical and neurophysiological insights have led to encouraging outcomes in the healthcare sector. Patients are given physical and psychological support in their healing process by the rehabilitation robots. According to studies, the utilisation of fun games and technology-enhanced social contact increases patient excitement. The robot also helps rehabilitation professionals provide patients with more regular, efficient, and effective training while gathering important data to monitor their recovery.

Origin -

Rehabilitation robotics is a part of a relatively new and rapidly expanding subject, particularly in the therapeutic setting. With the application of sensory-motor function training to animals with central nervous system (CNS) impairment, groundbreaking technologies have been found since the late 1980s and early 1990s However, the use of machines in rehabilitation dates back much further, to a patent submitted in 1910 by Theodor Büdingen, which creates an electrically controlled machine to assist and guide patients with cardiac difficulties during their walking motions.

Principles -

-The development of locomotor training, an evidence-based training technique to restore or enhance walking function, was founded on the then-emerging understanding that the neural system is pliable and stays that way after injury The principles of motor learning, such as task specificity, the power law of practise, diversity of training, and challenge, are followed by LT .

Effects of robotic rehabilitation on gait training : There have been numerous research on the impact of robot therapy on individuals with neck of femur fractures to enhance their functional gait A gait

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training system, which incorporates the idea of movement control through pelvic motion and CIMT in the lower extremities, is however rarely used in studies about robot therapy A brand-new exoskeleton-style lower limb rehabilitation robot is called Healbot T. It offers pelvic movement, including pelvic rotation, lateral translation, and CIMT, which restricts the range of motion of the healthy-side lower leg during gait, in contrast to previous robot systems used for gait rehabilitation.

Femoral neck fracture :

Neck of femur fractures are often brought on by high energy injuries, such a fall from a height or a car accident, or low energy injuries, like a fall in a weak older patient. They are frequently accompanied by other serious injuries. Fractures of the neck of the femur (NOF) can develop anywhere between the subcapital region of the femoral head and 5 centimetres distal to the lesser trochanter. According to the joint capsule, the neck of the femur can be divided into two separate regions : Intra-capsular: Immediately proximal to the trochanters, from the subcapital region of the femoral head to the basocervical region of the femoral neck. Extra-capsular - located outside the capsule, and includes : between the greater trochanter and the lower trochanter, or inter-trochanteric From the lesser trochanter to 5 cm distal to this, there are sub-tronchanteric bones. The femoral head receives blood that travels retrogradely along the femoral neck from the distal to the proximal.

Area affected gait training in muscles ,ligaments and joint :

Usually following a fall, patients with hip fractures visit the emergency room or their doctor's office. They frequently are unable to walk, and the affected limb may shorten and rotate externally. They frequently have hip pain. However, individuals with hip fractures occasionally only report generalised pain in their back, buttocks, thighs, groyne, or knees. Initial radiography findings may be ambiguous, and their ability to walk may be unaffected. To establish the presence of a hip fracture in these patients, further tests such bone scanning or magnetic resonance imaging may be required The following ligaments surround the hip joint: The front of the body's pelvis is joined to the femoral head by the iliofemoral ligament, which is Y-shaped.

The gluteus medius and minimus muscles oppose the high-tension pressures operating on the NOF under normal circumstances.

Robotic gait rehabilitation :

Physiotherapists may need to put in a lot of time and energy during lower extremity therapy, especially for gait recovery. This approach to rehab is not only overly expensive and hence unrealistic, but it also requires a lot of work from the therapists to deliver the care. But one of the most crucial elements of lower limb robotic therapy is gait. With the current techniques for gait improvement, numerous therapists are required to assist the patient in properly moving each joint and leg in order to reap the most benefits. Robotic systems for lower extremity rehabilitation, such as powered orthoses with computer-controlled motors to support joint mobility.

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Figure 1(source -Google image)

Indication of Robotic Rehabilitation :

Rehablitation device for locomotor impaired patient caused by :

- Stroke
- Cerebral palsy
- Parkinson's disease
- Spinal cord injury
- Hemiplegic patients
- Paraplegic patients
- Multiple sclerosis
- Traumatic brain injury
- Muscle weakness dueto the lack of mobility
- Spinal muscular atroph

Contraindications of robotic rehablitation:

- Training may be restricted under the following conditions:
- Body weight greater then 136kg
- Severely fixed contractures
- Bone instability (non-consolidated fracture ,unstable spinal column severe osteoporosis)
- Open skin lesions n the area of the lower limb and torso

- Circulatory problems
- Cardiac contraindications
- In general, patients who have been ordered to remain in bed or immobile due to for distance osteomyletis or oher inflammatory /infectious disorders
- Hip knee ankle orthosis.

Conclusion :

This study from the review papers conclude that robotic rehabilitation has a very beneficial effect on neck of femur fracture, it improves mobility and increases daily living activity and heals faster or we want to further research this study go.

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