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EFFECTIVENESS OF EARLY REHABILITATION IN SPINAL CORD INJURY

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Abstract :

Spinal cord injury (SCI) affects millions worldwide, with a significant population in India, predominantly young men. Causes vary from accidents to sports injuries, each resulting in diverse forms of SCI, classified by the American Spinal Injury Association (ASIA) scale. Clinical manifestations include spinal shock and autonomic dysreflexia, alongside secondary complications like pneumonia and pressure sores. Rehabilitation in the acute phase focuses on preventing complications and includes respiratory care, positioning, and exercise tailored to injury type. As stability improves, upright activities are introduced gradually. Skin protection is paramount due to sensory loss. Acute pain management involves various techniques. The transition to active rehabilitation emphasises functional goals and standardised outcome measures. Early rehabilitation optimises neural recovery, limiting secondary complications and improving motor and sensory functions. Timely intervention correlates with better functional outcomes, underscoring the critical role of early rehabilitation in SCI management.

Every year approximately 40 million people worldwide suffer from Spinal cord injury (SCI). In India approximately 1.5 million people live with SCI. Most of them are young men aged between 20-35 years. The most common causes of SCI are Road traffic accident, gunshot injury, knife injury, falls and sports injury. Injury is caused by flexion, compression, hyper extension, flexion rotation mechanism.

Spinal cord injury is classified by American Spinal Injury Association (ASIA) by considering the motor and sensory function.

ASIA Scale

A –Complete .Motor and sensory loss below neurological level

B-Incomplete . Sensory-but no motor function is preserved below the neurological level and includes sacral segments S4-S5.

C-Incomplete .Motor function is preserved below the neurological level and more than half of key muscles below neurological level , muscle grade less than 3

D-incomplete . Motor function is preserved below the neurological level, and at least half key muscles below neurological level, muscle grade greater than equal to 3

E-Normal . sensory and motor function are normal.

Spinal cord injury is damage to the bundle of nerves and nerve fibres that sends and receives signals from the brain.

Tetraplegia results in impairment loss of motor and sensory function in the upper limb, trunk, leg and pelvic organ. Paraplegia refers to impairment or loss of motor, sensory function in the thoracic, lumbar segment of spinal cord. With Paraplegia arm functioning is spared but trunk legs pelvic organs are involved in depending on the level of injury.

Clinical manifestation :

Immediately following SCI there is period of areflexia called Spinal shock .result from very abrupt withdrawal of connection between higher centre and spinal cord. It is characterised by absence of all reflexes, flaccidity, loss of sensation, and motor function below the level of lesion. The other important condition is Autonomic Dysreflexia. The clinical syndrome produces an acute onset of fatal autonomic activity, bradycardia , headache ,, profuse sweating increased spasticity , restlessness , vasoconstriction below the level of lesion, vasodilation ,constricted pupil , piloerection, blurred vision.

Indirect Impairments or complications :

The most common secondary complications are pneumonia, pressure sore, and DVT, musculoskeletal paralysis or Para paresis, bladder and bowel incontinence. Weak and paralysed muscles of inspiration leads to reduced ventilation of the lung, inadequate or absence strength of coughing makes it difficult to clean secretions leads to build up fluid in the lungs can result in pneumonia and atelectasis .Loss of vasomotor control spasticity, skin maceration ,from exposure to moisture , nutrition deficiency , poor general skin condition and secondary infection results pressure sore. Loss of normal pumping mechanism provided by active contraction of lower extremity musculature leads to DVT Within first 2 months following injury. Contracture –The hip joint is particularly prone to flexion deformity including component of internal rotation and adduction.

Heterotrophic ossification is ontogenesis in soft tissues below the level of lesion. It is always extra articular and extra capsular. Hip and knee joints are commonly involved. Early symptoms are thrombophlebitis, swelling, decreased ROM, erythema, local warmth near the joint.

The effect of bladder dysfunction following SCI poses serious medical complications. SCI with lesions that occurs within the spinal cord above the conus medullary develop a spastic or automatic bladder

A flaccid or non reflex [LMN] lesion occurs with SCI at the micturition reflex centre [S2-S-4] generally involving T-12 vertebral injury or below.

As with the bladder, the neurogenic bowel conditions that develop after spinal shock subsides are of two types. In cord lesions above the conus medullaris there is spastic or reflex bowel [UMN lesion] and in conus medullaris or cauda equine lesions a flaccid or non reflex bowel [LMN] develops.

Sexual dysfunction is as vital and normal part of the rehabilitation process .A gradually expanding body of literature is available .An early study by Comarr in the group with complete 154 patients with LMN lesions,74% have had no erection , 26% had erection with only by psychogenic stimuli. With incomplete LMN lesion, 83% had erection, but all by psychogenic means.

Relatively little literature exist addressing the impact of SCI on sexual function in woman. Women remain capable of sexual intercourse and potent for conception and carryout pregnancy under closed supervision.

ACUTE REHABILITATION IN SCI

Acute Rehabilitation starts once the patient is stabilised neurologically .The aim of the rehabilitation is to prevent complications. Intense passive joint range of motion should be done in acute phase to resolve contracture, muscle atrophy and pain .With paraplegia motion of the trunk and some motion of the hip are contraindicated generally, straight leg raising more than 60degree and hip flexion beyond 90 degree should be avoided. Positioning, splints for the wrist, hand and fingers are an important early consideration. Hand splint with wrist in neutral, c bar or short opponens spint must be advised. Ankle foot orthosis is indicated to prevent weak ankle dorsiflexor. Stretching should be done to protect the tenodesis effect in patients without active wrist extension and fingers that are not fully stretched. Respiratory care depends on the level of injury and individual's respiratory status. Diaphragmatic breathing exercise should be encouraged with manual contact just below the sternum even in the absence of thoracic and abdominal sensation, to facilitate expiration .Manual contacts are made over the thorax with the hands spread wide. High level of cervical lesion needs glossopharyngeal breathing. Abdominal corset can be provided to patients whose abdomen protrudes as it increases intra thoracic pressure and improves resting position of diaphragm. Incentive respirometry can be advised for and patient must perform for 3-4 times per day for effective coughing and breathing.

An important consideration in planning exercise programs during acute phase is to avoid stress at the injury site and Specific application of resistance may be contraindicated to musculature of the scapula and shoulder in tetraplegia and musculature of the pelvis and trunk in paraplegia. During acute phase emphasise is on bilateral upper extremity activity as they avoid asymmetric ,rotational stresses on the spine .With tetraplegia guided strengthening of anterior deltoid ,shoulder extensor, biceps ,lower trapezius ,radial wrist extensor, bicep ,triceps and pectorals should be started .With paraplegia strengthening of shoulder depressor ,triceps , latismus dorsi must be emphasised.

Once the radiographic findings shows the stability in injury site of spine and the patient is advised for upright activities ,upright activities can be initiated by elevating the head of the bed, progressing to a tilt in space wheelchair with elevating leg rest and proceed to tilt table standing with continuous vital chart.

Skin protection and prevention of bedsore needs constant 24 hours care in cases of sensory loss. Every 1 hourly change in position is mandatory. Avoid raising head of the bed above 30 degree or higher as it increases the peak interface pressure between the skin at the sacral area and support surface .Avoid dragging the patient across the surface while turning in bed to prevent shear related injury. Before wheelchair seated select a pressure redistribution cushion, adjust footrest and arm rest to maintain proper posture and pressure redistribution. Do not use a ring or doughnut cushion. Teach individuals to perform the most appropriate pressure relieving manoeuvres. Incorporate the skin inspection into the patient's daily routine before and after washing. Provide the patient with equipment for the skin inspection long handle mirror.

Acute pain can be managed by transcutaneous electrical stimulation, Cryotherapy, and guided stretching and strengthening activity.

Conclusion:

In acute care specific functional goal can be established as a part of overall rehabilitation planning. All the examination done in acute phase must be carried out once patient enters into the active rehabilitation program. A variety of standardised outcome measures used for functional recovery like FIM, SF-36 can be used for outcome measures.

At the time of Hospital discharge patient and family members should be demonstrated and educated properly the acute rehabilitation regimes till the patient advised for active rehabilitation programs by the treating surgeons.

Early Rehabilitation promotes neural plasticity, sprouting, regeneration limiting the further damage and secondary complications and potential to improve gross motor function, fine motor performance, sensory function, reflex function and functional goal. The shorter the duration between spinal cord injury and Rehabilitation therapy the greater the FIM score latter on.

