



Pelvic Floor Rehabilitation In Complete Spinal Cord Injury

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ABSTRACT

Introduction: One of the most relevant disabilities is caused by spinal cord injury (SCI). Typical causes of spinal cord damage are trauma, disease, or congenital disorders. SCI compromises the function of the central nervous system. The pelvic floor represents the lower closure of the pelvis and it is able to support the pelvic organs. **Case Report:** acute SCI patient, following intradural-extramedullary spinal neof ormation level D6-D9. Rehabilitation approach to pelvic floor included a series of techniques aimed at improving the contractility and tone of the pelvic floor muscles. At the end of 6 sessions patient presented major awareness of bladder emptying through intermittent catheterization and the partial recovery of tactile sensitivity in the wall of the vagina. **Conclusions:** This paper suggests the possibility for inserting the treatment of the pelvic floor in the neuro-motor rehabilitation program of the complete SCI. The awareness of pelvic floor muscles contraction and bladder functions represent important goals.

Keywords: Spinal Cord Injury, Pelvic Floor Rehabilitation, Visceral awareness.

INTRODUCTION

The pelvic floor represents the lower closure of the pelvis and it is composed by different layers of muscles and ligaments. Its function is to support the pelvic organs, constantly subjected to important pressure variations, both in static conditions due to the effect of gravity and for the movements of the abdominal organs, and, in dynamic conditions, when there is an increase in pressure intra-abdominal. The pelvic floor, which includes the urinary, genital and digestive systems with the bladder, prostate, uterus, vagina, rectum and anus, can be affected by organic and functional diseases. All these conditions, Pelvic floor physical therapy is a treatment approach that uses the principles of physical therapy to improve the strength and function of pelvic floor muscles and alleviate pain, weakness and dysfunction in the muscles. Spinal cord injury compromises the complex neural network involved in the transmission, modification and coordination of motor, sensory and automatic control of the organs and often determines a very serious disability in the injured person. Neurogenic bladder and bowel represent a dysfunction resulting from the lack of central nervous control. It is a condition commonly observed in persons with spinal cord injury (SCI). Bowel and bladder management is the problem that is most perceived by the SCI patient as negative, second only to paralysis, loss of sensitivity to sexual satisfaction, architectural barriers, addiction and work problems. (1) SCIs were classified as complete and incomplete by the American Spinal Injury Association (ASIA) classification (2). The ASIA scale grades patients based on their functional impairment from A to E, where A represents the greatest impairment and E represents the normal condition. Approach to pelvic floor rehabilitation in SCI patients can improve the strength and endurance

of voluntary contractions in Incomplete lesion and reduce neurogenic detrusor over-activity and incontinence (3) Patients with Complete SCI retain some residual innervation of the PFM after injury, possibly via indirect cortical descending pathways. (4) According to this concept we decided to set up neuro-motor rehabilitation of pelvic floor in SCI patient. The aim of the study was twofold:

1. to improve perineal muscles "performance"
2. increase the awareness in pelvic floor motor function

CASE REPORT

In this study, we have evaluated a patient admitted to the Spinal Unit of the Scientific Institute of Pavia of ICS Maugeri, in the period between January 2021 and June 2021. The patient was a 47-year-old caucasian woman, who had a history of paraplegia, neurologic bowel and bladder following intradural-extramedullary spinal neof ormation at level D6-D9.

On January 12 case report underwent surgery for exeresis of intradural-extramedullary neof ormation D6-D9. (Fig.1) and six days later she appeared on physical examination: alert and oriented with intact cranial nerve function. Motor and sensitivity functions were preserved in upper limbs. Lower limbs presented a preserved range of motion (ROM) of the hip, knee and ankle bilaterally. Frequent spontaneous muscle spasms were observed on the sural triceps bilaterally and on the hip flexors during its passive extension bilaterally. Muscle strength in weightlessness was 1/5 on the right, on the other side apparently no motor activity was present, osteotendinous reflexes (ROT) were normal in the upper limbs, hyperelicitable in the lower limbs bilaterally. Patient was unable to maintain the sitting position in the wheelchair because of poor trunk control. The superficial sensitivity was altered and the patient reported paraesthesia in both lower limbs and anesthesia in pelvic floor Bladder function was impaired: patient was unable to empty her bladder completely causing a significant post void residual volume; self-catheterization, performed four times a day. On the rectal examination, the external anal sphincter muscle did not show any motor response. Patient was dependent in the activities of daily living (ADL). Personal rehabilitation program (PRI) aimed to: improve motor performances and the grade of autonomy, control of bladder and bowel function. Motor Evoked Potentials, (MEPs) of the lower limbs showed a pathology of the first motor neuron and / or intrarachide of the second motor neuron. Somatosensory Evoked Potentials, (SEPs) resulting from stimulation of the clitorideo nerve: no cortical reponse (P1). Magnetic resonance imaging (MRI) of the dorsal spine evidenced the results of the removal of schawannoma at D6-D9 level. PRI consisted in following steps: joint excursion and stenic recovery of the lower limbs, prevention and control of spasticity, recovery of the postural passages in autonomy, upright posture control and walking with assistance. PRI included 6 sessions of pelvic floor rehabilitation over the last 4 weeks of hospitalization period. Physiotherapist used a series of techniques aimed at improving the contractility (strength) and tone (resistance) of the pelvic floor muscles.

Rehabilitation approach to pelvic floor included the following moments:

- Breath awareness exercises that allow the patient to perceive the duration and depth of the inspiratory and expiratory phases
- Partial motor activation of sphincters that are placed on the pelvic floor and perception of their residual motor function
- Define the position of the vagina and activation of its walls

- During the treatment, a skilled physical therapist accesses the muscles through the rectum or vagina and makes manipulations on them
- The therapist may either stretch the muscles if they are short and contracted or apply resistance to improve strength if they weak and dysfunctional.

At the end of 6 sessions patient presented a better awareness of bladder emptying through intermittent catheterization and the partial recovery of sensibility in the left half vaginal wall. Partial motor activation of the external anal sphincter muscle was present to digital rectal examination.

The follow-up 5 months after the hospital discharge confirmed the persistence of the outcomes obtained at the end of 6 rehabilitation sessions.



Fig.1: Nuclear Magnetic Resonance (NMR) Surgical excision of schwannoma of the cauda at D12-L1 level. An hyperintensity lesion is evident in spinal cord at the level of D7-D8 tract.

DISCUSSION

This case report describes the results of pelvic floor rehabilitation on a woman with SCI caused by schwannoma at D6-D9 vertebrae. Case report presented a complete spinal cord injury in according to the American Spinal Injury Association scale. The awareness of bladder emptying through intermittent catheterization and the partial recovery of sensibility in vaginal at the end of rehabilitation sessions can be explain by some indirect evidence for preserved function below the injury level, which has not been detected by the complete SCI. Bjerkefors et al. (5) described individuals with motor-complete SCI above T6 were able to activate abdominal muscles in response to transcranial magnetic stimulation and during maximal voluntary (or attempted) contractions. The activation was induced directly through corticospinal pathways,

and not indirectly by stretch reflex activations of the diaphragm. Transcranial magnetic stimulation and electromyography measurements provide a useful method to assess motor preservation of abdominal muscles in persons with spinal cord injury. The pelvic floor rehabilitation program of case report, consisted in different steps where breath awareness exercises are always present. Abdominal muscles help breathing. During inhalation phase, when the diaphragm descends, it pushes the abdominal viscera downwards and the abdomen swells due to the elasticity of the abdominal wall. Then the abdominal muscles, like a rubber band, return to their resting position they push the diaphragm upwards allowing for exhalation phase. Ferla (6) and other authors concluded that the abdominal and pelvic floor muscles work in synergy in healthy women. Better knowledge of the contraction and synergy may favor the development of strategies for the prevention and treatment of disorders of the female pelvic floor muscles. The first study found was published in 1994 by Bø and Stien (7). In this study it was observed that the PFM contract synergistically during the contraction of the abdominal muscles. Thus, the authors suggest that abdominal exercises can strengthen the PFM. Multiple EMG studies have demonstrated that the PFM are co-activated during various activities (e.g., coughing, postural adjustments) that also engage the trunk and gluteal muscles.(9–12) Co-activation of the PFM with other postural muscles in these functional tasks is thought to be mediated via multiple cortical and subcortical regions.(8,12,13) The synergic work of the pelvic floor and diaphragm muscle allows to improve the motor activation of muscle less visible on physical examination. According to literature our results suggest that persons with SCI retain some residual innervation of the PFM after injury, possibly via indirect cortical descending pathways.(14)

CONCLUSION

This paper suggests the possibility for inserting the treatment of the pelvic floor in the neuro-motor rehabilitation program of the complete SCI. Partial recovery of perineal muscles "performance" and the awareness of pelvic floor and bladder functions represent important goals. The bowel and bladder management are a problem perceived negatively by the SCI patient, second only to paralysis, loss of sensitivity to sexual satisfaction, architectural barriers, addiction and work problems. Pelvic floor rehabilitation could integrate the pharmacological response to sphincter dysfunctions

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