

Case Report

Rehabilitation of a SCI patient involving the medulla oblongata injury after a traffic accident: a case report

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Abstract: Rehabilitation from medulla oblongata injury is extremely rare. We found a case with injury from medulla oblongata to spinal cord C3, which was manifested in sensor and motion loss, gatism and a short-time conscious disturbance. Due to the incomplete injury, the rehabilitation was successful while the gatism was completely recovered and most sensorimotor function regained. This patient was diagnosed with C2 cervical spine fracture, medulla oblongata injury and spinal cord injury (C4, AIS C). Therapeutics interventions included respiration, reposition, transfer, eating, hygiene, dressing and grooming training, passive and assistive movement, tilt bed, and low frequency pulsed electric therapy for four limbs and bladder to the restoration of function, accompanied with drugs to nourish nerve and to improve circulation. This case showed a surprisingly achievement in rehabilitation from SCI involving medulla oblongata and deficiency of specific therapy in this field as well.

Keywords: SCI, medulla oblongata, rehabilitation

Introduction

Spinal cord injury (SCI) is a series of complex syndromes of central nerve system [1, 2], which occurs mostly in young males and majorly caused [3] by traffic accidents (48%), falls (23%), or violence (14%), etc. Different levels of SCI are with various symptoms [4-7], such as quadriplegia in cervical SCI, paraplegia in thoracic or lumbar SCI and gatism [8-10] in SCI from whichever level. SCI level from medulla oblongata was rarely seen. Medulla oblongata is regulated to respiration, digestion, blood pressure and cardiopulmus [11-13], therefore it is called as vital center. Patients can hardly survive from medulla oblongata injury because of respiration ceases or cardiac arrest. However, with increasing rates of traffic accidents causing SCI involving medulla oblongata, rehabilitation from the incident is a formidable task.

Case report

A 26-year-old woman who presented quadriplegia and gatism 15 days after a crash in a traffic

accident admitted to the Rehabilitation Department of the Second Xiangya Hospital of Central South University in May 5th, 2015. The patient has been undertaken an operation of "Halo traction of skull and internal fixation of cervical spine" in Spine Department of Xiangya Hospital in April 20th, 2015. During the postoperative period, she was confined to the sickbed in a coma for about 10 days. Owing to the good nursing care, she had no pulmonary infection, thrombus, pressure sore or other complications. When admitted to the Rehabilitation Department, she suffered from hypesthesia, quadriplegia and gatism, and resulted in disability on rotation, sit transferring or standing while then her activity of daily life (ADL) was entirely depended on family (Barthel index =5'). At April, 21st, 2015, the patient took a series of examinations. An X-ray image showed the woman was injured the second cervical vertebrae (**Figure 1**). A magnetic resonance image (MRI) demonstrated a hyperintense signal from medulla oblongata to spinal cord C3 (**Figure 2**). On physical examination, myodynamia of her bilateral upper and lower limbs was about grade 1; sen-

A case report of SCI with medulla oblongata injury



Figure 1. Lateral X-ray of cervical spine showed fracture of the second cervical vertebrae.



Figure 2. A magnetic resonance image (MRI) demonstrated a hyperintense signal from medulla oblongata to C3.

sation to pinprick and light touch was lost from the C5 level, without awareness of the need to empty the bladder nor sensation for a bowel movement. She had no voluntary sphincter contraction, and could only partially prevent the leakage of stool and urine. She was measured at class C on American Spinal Injury Association (ASIA) scale. The Rehabilitation Department conducted a series therapy prescriptions: (1) respiration, reposition, transfer, eating, hygiene, dressing and grooming training; (2) passive and assistive exercises; (3) short protocol of everyday tilt bed, each time 30 minutes, from 30° and slowly elevated to 90°; (4) everyday low frequency pulsed electric therapy for four limbs (intensity based on the fasciculation, frequency between 30 and 50 Hz), each time 30 minutes; (5) everyday low frequency pulsed electric therapy for bladder (intensity 30 mA, frequency 25 Hz), each time 30 minutes. These therapy prescriptions accompanied with drugs to nourish nerve and to improve circulation, aiming at the restoration of function. A week later at May 11st, the physical examination result was improved, with the myodynamia of her left upper and lower limbs were at about grade 2, and sensation to pinprick and light

touch was lost from the T1 level. The patient could change her position by herself, but couldn't sit alone, nor do personal hygiene or walk, etc. She could control defecation but partially urinate. Her ability of daily life was promoted to 15' in Barthel index. A month later, at June 4th, her physical function had greatly improved with the examination: (1) myodynamia of her left upper and lower limbs at about grade 3; (2) sensation loss lowered to the T1 level; (3) gaitism totally recovered. She could control defecation and urination autonomously with ability of daily life improved to 20' in Barthel index. From this time, prescriptions had changed: (1) passive exercises replaced by active assistive exercises; (2) removed low frequency pulsed electric therapy and tilt bed. (3) focused on the occupational therapy to restore the hands' delicate functions, physical coordination and balance. At July 20th, when the patient discharged from hospital because of economic problems, her sitting and standing balance reached the third degree, she could eat alone with a spoon, transfer from bed to chair and walk for a short distance about 10 meters all by herself. On physical examination,

A case report of SCI with medulla oblongata injury

myodynamia of her proximal extremity were at grade 4, and distal extremity approximately at grade 3; sensation to pinprick and light touch and bladder and bowel movement were totally recovered.

Discussion

Few case of spinal cord injury with high level like medulla oblongata by traffic accidents was reported. Medulla oblongata was a complex construction of multitudes of nerve corpuscle as well as a part of brainstem [14-16], controlling multiple functions, including (1) circulation; (2) respiration; (3) sensor; (4) motion; (5) muscular tension; (6) digestion; (7) sleep-waking cycle; (8) autonomic nerve function, etc [13, 14]. Owing to its vital center function, medulla oblongata pathologic changes mainly resulted in deaths of patients [17]. As a result, the rehabilitation of medulla oblongata SCI was still inexperienced. However, it can't be negligible for the high mortality and high deformity rates.

In this case, unlike the typical brainstem injury, the woman manifested in sensor and motion loss and gaitism instead of serious cardiac arrest or respiratory problem while MRI demonstrated a foci from medulla oblongata to C3. Though imaging featured in medulla oblongata, but no relevant clinical symptoms occurred to this patient, this phenomenon could be owing to the reason that many scholars claims there is no significant relationship in functions and radiographic findings through their clinical experience.

When the patient was treated empirically with cinesiotherapy and low frequency pulsed electric therapy to the restoration of functions (ways of SCI treatment), accompanied with drugs for a month, her sensation loss and gaitism were totally recovered, and her motor function resumed mostly with four limbs could almost resist to gravity. These exhibitions could be ascribed for the reasons below: (1) Spinal cord cells concerning stunning or hibernating could restore some function after a certain period of time without any intervention, inducing a complicated prognosis [18, 19]. After spinal cord injury, central nervous system would take out a series of adaptive actions, including sprouting of spared fibers, axonal branching, synaptogenesis, and dendritic growth and reorganization

[20, 21]. Little reversal bleeding lesion or spinal cord edema absorbed after the spinal shock could also explain the restoration of functions. Unfortunately, with the economic problem, the patient was discharged from hospital without review of cervical spine MRI. Two other reasons could be accounted for the rapid recovery: the early interventions of surgery and the rehabilitation treatment got involved timely and sufficiently. (2) The early intervention of surgery included nerve decompression, fracture immobilization and spinal stabilization, which had the benefit in reducing surgical blood loss, shortening the length of hospitalization, improving neurological outcome with less nerve injury and obstruction in blood circulation, and decreasing surgical or SCI complications, therefore it improved neurological recovery. (3) Certain rehabilitation methods facilitated the function restoration through plasticity-promoting treatments efficient use of remaining CNS tissue. For one aspect, rehabilitation training could induce nerve nourish factors expression in CNS environment and reduce the complications of SCI. For another aspect, rehabilitation team made professional instructions for escorts healthcare and attend patient's attitude, avoiding anxiety and depression, even suicide. Patients positively and initiatively taking part in medical prescription was the significant element of prognosis.

Though the consequence was surprisingly successful, we should pay attention that there was deficiency of specified treatment of medulla oblongata injury. With the high rate of traffic accidents, the number of high level SCI patients is increasing. However, when dealing with those cases, the key point in the early stage must be emergency medical method, such as improving circular and respiratory function or doing surgeries. While as long as the vital signs are stable, rehabilitation treatments should be involved in prescriptions. However, physicians, especially rehabilitation doctors are not instructed with an accurate guidebook to a customized program for the patients' body function recovery or activity of daily life, which need important breakthrough.

Disclosure of conflict of interest

None.

A case report of SCI with medulla oblongata injury

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