Spinal cord injury (SCI)

Refers to any injury to the spinal cord that is caused by trauma instead of disease.

Total health care costs related to TSCIs exceed $10 billion annually in the United States alone, and lifetime per person direct and indirect costs can exceed $3 million [1) 2)].

Level

There is disagreement over what should be defined as “the level” of a spinal cord injury. Some define the “level” of a spinal cord injury as the lowest level of completely normal function (thus a patient would be termed a C5 quadriplegic even with minor C6 motor function). However, most sources define the “level” as the most caudal segment with a motor function that is at least 3 out of 5 and if pain and temperature sensation is present.

Epidemiology

Spinal cord injury epidemiology.

Classification

see Spinal cord injury classification.

Etiology

Spinal cord injuries have many causes, but are typically associated with major trauma from motor vehicle accidents, falls, sports injuries, and violence.

see Spinal stab wound.

Multiple cellular, molecular, and biochemical changes contribute to the etiology and treatment outcome of contusion spinal cord injury (SCI). MicroRNAs (MicroRNAs) aberrant expression have been found after SCI [3)].

Pathophysiology

see Spinal cord injury pathophysiology

Signaling pathways

Although many scholars have utilized high-throughput microarrays to delineate gene expression patterns after spinal cord injury (SCI), no study has evaluated gene changes in nucleus raphe magnus (RM) and somatomotor cortex (SMTC), two areas in brain primarily affected by SCI. In present study, we aimed to analyze the differentially expressed genes (DEGs) of RM and SMTC between SCI model and sham injured control at 4, 24 h, 7, 14, 28 days, and 3 months using microarray dataset GSE2270 downloaded from gene expression omnibus and unpaired significance analysis of microarray method. Protein-protein interaction (PPI) network was constructed for DEGs at crucial time points and significant biological functions were enriched using DAVID. The results indicated that more DEGs were identified at 14 days in RM and at 4 h/3 months in SMTC after SCI. In the PPI network for DEGs at 14 days in RM, interleukin 6, glyceraldehyde-3-phosphate dehydrogenase (GAPDH), FBJ murine osteosarcoma viral oncogene homolog (FOS), tumor necrosis factor, and nuclear receptor subfamily 3, group C, member 1 (glucocorticoid receptor) were the top 5 hub genes; In the PPI network for DEGs at 3 months in SMTC, the top 5 hub genes were ubiquitin B, Ras-related C3 botulinum toxin substrate 1 (rho family, small GTP binding protein Rac1), FOS, Janus kinase 2 and vascular endothelial growth factor A. Hedgehog and Wnt signaling pathways were the top 2 significant pathways in RM. These hub DEGs and pathways may be underlying therapeutic targets for SCI [4].

Clinical features

Depending on where the spinal cord and nerve roots are damaged, the symptoms can vary widely, from pain to paralysis to incontinence.

Spinal cord injury (SCI) disrupts autonomic circuits and impairs the synchronistic functioning of the autonomic nervous system, leading to inadequate cardiovascular regulation. Individuals with SCI, particularly at or above the sixth thoracic vertebral level (T6), often have impaired regulation of sympathetic vasoconstriction of the peripheral vasculature and the splanchnic circulation and diminished control of heart rate and cardiac output. In addition, impaired descending sympathetic control results in changes in circulating levels of plasma catecholamines, which can have a profound effect on cardiovascular function. Although individuals with lesions below T6 often have normal resting blood pressures, there is evidence of increases in resting heart rate and inadequate cardiovascular response to autonomic provocations such as the head-up tilt and cold face tests [5].

In the Hospital

ASIA impairment scale

Evaluation of reflexes

Abdominal reflexes.....

Diagnosis

see Spinal cord injury diagnosis.

Treatment

see Spinal cord injury treatment.

Urologic Health Condition

Urinary incontinence (UI) rate is high among SCI patients, and more common in females with fairly good proportion of patients using incontinence medication. Main bladder management method was clean intermittent catheterization (CIC) and more prevalent in males, although the use of CIC decreased with time. Urinary stone surgery was the leading surgical procedure [6].

Rehabilitation

Spinal cord injury (SCI) rehabilitation remains a major clinical challenge, especially in cases involving chronic, complete injury. Existing interventions for assisting patients with SCI in walking, including body weight support systems, robotic assistance, and functional electrostimulation of the legs, have not shown evidence of generating significant clinical improvement in somatosensory function below the level of the injury. In the past 2 decades, brain machine interfaces (BMIs) have become popular tools for restoring limb function in paralyzed patients, although no study has suggested that long-term training with BMI-based paradigms and physical training could trigger neurological recovery, particularly in patients with complete SCI

Outcome

Spinal cord injury outcome

Complications

Spinal cord injury complications.

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