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THE DRUGS' EFFECTS ON HYPOXIA, NEURODEGENERATIVE DISEASES, CLINICAL DIAGNOSIS AND THE PSYCHOLOGICAL IMPACT ON THE PATIENTS WITH THE SPINAL INJURIES

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Анотація. *Токсичність ситуацій, а також те, як ліки їх змінюють, було темою, які ми розглянули в нашій статті про зв'язки між гіпоксією та нейродегенеративними захворюваннями. Через складні та маловивчені біохімічні механізми, що беруть участь у нейродегенеративних захворюваннях, а також відсутність систем, які б належним чином відтворювали ці умови, медичні дослідження цих захворювань є складними. Гіпоксія, яка може мати додаткові причини, крім нестачі кисню або глюкози, виникає, коли пацієнт перебуває у непритомному стані. Будь-який регулюючий орган повинен забезпечити безпечне використання ліків для захисту здоров'я населення та цілісності системи охорони здоров'я країни. Незаконний препарат, якщо виникає побічна фармакологічна реакція, що призводить до смерті або захворювання з симптомами, вважається причиною хвороби. Пацієнти з хворобою Альцгеймера або іншими нейродегенеративними захворюваннями демонструють значні зміни в роботі мозку навіть протягом одного дня. Ці зміни не можна пояснити швидкою загибеллю або розвитком нервових клітин. Більш імовірно, що вони відображають зміни в активності мозкової мережі і, ймовірно, довгострокове отруєння, спричинене мутацією білків. Болісний характер травми спинного мозку вимагає змін для людини у фізичному, соціальному, професійному та сексуальному плані. Це також створює велике навантаження на сім'ю. Масштаби психологічної реакції на таку травму все ще є предметом дискусій, незважаючи на те, що можна припустити високий рівень психологічних порушень після травми спинного мозку. Частково виною такої ситуації є те, що більшість досліджень у цій галузі не мають наукового підґрунтя. У цій статті розглядаються більш сучасні дослідження симптомів депресії у людей з травмами спинного мозку. Розглядаються недоліки цього дослідження та надаються рекомендації щодо майбутніх досліджень і психологічної допомоги особам, які страждають на травми спинного мозку.*

Ключові слова: *нейродегенеративні захворювання, вікова нейродегенерація, хвороба Альцгеймера, бета-пептид амілоїду, гіперфосфорилювання бета-пептиду амілоїду, окислювальне фосфорилювання, мітохондрії, розпад глюкози в мітохондріях, енергетичний метаболізм, синтез АТФ.*

Abstract. *The toxicity of these situations and also how medications alter them have all been topics we covered in our discussion of the connections between hypoxia and neurodegenerative diseases. Due to the complex and poorly known biochemical mechanisms involved in neurodegenerative diseases, as well as the absence of systems that properly replicate these conditions, medical research for these diseases is challenging. Hypoxia, which can have additional reasons besides a lack of oxygen or glucose, happens when a patient is unconscious. Any regulatory authority must ensure the safe use of medications to protect the general public's health and the integrity of the country's healthcare system. Illegal drug if an adverse pharmacological reaction occurs, results in death or illness with symptoms, it is considered to be a disease. Patients with Alzheimer's disease or other neurodegenerative diseases show considerable changes in their brain functions, even on the same day. These changes cannot be described by the rapid death or development of nerve cells. It is more likely that they reflect changes in brain network activity and, probably, long-term protein-mutation-induced poisoning. The painful nature of spinal cord injury necessitates changes for the person physically, socially, professionally, and sexually. It also puts a lot of stress on the family. The magnitude of the psychological response to such a trauma is still up for debate, despite the fact that one could assume a high rate of psychological disruption following the spinal cord injury. The fact that most studies in this field lack scientific background can be partially blamed for this situation. This essay examines more current research on depression symptoms in people with spinal cord injuries. The shortcomings of this study are explored, and recommendations for future research and psychological care for spinal injury sufferers are given.*

Key words: *neurodegenerative diseases, age-related neurodegeneration, Alzheimer's disease, amyloid beta-peptide, amyloid beta-peptide hyperphosphorylation, oxidative phosphorylation, mitochondria, mitochondrial glucose breakdown, energy metabolism, ATP synthesis.*

Introduction.

Chronic inflammation is a common component of neurodegenerative disorders, which affects pathophysiology by activating microglia, secreting pro-inflammatory cytokines, including interleukin-1 and interleukin-6, and producing reactive oxygen species. Overall, these events contribute to the spread of oxidative stress, which is associated with changes in the brain's microenvironment's stress response and a rupture and dysfunction of the blood-brain barrier (BBB) [1]. Neurodegenerative diseases can affect local pathways, chemical pathways, synapses, neuronal subgroups, and higher-order neural networks in specific brain areas. Errors in the network may set off a long decline that affects the functionality and health of synapses and neurons [2]. Alzheimer's is one of the most common brain disorders. Tauropathies represent a broad group of neurodegenerative diseases that impact the body as a whole and the brain particularly. They are linked to the formation of abnormal protein structures in the brain that result in oxidative

stress, inflammation, and increases in intracellular calcium levels. Two important aspects of Alzheimer's disease include the extracellular accumulation of amyloid beta-peptide (Aβ) and the hyperphosphorylation of the Aβ peptide, which results in its intracellular accumulation [3]. The blood-brain barrier prevents glutamate from entering the brain from the circulation, glutamate transporters on synaptic membranes keep it balanced, and an excessive amount of glutamate must have a debilitating effect on the brain cells. However, practically (in vivo) body's functioning mechanisms inhibit this in three possible ways. As a result, due to MSG's impacts on creating neurological diseases, no solid evidence could be established. That doesn't, however, rule out the idea that glutamate can cause neurodegenerative disorders. Even when controlled, consistently high glutamate levels tend to cause neurodegenerative disease [4].

The aim of the study.

To analyze the pathophysiological mechanisms underlying neurodegenerative processes and spinal cord injuries.

Main part.

All living things need oxygen to survive, including brain cells and other types of cells involved in tissue development, but too much oxygen can be harmful. As a result, it is strictly controlled by a complex system that controls and maintains record of how this oxygen excess is utilized and absorbed. Oxidative phosphorylation uses oxygen to break down glucose in mitochondria and produces the cellular energy currency, such as ATP. Mitochondria utilize their own set of molecular machinery. In order to participate in oxidative phosphorylation, enzymes and proteins must be synthesized (through DNA) [5]. Age-related neurodegeneration is caused on by hypoxia. It is well known that hypoxia causes significant changes in genes expression. Hypoxia alters both gene expression and the activities of proteins through posttranslational protein modifications. The findings of clinical and experimental studies indicate that cerebral vascular disease and hypoxic-ischemic brain injury are the primary causes of dementia and cognitive decline. The progressive cycle of hypoxic-ischemic brain injury, which results ultimately in Alzheimer's and cognitive decline, causes protein misfolding, aggregation. In addition, protein translation changes and post-translational changes are observed in response to both temporary short-term and prolonged hypoxia [6]. When tumor cell tissue oxygen levels are below normal levels, hypoxia commonly develops within solid tumors. As a result, the production of abnormal vasculature is brought on by the growth of the tumor mass, which endangers the blood supply. However, tumor hypoxia also promotes vascular endothelial growth factor (VEGF) to be expressed more commonly, which in turn promotes angiogenesis, which is crucial for supplying the tumors with growing metabolic needs. Because cells that survive in hypoxic environments frequently develop resistance to radiation therapy and chemotherapy, hypoxia also helps tumors to move toward the cells with more expressed malignancy [7].

Pro-drugs that target and activate hypoxia play a very significant role in Pharmacology and Oncology. This research has resulted in a better knowledge of the role that hypoxia plays in the development of tumor metastatic disease and in the control of drug action, among many other factors. In view of this, the development of hypoxia-targeted treatment has become a promising method, particularly in the field of cancer. It has been shown possible to track the pharmacokinetics and drug release profiles of different pro-drugs in hypoxic conditions by combining them to "all-in-one" therapeutic and diagnostic agents like fluorophores, PET or MRI. Drug delivery applications therapy is a "wise" combination of diagnostic and treatment that, by visualizing the state of the disease, delivers both positive and negative feedback information after therapeutics and can thereby boost treatment efficacy [8]. For people who have suffered from spinal injuries, losing their ability to move permanently is terrible. While being paralyzed is a terrible loss in and of itself, many people also suffer losses in their professional and social lives. Unpleasant side effects like diarrhea, infertility, and pain may develop. A person with spinal cord injuries (SCI) must make challenging adjustments, and it significantly stresses family duties and bonds. Based on the foregoing issues, one would predict that this challenged population has a high rate of psychological illness [9]. Experience medical issues with a rare form, including spinal cord injury (SCI). Major advances have actually been developed globally in lowering illness and mortality after spinal cord injury. During the development in patients, practice has been largely credited with the increased life expectancy and improved quality of life after a spinal cord injury, a considerable share of it is also given to early care of a patient and long-term prevention study [10]. A type of injury that is incomplete is central cord syndrome. A hyperextension injury with pre-existing cervical spondylosis and/or central canal blockage is the common mechanism. A disproportionately affecting larger motor impairment in the upper (especially distal upper) or lower extremities, common bladder dysfunction, and various degrees of posterior sensory loss are the key features of the test. Anatomically, the medial somatotopy of the arms in the long spinal tracts can explain the mentioned distribution [11]. The second incomplete pattern of injury is anterior cord syndrome. The anterior two-thirds of the spinal cord are commonly injured as a result of anterior spinal artery injury from either vascular occlusion (embolic stroke) or ligation. Retropulsion of a disk or bone fragment can also cause direct physical stress to the anterior cord, usually with bending acting as the actual reason. While maintaining the posterior column, this area contains descending autonomic fibres, corticospinal tracts, and spinothalamic tracts. Patients eventually suffer from total paralysis, loss of pain and temperature, while maintaining the vibration and tactile location intact [12]. These events inhibit neuronal regeneration and axonal growth at the damage site and result in long-term degenerative changes. There are no adjustments for Hypertension, and to deadline, no drugs can undo tissue damage or encourage the regrowth of surviving axons through the lesion site. The only approved therapy for acute inflammation reduction is the use of corticosteroids, which is a controversial strategy for treating. There are a few experimental drugs being researched right now, such as antibodies against highly neurotoxic myelin debris proteins, control of damaged axonal microtubules using paclitaxel/taxol and epothilone B, and chondroitinase ABC, an enzyme

that breaks down the growth-inhibitory glycosaminoglycan substituents in proteoglycans that collect in large amounts in the fibrotic scar that forms after severe and block the development of neurons through the wound. Drug development is challenging due to the complexity of the spinal tissue, the extremely severe inflammatory, fibrotic, and neurodegenerative pathology, as well as the fact that the population of people with SCI is small compared to that of people with other neurological illnesses. Throughout this study, six spastic SCI patients with SCS and I with significant spasticity reduction were included. These patients' SCS device' placement ranged from Th_{10} to L_{I}. Clinical observations of the patients were made, and patient assessments of the level of spasticity were recorded. A polyelectromyographic recording of muscle responses to various movements, including responses to passive movements of joints and reactions to vibration of the various muscle groups, was made while using twelve channels of surface electrodes. SCS was performed at 30 Hz with pulse durations of 200 ps and amplitudes ranging from 2 to 8 mA. A broad growth of unconjugated adipose tissue in the epidural space is known to as epidural lipomatosis. It has almost all been observed in people who are slightly to severely obese and have autoimmune Cushing's syndrome without other psychomotor retardation medical conditions. There have only been five cases of epidural lipomatosis in children, among which one was related to long-term steroid use. Personal life changes as a result of spinal cord injury (SCI). These are normally followed by psychological effects that reduce rehabilitative capacity and the possibility of returning to a previous, comfortable social life and job. Particularly, spinal cord injury patients showed higher levels of anxiety and depression than non-injured people. Our research centered on participation in sports as a potential strategy for enhancing psychological well-being in SCI patients.

The patient's information: hospital stay, injury site, pain symptoms, treatment, family role, prescribed medication dosages, and psychological or clinical issues.

Case 1. Sweta a 23-year-old Varnasi resident, has spinal cord damage. She took guidance from the PMR or psychological departments of AIIMS , Delhi. She was depressed due to her inability to focus and lack of academic confidence. Her body rejects sprays and medications (ibuprofen, aspirin). She has previously received three epidural injections, but there has been no improvement. Suddenly developing lumbar or sacral area discomfort [L4-S5], even while being psychologically down. However, she did not have a bacterial infection or bedsores.

Case 2. Rohan Sharma, a 32-year-old resident of Delhi with a spinal cord injury, consults for AIIMS Delhi's PMR, Pain Clinic, or Psychological Department. Due to pressure to sleep in a specific location, he developed bedsores from bacterial infection. His family is there to support him, but he lacks self-assurance because of bedsores or the inability to feel his bladder empty. To remove the poisonous urine, we catheterized. In healthy wounds, betadine is not used.

Spine injury patient: patient with spine injuries often come for dressing. Betadine must not be applied on a healthy wound instead it should be dressed in Normal saline. Try to wear any tight garments and calm the patient. Unless in danger, don't transfer the patient. To avoid twisting or bending movements, support the head, neck, and spine at all times in a stable position. Apply a cervical collar, if you are trained to do so, to minimize neck movement if the ambulance is delayed.

In Hypoxia condition: to manage the disease and enhance patient outcomes, the underlying issue that is generating the hypoxia must be treated. For instance, if infection is the underlying cause of hypoxia, additional treatments for hypoxia may include antibiotics, increased fluid intake, oral suctioning, posture modifications, exercises in deep breathing and coughing and swallowing techniques.

Psychological impact during neurodegenerative disease: particularly in neurodegenerative disease, depression can be early time on and even be the primary symptom, more commonly but not always in the early phases of degenerative brain processes. Diseases like Alzheimer's and Vascular dementia result in more widespread cell death and memory loss. As of current time, no neurodegenerative condition can be cured, and present medications only treat the symptoms or slow the disease's growth.

Conclusions.

The presented clinical cases highlight the complex and multifactorial nature of spinal cord injury (SCI), demonstrating not only the physical but also the significant psychological and social challenges faced by affected individuals. Both patients experienced persistent pain, functional limitations, and secondary complications such as depressive symptoms, loss of self-confidence, and, in one case, infection-related bedsores and bladder dysfunction. These findings emphasize the importance of a multidisciplinary approach that integrates physical rehabilitation, psychological support, family involvement, and appropriate medical management. Early intervention, continuous monitoring, and individualized treatment plans remain essential for improving the quality of life and long-term outcomes for patients with SCI.

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