Application of Knee Jerk Reaction

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Abstract: In modern medical treatment, the researchers began by studying the knee-jerk reflex to predict or treat some diseases, although there is no great progress and results, people have been sensing knee-jerk reflex and the importance of the application of some scientists have begun to study patellar reflex and cranial nerve because knee-jerk reflex and nerves are closely related, so this could be a breakthrough. First, the paper described in detail the knee reflex, where stimulation of tendons sends signals through receptors to the spinal cord and then from nerves to the effector body. Second, knee jerk reflex application on the definition of motor nerve injury of neuron paralysis and reduce nerve palsy, knee jerk reflex action and clinical manifestations, also gives some cases of upper neuron stroke, stroke patients motor nerve dysfunction can't control his own body, but the illness and the degree of improvement can be determined by the knee jerk. The lower neuron is amyotrophic lateral sclerosis, knee reflex is also used to judge the patient's recovery; This paper introduces the causes of cerebral palsy in children, and proves the relationship between knee reflex and cerebral palsy in children through three experiments: the intensity of knee reflex can judge the degree of children's disease, and also introduces some methods to correct and treat cerebral palsy in children. Finally, the application and cases of Lyme disease and knee reflex in Lyme disease are introduced. For example, some patients with Lyme disease may have leg failure or knee reflexes in both legs.

1. Introduction

The keen-jerk reflex test is an important diagnostic tool for determining neurological disorders in the central nervous system. The physical examination of psychiatry requires examinations of all systems throughout the body, but the focus is on the nervous system. The doctor checks the body surface sensation to diagnose whether the sensory nerves are normal. When there is numbness, tingling, or pain on a part of the patient's body surface, the doctor first punctures this part of the skin with a pointed needle, and then gently punctures the same area with a blunt needle to determine whether the patient can distinguish the feeling of blunted and sharp needle. Reflex is the body's automatic response to stimuli. When the doctor taps the tendon under the knee with a percussion hammer, a reflex occurs in the lower limbs. This reflex is called the knee-jerk reflex. The knee-jerk reflex shows the common functions of sensory nerves that afferent to the spinal cord, synaptic connections within the spinal cord, and motor nerves that return to the lower limb muscles. The reflex arc is a complete loop from the knee to the spinal cord and back to the leg and does not involve the brain. Neurologists use keen-jerk reflexes to detect diseases like inflammatory diseases of the brain (encephalitis, meningitis), myelitis, epilepsy (convulsions), Parkinson's, epilepsy, cerebral palsy, sciatic neuropathy, peripheral neuropathy (numbness and weakness of the limbs), and myasthenia gravis, etc.

The purpose of this study is to analyze the application of the keen-jerk reflex. To this end, the essay concluded the mechanical process of the knee jerk reflex and the clinical use of the keen-jerk reflex. Such as to introduce what disease can be diagnosed by keen-jerk reflex, and how these diseases change the nervous system and the response of keen-jerk reflex. Also, Inclu the treat of these diseases.

2. Overview of Knee Jerk Reaction

The part of the knee jerk reaction can divide into three-part. It is done by two neurons: sensory neurons and motor neurons. The first part, the main part of the body is the receptor can be interpreted as a sensory nerve terminal device in skeletal muscle that senses varying stimuli and is covered by a capsule of connective tissue. Each capsule contains between six and 14 skeletal muscle fibers, The mechanoreceptors in the tendon of the quadriceps muscle will receive a stimulus such as a small hammer tapping on the underside of the knee ligament, the tendon, that will cause the quadriceps muscle in the thigh to contract. Receptors in the quadriceps in the thigh pick up the signal. In the second part, the quads are stimulated, and the nerve conduction that happens is that an action potential is generated in the neurons, and then it travels across the afferent nerve to the spinal cord called the knee reflex center in the gray matter of the spinal cord. The motor neurons then react directly with the sensory neurons in the gray matter of the spinal cord, which can then generate an action potential if the signal is strong enough to send the nerve down to the quadriceps femoris muscle in the thigh (fig.1).

In addition, the quadriceps end of the thigh muscle receives an action potential from the bone marrow nerves, and then the biceps femoris of the posterior thigh muscle dilates, and the quadriceps contract to allow the calf to move forward rapidly. The total response time for these three steps is very short and the average person is between 145 and 160 milliseconds [1]. At the last, the knee jerk reflex is also a stretch reflex, a monosynaptic reflex, and a spinal reflex. Number one is because the knee jerk reflex is involved in skeletal muscle because it's in the quadriceps tendon and it's pulled through the stimulation of the tendon and then it's transmitted to the spinal cord and it generates an action potential and then it's transmitted to the effector in the thigh to respond. Second, although the complete process of the knee-jerk reflex usually takes between 145 and 160 milliseconds, scientist Charles Scott Sherrington [2] conducted a comparison experiment. The first group cut the back of the spinal cord and tested the response. The second group is to anesthetize the muscle, primarily the tendon but to do a reaction test there will be some response and for example, there will be a stretch reflex. Charles Scott Sherrington was the first to explore the important role of the stretch reflex in postural regulation by demonstrating that the afferent and efferent nerves have no intermediate neurons and are directly connected. Third, because the quadriceps tendon is stimulated to pass nerve fibers in the spinal cord to again to the effector and action potentials, but through the brain can stop the knee-jerk reaction in the subjects of the normal, so when the knee-jerk reflex not because the conscious reaction to knee taps of muscle contraction [1].

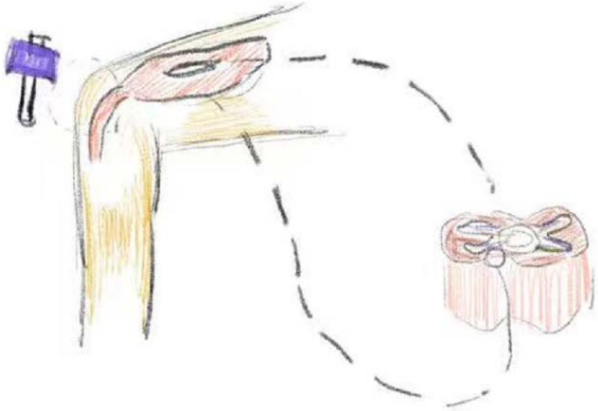

Figure 1. The model of knee jerk reflex. This diagram illustrates the main parts of the knee jerk reflex, such as the quadriceps (receptor), spinal cord, and effector.

3. Application

3.1 Clinical application of knee jerk reflex

The knee jerk reflex has a very wide range of applications in judging motor neuron diseases. Because clinically, it is usually possible to diagnose which part of the motor neuron of the human body is damaged by different degrees of the knee bounce reflex. First of all, if the patient's symptoms are that the calf is lifted violently after tapping the knee, this response can be regarded as hyper knee jerk reflex and it also means that the patient's upper motor neurons may be damaged. The upper motor neuron refers to the neuron that transmits nerve impulses from the gray matter of the human brain until it reaches the lower motor neuron. In the transmission process, the upper motor neuron usually has two pathways, the direct pathway, and the indirect pathway, but they will eventually reach the lower motor neuron. The most common type of direct pathway is the corticospinal tract. The corticospinal tract starts from the cerebral cortex. When it descends to the inferior medulla, many corticospinal cords will begin to cross. This is why most of the cortex of the right brain controls the left half of the muscles, while the right half of the muscles are controlled by the left cerebral cortex. The other kind of pathway is the indirect pathway, or extracortical pathway, which refers to all pathways except the corticospinal tract and cortical bulbar tract. The role of upper motor neurons in the entire transmission process is to regulate nerve impulses, that is, they can play a certain inhibitory effect to ensure that the reflexes do not look so intense [2]. Therefore, when the upper motor neuron is injured, the nerve impulse will not be inhibited during the conduction process.

Stroke is one of the diseases that are closely related to upper neuron damage. Stroke refers to the sudden interruption of blood supply to the brain or the loss of nutrient supply to the brain after a large number of cells die. The disease often lasts for 24 hours, causing great damage to the human body. The relationship between this disease and the upper neuron is that ischemia also affects the normal function of the upper motor neuron. Because the blood vessels in the anterior circulation of the brain are blocked, that is, the clogging of the internal arterial system will affect the cortex that controls the motor nerves. It is difficult for stroke patients to control their limbs. For example, they usually look like their mouths are always tilted to one side on the outside. Knee jerk reflex can play a role in the treatment of stroke to check whether the condition is improving. For example, there is a drug that is commonly used in a clinical practice called Pro-urokinase. Injected within six hours of the onset of the disease, it quickly dissolves the clot and improves circulation. When blood circulation is no longer affected, the upper motor neurons can return to normal function and continue to play an inhibitory role. At this time, the patient will no longer have too intense a reaction when receiving the knee jerk examination. There is also a surgical procedure, usually using a brain pacemaker. The electrical stimulation pulse generated by the brain pacemaker acts on the target nucleus in the brain through the electrode contacts, can also suppress the over-excited neurons and thus relieve hyperactive knee-jerk reflexes.

Then, if the patient does not produce the knee reflex after tapping the knee, that is, the patient’s knee jerk reflex disappears, and it is usually clinically diagnosed as paralysis or injury of the lower motor neurons. The lower motor nerve is connected to the upper motor neuron and continues to transmit nerve impulses to the skeletal muscle. In this process, the lower motor neurons involved can usually be divided into two types: α motor neurons and γ motor neurons. Alpha motor neuron is a somatic motor neuron with a larger cell body in the anterior horn of the spinal cord. The axon is thicker and is the efferent part of the entire reflex arc. It is also called the final pathway of the somatic skeletal muscle motor reflex. The gamma motor neuron innervates the inner spindle muscle, regulates the sensitivity of the muscle spindle to stretch stimulation, and maintains a certain muscle tension. Therefore, if the lower motor neuron is injured, the nerve impulse cannot be transmitted to the skeletal muscle, so the skeletal muscle cannot respond to the stimulation.

Usually, lower motor neuron damage can lead to neurogenic muscle atrophy such as amyotrophic lateral sclerosis. Because after nerve conduction problems, part of the muscle fibers will be disused and exercise capacity will be reduced. In addition, acetylcholine, which is originally released at the end of alpha motor neurons as a nutrient, will also decrease with injury, which leads to muscle

atrophy. In such cases, the knee jerk reflex is still a way for doctors to judge the patient's recovery. Clinical usually use bone marrow hematopoietic nerve factor, with professional technology for cell separation, extraction, purification, let have high purity, high activity, high concentration of nerve factor as clinical treatment materials. Through high-end interventional technology, these nerve factors are transported from carotid artery intervention and targeted localization to the patient, and the patient's nerve cells are activated to achieve their cell differentiation. After such treatment, the patient's damaged lower motor neurons are improved or replaced so that the transmission of nerve impulses is not affected. And when the doctor sees the knee-jerk response come back, it means the treatment has succeeded.

3.2 The relationship between cerebral palsy in children and knee jerk reaction

Cerebral palsy in children is a disease that occurs due to obstacles in the nerve center of the head and therefore affects the normality of the limbs. Its symptoms include visual, language, and hearing disorders, as well as problems such as epilepsy and mental retardation. The problem has seriously affected the normal life of children and has brought a certain burden to many families. Central nervous disorder syndrome is caused by non-progressive damage to the developing brain, usually caused by a rubella virus infection, premature asphyxia, cerebral hypoxia, neuronal damage, traumatic bleeding, cerebral infarction, and other triggers [3].

The clinical manifestations of cerebral palsy in children are central movement disorders, such as muscle weakness, abnormal posture, and reflexes. The patient's original reflex remains and the normal reflex pathway caused by central coordination disorder is blocked, while the abnormal reflex pathway is fixed and the posture and movement are abnormal. It is divided into the following categories. The first type is dyskinesia: because of the damage to the brain nerves, the patient's exercise ability is lower than that of people of the same age, and there are different symptoms in different degrees. Can grasp things normally, can't walk on both feet, and can't control the body to do some daily activities. The second is dysplasia of teeth. The incidence of various dental diseases such as poor tooth texture, dullness, loose teeth, easy decay, and dental caries is also higher than that of normal children. The third is epilepsy: Approximately 50% of patients, especially those with mental retardation, will have such symptoms, which are usually stimulated by external objects to cause seizures.

The fourth is postural incoordination: the patient has poor postural stability, awkward posture during exercise or at rest, asymmetrical left and right sides, abnormal placement of hands and feet, and obvious spasms of facial muscles and tongue muscles. As a result, the child has difficulty breathing or eating, and difficulty in closing the mouth. In some serious cases, the head cannot be placed in a vertical center position and a more natural posture like a normal child. Usually, it is habitually shaking back and forth, or swaying to one side. Finally, emotional instability is more impatient: most of the personality is more irritable, willful, and the mood fluctuates greatly. The most typical examples are self-harm: using tools or through the environment to harm one's body. Partial execution is: forcing yourself to repeat a certain action. However, the current scientific and technological treatment methods are not enough to completely cure children with cerebral palsy. Although 75% of them are spastic cerebral palsy, even if surgical treatment and rehabilitation training are carried out in time, there will still be some sequelae, and because of the long treatment cycle, some families will not choose to go for treatment.

This article mainly introduces the relationship between cerebral palsy and knee reflex in children. Through experiments, the researcher selected 34 babies who met the test requirements from 43 babies aged 0-2 to experiment. The researcher will analyze the data through the video of the electromyogram of the knee spurs. And the final result of this experiment is that the baby and the knee reaction are related, and over time, the baby's condition may become more serious if the baby's knee reaction is abnormal [4].

Therefore, this experiment can also prove the hypothesis of this part: the relationship between knee jerk reflex and cerebral palsy in children. The degree of knee jerk reflex (reaction strength) can be used to judge the physical condition of the baby and whether it has infant cerebral palsy. If it has infant cerebral palsy, it can help to infer the severity of the baby's disease [5].

And then the researchers were designed to measure the torque of tendon jerk in response to patella tendon twitching by comparing the knee position perception of normal and over-reflexes participants. Experimental data suggest that sensorimotor injuries are a component of patients who are not as common as previously reported. Moreover, in most patients with cerebral palsy, joint position sense is not affected when their body reflexes are excessive [6].

On the other hand, the focus of researchers was on an important spinal reflex known as the patellar tendon reflex, which has become an important diagnostic tool for the objective evaluation of neurological disorders. In addition to the decreased latency of reflexes associated with rapid reflexes, knee latency and peak angular velocity did not distinguish between cerebral palsy and normal. And there was also evidence of a difference in this variable in cerebral Palsy compared to normal controls [7].

In the future, babies' health can be judged by knee jerk reflex, and babies with different degrees of disease can be treated with different degrees of reasonable treatment so that the treatment is more reasonable and efficient. For example, patients with low knee-jerk reflexes can use psychotherapy to have gentle conversations with the patient or perform music therapy and adjust the tune-away rhythm and morbid psychology through the patient's response level. Patients with moderate conditions can carry out rehabilitation training such as massage, acupuncture, and massage or some rehabilitation training about posture or perception, such as Bobath method is to suppress abnormal posture so that patients' posture can be restored and continue to develop normally. If the patient's knee reflex is almost absent, more direct treatments can be used, such as surgery to cut the nerve or medication, such as botulinum toxin A, brain actin, brain glycoside carnosine, cytidine phosphocholine, etc.

3.3 Other Diseases That Could Be Diagnosed by Knee Jerk Reflex

Lyme is an infectious disease, and spirochetes are the mediates. The main clinical symptom is damaging to the nervous system. The most common neurological damage is meningitis, encephalitis, cranial neuritis, motor, and sensory neuritis. In the first stage of Lyme disease, only antibiotics can be effective, but in the second and third stages, antibiotics will not help, especially if the nervous system is damaged, there is no specific treatment.

After people are affected by spirochetes, their skin, nervous system, heart, and the keen joint will be affected. Especially for the nervous system, there are about 15% of patients appearing instigation of the numb brain, encephalopathy, chorea, cerebellar coexistence barrage, brain irritation, coma, facial paralysis, or trigeminal neuralgia, etc. Also, there are about 60% of patients show their keen joints will continually swelling and pain, 10% of patients can become chronic arthritis. These diseases will result in decreased or disappeared keen-jerk reflex.

According to reports, advanced and advanced Lyme disease is similar to other chronic neurological diseases, including primary sclerosis and mediolateral disease asymptomatic. Some are due to comparable features (such as virtual clonal bands in the sheath). However, neurosurgery can usually be diagnosed based on clinical conditions. Disorders are distinguished from common central nervous system features of sclerosis. Other features (still involved in the medulla oblongata, rejuvenation). However, if some conditions are likely to be difficult, such as the patient's treatment during the disease, it will only become more obvious after further research and treatment or in the future.

There is a clinical case that shows A middle-aged man in New Forest who had a 3 weeks history of severe illness. She is weak and uncoordinated. Physical examination: right finger extension elbow force, right arm flexion-extension pressure, right dorsiflexion of the foot. The right knee jump does not exist. He was diagnosed with Lyme, which caused spiralitis, radiculitis. He was treated with intravenous ceftriaxone and recovered almost completely [8].

Hypothyroidism is a disease in which the body's metabolism is reduced due to the reduction of thyroid hormone synthesis and secretion, or its insufficient physiological effects. Symptoms of hypothyroidism are paleness and swelling, indifferent expression, dry skin, feeling fatigue, slow response, and bradycardia. Some patients even have infertility, impotence, and sexual dysfunction. The neurological system will have responses and caused people to have memory loss, mental

retardation. Appearing feelings of drowsiness, anxiety, dizziness, headache, tinnitus, deafness, ataxia, prolonged knee-jerk reflex, and dementia in severe cases, Stupor, even lethargy [9].

Miller Fisher syndrome is a rare, acquired polyneuritis disease. Its pathological phenomenon is the functional defect of the cranial nerve nucleus of the brainstem. Miller-Fisher syndrome is a variant of Guillain-Barre Syndrome (GBS). GBS is an acute, usually rapidly progressive form of inflammatory polyneuropathy. The cause is unknown, but it may be due to autoantibodies attacking the peripheral nerve myelin sheath, which leads to acute ascending paralysis and disorder of nervous system conduction. Although patients affected by this may recover on their own, about 75% of patients will suffer from persistent neurological disorders, and about 5% of patients will die of corresponding complications.

Miller Fisher syndrome accounts for 5% of GBS. The pathological phenomenon is the functional defect of the cranial nerve nucleus of the brainstem. Once the nucleus of the upper cranial nerve is abnormal, the patient will have eye movement paralysis or dyskinesia. If the nucleus of the lower cranial nerve is damaged, there will be abnormal swallowing function. According to past reports, about 40% of patients with Miller Fisher syndrome have dysphagia during their illness, but these reports rarely mention the treatment and prognosis of dysphagia. People will have responses like knee-jerk reflex is weakened or disappeared, especially at the distal end [10].

4. Conclusion

Knee-jerk reflex is a common physical examination in neurology. The knee-jerk reflex is generally used to examine patients who are suspected of having some motor neuron paralysis. If the knee reflex is weakened or disappears, it is more common in the spinal cord or peripheral neuropathy. This is a sign of lower motor neuron paralysis; if the knee is a hyper reflex, it means that there is paralysis of upper motor neurons. Stroke is one of the diseases closely related to upper neuron damage. Knee reflex can play a role in the treatment of stroke, to check whether the condition is getting better. For example, a drug commonly used clinically is called urokinase. Injecting it within 6 hours after the onset of the disease, the upper motor neuron can restore normal function and continue to exert its inhibitory effect. At this point, the patient will no longer have a strong reaction when undergoing a knee jerk examination. Knee reflex is a way for doctors to judge the patient's recovery. When the doctor sees the knee-jerk reflex, it means that the treatment is successful. Through an experiment, the relationship between infantile cerebral palsy and knee-jerk reflex is obtained. The result is that the baby and knee reactions are related. The degree of knee reflex (reaction intensity) can be used to determine the baby's physical condition and whether there is infant cerebral palsy. If it is a baby with cerebral palsy, it can help infer the severity of the baby's disease. Different treatment for babies with different degrees of disease makes the treatment more reasonable and effective. Other diseases like Lyme, hypothyroidism, and Miller Fisher syndrome can also be diagnosed by the weakening or disappeared keen-jerk reflex.

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