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Regenerative approach toward Peripheral Nerve Injuries

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Background

Peripheral nerves injuries occur frequently. They constitute a major cause of disabilities. Injuries affecting the peripheral nervous system Impairs the ability to move muscles, to feel normal sensation and must often result in chronic painful neuropathies. Peripheral nerve injuries can be traumatic,n on traumatic or surgical in nature, however the most challenging of them of all is the traumatic and surgical injuries. Traumatic and surgical peripheral nerve injuries posed immense challenge in their treatment modalities; they are also associated with poor clinical outcome. The simplest technique for nerve repair is co-amputation of the two ends of the nerve using sutures or fibrin glue, but this technique has its own limitation because in many case of nerve transection, there is loss of nerve segment and most often there is a time lag between injury and surgical repairs, which can lead to nerve end retraction, resulting in the formation of nerve gap. When nerve gap is formed, suturing the end to end of the nerve will lead to the creation of tension along the nerve segment, which results in poor regenerative outcome.

To overcome this problem, the two ends of the nerve are approximated using different grafts such as nerve autografts, nerve allograft, Muscle grafts, vein grafts, muscle vein grafts and synthetic nerve guidance conduits (NGCs).

Nerve autografts are considered the gold standard for bridging nerve gaps. They have the following advantage:

- more Biocompatibility than artificial materials
- less toxic
- provide support structure to promote cell adhesion and migration.

However they have certain problems associated with them, some of them include loss of function at the donor site, size mismatch between donor nerve graft and injured nerve, increase potential for neuromas formation at the donor site, the need for multiple surgeries and multiple small grafts for long nerve gaps. Also complete functional recovery is seldom obtained autograft.

This paper seek to present techniques that not only enhance the performance of autograft but also present alternative with better functionality than autograft which will lead to better clinical outcome.

Method

The writing of this paper follows intensive and immense literature review on the subject matter. Factors that influence and support peripheral nerve regeneration were extensive reviewed, as well as factors and molecule that slows or inhibit peripheral regeneration of peripheral nerves were also reviewed .This paper also reviewed the mechanism and molecules responsible for slowing down peripheral nerves regeneration. A thorough review of different gels was also done in clearing their roles in axonal elongation.

Conlusion

Nerve growth factors are produce in the target organs of sensory and sympathetic nerves in the peripheral nervous system and they play a major role in promoting the survival of sensory ganglia and nerves. Brain derived neurotropic factor is expressed in very low amount in intact uninjured adult peripheral nerves, but is up regulated following injury. Brain derived neurotropic factor (BDNF) help in promoting the survival and outgrowth of not only sensory and sympathetic nerves but also motor nerves.

Neurotropic factor have the potential to be employ in clinical therapies of disease that are characterize by suppress function of Schwann's cells (SC) for example in Multiple sclerosis.

The sural nerve is the common natural nerve graft because it is easy to obtain and has the appropriate diameter for most grafting needs and is relatively dispensable. A motor nerve has a preference for a motor nerve graft and shows inferior regeneration if a sensory nerve is used. Mixed nerve also shows superior regeneration with either a mixed nerve or a motor nerve graft.as compared to a sensory nerve graft.

Chondroitin sulfate proteoglycan (CSPGs) are up regulated almost seven fold in the distal segment of peripheral nerve gap following transection and this molecule hinder peripheral nerve regeneration .treatment with chondroitinase ABC digest CSPGs, which can enhance nerve regeneration. However CSPGs is not up regulated in crush injury. Neurotrophin 4/5 promote axonal growth.

The use of Muscle grafts, vein grafts, muscle vein grafts and synthetic nerve guidance conduits (NGCs) are associated better regenerative outcome and ultimately better clinical outcome, as compared to end to end coaptation of the nerves.

Overview

Peripheral nerves relay signals to the rest of your body from your brain and spinal cord, helping you do stuff like thinking your feet are cold and shifting your muscles so you can walk around. The peripheral nerves are weak and easily affected, made of fibers called axons which are protected by surrounding tissues.

A nerve lesion can affect the ability of your brain to communicate with your muscles And their hearts. Peripheral neuropathy is known as damage to peripheral nerves.

It is important that you get medical attention as soon as possible for a peripheral nerve injury. Early diagnosis and therapy can prevent complications and permanent damage.

Symptoms

You can experience symptoms of a peripheral nerve injury, ranging from mild to severely restricting your everyday activities. Sometimes, the symptoms depend upon which nerve fibers are affected:

Nerves engine: Such nerves regulate all movements, such as walking , talking, and keeping things under your conscious control. Such nerves are usually impaired by muscle weakness, which is painful And muscle twitching uncontrollably.

Nerves of a tactile sort: You can feel a number of symptoms because these nerves transmit information about touch, temperature , and pain. Those involve tingling, or numbness in the hands or feet. You may have difficulty feeling discomfort or temperature changes, walking, keeping your balance with your eyes closed or buttons fastened.

Nerves which are independent (aw-tu-NOM-ik): This group of nerves controls functions that are not actively regulated, such as breathing, functioning of the heart and thyroid and digesting of food. Symptoms may include heavy sweating, blood pressure increases, failure to withstand heat and gastrointestinal symptoms.

Because many peripheral nerve injuries involve more than one form of nerve fibers, you can experience a variety of symptoms.

Causes

- This can affect the peripheral nerves in many ways:
- An accident injury, a fall or a sport may stretch, compress, crush or cut nerves.
- Health problems include diabetes, syndrome with Guillain-Barre and carpal tunnel syndrome.
- Autoimmune conditions include lupus, arthritis rheumatoid, and the condition of Sjogren.
- Certain factors include artery narrowing, hormonal imbalances, and tumours.