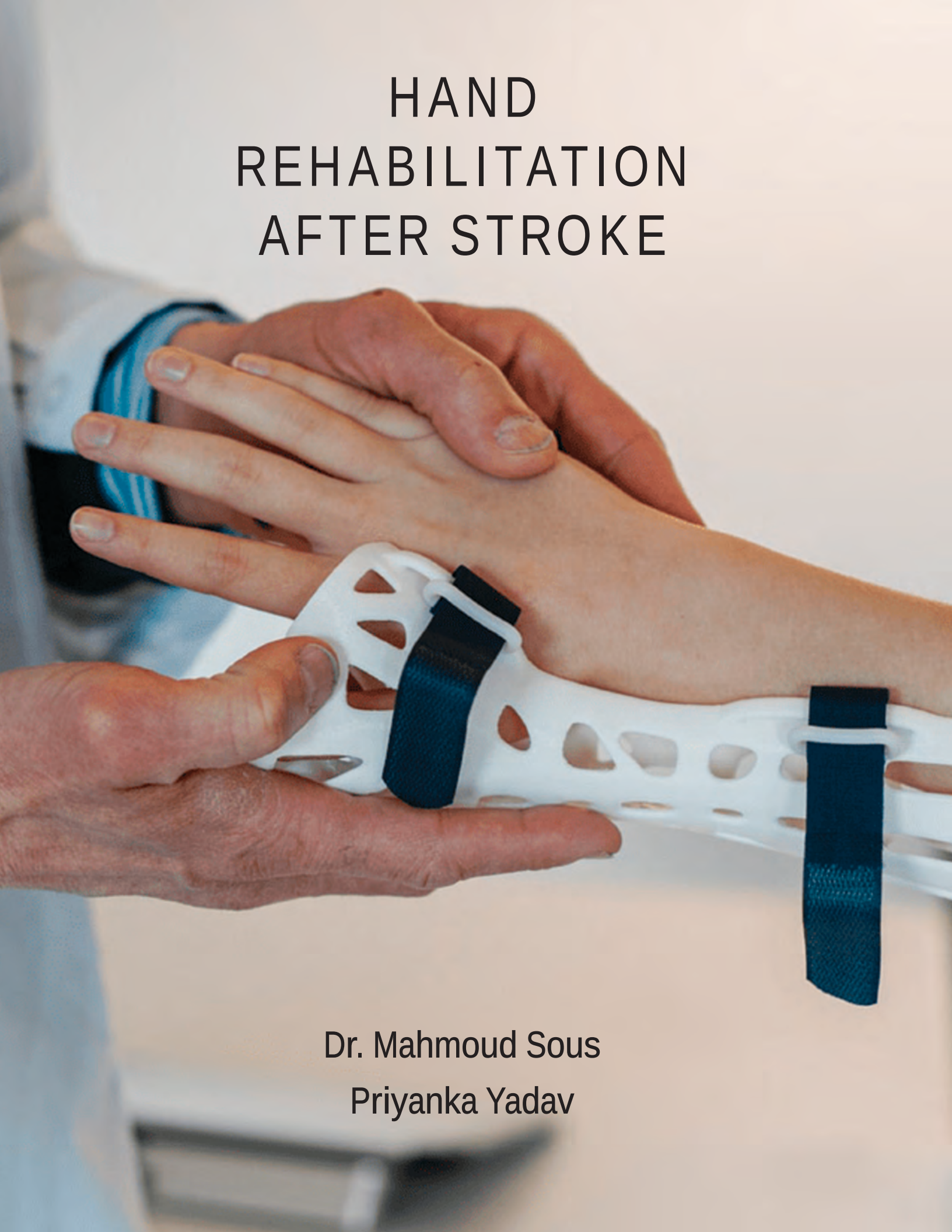
HAND REHABILITATION AFTER STROKE



Dr. Mahmoud Sous

Priyanka Yadav

HAND REHABILITATION AFTER STROKE

A complete care guide for Hand Rehab

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Dr. Mahmoud Sous – Ph.D.

During the period of 1995-1999, I went to the medical school in Poland to research about the various methods of back pain treatment. After finishing my PhD, I took variety of courses including naturopath, acupuncture, and manual techniques. This gave me an idea that exercises, and massage could be helpful in treatment of chronic pain. But my findings didn't stop me here, I also worked as a naturopath practitioner in Canada where I got familiar about treatments with Chinese medicines, osteopath techniques and some other manual therapies which helps in pain management.

Fixing injuries requires an understanding of anatomy and biomechanics. That is why my research and treatment belong to the holistic approach of using different techniques and remedies for the treatment of back pain. In 1990, I realize that there are some complex spinal aspects and issues which leads to of back pain. So, from my case studies I formulated a guideline which is clear and easy to understand and will fix your issues.

My goal is to help people visualize how the body functions and what happens inside when you experience pain. Healing requires to focus on one's action because pain results due to faulty actions and movements. This thought motivated me to work on a book which will include all home remedies where people can treat themselves to fix their pain. I have included knowledge based on my clinical research using manual massage therapy, food habits, nutrition facts, heat, sauna, hydrotherapy, cold water treatments which overall helps in pain management. It gives me pleasure to introduce this book to the community where I have shared all my experienced treatment plans.

Priyanka Yadav (Physiotherapist)

I started my career in 2011, since then I have worked as a Physiotherapist in several clinics and hospitals in India. Working mostly in the Outpatient department made me realize that Physio's role is extremely crucial in the rehabilitation and recovery process of a patient. My desire to reach out to more people motivated me to work for this book. Have worked with Dr. Mahmoud on several research books on self-pain management. We have been constantly working on curating the best suited protocol for various Musculoskeletal conditions. Additionally, we have also included approaches with alternative medicine.

We Believe in a Pain-Free Sciety!

Dr. Sous's Team who have contributedwith theiw approaches in this book.

* Priyanka Yadav - Physiotherapist / Massage Therapist
* Mandeep Kaur - Physiotherapist
* Youssef Elaridi - RMT
* Haitham Ajoury - Layout & Design

This is a self-help book written by Mahmoud Sous PhD, DO and team. It is the result of more than 16 years of musculoskeletal experience practicing in corporate and private physiotherapy clinics around the world. This book was created to help you get to know your shoulders better and is based on more holistic approach to treat and prevent shoulder injuries and pain. Shoulder pain is very common, and although shoulder pain can be alarming, serious, or permanent damage to the shoulder is uncommon. This book will help explain how the shoulder is put together and why shoulder pain and dysfunctions occur, enable you with ways of coping with pain.

We believe in a Pain-Free Society!

ABOUT THE BOOK

A Quick Reference Guide with a comprehensive overview of hand rehabilitation after brain injury or stroke is a valuable resource for individuals seeking to regain hand function and improve their quality of life. This guide takes the reader on a journey, starting with basic information about the anatomy of the hand and gradually progressing to more complex topics such as advanced treatment techniques. By providing all the necessary information in one source, this guide ensures that readers have a comprehensive understanding of hand rehabilitation. One of the highlights of this guide is its coverage of the most advanced treatment technology available in hand rehabilitation. It explores innovative methods such as using hand robot gloves and mirror training to improve neuroplasticity. These cutting-edge techniques have shown promising results in helping individuals recover hand function after brain injury or stroke. The guide explains how these technologies work and provides practical information on their implementation. In addition to discussing advanced treatment techniques, this guide offers a variety of hand exercises that can be used with stroke or hemiplegic patients. These exercises are designed to build strength and dexterity, helping individuals regain control and functionality in their hands. Each exercise is accompanied by step-by-step instructions, ensuring that readers can easily perform them and track their progress. This practical approach makes the guide a valuable tool for both patients and healthcare professionals.

Moreover, this comprehensive guide goes beyond hand rehabilitation alone. It covers various related topics, such as massage therapy and the use of herbs and herb-infused oil for hand recovery. It also includes information on body soak recipes and herbal remedies specifically tailored for brain injury recovery. Additionally, the guide addresses other aspects of rehabilitation, including orthotic devices, wheelchair seating/mobility, dysphagia, home modifications, and more. This holistic approach ensures that readers have access to a wide range of information that can support their overall recovery journey. Lastly, the guide emphasizes the importance of natural supplements and proper nutrition in the recovery process. It highlights specific natural supplements that are essential for speedy recovery and provides valuable insights into how nutrition can contribute to overall rehabilitation. By addressing the importance of a well-rounded approach to recovery, this guide becomes an ultimate resource for individuals looking to revolutionize their rehabilitation journey. In conclusion, A Quick Reference Guide with a comprehensive overview of hand rehabilitation after brain injury or stroke is an invaluable resource for individuals seeking to regain hand function and improve their overall quality of life. The guide covers basic information about hand anatomy as well as more complex topics such as advanced treatment techniques. It provides a variety of hand exercises, step-by-step instructions, and a combination of personal experience and scientific theory. Additionally, it addresses related topics including massage therapy, herbs, orthotic devices, and nutrition. This guide is a must-have for anyone on a hand recovery journey, offering a wealth of information and practical guidance.

Contents

CHAPTER 1: INTRODUCTION

Did you know that cerebrovascular accidents, more commonly known as strokes, are not only the second leading cause of death but also the third leading cause of disability worldwide? According to the World Health Organization, the number of people experiencing strokes each year is actually increasing, despite the decrease in stroke mortality rates over the past two decades. After a stroke, one of the most common challenges individuals face is upper limb impairments. These impairments can range from muscle weakness and contractures to changes in muscle tone and coordination issues with their arms, hands, or fingers. As a result, everyday tasks like reaching, picking up objects, and even basic activities of daily living such as washing, eating, and dressing become incredibly difficult. These impairments not only affect their ability to participate fully in society but also impact their professional activities. It's alarming to think about the impact strokes have on individuals and their quality of life. By understanding the scope of the problem and the specific challenges faced by stroke survivors, we can work towards improving their rehabilitation and overall well-being.

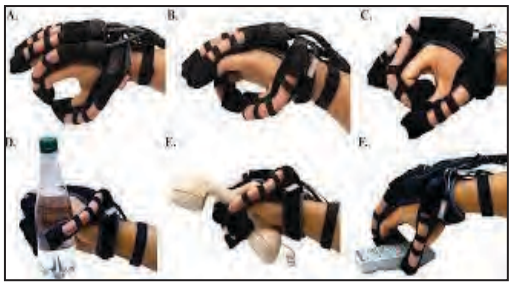
Hand function is often one of the slowest to return after stroke due to its distance from the brain and spinal cord. Being distal to the midline of the body means that the hands and feet are located farthest from the central nervous system. As a result, nerve signals have a longer distance to travel in order to communicate, leading to delays or inhibitions in this communication process after a stroke. This delayed or inhibited communication can significantly impact hand function, resulting in decreased dexterity and coordination. Moreover, the muscles of the hand are relatively small and prone to quick fatigue. When muscle activation is inhibited and the hand is not used as frequently after a stroke, these muscles can undergo atrophy, meaning they become smaller and weaker. The combination of inhibited muscle activation and decreased use of the hand can lead to a decline in hand function and severe difficulties with fine motor movements. Recovering hand function after a stroke requires a comprehensive rehabilitation approach that focuses on restoring neural connections, strengthening muscles, and improving coordination. Occupational therapists often play a crucial role in this process by utilizing various therapeutic techniques and exercises to promote hand recovery. These may include activities such as repetitive hand movements, stretching, and strengthening exercises, as well as the use of assistive devices and adaptive strategies to compensate for any residual deficits.

Robotics is a field of engineering that can contribute to solving this problem. This field has been extensively developed and is being applied in a great diversity of scenarios and human fields of action, as has been the case in the field of rehabilitation.

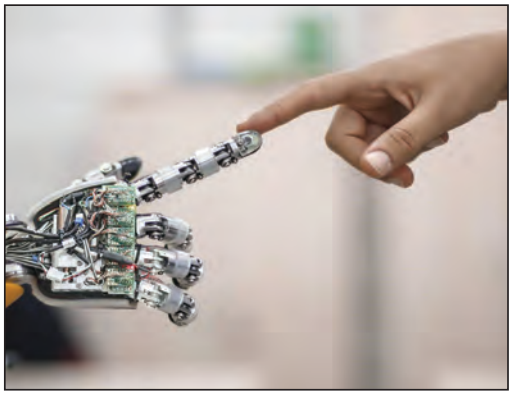
In the last decade, automated devices used for neuro-rehabilitation have been altered in order to improve limb function in people who have undergone traumatic injuries or have congenital or neurological disorders.

The human hands are very complex and versatile. Researches shows that the relationship between the hand function and the ability to perform ADL is stronger than the other limbs. The deficit in hand function would seriously impact the quality of patients' life, which means more demand is needed on the hand motor recovery. However, although most patients get reasonable motor recovery of proximal upper extremity according to relevant research findings, recovery of hand functions has been limited due to low effectivity. There

are two main reasons for challenges facing the recovery of the hand. First, in movement, the hand has more than 20 degree of freedom (DOF) which makes it flexible, thus being difficult for therapist or training devices to meet the needs of satiety and varied movements. Second, in function, the area of cortex in correspondence with the hand is much larger than the other motor cortex, which means a considerable amount of flexibility in generating a variety of hand postures and in the control of the individual joints of the hand.



The benefit of this proposal is to use the results to prove that medical therapies involving repetitive movement allow the rapid establishment of affected neural connections. This system allows you to automate and optimize therapies, making them more intensive and decreasing the labor required of therapists in hand function training.

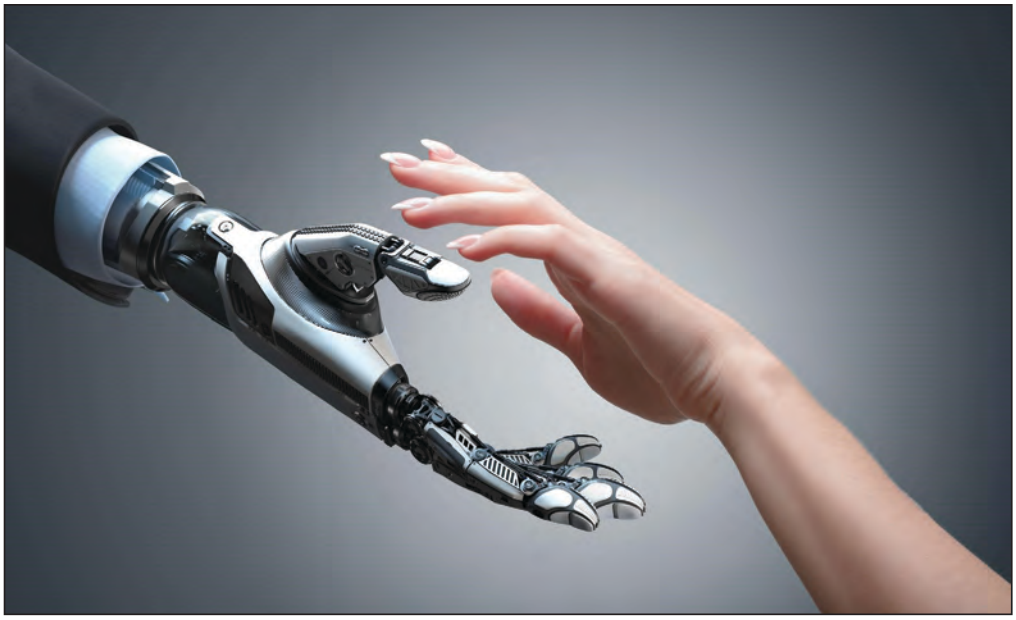


THE ROBOTIC

Robotics has been defined as the application of devices with electronic or computerized systems designed to perform human functions. A therapeutic robot is a system that detects the user's movements, uses this information to adjust parameters, and provides visual and sensory feedback to the patient. In itself, it has been reported that they are non-invasive devices, easy to control, with little risk for the patient, and with good effectiveness for treatment.

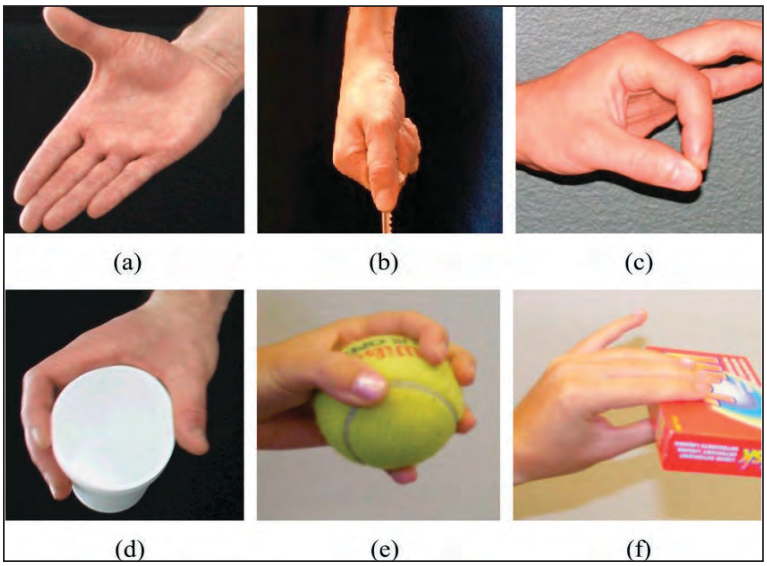
Robotics is one more tool in rehabilitation programs that allows increasing the intensity and quality of therapy. Although its development is advancing by giant steps and the results are very favorable, the success of the therapy requires clinical knowledge to identify which technology should be applied to each patient at each moment and how to make use of robotics to provide therapy based on the principles of motor learning, biomechanics and neuroplasticity.

Robotic rehabilitation devices, along with conventional therapy, provide a tremendous amount of benefits to clinics and patients, and are a solution for today to meet the challenges of tomorrow.



CHAPTER 2: FUNCTIONAL REHABILITATION OF HAND

The function of the hands is extremely important in daily life. From the moment we get up until we go to bed, we need them to perform countless tasks. For this reason, when a person suffers an injury to the hand or arm, or has a disease that affects their function, it is necessary to carry out a functional rehabilitation of the same. Loss of motor function in one or both hands is a common symptom of neurological diseases like stroke and spinal cord injury, which can significantly lower a person's quality of life. Activities that are frequently taken for granted become difficult or practically impossible as a result of tight and spastic muscles, diminished grasping power, and a general lack of hand coordination.



Even though hand exercises must be repeated several times for physical therapy to be beneficial, many patients are unable to receive regular care because it is too expensive or requires too much travel.

The functional rehabilitation of the hands has its main objective to improve their function, as well as sensitivity and strength. For this, a series of exercises and specific techniques are used. In many cases, functional hand rehabilitation is performed in conjunction with physical therapy.

The duration of the functional rehabilitation of the hands will depend on the severity of the injury or illness. In some cases, rehabilitation can last a few months, while in others, it can take years. If you suffer from a hand or arm injury, or from a disease that affects their function, it is important that you go to a specialist so that they can evaluate you and can indicate the most appropriate treatment for you.

HAND FUNCTIONAL REHABILITATION ROBOT

The hand rehabilitation device designed to help with hand dysfunction caused by stroke, hemiplegia, cerebral hemorrhage, cerebral infarction, peripheral nerve injury of hand, orthopedic surgery, spinal cord injury, hand burn, children cerebral palsy, etc. Low self-esteem and high levels of frustration are common among people with hand motor-impaired disabilities due to their inability to perform every day tasks. Something as simple as picking up a phone, tying a shoelace or fastening a blouse can be overwhelming and adversely affect the quality of life we all deserve.

The artificial intelligent hand rehabilitation robot combines flexible robotics technology and neuroscience. It uses flexible pneumatic bionic muscles as the power source. By repeatedly driving the bionic muscles on the gloves to expand and contract, the gloves can pull the fingers to drive the joints of the affected fingers. Helps you to do flexion and extension exercises.

How this robot works?

It is associated with the basic mechanism of improving motor function after stroke, or any kind of brain insufficiency resulting in neuroplasticity. It is a term that refers to the brain's ability to modify the physical structure and function throughout life and in response to experience and training. One important goal of rehabilitation of stroke patients is the effective use of neuroplasticity for functional recovery. Therefore, high-intensity practice and repetitive training are required to help the patient's brain to re-learn the ability to move, making stroke rehabilitation a labor-intensive process.

How this Hand Glove Robot helps in training your hand?

One of the primary goals of robot-based hand motor therapy is consistent improved steadiness and hand function, traits often challenging to attain when the muscles have yet to heal. This is especially difficult to maintain as you become more tired toward the end of the therapy session. Robotic devices gently support and guide movements of the hand to increase exercise consistency.

It is combined with flexible robot technology and neuroscience, it can help patients master fingers flexion and extension, reduce hand muscle tension, relieve edema and stiffness, promote rehabilitation of brain nerve injury through exercise, improve hand activity and accelerate the rehabilitation of hand function.

Robot-assisted therapy is a relatively new intervention, increasingly used in the rehabilitative treatment of the patient, it allows to increase the number of repetitions in performing specific task movements, robot-assisted hand therapy presents benefits in all phases of rehabilitation that translate into motor and functional improvements of the upper limb and improvements in hemi spatial damage. Although there is a great similarity between these mechanisms and the human arm, robotic arms were mainly designed to be programmed in cyclical tasks. The ones that stand out the most are those that use technologies that take advantage of the excellent capacity that human beings have to perceive external information. And also because the human being has the excellent ability to control the movement of their extremities, it was decided to develop an assistant capable of capturing the movements of the human arm in movements of a robotic arm and combined with the ability to perceive view of an operator, obtain a teleoperation system with excellent features, intuitive and innovative.

How to use Soft Hand Glove

Please charge the device atleast for 30 minutes if using for the first time. Insert the powe glove plug into the power socket on the side of the machine. Press and hold the power button for 2 seconds. Wait for the glove to fully extend and then put on the glove. Once you put on the glove, pull the whole glove towards the wrist so that the fingertips go as far as possible into the glove. Then tighten on the wrist and fasten the velcro of lateral strap without creating any discomfort.

Passive Training

Press on menu button to select passive mode, select the extension and flexion index. To train for the first time. The recommended extension index is set to 8 and the flexion index set to 3. Press the start button to start training.

Bilateral Mirror Training

To perform the mirror training put the insert the data glove plug into the data pocket and the power glove plug into the power socket on the side of the host. Wear the data glove on your healthy hand and power glove on the affected hand. Select mirror mode and press the start button. During the training the affected hand follows the movement of the healthy hand and does flexion or extension simultaneously. If both hands are unable to do the movements it is recommended to start with passive training.

The healthy side drives the affected hand, simultaneous movement of hands, activating mirror neurons, the motor nerve pathway of the normal healthy hand was copied to the affected hand.

ADL Training: It also helps you to trains your brain to do the activities of daily living like grasping a glass, gripping or squeezing with your affected hand. Just like bilateral mirror training you need to do action like gripping something or grasping a glass with your good

hand and the affected hand will follow. You might need to train your affected hand quite sometime to perfect a particular movement. However it will come with practice.

Before we dive into the details of neurons and the neural pathways you should know some basic anatomy and physiology of hand, to understand the mechanism of action of this device better.

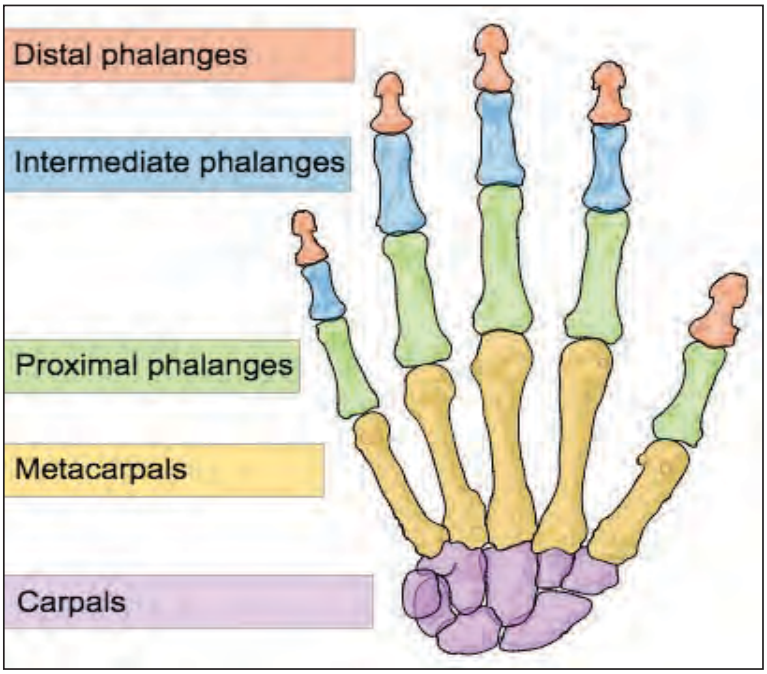
CHAPTER 3: HAND ANATOMY

The hands are two important parts of the human body, prehensile and with five fingers each, located at the ends of the forearms. They range from the wrist to the fingertips in humans. They are the main organ for the physical manipulation of the environment. The tips of the fingers contain some of the areas with the most nerve endings in the human body, they are the main source of tactile information about the environment, which is why the sense of touch is immediately associated with the hands.

As in the other paired organs (eyes, ears, legs), each hand is controlled by the cerebral hemisphere on the opposite side of the body. There is always a dominant cerebral hemisphere over the other, which will be in charge of activities such as manual writing, handling utensils when eating, among others. In this way, the individual may be left-handed, if the predominance is of the left hand or right-handed if it is of the right (right hand); this is a personal trait of each individual.

The anatomy of the hand is complex, intricate, and fascinating. Its integrity is absolutely essential for our everyday functional living. The hand is divided into three regions:

1. Proximal region of the hand is the carpus (wrist)
2. The middle region the metacarpus (palm)
3. The distal region the phalanges (fingers).

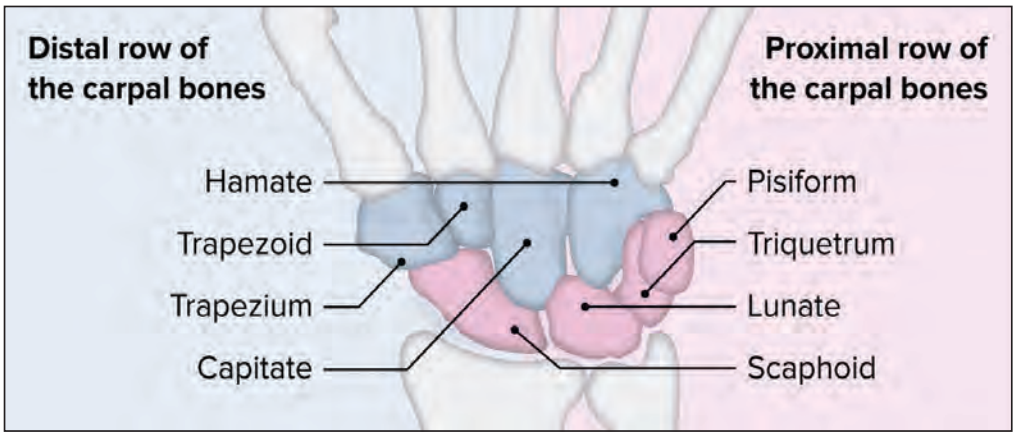


The hand and wrist have a total of 27 bones arranged to roll, spin and slide; allowing the hand to explore and control the environment and objects.

CARPALS:

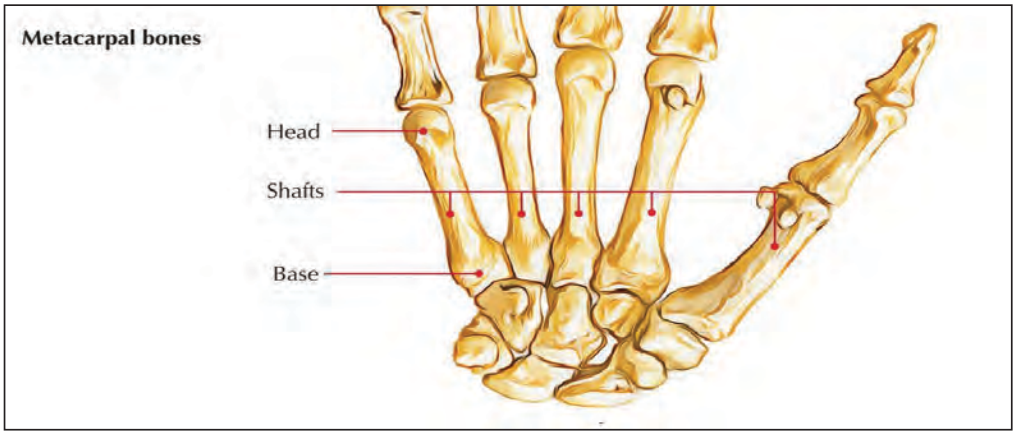
The carpus is formed from 8 small bones collectively referred to as the carpal bones. The carpal bones are bound in two groups of 4 bones:

- The pisiform, triquetrum, lunate and scaphoid on the upper end of the wrist.
- The hamate, capitate, trapezoid and trapezium on the lower side of the hand.

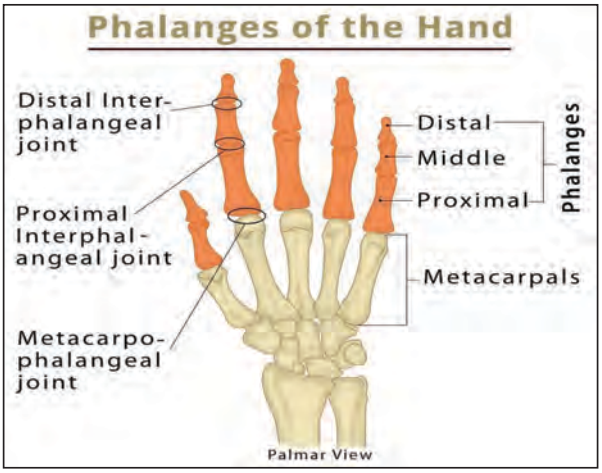


Other bones of the hand are:

METACARPALS –The 5 bones that comprise the middle part of the hand.



PHALANGES: (singular phalanx) The 14 narrow bones that make up the fingers of each hand. Each finger has three phalanges (the distal, middle, and proximal); the thumb has two.



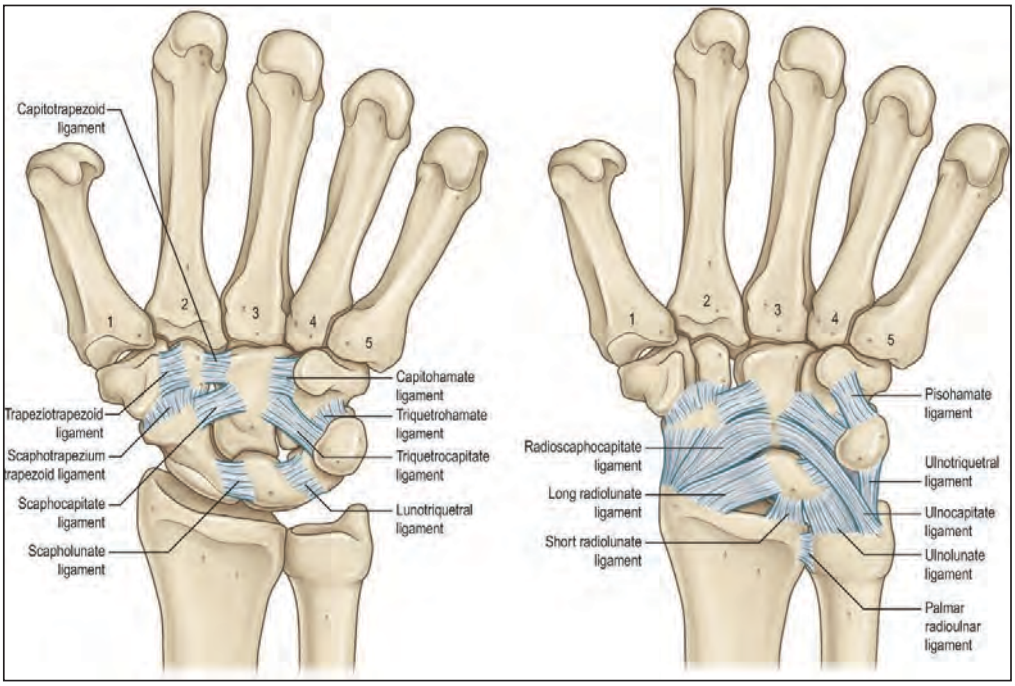
Soft tissues.

Our hand bones are held in place and supported by various soft tissues. These include: articular cartilage, ligaments, muscles and tendons.

Articular cartilage is a smooth material that acts as a shock absorber and cushions the ends of bones at each of the 27 joints, allowing smooth movement of the hand.

Muscles and ligaments function to control the movement of the hand.

Ligaments are tough rope-like tissue that connect bones to other bones, holding them in place and providing stability to the joints. Each finger joint has two collateral ligaments on either side, which prevents the abnormal sideways bending of the joints. The volar plate is the strongest ligament in the hand. It joins the proximal and middle phalanx on the palm side of the joint and prevents backwards bending of the PIP joint (hyperextension).



Muscles.

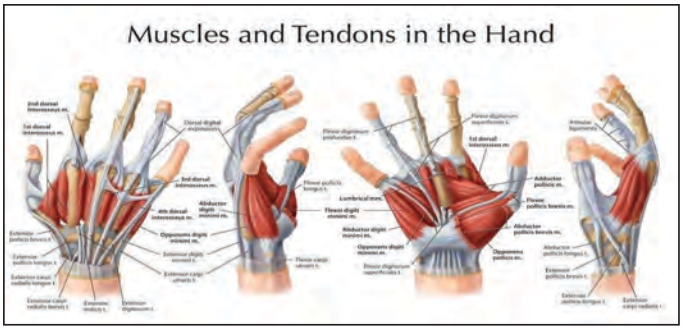
Muscles are fibrous tissues that help produce movement. Muscles work by contracting.

There are two types of muscles in the hand, intrinsic and extrinsic muscles.

Intrinsic muscles are small muscles that originate in the wrist and hand. They are responsible for fine motor movement of the fingers during activities such as writing or playing the piano.

Extrinsic muscles originate in the forearm or elbow and control the movement of the wrist and hand. These muscles are responsible for gross hand movements. They position the wrist and hand while the fingers perform fine motor movements.

Each finger has six muscles controlling its movement: three extrinsic and three intrinsic muscles. The index and little finger each have an extra extrinsic extensor.



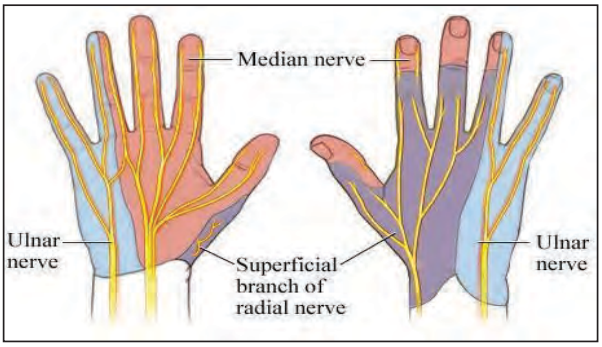
Tendons.

Tendons are soft tissues that connect muscles to bones. When muscles contract, tendons pull the bones causing the finger to move. The extrinsic muscles attach to finger bones through long tendons that extend from the forearm through the wrist. Tendons located on the palm side help in bending the fingers and are called flexor tendons, while tendons on top of the hand help in straightening the fingers, and are called extensor tendons.

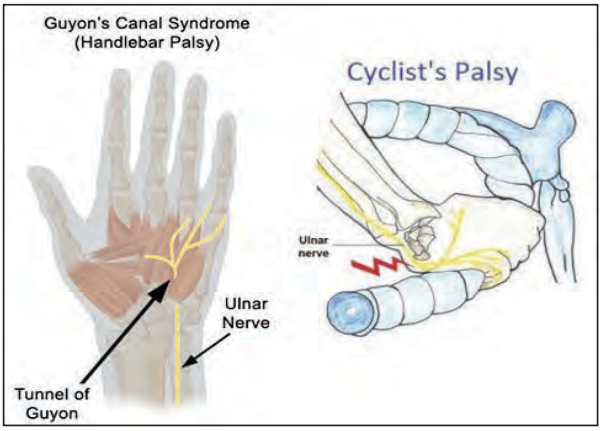
Nerves.

Nerves of the hand carry electrical signals from the brain to the muscles in the forearm and hand, enabling movement. They also carry the senses of touch, pain and temperature back from the hands to the brain.

The three main nerves of the hand and wrist are the ulnar nerve, radial nerve and median nerve. All three nerves originate at the shoulder and travel down the arm to the hand. Each of these nerves has sensory and motor components.

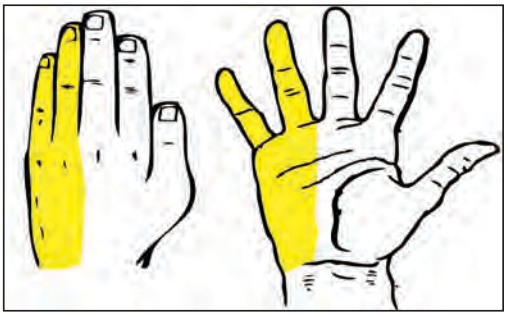


Ulnar Nerve: The ulnar nerve crosses the wrist through an area called Guyon's canal and branches to provide sensation to the little finger and half of the ring finger.



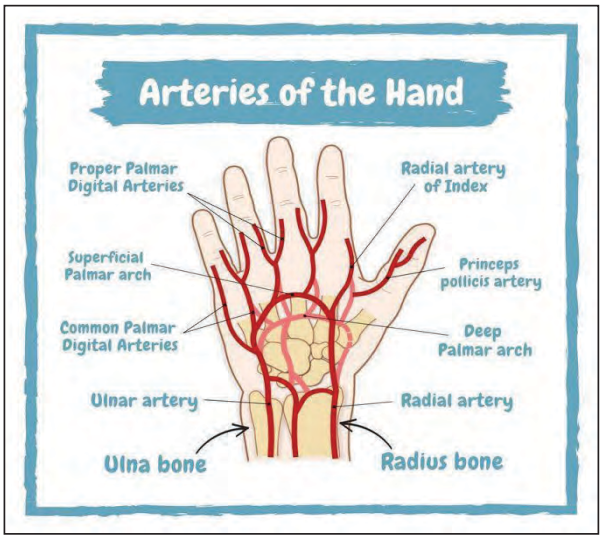
Median Nerve: The median nerve crosses the wrist through a tunnel called the carpal tunnel. The median nerve provides sensation to the palm, thumb, index finger, middle finger, and part of the ring finger.

Radial Nerve: The radial nerve runs down the thumb side of the forearm and provides sensation to the back of the hand from the thumb to the middle finger.



Blood Vessels.

Blood vessels travel beside the nerves to supply blood to the hand. The main arteries are the ulnar and radial arteries, which supply blood to the front of the hand, fingers, and thumb.



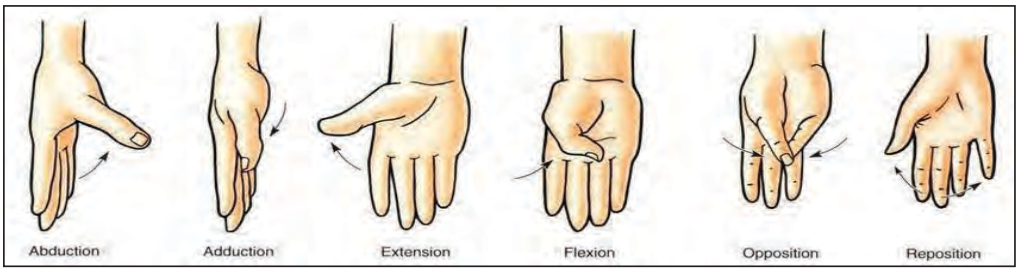
The ulnar artery travels next to the ulnar nerve through the Guyon's canal in the wrist. The radial artery is the largest artery of the hand, traveling across the front of the wrist, near the thumb. Pulse is measured at the radial artery.

Other blood vessels travel across the back of the wrist to supply blood to the back of the hand, fingers, and thumb.

Movements:

Regarding the movements of the hand, the wrist joint has two degrees of freedom and supports the totality of any effort made by the hand. The fingers also have two degrees of freedom at their joint with the palm, also called the metacarpophalangeal joint, since it articulates the proximal phalanx with the metacarpal bone. One degree of freedom corresponds to abduction and adduction movements, lateral movements that allow opening the fingers, this movement is very limited. The other degree of freedom corresponds to the flexion movement which is very large.

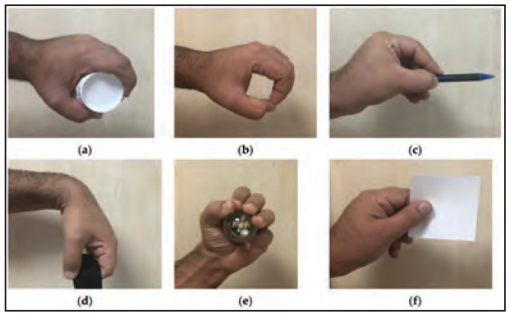
The thumb has great mobility, which is key for grasping objects, and the other four fingers move in a limited way laterally, although their ability to flex to open and close the hand is very good.



Grips

Our elongated thumb is able to oppose our fingers, and hence manipulate objects and instruments with a far greater degree of precision than primates and other animals. The function of the hand is to grip, grasp and form precise movements, e.g. writing and sewing.

This ability to flex the fingers is very important to the ability to catch objects and hold them securely. The gripping techniques were classified by Schlesinger into six different categories: cylindrical, toe, hook, palm, spherical, and side grip, as shown in the following image.



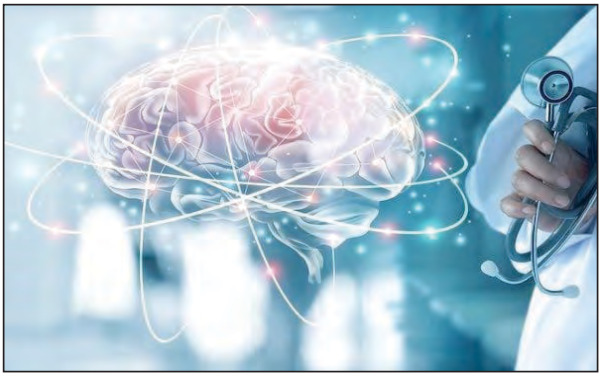
CHAPTER 4: PATHOLOGY OF WRIST & HAND

I. Neurological diseases that affects hand and their rehabilitation

Neurological diseases are a group of disorders that affect the nervous system. These disorders can affect any part of the nervous system, including the brain, spinal cord, and peripheral nerves. Neurological diseases that affect the hands can cause weakness, loss of sensation, numbness and/or pain.

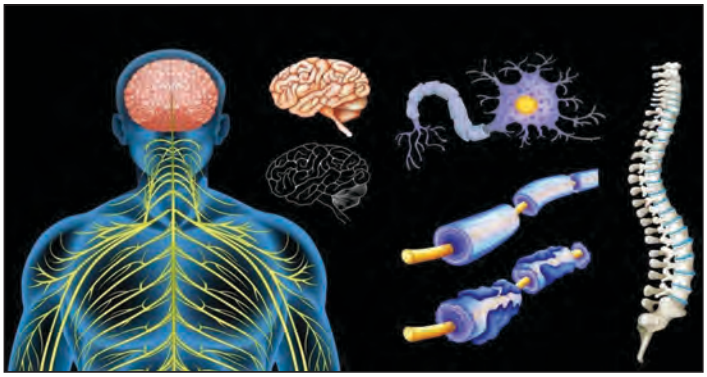
These types of conditions can be caused by a variety of factors, including injury, infection, genetic disorders, and developmental disorders.

Among the pathologies that frequently affect the hands we can find: multiple sclerosis, stroke, Parkinson's disease, amyotrophic lateral sclerosis (ALS) and Guillain-Barre syndrome.



Some of the common neurological conditions that affects hand functions:

Multiple sclerosis is a chronic neurological disease that affects the central nervous system. In this disease, plaque formation occurs in the brain and spinal cord. These plaques can damage nerve tissue and cause a variety of symptoms, including weakness, loss of sensation, numbness, and pain in the extremities.



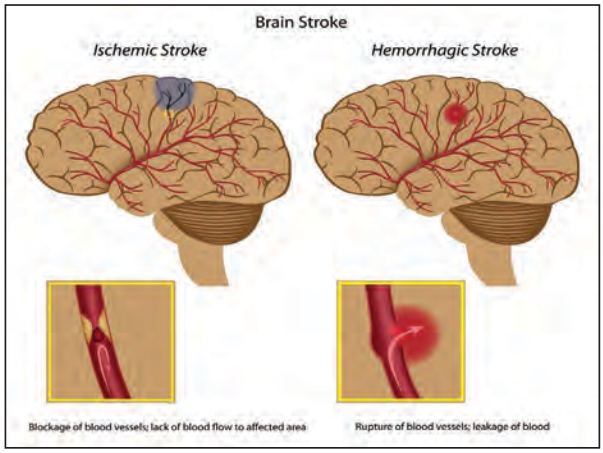
Stroke

A cerebrovascular accident (CVA) occurs when a blood vessel that supplies blood to the brain is blocked or ruptured. A stroke occurs if the flow of oxygen-rich blood to a portion of the brain is blocked. Without oxygen, brain cells start to die after a few minutes. This can lead to stroke, which can affect nerve tissue and cause weakness, loss of sensation, numbness, and/or pain in the extremities. Sudden bleeding in the brain also can cause a stroke if it damages brain cells.

What are the types of stroke?

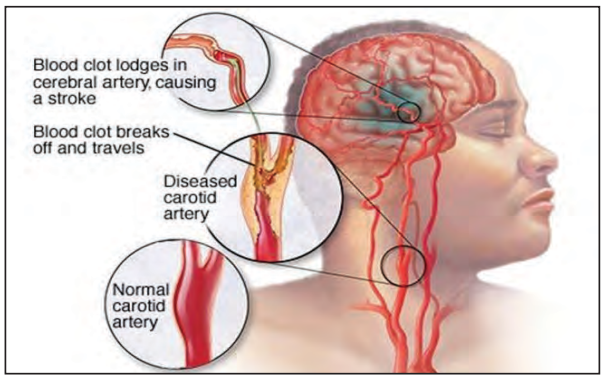
There are two types of stroke:

- Ischemic stroke is caused by a blood clot that blocks or plugs a blood vessel in the brain. This is the most common type; about 80% of strokes are ischemic.
- Hemorrhagic stroke which is caused by a blood vessel that breaks and bleeds into the brain.



Another condition that's similar to a stroke is a transient ischemic attack (TIA). It's sometimes called a "mini-stroke." TIAs happen when the blood supply to the brain is blocked for a short time. The damage to the brain cells isn't permanent, but if you have had a TIA, you are at a much higher risk of having a stroke.

A stroke is a medical emergency, and prompt treatment is crucial.



What are the symptoms of stroke?

The symptoms of stroke often happen quickly. They include:

- Sudden numbness or weakness of the face, arm, or leg (especially on one side of the body)
- Sudden confusion, trouble speaking, or understanding speech
- Sudden trouble seeing in one or both eyes
- Sudden difficulty walking, dizziness, loss of balance or coordination
- Sudden severe headache with no known cause.

Hand and Finger Reactions after Stroke

The following are common reactions survivors have after a stroke:

Muscle Spasticity

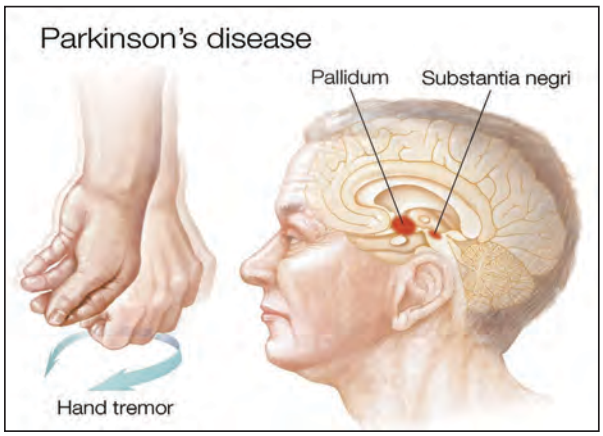
When a stroke occurs, the hands may experience increased tone or stiffness due to disrupted connections between the brain and the hand muscles, this is called spasticity. Without this strong neural connection, it may become more difficult to fully straighten the fingers or grasp an item.

Hand Strength and Function

The grip, strength, and overall function of the hands is often impaired, making it difficult to completely lift, grasp, or release items. This complicates everyday tasks and possibly the ability to be independent with functional activities. Loss of sensation & sometimes pins-and-needles feeling.

Parkinson's disease

Parkinson's disease is a neurodegenerative disease that affects the central nervous system. The disease is characterized by the death of cells that produce dopamine, a neurotransmitter that regulates movement. This can cause a variety of symptoms, including tremors, stiffness, slowness of movement, and balance problems.



Hand Deformity in Parkinson's disease

Hand abnormalities are common in patients with PD and consist mainly in mild to moderate degree of MCP joint flexion that correlates with the severity of ipsilateral rigidity and bradykinesia. They interfere with activities of daily living, like grooming putting on or off clothes or simply grabbing something or eating. A striatal hand deformity (SHD) is recognized by flexion of the metacarpophalangeal (MCP) joints, sometimes in combination with hyper-extension of the proximal interphalangeal (PIP) joints. The term "striatal deformity" has been used since the 70's to describe various abnormal parkinsonian postures of the hand, foot and spine.

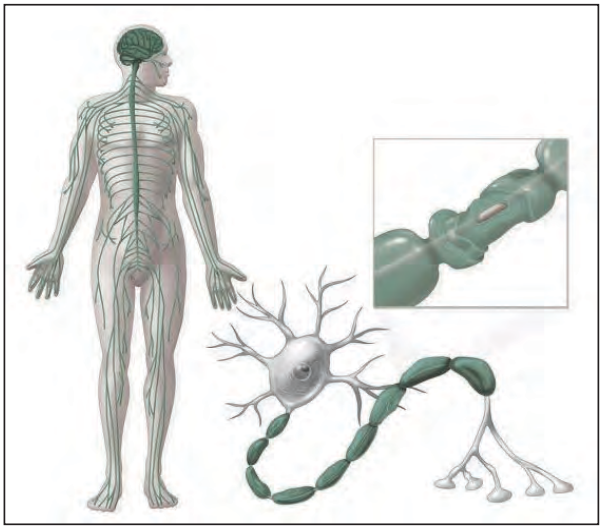
ALS

Amyotrophic lateral sclerosis (ALS) is also a neurodegenerative disease that affects the central nervous system. ALS is a fatal motor neuron disease. It is characterized by progressive degeneration of nerve cells in the spinal cord and brain. ALS affects voluntary control of arms and legs, and leads to trouble breathing. However, it does not affect intelligence, thinking, seeing, or hearing.

Its main feature is the death of cells that produce the neurotransmitters acetylcholine and glutamate, resulting in muscle weakness, loss of sensation, numbness, and/or pain in the extremities.

ALS often begins with muscle twitching and weakness in a limb, or slurred speech. Eventually, ALS affects control of the muscles needed to move, speak, eat and breathe. There is no cure and no proven treatment for ALS. However, you can try to manage the symptoms as they develop.

Guillain-Barre syndrome (GBS) is a rare disorder where the body's immune system damages nerve. The damage to the nerves causes muscle weakness and sometimes paralysis. While its cause is not fully understood, the syndrome often follows infection with a virus or bacteria. It is mainly characterized by inflammation of the peripheral nerves, which can cause weakness, loss of sensation, numbness and/or pain in the extremities.



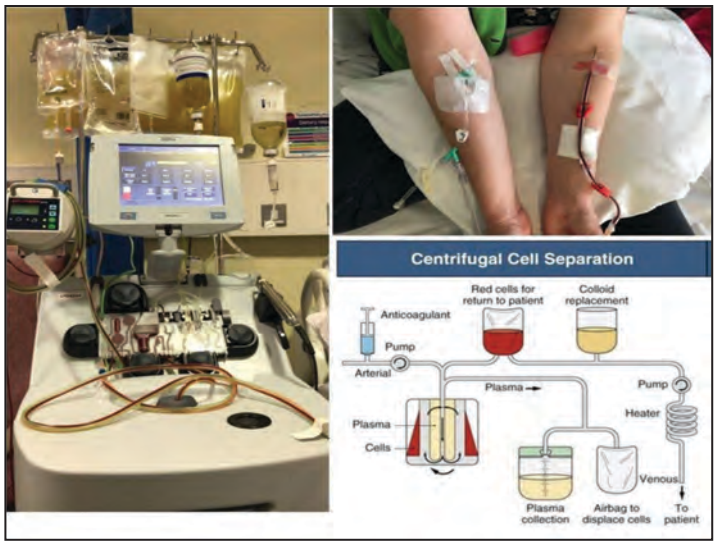
How is Guillain-Barre syndrome (GBS) treated?

The symptoms of GBS often progress quickly and thus require hospitalization for urgent treatment. There are two treatments that may help speed up recovery from GBS:

1. **Intravenous immunoglobulin therapy (IVIG):** This is an infusion of antibodies (the proteins that your body uses to fight foreign invaders) that has been collected from tens of thousands of other people. This infusion helps calm down your body's immune

system attack on your nerves.

2. **Plasma exchange (plasmapheresis):** This is a procedure that involves filtering the liquid part of your blood (known as plasma). During this filtering process, your body's antibodies which are attacking the nerves are removed and the "cleaned" plasma is returned back to your body. This helps stop the body's immune system from continuing to attack your nerves.



People with Guillain-Barre syndrome need physical help and therapy before and during recovery. Your care may include:

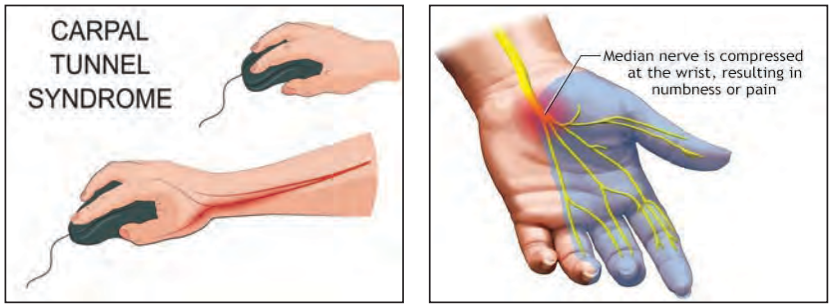
- Movement of your arms and legs by caregivers before recovery, to help keep your muscles flexible and strong
- Physical therapy during recovery to help you cope with fatigue and regain strength and proper movement
- Training with adaptive devices, such as a wheelchair or braces, to give you mobility and self-care skills

There are many diseases and reasons why the mobility of our hands can be affected and reduced. For this reason, it is important to detect it at the beginning to be able to work from the neuro-rehabilitation aspect as soon as possible.

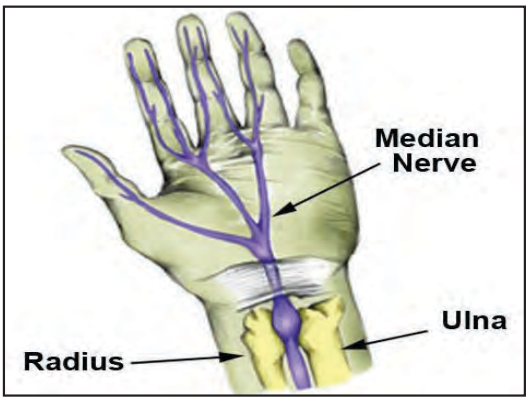
II. Overuse Injuries

Carpal Tunnel Syndrome (CTS)

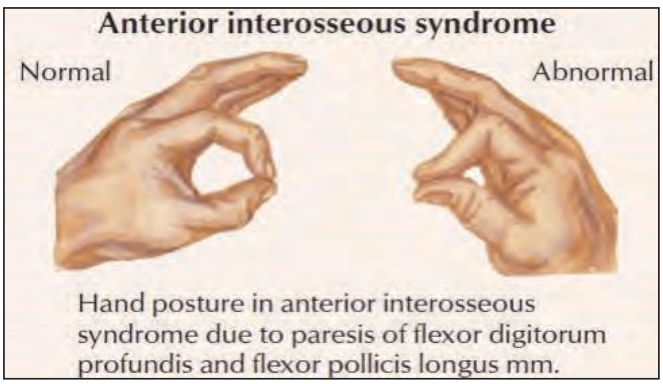
Tissue swelling inside the carpal tunnel puts pressure on the median nerve. Compression to the median nerve can result in pain, sensory changes in the median nerve distribution, and hand weakness.



2. Anterior interosseous nerve syndrome: Damage to the anterior interosseous nerve (a motor branch of the median nerve) causes weakness or paralysis in the thumb and index finger.

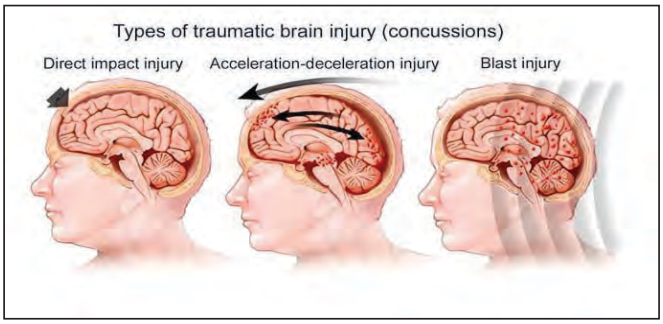


It can affect your ability to pinch items between your thumb and index finger. It also causes wrist pain.



CHAPTER 5: BRAIN INJURY AND ITS CONSEQUENCES

Acquired brain injury or head injury are umbrella terms describing a cascade of injuries that occur to the skull, brain, underlying tissue, and blood vessels in the head.



How does brain injury occur?

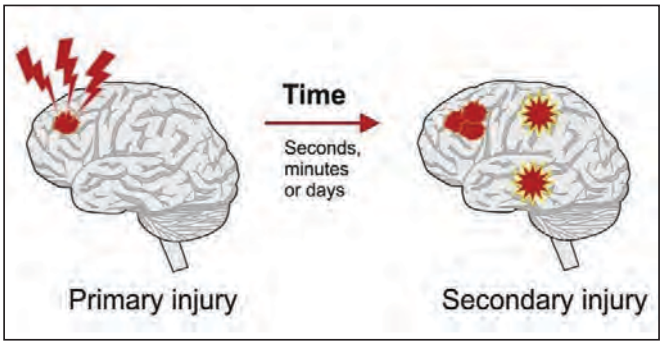
Brain injury can occur through:

- **Sudden onset** – caused by trauma, infection, lack of oxygen (for example, during near drowning or suicide attempts or motor vehicle accident), strokes or drug use episodes.
- **Insidious onset** – from prolonged alcohol or substance abuse, tumors, or degenerative neurological diseases.

What happens after brain injury?

Immediately following a brain injury, two things occur:

1. Brain tissue reacts to the trauma from the injury with a series of biochemical and other physiological responses. Substances which are present in the brain cells starts getting accumulated in brain, further damaging, and destroying the cells which is called secondary cell death.
2. Depending on the severity of brain injury, effects may include temporary loss of consciousness or coma, respiratory (breathing) problems, and/or damaged motor functions.

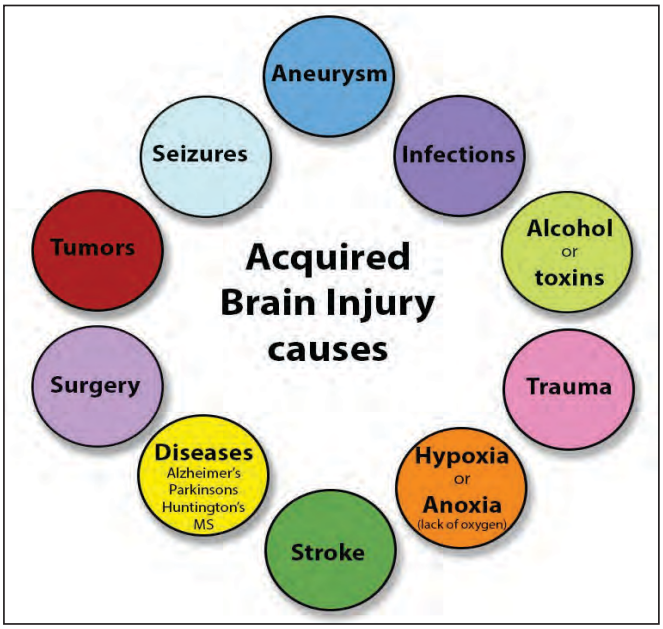


Waking up following loss of consciousness is not immediate. It is important to be aware of the various neurologically based symptoms that may occur during this period, such as irritability, aggression, posturing, and other issues. Post-traumatic amnesia (PTA) is also typically experienced as an injured person regains consciousness. PTA refers to the period when the individual feels a sense of confusion and disorientation (i.e., wondering who or where they are and what has happened to them) and an inability to remember recent events.

As time passes, these responses typically subside, and the brain and other body systems approach stability. Unlike bones or muscle tissue, the neurons in the brain do not mend themselves. New nerves do not grow in ways that lead to full recovery. In fact, certain areas of the brain remain damaged, and the functions that were controlled by those areas may be disrupted and lead to changes in the individual's life.

What is an Acquired Brain Injury?

Acquired brain injury is any damage to the brain that happens after birth by any external trauma or unusual medical event. The effects of an acquired brain injury can be severe and life-altering. The brain controls every area of human body: physical, intellectual, behavioral, social, and emotional. It affects the life of a person adversely when damaged.



Common causes of acquired brain injury include:

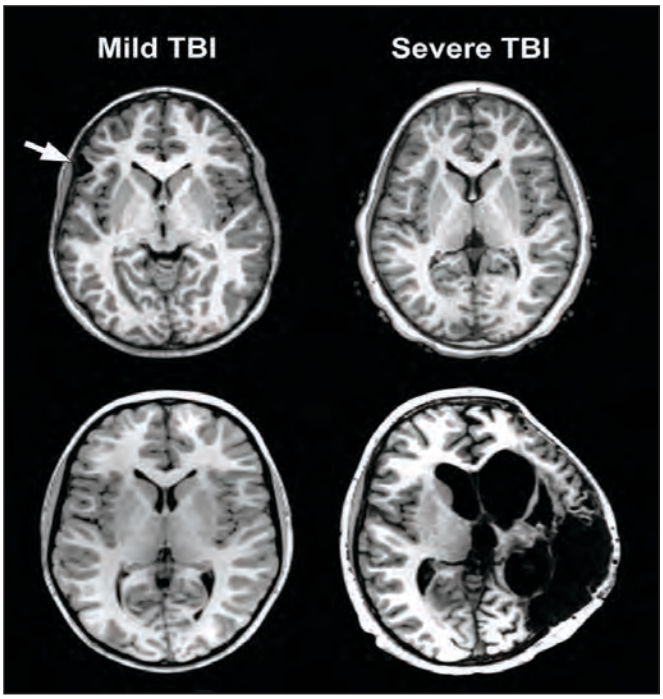
- External forces applied to the head and or neck (traumatic brain injury)
- Anoxic/hypoxic injury (cardiac arrest, carbon monoxide poisoning, airway obstruction, hemorrhage, & drowning)
- Intracranial surgery
- Infectious diseases

- Seizure disorders
- Toxic exposure (substance abuse, ingestion of lead and inhalation of volatile agents).
- Aneurysms
- Medical causes like stroke (vascular obstruction)

The severity of damage to the brain after an injury is the primary factor in predicting the injury's impact on the individual. Brain injury is typically categorized as mild, moderate, or severe.

Classification System For Traumatic Brain Injury			
Classification	Duration Of Unconsciousness	Glasgow Coma Scale	Post-Traumatic Amnesia
Mild	<30 Minutes	13-15	<24 Hours
Moderate	30 Minutes-24 Hours	9-12	1-7 Days
Severe	>24 Hours	3-8	>7 Days

A severe brain injury may cause the individual to experience an unconscious state, where one appears to be in a deep sleep and cannot be aroused or get any kind of response. Assessments will typically reveal that the individual has no sleep and wake cycles. This loss of consciousness (LOC) is referred to as a coma. Depending on varying factors and the severity of injury, the individual may remain in a coma, emerge from a coma, or experience an increased level of consciousness.



A person who is truly in a coma will not be considered for any type of brain injury rehabilitation program. People can, however, experience different states of consciousness after brain injury. Understanding these disorders of consciousness can be important when discussing treatment and possible rehabilitation options.

IMPORTANCE OF HOLISTIC REHABILITATION

Early medical management

The aim early medical management is to limit the development of secondary brain damage while providing the best conditions for recovery from any reversible damage that has already occurred. This involves establishing and maintaining a clear airway with adequate oxygenation and replacement fluids to ensure good peripheral circulation with adequate blood volume.

Surgical intervention

Usually after injury the brain tissue reacts and there is loss of excess fluid in the spaces which compresses the brain and affects it functions. Emergency surgery is often required to decompress the injured brain and minimize damage:

- Surgery to remove the hematoma and thus reduce pressure on brain tissue.
- Removal of part of the skull to relieve pressure.
- Surgical repair of severe skull fractures, and/or removal of skull fragments from brain tissue.
- Insertion of intracranial pressure (ICP) Monitoring Device.

Rehabilitation post brain injury

Rehabilitation channels the body's natural healing abilities and the brain's relearning processes so an individual may recover as quickly and efficiently as possible and involves learning new ways to compensate for abilities that have permanently changed due to brain injury. The focus of rehabilitation is to enable individuals to perform their activities of daily living (ADLs) safely and independently so they can move on to other forms of rehabilitation or transition to their home.

There are several rehabilitation options based on a person's ability to participate in a rehabilitation program. As every individual is unique, each brain injury case is not the same. Therefore, approach to neurological rehabilitation and physiotherapy post-traumatic brain injury should observe various aspects like their functional status, learning skills, and understanding of injury, extent of injury as

well as age of patient. Physiotherapy is an integral part of neurological rehabilitation team and neurological physiotherapy is an integral part of rehabilitation. The physiotherapy programme require input from a range of clinicians, including Physiotherapists, Occupational Therapists and Orthotists. It is directed by professionals with experience in the management of neurological conditions.

Treating acquired brain injuries demands a personalized, evidence-based, and multidisciplinary approach guided by the patient's needs and goals. Creating a therapeutic environment that matches the patient's tolerance for distraction and need for structure results in a much higher likelihood of the patient being able to return to home, work and community. Scientific literature says that a combination of individual therapies and therapies provided with other people around is proven effective for brain injury rehabilitation.

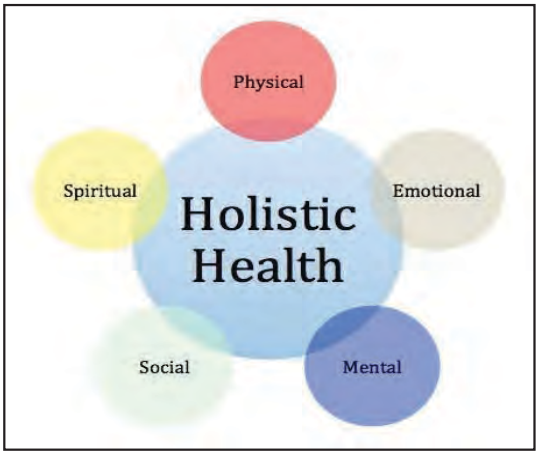
History of advancement in rehabilitation

Rehabilitation of brain injury developed during world wars I and II with astounding works of Poppelreuter, Goldstein, Russel, and Luria. They identified neurocognitive and affective disorders as a key in rehabilitation, but later this was forgotten. In the 1950s and 1960s rehabilitation practices were mainly emphasized on clinically obvious movement issues, within orthopedic area of care. Later, psychological approaches were developed but remained less familiar. However, these approaches were commonly used in 1980s, with both behavioral and holistic approaches.

Importance of "HOLISTIC REHABILITATION"

The rehabilitation for brain injury is constantly emerging with innovative and diverse approaches to treatment. There must be a continuum of services to support the individual throughout the recovery process which includes the inpatient phase, as well as the community phase. It includes many forms like physical, occupational, speech, and psychiatric as well as social support. Many times, rehabilitation is determined by the medical examination the individual report during the event. This often leads to the time when patient care is neglected considering the chances of recovery. But despite of all the reports and existing symptoms, there is evidence that intense rehab can give good functional outcomes. Although it is evident that there is always lack in single approach and rehabilitation for such people must follow a holistic approach.

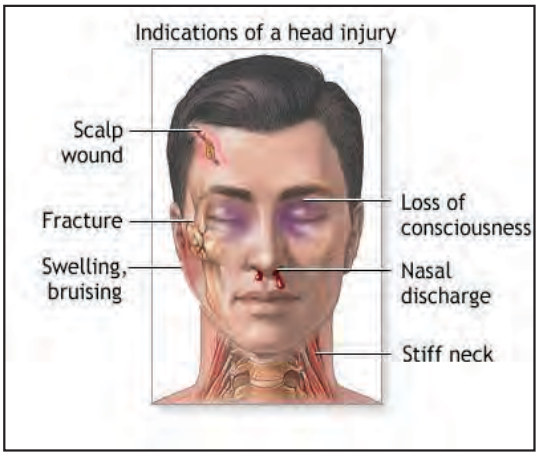
The holistic approach in rehabilitation emphasizes practioners to view the person as whole and focus on all the needs as well as address all the unique needs of an individual. It includes physical, emotional, mental, social, and spiritual aspects with other adjunctive therapies like massage, acupuncture, nutritional diet, salt-cave (Halo) therapy, hydrotherapy, acupressure and many more.



How to know if someone is having brain injury?

After an impact or injury to the head, a person can experience a variety of symptoms. Common symptoms of a brain injury include:

- Thin, clear liquid coming out of the ears or nose
- Loss of consciousness
- The black center of the eye is large and does not get smaller in light or unequal size of pupils.
- Vision changes - blurred vision or seeing double, not able to tolerate bright light, loss of eye movement, blindness
- Dizziness, balance problems
- Difficulty breathing
- Not alert and unable to respond to others



- Paralysis, or difficulty moving body parts
- Weakness, Poor coordination
- Slow pulse, slow breathing rate, with an increase in blood pressure
- Headache, vomiting, confusion
- Ringing in the ears, or changes in ability to hear
- Difficulty with thinking skills
- Inappropriate emotional responses, difficulty speaking
- Body numbness or tingling
- Loss of bowel control or bladder control

Diagnosing brain injury and determining injury severity are two different things. In cases where the injury is more severe, it is usually clear from the individual's symptoms that some type of brain injury has occurred. In situations where the brain injury is mild or moderate, further assessment is often needed to diagnose the brain injury.

What are the diagnostic tests performed in hospital?

Immediately post injury, all patients undergo an urgent neurological examination in addition to a surgical examination. Magnetic Resonance Imaging (MRI) and Computerized Tomography (CT) scanning are frequently used for brain imaging. CT scanning is indicated in the very early stages of post-injury. A CT scan can show potential fractures and can detail hemorrhages and hematomas in the brain, as well as contusions and swelling. An MRI is often used once the patient is medically stable which gives a more detailed view of their brain tissue and the damage.

CHAPTER 6: UPPER EXTREMITY STRETCHING AND EXERCISES

Any kind of brain injury can lead to spasticity when it disrupts areas of your brain that control that natural tension of a muscle (also called muscle tone). Spasticity affects up to 43% in people who've survived an injury within a year of the event. The condition makes muscles stiff and tight.

Exercises for spasticity help enhance neuroplasticity, or the brain's ability to create new pathways to perform functions (like managing muscle tone) as said by the experts. Stretching and moving can also help you avoid some long-term effects of spasticity, such as contracture.

How is it treated?

Treatment options for spasticity depend on the severity of your symptoms after brain injury. Your doctor may also suggest trying a variety of treatments and management strategies at the same time. Here are some common treatment options,

- exercise and stretching
- muscle braces
- injections of certain medications, such botulinum toxin (Botox)
- oral medications, such as baclofen, diazepam, tizanidine, and dantrolene sodium
- intrathecal baclofen therapy (ITB)

Precautions for Stretching

- Wear clothing that doesn't restrict movement
- Ensure the room temperature is comfortably cool
- Don't force any movement that causes pain or increases spasticity. Some feeling of stretch is fine; pain, numbness or tingling is not.
- If pain occurs, stop. Check with your health care professional before trying that move again. If discomfort occurs, cut back to a motion that's easier
- Go slowly. All movements should be done evenly, allowing the muscles time to respond to the stretch by relaxing
- Moving quickly can increase spasticity or stiffness. Hold each stretch for 30–40 seconds at the comfortable far end of your range.
- It may help to count out loud or use a timer. Then gently return to the starting position.
- Progress as tolerated; the body will vary from day to day. The idea is to increase the range of pain-free motion. Therefore, it's important to distinguish between pain and the feeling of stretch. Stretch is okay; pain is not.
- A family member or caregiver may be able to help with stretching. It is important that the support partner knows what they are doing when assisting; otherwise, they may be at risk to injuring the patient or themselves
- Avoid over-exertion. Include rest periods, and sip cool water to prevent over-heating or dehydration.

Passive stretching:

Shoulder Flexion: Supporting the arm and wrist, pick the arm up and over the head to a position behind the ear or as high as tolerated by patient. Allow to return to resting position under control. Over-pressure can be applied to gently increase the stretch as tolerated

by the patient.

Shoulder Abduction: Supporting the arm and wrist, pick the arm up and move out to the side towards the head or as high as tolerated by the patient taking additional care with a low tone shoulder. Allow to return to resting position under control. Over-pressure can be applied to gently increase the stretch as tolerated by the patient.

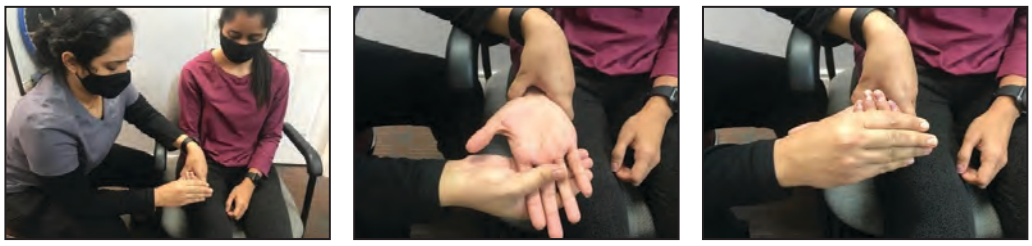
Shoulder Rotation: Supporting at the wrist and elbow take the shoulder out to the side, then rotate the arm forwards and backwards within the range available. Take particular care with a low tone shoulder. Over-pressure can be applied to gently increase the stretch as tolerated by the patient.

Elbow Flexion/Extension: Supporting at the wrist and elbow, bend the arm towards the shoulder. Keeping the same position, straighten the arm towards the bed. Over-pressure can be applied to gently increase the stretch as tolerated by the patient.

Elbow Pronation/Supination: Supporting the wrist and elbow, gently turn the hand and wrist outwards and inwards. Over-pressure can be applied to gently increase the stretch as tolerated by the patient.

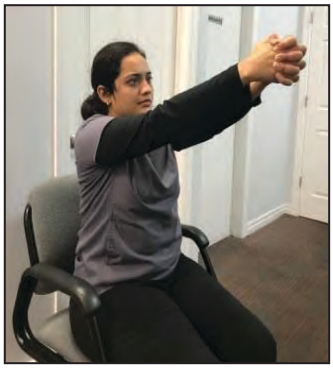
Wrist Flexion/Extension: Holding the arm and hand, with the wrist straight, bend the hand forwards and backwards. Repeat with the hand in a fist position if possible. Over-pressure can be applied to gently increase the stretch as tolerated by the patient. Allow to return to resting position, applying any splints or supports as advised.

Finger Flexion/Extension: Take each finger and pull gently to touch the base of the finger and then outstretched away from the palm. Can be completed individually or together. Repeat this movement for the thumb. Over-pressure can be applied to gently increase the stretch as tolerated by the patient. Allow to return to resting position, applying any splints or supports as advised.



Self – Stretches:

Shoulder forward arm lift: Interlock your fingers or hold your wrist. With your elbows straight and thumbs facing the ceiling, lift your arms to shoulder height. Slowly lower your arms to starting position.

Shoulder – Rock the baby stretches: Hold your affected arm by supporting the elbow, forearm, and wrist (as if cradling a baby). Slowly move your arms to the side, away from your body, lifting to shoulder height. Repeat this motion in the other direction. Slowly rock your arms side-to-side and keep your body from turning.



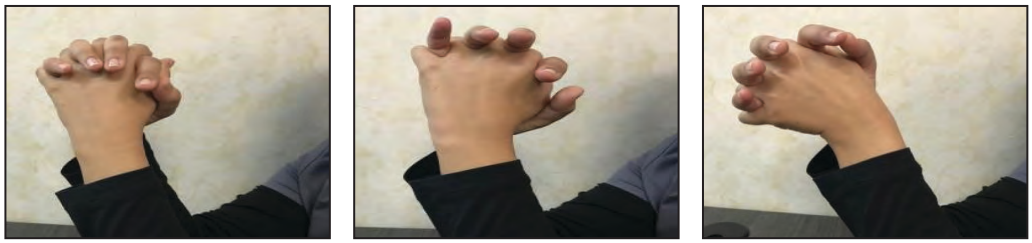
Shoulder – Rotation stretches: Interlock your fingers or hold your wrist. With your elbows bent at 90 degrees, keep your affected arm your side. Slowly guide your affected arm across your stomach. Hold for few seconds. Slowly guide your forearm away from your body, keeping your elbow at your side.



Elbow stretch: Interlock your fingers or hold your wrist. Start with your arms straight. Slowly bend your elbows. Hold for few seconds. Slowly return to starting position, with elbows straight.

Wrist side to side stretch: Interlock your fingers or clasp your hands together. Slowly bend your wrist to the left, then to the right. Hold for few seconds.

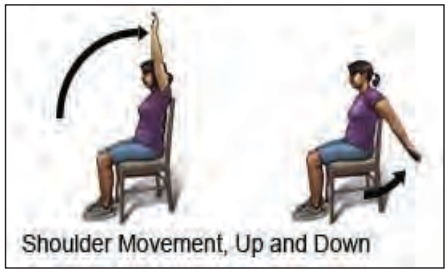
Wrist forward and backward stretch: Interlock your fingers or clasp your hands together. Place your hand on your lap or supported on a table. Slowly bend your wrist towards you, then away from you. Hold for few seconds.

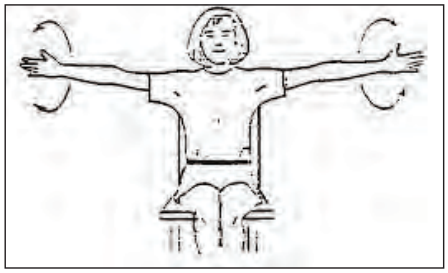


Thumb and fingers stretch: Place your affected hand on your lap or supported on a table. Place the thumb and index finger of your non-affected hand, between the thumb and index finger of your affected hand. Stretch the thumb and index finger apart.

Exercises for strength control: There are many ways to improve strength and awareness of your weak side. If you have good recovery of movement and can do most basic activities, strengthening can be done by using equipment such as weights. Exercise should be directed toward strengthening specific movements. It is important to select the right exercise for your stage of recovery. If you have doubts about what you can do, stick to the simple basic exercises and work on them until you are confident that you are doing them correctly.

Active range of motion exercises: Active range of motion is movement of a joint provided entirely by the individual performing the exercise. In this case, there is no outside force aiding in the movement.





Purpose of doing AROM

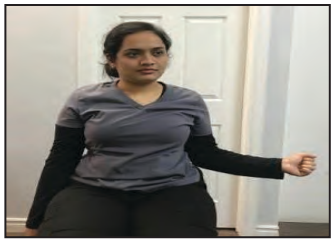
- increase strength
- maintain/improve endurance
- promote circulation
- maintain/increase range of motion (ROM)

Shoulder:

Flexion: Begin with your arms straight at your side. Keeping your elbow straight, lift one arm up over your head as far as possible.

Abduction: Lift your arm out to side with palm down. Keep elbow straight.

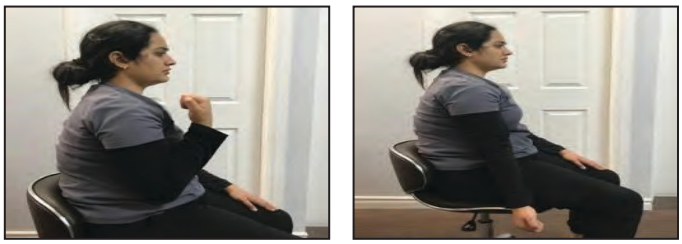
Shoulder rotation: Bring arm close to your body with elbows flexed to 90 degrees. Keeping the elbows fixed move your hand towards the body then away from the body.



Shoulder extension: Move arm(s) backwards keeping elbows straight. Do not lean forward.

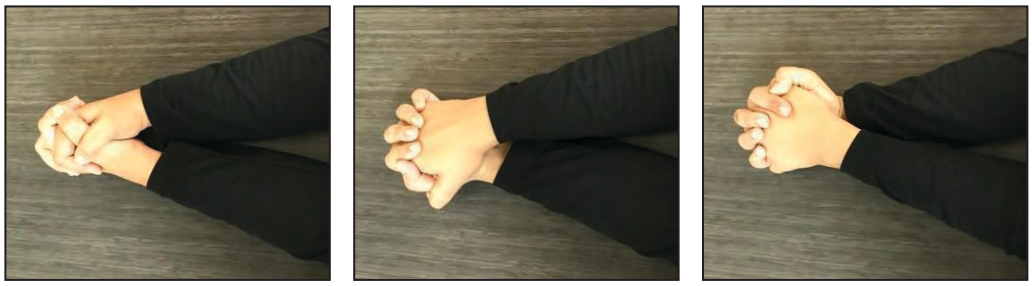
Elbow:

Flexion and extension: Bend elbow. Straighten elbow and hold.



Elbow extension: Hold arm above head, elbow pointing to ceiling. Straighten elbow.

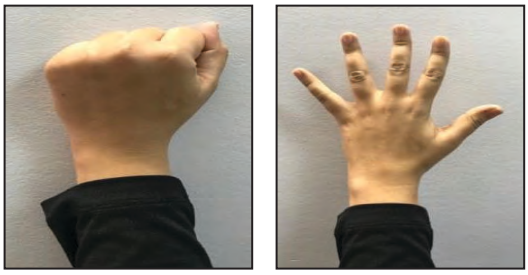
Forearm pronation and supination: Turn palm up. Keep elbow at side. Turn palm down and hold.



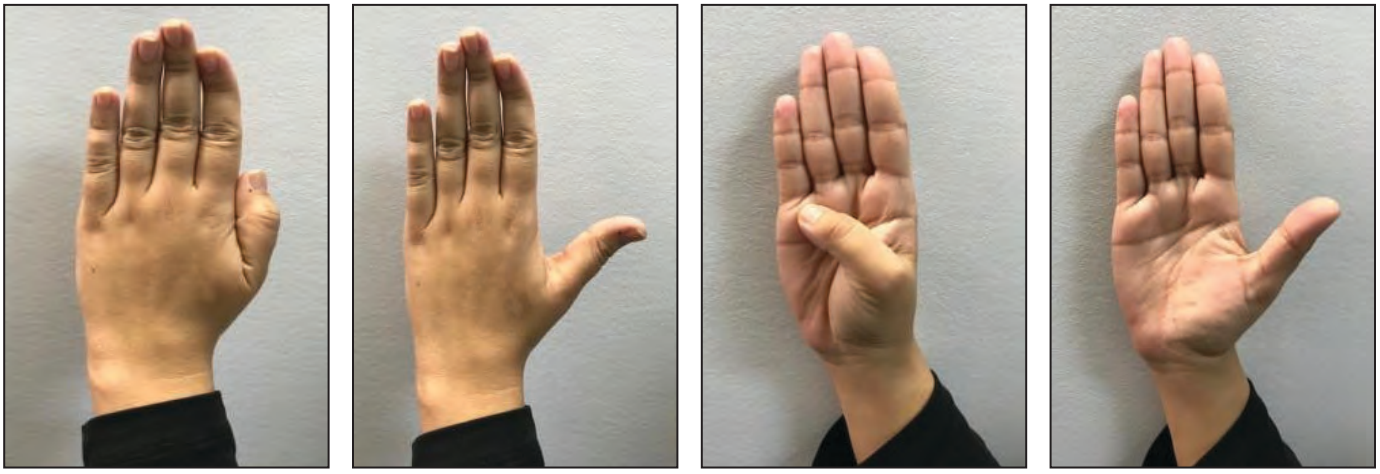
Wrist flexion/extension: Begin with palm down, raise hand up and then bring down.

Wrist Ulnar/radial deviation: Make a fist, begin with wrist taking on the sideways.

Fingers flexion/extension: Make a fist and open all the fingers following.

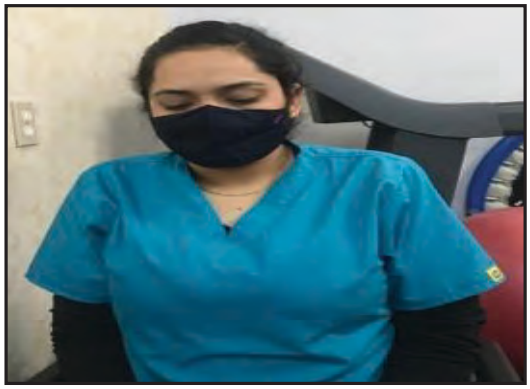


Thumb movements:

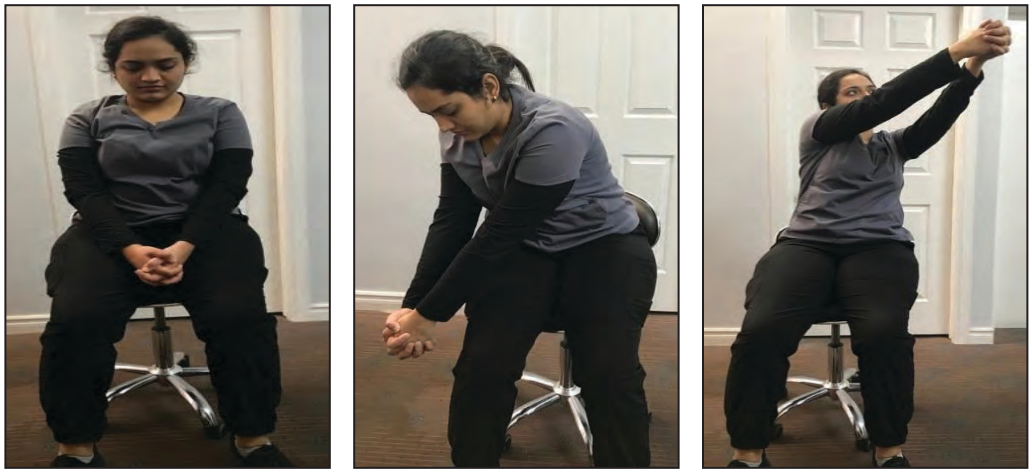


Exercise to improve functional ability:

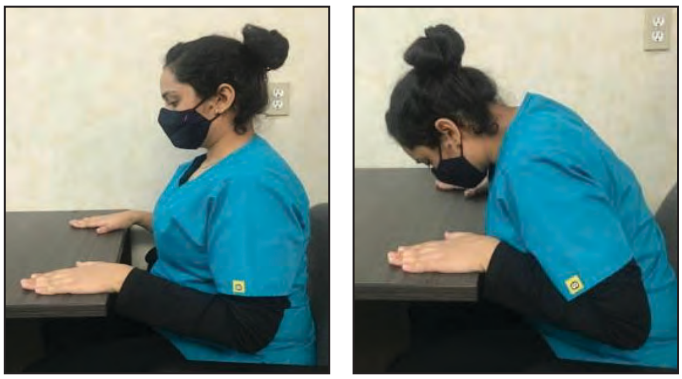
Shoulder shrug: Sit in a chair with your arms by your side. Make sure your back is touching the back of the chair. Raise your shoulders towards your ears for a count of 3. Return to the starting position.



Twisting: Make sure your back is touching the back of the chair for the whole exercise. Clasp your hands together and pull forward until you feel a stretch through your back. Turn your body to the left. Hold for a count of 3. Turn your body to the right. Hold for a count of 3.

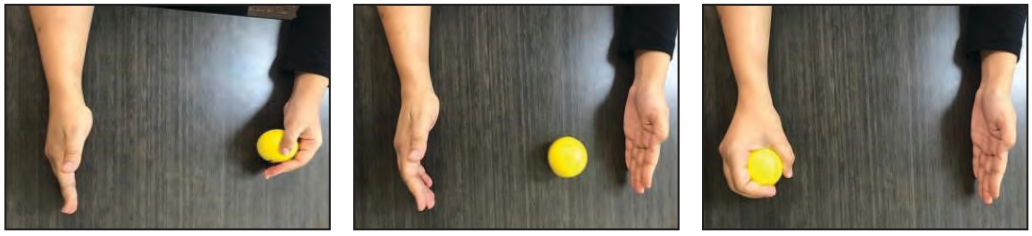


Push-ups: Place the table against a wall. Place your hands on the table-palms down or you can place your palms on the edge of the table. Lean your chest towards the table for a count of 5. Push away from the table for a count of 5. If you cannot put your weaker hand flat on the table, place your forearms on the table and then do the push-up.

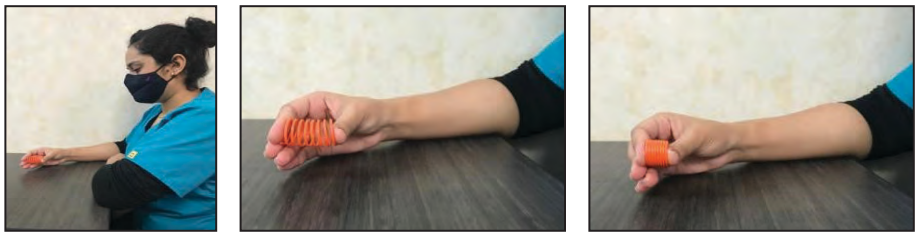


Object moving: Place the bean bag in your weaker hand. Pick the bean bag up and move it to the 1st dot. Drop the bean bag on the dot and place your weaker hand in your lap. Then reach with your weaker hand to pick up the bean bag, placing it on dot 2 and following the others until you have dropped the bean bag on each dot. Once you have finished the arc, start at dot 5 and retrace your steps.

Ball rolling with no partner: Place your hands shoulder width apart. Roll or push the ball back and forth between your hands. Continue until you have caught the ball with your weaker hand. If this is easy for you try rolling the ball faster or placing your hands further apart. If this is hard for you, use the bean bag and push it towards each hand.



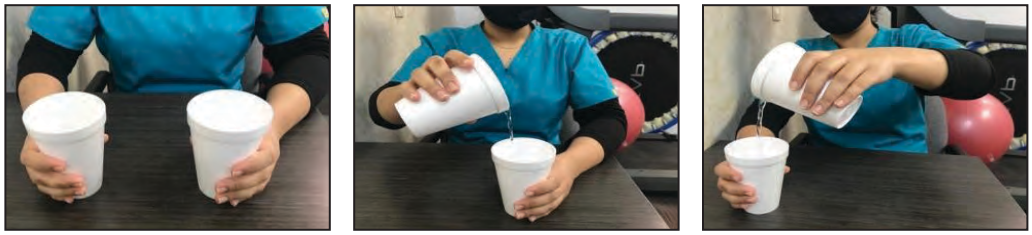
Grip power: Place your weaker arm on the table. Place the gripper in your palm between your knuckles and your thumb pad. Squeeze the gripper as hard as you can for a count of 3. Relax your hand for a count of 3. Remember to focus on opening your hand.



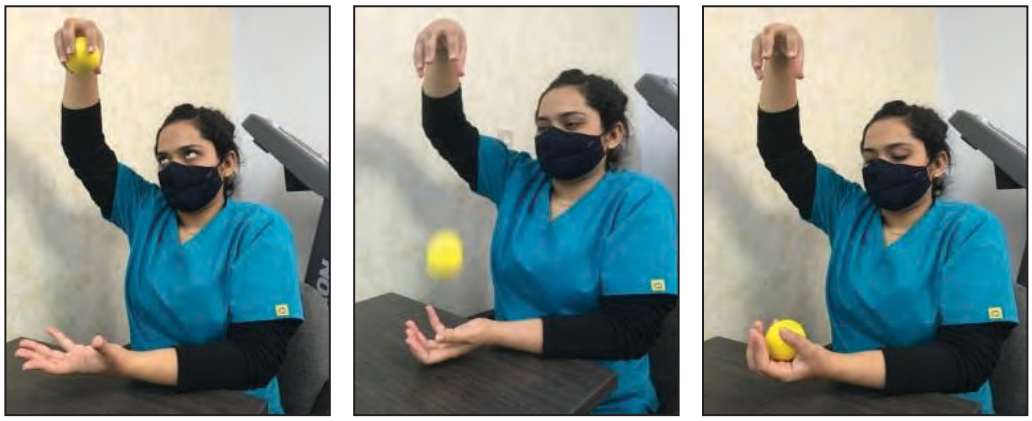
Chair ups: Sit in a chair with both your hands on the arm rests. Using your arms NOT your legs, push your body upwards so that your bottom comes off the chair. Put as much weight as can through your arms NOT YOUR LEGS when pushing up.

Advanced moving the object: Place the target board on the ground about 6" in front of your chair. Place the ball in your weaker hand. Hold on to the arm rest with your stronger hand and lean forward. Place the ball on dot 1 - now sit upright with back against chair. Lean forward and pick up the ball placing it on dot 2, sit up. Repeat this process for each dot. If at any time you feel dizzy STOP and rest for 1 minute. Try again but if you continue to feel dizzy go to next exercise.

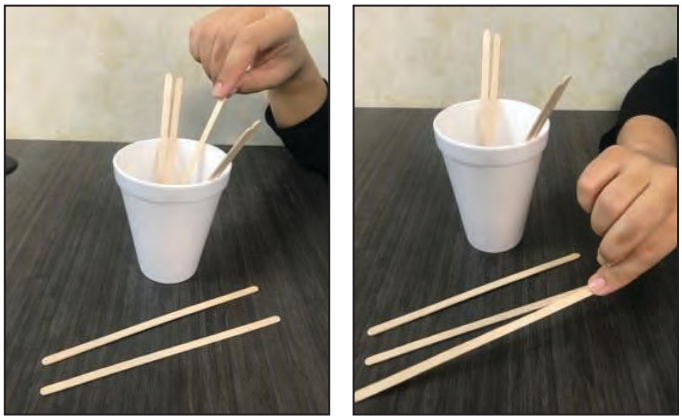
Pouring: Place two cups on the table, one half full of water. Hold the empty cup with your stronger hand, pick up the cup with water with your weaker hand. Pour the water into the empty cup.



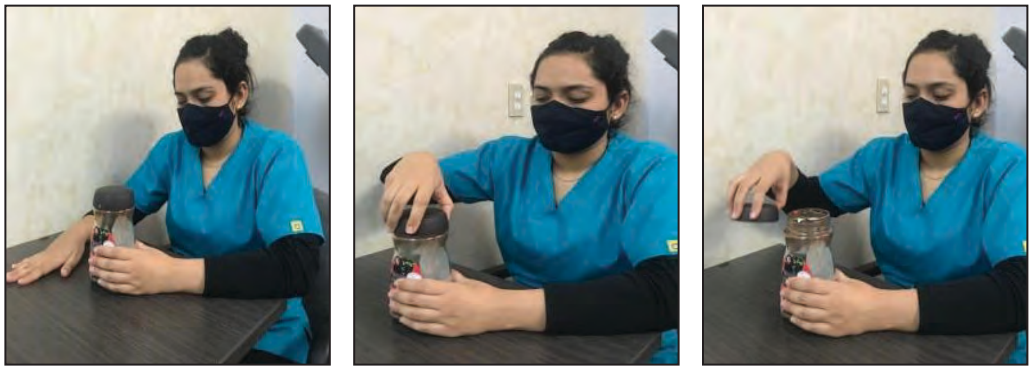
Drop and catch the ball: Place the ball in your stronger hand. Raise this arm as high as you can but not higher than your shoulder. Place your weaker hand on the table. Drop the ball and try and catch it with your weaker hand. Then switch and drop the ball with your weaker hand. If it is hard to use the ball, use the bean bag instead.



Picking up the sticks: Put your sticks and a cup on the table. Using your weaker hand, take each stick and place in the cup. Using your weaker hand, turn the cup upside down and dump them out.



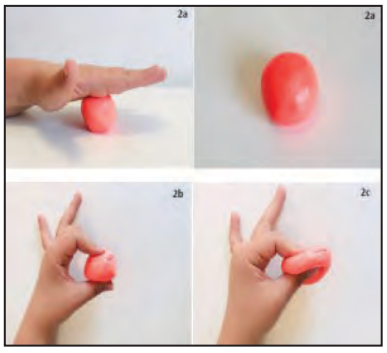
Opening/Closing the jar: Place the jar on the table. Hold the jar with your weaker hand and take off the lid with your stronger hand. Now hold the jar with your stronger hand and take off the lid with your weaker hand.

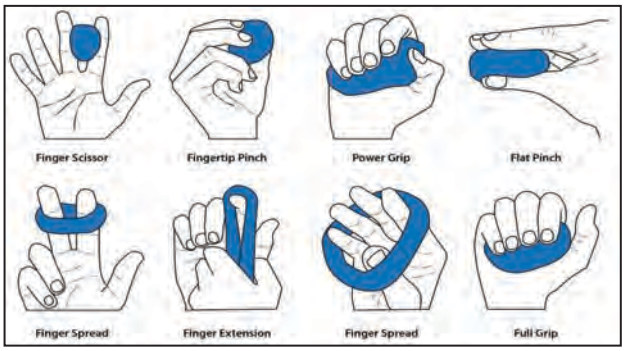


Squeeze: Place your weaker arm on the table. Place the ball in your hand and squeeze as hard as hard as you can for a count of 5. Relax your hand for a count of 5.

Finger power: Place the putty on the table and roll into a thick rope. Take each finger of your weaker hand, starting with your thumb, and push into the putty. After you finish all 5 fingers, take a 30 second break. Then repeat two more times.



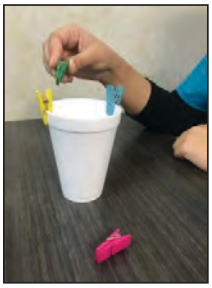





Waiter-cup: Follow the arc pattern you did with the bean bag with a cup, do it 3 times. Repeat the arc pattern with the cup but do it as fast as you can, do it 3 times.



Hanging up the clothes: Place a cup on the table. Using your weaker hand, take each clothes peg and clip it on the edge of the cup. Using your weaker hand, take each peg off the cup and place on the table.



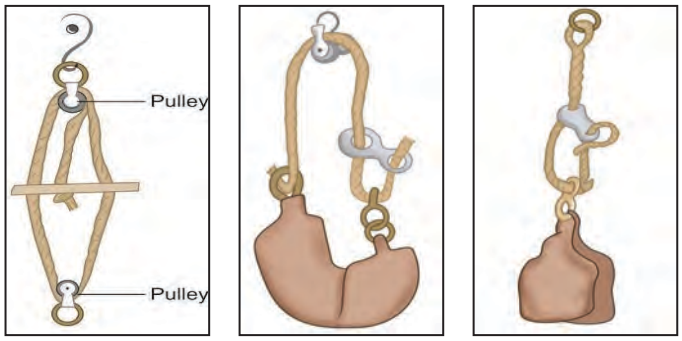
CHAPTER 7: SUSPENSION THERAPY

What is suspension therapy?

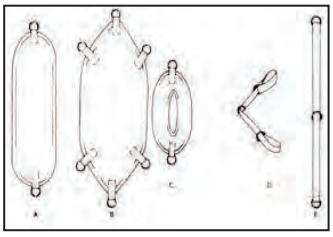
Suspension Exercise therapy is a technique in Exercise therapy in which a body or a part of it is suspended in the air by ropes and slings attached to fixed points. It increases range of motion and muscle strength. It is an efficient a way of carry out exercises with ease which can be beneficial to the therapist and to the patient.

What are the parts used in suspension therapy?

- **Ropes** – Single, Double or Pulley Rope



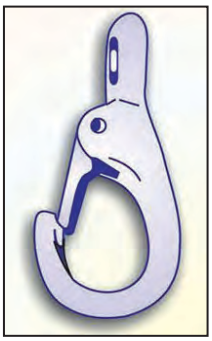
- **Slings**- Single, Double, Three Ring and Head Slings



- **Wooden Cleat** – Usually have two to three holes which are used to change the length of the rope without having the disadvantage of tying the rope every time for a specific rope length.

- **Springs –** Used to assist especially when the patient has an MMT between 2 and 3.

- **Dog Clip and S hooks –** Used to attach Slings with the rope and the Frame. Dog Clips are safer than S hooks as they can secure the rope without slipping.



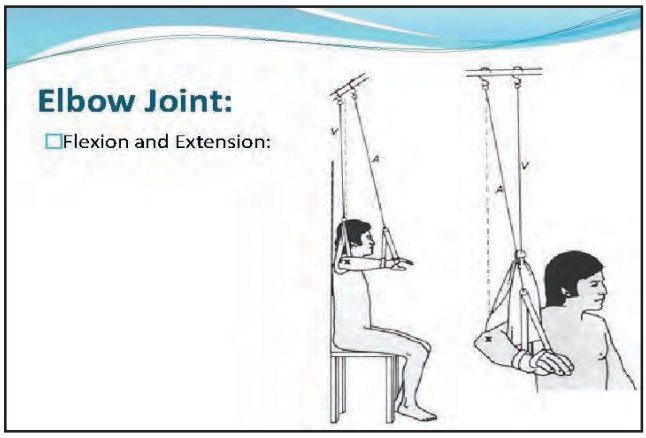
Types of Suspension therapy:

Axial Suspension: Joint axis is taken as the point of the suspension. The limb is supported by the slings above the axis of the joint. If the movement is initiated the limb is moved both sides. The part moves parallel to the floor. Uses-

- Relaxation
- Maintain muscular property
- To Increase the blood circulation
- Increase the venous drainage
- Increase the lymphatic drainage

Vertical suspension: COG of the body part or the body is taken as a point of suspension. Used to provide support to the body part of the patients. Uses-

- To support the body part
- To reduce the pressure sore

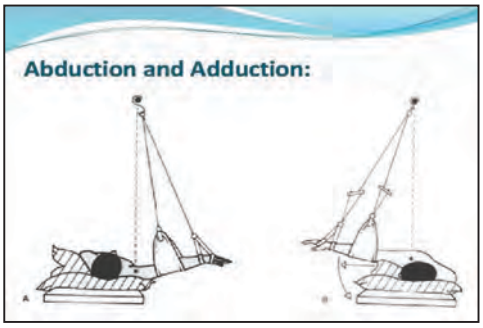


Pendular suspension: The point of suspension should be shifted away from the joint axis. Movement usually takes place against gravity. Muscle will be getting resistance while moving if the axis is shifted opposite to that movement. Uses-

- To strengthen the muscle.
- To increase the muscle power
- Increase the endurance.

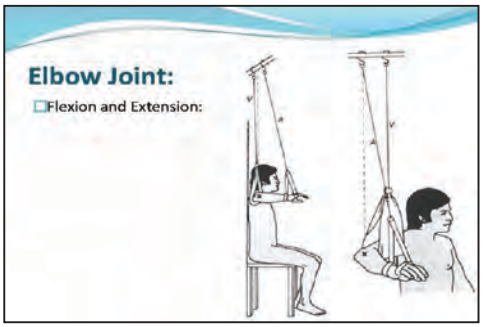
Exercises for different joints of body with suspension frame:

Shoulder Abduction/Adduction: The starting position is lying, the arm which is to be moved should be placed up. This allows the normal movement to be performed. Two single ropes are required, one attached to a single sling under the elbow and one to a three-ring sling applied to the wrist and hand. The fixation point is over the shoulder joint. If there is some muscle power the patient can do the movement by himself or if there is no power, someone can assist with the movement.



Shoulder Flexion/Extension: The starting position is side lying on pillows. Female patients need two pillows under the head and one under the shoulder to allow the forearm to clear their wider pelvis. The slings and ropes are arranged as described above.

Elbow flexion/Extension: The starting position is sitting. One point is fixed over the elbow joint. One sling is used to support the elbow and three-ring sling used at the wrist and hand.



Making your own Pulley System

Gather the supplies: A small pulley, 12-foot to 14-foot length of 5/16" polyester rope, Household scissors, discarded tubing or garden

hose for handles (optional). Polyester rope is preferred because it is soft and glides easily on the pulley wheel. It is also pliable enough so that you can close a door on it without damaging the door. This is important since the pulley will be anchored in this way. While a bigger rope may feel comfortable in your hand, you will probably be unable to close the door on it. If anything, it is better to have a thinner rope than a thicker one.

Make the pulley hanger: You will start by cutting a one-foot length of rope to make your pulley hanger. Simply string the rope through the top of the pulley and tie a double overhand knot to secure (as pictured). A double overhand knot is simply a basic overhand knot done twice. There should be around two inches of rope on one side of the knot and nine inches on the other.

Create the pulley anchor: To make the anchor, tie another double overhand knot on the longer end of the hanging rope. The knot will be situated on the outside of the door when shut and prevent the rope from slipping out. If the anchor is small or looks flimsy, make addition knots to ensure the pulley system is properly anchored when installed.

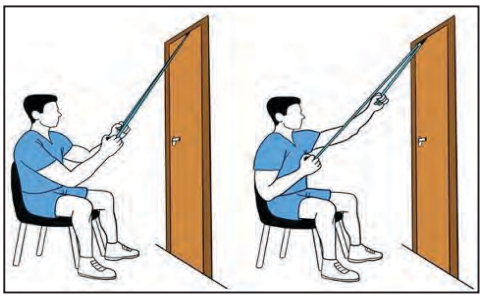
Build the pulley line: Cut another piece of rope around 10 to 12 feet long. Don't worry if it is too long; you can adjust the size of the line to fit your needs. Feed one end of the rope through your pulley, tying the end of the rope into a handle using an overhand loop knot (as pictured). Like the overhand knot, the overhand loop is the most basic of knots. To make one:

- Create a loop large enough to accommodate your hand.
- Take the loop and create another loop, passing the end once or twice through the circle.
- Pull tight to secure.
- The loop also prevents the rope from slipping out of the pulley.

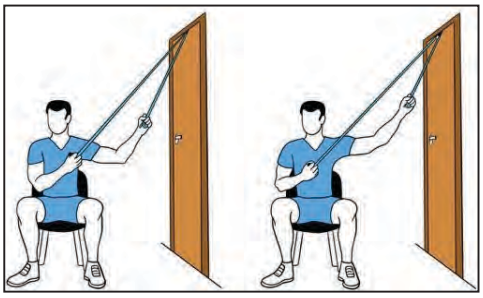
Create a second handle: Create another looped handle at the opposite end of your rope. Some people like to string a four-inch length of plastic tubing (or a cut piece of a discarded garden hose) into the loop to create a comfortable grip.

Hang your pulleys: Once you have made your pulley, sling the knotted anchor over the top the door and shut it. The door should be able to close tightly, and the knot should hold firmly when tugged. You now have a basic but effective shoulder pulley system you can use at home. Speak with your physical therapist to determine which pulley exercises are most appropriate for you.

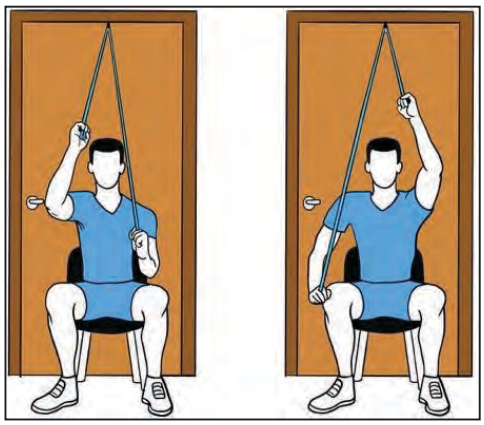
Exercise 1: In the first shoulder pulley exercise, your chair faces the door square on, with the door anchor fixed over the door. The uninjured arm pulls the injured arm, gently stretching it forwards and up. Hold in the final position for 10 seconds and then lower the arm.



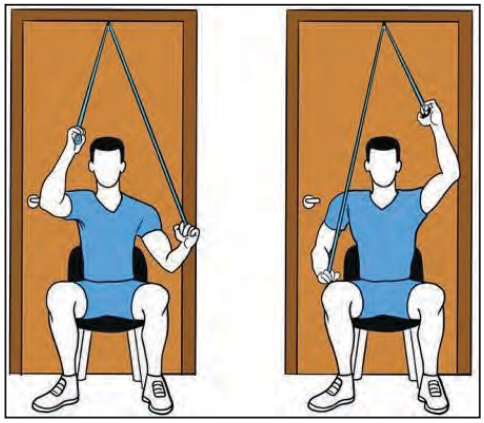
Exercise 2: Once you are comfortable with the first exercise, turn your chair 90 degrees and perform the same exercise from the side. Gradually let your shoulder stretch and increase its range of motion.



Exercise 3: When you feel that your range of motion has improved, you can turn the chair so you're facing away from the door. Using the uninjured arm, lift the injured arm up directly in front of you, holding in the final position for 10 seconds or more.

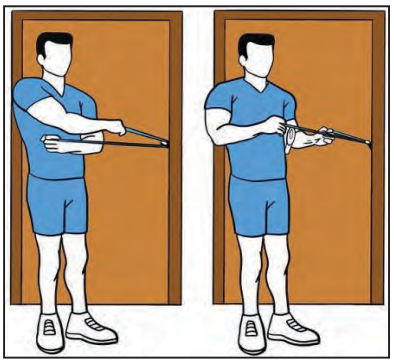


Exercise 4: The next step is to adjust the angle of your arm from your body to 45 degrees. Perform the same movement at this angle, stretching the arm as high as you can go without too much pain. Always hold in the final position for at least 10 seconds.



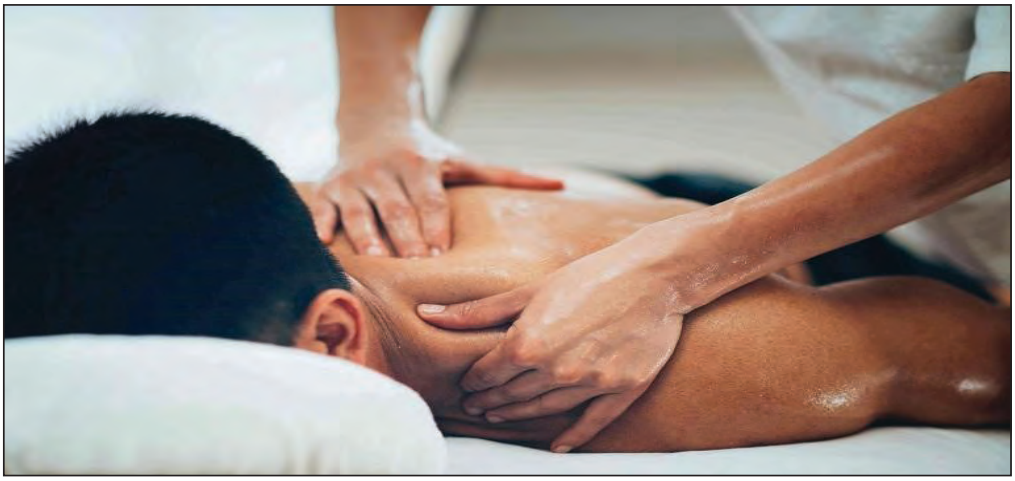
Exercise 5: The next exercise is done in a standing position. Lift the injured arm behind your back, as in the picture. Start off slowly with only small movements and gradually increase the range of motion.

Exercise 6: Once you have gained a good level of mobility you can begin rotational shoulder exercises. Standing side on to the door, pull the affected arm so that it is rotating outwards, again holding in the final position, and gradually increasing the range of motion. Do not let your shoulder hunch up or move forward. Maintain a natural upright posture, and keep your elbow fixed at your side. Holding a rolled-up towel between your elbow and body will help with this.



CHAPTER 8: ROLE OF MASSAGE THERAPY IN REHABILITATION

Massage therapy has long been used to ease pain, provide comfort, and address cognitive and neurological issues. Currently, there are many massage therapists who focus their practice solely on headaches, sports related concussions and other TBI related issues. Massage therapy helps people who have suffered from TBI by easing the pain of a traumatic injury, providing comfort, flushing the lymphatic system to enable healing and by helping with neurological issues.



Effectiveness of massage therapy:

Individuals who have suffered a brain injury are often unable to exercise and can remain inactive for long periods. This can cause issues with metabolic waste products that needs to be removed from the body. Massage therapy can help, ensuring that the flow of blood and lymph fluid is improved.

Using massage therapy, it's possible to improve and potentially partially restore the proper joint function. This can include everything from the spine to the extremities.

Brain injuries can also cause chronic tension in certain areas of the body. To improve this, oxygen flow needs to be improved in these areas. This provides healthy nutrients to the body and awakens sensory receptors and ensures that the muscles become more active.

People who suffer from a brain injury often experience painful muscle spasms. This can be recurring and unfortunately common throughout even a short time. This is typically caused by scar tissue that hasn't healed fully and instead becomes stretched or broken. A deep muscle massage can help here, particularly if a person has inactive muscles due to this type of injury.

Preparation of the patient for massage:

- Ask the patient to sit in the middle of the table, then lay on her side, using the arms to support her weight while lying down.
- Have her turn onto her stomach with her face in the face cradle. Place a bolster under the ankles and adjust the drape.

Deep, rhythmic breathing by you, the therapist, throughout the massage will help you maintain your focus, connect with your client, and facilitate the flow of the massage.

Hands and Arms (Approximately 8 Minutes)

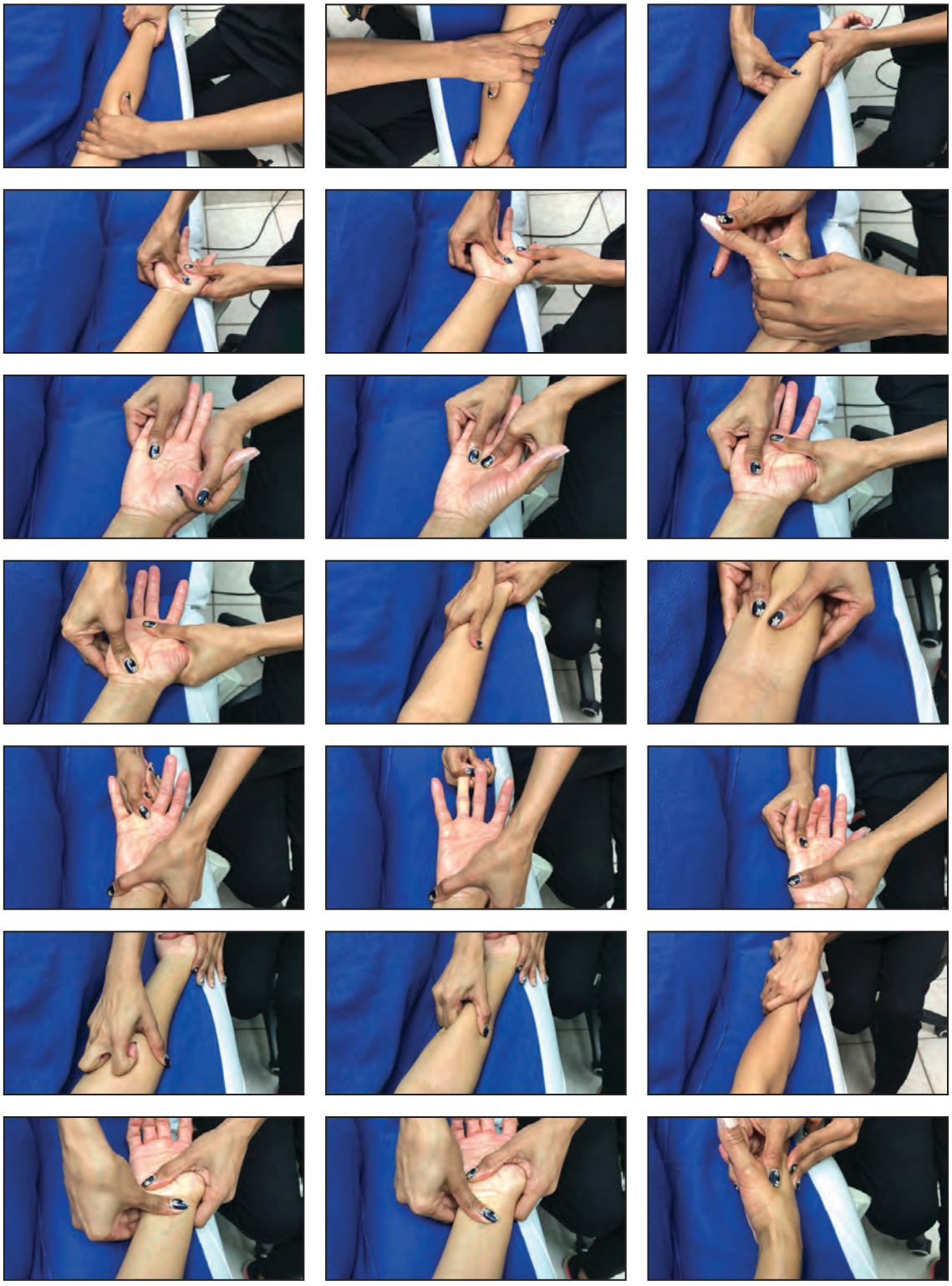
- Effleurage the patients right hand and arm several times to spread lubricant and warm the tissues. Use alternating one-handed petrissage on the palm and thumb glide between the metacarpals.

- Turn the hand over: slip your little finger in between the client's middle and ring finger, and your fourth finger between the client's ring and little finger.

- Put your other little finger between the client's middle and index finger, and your ring finger between the client's index finger and thumb. Open the palm of the hand and work with thumb glides; hold acupressure points (unlike the foot, these points are held two at a time: hold 1 and 2 at the palm heel, move one thumb's width toward the fingers for 3 and 4, move one thumb's width toward fingers for 5 and 6, and move back down).

- Release the fingers and hold the hand with one of your hands; draw the forearm up to a 45- degree angle, elbow resting on the table. Use one-handed petrissage on the forearm, alternating hands. Thumb glide and friction the forearm.

FOREARM AND HAND



How to do Self Hand Massage:

To get the most benefits from a hand massage, it's best to do it every day for at least 15 minutes. Try to use moderate pressure instead of light pressure, especially if you have hand pain. Doing a hand massage before bedtime may improve the quality of your sleep.
You may want to apply some heat to your hands and arms before you start to help your muscles relax. Then, take the following steps:

- Remove all jewelry. Before you begin massaging your hands and fingers, be sure to take off any rings or bracelets that may get in the way.

- Sit in a comfortable position. To apply moderate pressure, it may be easier to have one hand on a table while you use your other hand to do the massage strokes.

- Loosen your hands up. Shake them out and wiggle your fingers about. Stretch your hands by flexing them as wide as you can, and then make a fist. Bend your wrists with your hands points down, and then flex your hand up and down several times. Continue to use these techniques for about one minute before you begin to massage your hands.

- Use your palm to stroke your forearm from the wrist to the elbow and back again on both sides. If you want to, you can extend the stroking to your shoulder. Do this at least three times on both sides of your forearm. The idea here is to warm up your muscles.

- Use your palm to stroke from your wrist to your fingertips on both sides of your hand. Do this at least three times. Use moderate pressure.
- Use your thumb to do most of the work. Start by holding out one of your hands, keeping your fingers straight. Then, wrap your opposite hand's fingers around the back of your hand with your fingers facing straight up. Your thumb should be laying on your palm and pointing towards you.

- Apply the amount of pressure you are comfortable with. Start off using light pressure, and then work your way towards a deeper massage. This will help you find tender, sore, or tight spots.

- When you reach the finger, continue to pinch up the finger with a firm pressure. Inch your thumb up and down each finger, starting at the balls, and working your way up slowly to the tip of your finger. Squeeze along the sides of your fingers, too. Repeat this for every finger.

- Reverse your hand placement and go to the space between the thumb and the index finger. There is a muscle here that holds most of the tension in the hand. Here, you will do some deep compressions, kneading, or gliding. You can do this by either pinching with the thumb and index finger or using your knuckles.

CHAPTER 9: HERBS AND HERB INFUSED OILS

From ancient time, one of the more versatile use of herbs is mixing it to make infused oil. These oils work in two ways – causes emotional and physical response and penetrates the skin to underlying tissue and distributes their therapeutic properties. There are many herbs found locally who has amazing therapeutic properties and are used to make infused oil. Knowing some of the differences can be helpful to choose the best herb for the situation.
We will share with you some recipes and important herbs which will help reduce pain, inflammation and boost your recovery. There are few herbs which you will get in your kitchen which has amazing healing properties. Let's see their benefits:

Eucalyptus - You might relate the eucalyptus herb as a remedy for the flu or for colds. While it does help with these conditions, it is also an effective herb for pain relief due to its ice, cooling effect. The leaf contains tannins which are known to reduce swelling and inflammation, resulting in pain relief. The common use is as a topical pain relief treatment.

Black Pepper - Black pepper has potent anti-inflammatory properties that lessen brain inflammation, which helps hasten recovery. The fact that essential black pepper ingredients support cognitive function and even halt cognitive ageing is even more exciting.

Black pepper also improves blood flow throughout the entire body, including the brain. Because of the improved blood flow, your brain will have easier access to the essential nutrients that promote healing. Black pepper contains essential oils like piperine, a naturally occurring alkaloid, which is the source of its bold character and heat, as well as the monoterpenes sabinene, pinene, terpenene, limonene, and mercene, which give this spice its aromatic qualities.

Frankincense holds many benefits that make it useful for brain injury patients. For example, it has a potent anti-anxiety effect and can help reduce inflammation and nausea. However, the primary reason frankincense is so powerful for TBI recovery is because it is rich in compounds known as sesquiterpenes.

Sesquiterpenes deliver oxygen molecules directly to cells. They can also pass through the blood-brain barrier, which means they help bring more oxygen to damaged brain cells.

Cedarwood

Another essential oil that improves cognitive function is cedarwood.

Because it also is high in sesquiterpenes, cedarwood helps the brain heal in many of the same ways that frankincense does. Cedarwood also has sedative properties, which is ideal for brain injury patients struggling with insomnia and other TBI sleep disorders.

Mustard Seeds - Mustard seeds contain vitamins A, B6 and C (and other vitamins), dietary folate, omega-3 fatty acids, and minerals like magnesium, potassium, selenium, manganese, phosphorus, and copper. The seeds also have the following health-promoting plant compounds, which include Glycosylates and isothiocyanates.

Clove - Clove is a perfect home remedy for toothache since ages. Clove, which forms on the Eugenia Caryophyllids plant, has been shown to possess anti-inflammatory properties that relieve pain. This spice also kills bacteria, fungi, and viruses. These are the functions of the chemical called eugenol. Clove essential oil is quite inexpensive and very beneficial.

Lavender is perhaps the best essential oil for brain injury patients with anxiety problems or sleep disorders.

According to studies, lavender oil causes a significant decrease in blood pressure, heart rate, and skin temperature, which indicates that it triggers a calming response in patients. Lavender also improves sleep quality and helps patients improve their insomnia symptoms.

Peppermint

One of the best essential oils for brain injury patients is peppermint oil.

The main ingredient in peppermint oil is menthol, which acts as an analgesic (i.e., painkiller). As a result, peppermint oil can ease muscle pain and headaches, common problems after a brain injury or concussion. It's also helpful for treating stomach issues.

Rosemary

Besides boosting memory, rosemary oil can make you feel more alert and attentive, which will significantly benefit patients with cognitive fatigue after brain injury.

Himalayan Salt - Himalayan Salt is the world's purest and richest, boasting 84 minerals and trace minerals. It's become increasingly popular nowadays, as many have attributed numerous health benefits to it.

The healing properties of pink Himalayan salt are believed to restore restful sleep, relieve muscle aches, and increase energy in body. Other than being beneficial for muscle aches and pains, it can also be used to relieve muscle spasms. When infused the salt in carrier oil and applied to the surface, the natural antioxidants present can help to prevent free radical damage and thus reducing the possibility of future muscle pain.

Some mixed herb recipes which you can prepare at home using your kitchen herbs for your pain are mentioned below:

The first recipe:

Ingredients

- 3 teaspoons of turmeric powder,
- ½ a teaspoon of black pepper
- A teaspoon of lemon peel
- A teaspoon of Himalayan salt
- ¾ cup of regular drinking cups of olive oil

Method:

- Take all the ingredients and coarse grind in the mixture. Take the powder and add olive oil into it and stir it up. You can store this in a dark color bottle to prevent it from direct sunlight.
- Also, it can be placed in a refrigerator to ensure its protection.
- Take small amount of oil, massage on your hands and forearm with gentle pressure, and try working on the areas which are stiff.
- After massage, you can take a hot compress and gently wipe off your skin.
- Massage can be done once in a day.

Benefits:

- Relieves acute pain
- Stimulates blood circulation
- Stimulates and revitalizes nerves
- Reduces inflammation
- Moisturizes the skin and nourishes the muscle






The second recipe:

Ingredients:

3 teaspoons ground dry olive leaves

6 teaspoons of dried sour grapes

3 teaspoons of dried wild thyme

Half a cup of drinking cups of extra-virgin olive oil

Method:

- Take the amount of dried olive leaves, thyme, and dried sour grapes, grind the dry ingredient until it becomes like powder.
- Then, add virgin olive oil and mix it well.
- And put in an airtight container, away from heat and sun or in the fridge
- Take small amount of oil, massage on your hands and forearm with gentle pressure, try working on the areas which are stiff.
- Use it 3 to four times a day with gentle pressure on hand.
- After massage, you can take a hot compress and gently wipe off your skin.








The third recipe:

Ingredients:

A teaspoon of hot pepper

5 spoons of green tea

3 teaspoons of sesame seeds

2 teaspoons of salt

A full cup of extra-virgin olive oil

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a fine powder.
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun and in the fridge
- Use 3 times a day (morning, noon, and evening) with gentle pressure on the hand.
- After massage, you can take a hot compress and gently wipe off your skin.
- Make sure you stir the mixture before using.

Benefits:

- Eliminates pain directly
- Stimulates blood circulation
- It stimulates and revitalizes the nerves and aids in healing
- Eliminates inflammation
- Nourishes muscle and moisturizes the skin




The fourth recipe:

Ingredients:

3 teaspoons of fine turmeric powder

3 teaspoons of sage powder

A teaspoon of cinnamon powder

A cup of regular cups olive oil

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a fine powder
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun and in the fridge
- Use 3 times a day (morning, noon, and evening) with gentle pressure on the back.
- Make sure you stir the mixture before using.
- After massage, you can take a hot compress and gently wipe off your skin.

The fifth recipe:

Ingredients are,

3 teaspoons of sesame seeds

2 teaspoons of cinnamon bark

4 teaspoons of Cress seeds

Half a large cup of olive oil

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a fine powder

- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun and in the fridge.
- Take a small amount and Use 3 times a day (morning, noon, and evening) with gentle pressure on the back.
- Make sure you stir the mixture before using.

Benefits:

- Reduces the pain
- It activates the free nerve endings and blocks the pain receptors.
- Stimulates blood circulation
- Reduces inflammation and swelling

The sixth recipe:

Ingredients are,

A teaspoon of black mustard

A teaspoon of sesame

3 teaspoons of ground bay leaves

Half a large cup of drinking glasses of olive oil

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a coarse powder.
- Add virgin olive oil to it and mix well
- Place it in an airtight container, away from heat and sun or store it in the refrigerator.
- Use 3 times a day (morning, noon, and evening) with gentle pressure on the back.
- Make sure you stir the mixture before using.
- After massage, you can take a hot compress and gently wipe off your skin.

Benefits:

- Reduces the pain
- It activates the free nerve endings and blocks the pain receptors.
- Stimulates blood circulation
- Reduces inflammation and swelling






The seventh recipe:

Ingredients:

A teaspoon of chili powder

5 teaspoons of chamomile powder

3 teaspoons of turmeric

Half a large cup of extra-virgin olive oil

Method:

- Do not but any powders from the store. Instead use whole herbs to enhance more benefits.
- Take all the dry ingredients and grind it in a coffee grinder until it becomes a coarse powder.
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun or store it in the refrigerator.
- Use 2 times a day (morning, evening) with good pressure on the back.
- Make sure you stir the mixture before using.
- After massage, you can take a hot compress and gently wipe off your skin.

Benefits:

- Relieving acute pain
- Relaxes the muscle and calms the nerves, in addition to softening and lightening the skin
- Stimulates nerves
- Reduces inflammation








CHAPTER 10: BODY SOAK FOR RELAXATION

But first let us understand how soaking helps?

Salt is considered a home remedy for generations. Soaking the hand with it relieves aches and pains, reduces inflammation, improves blood circulation. In addition, there is a lot of research indicating that it helps to remove toxins from the body and relieve stress. Skin absorption of minerals relieves cramping and hand pain, enhances the absorption of magnesium through the skin, which helps relax muscles and nerves and relieves hand pain. It has antibacterial and antifungal properties, improving blood flow to the skin, thus enhancing the chances of recovery.

Recipes for body soaking

Recipe 1

Ingredients:

A cup of Epsom salt/Dead Sea or homemade table salt

Half a cup of apple cider vinegar

Dry chamomile, mint, basil, and thyme

Method:

- Mix all the dry herbs and boil it with water until simmers.



- Add warm water and stir well.



- Add salt, apple cider vinegar and stir well.


- Soak your body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).



Benefits:

- It reduces toxins present in the body and lessens the pain
- Reduces infections, bacteria, and fungus
- Stimulates blood circulation
- Nourishes the skin and make it smooth.

Recipe 2

Ingredients:

Half a cup of Dead Sea Salt or Epsom salt

10 teaspoons of dry or fresh mint leaves

10 teaspoons of dry or fresh mint leaves

Method:

- Mix all the dry herbs in a bowl. Add warm water, salt, and apple cider vinegar into it and mix well. Soak your body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).

Recipe 3

Ingredients:

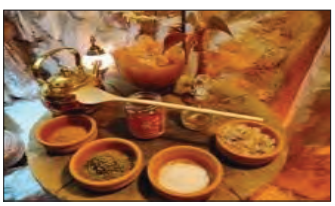
A large cup of dead sea salt, Himalayan salt, or Epsom salt

4 teaspoons of ginger

4 teaspoons basil

5 teaspoons of olive oil

A cup of apple cider vinegar






Method:

- Mix all the dry herbs in a bowl.



- Add warm water, olive oil, and apple cider vinegar into it and mix well.



- Then, soak your body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).

Recipe 4

Ingredients:

10 teaspoons of table salt
A large cup of apple cider vinegar
3 teaspoons of mint
3 teaspoons of sesame
5 teaspoons of wild thyme
5 teaspoons of black seed powder
5 teaspoons of flaxseed

Method:

- Take flax seeds, black seeds, sesame seeds, and grind it well. Take it in a bowl.



- Mix all the dry herbs (mint, thyme, and salt) in a bowl.



- Add warm water, olive oil, and apple cider vinegar into it and mix well.



- Then, soak your body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).

Recipes especially for Hand soak:

Recipe 1

Ingredients:

2 teaspoons of fennel
3 tablespoons of mint
5 spoons of ginger
4 tablespoons of sage
4 tablespoons of table salt
A cup of white vinegar

Method:

- Mix all the dry herbs in a bowl.



- Add warm water, olive oil into it and mix well.



- Then, soak your hands in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).
- Prefer a bowl or tub which is non-metallic.

Recipe 2

Ingredients:

3 tablespoons of ginger

2 tablespoons of lavender

4 tablespoons of mint

Method:

- Mix all the dry herbs in a bowl.




- Take hot pepper and grind it well. Take it in a bowl and mix with the other herbs.



- Add warm water, olive oil, and lavender into it and mix well.




- Then, soak your feet in tub filled with this mixture every evening for 30 minutes. (Repeat it for 2 times a day).
- Prefer a bowl or tub which is non-metallic.

Recipe 3

Ingredients:

A cup of apple cider vinegar

3 teaspoons of Moringa

3 teaspoons of sesame seeds

5 teaspoons of cinnamon

A quarter cup of olive oil

Method:

- Mix all the dry herbs (moringa and cinnamon powder) in a bowl.


- Take sesame seeds and grind it well. Take it in a bowl and mix with the other herbs.



- Add warm water, olive oil into it and mix well.



Then, soak your hands or the whole body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer

time if you need).

Benefits:

- It reduces toxins present in the body and lessens the pain
- Reduces infections, bacteria, and fungus
- Stimulates blood circulation
- Nourishes the skin and make it smooth.

Recipe 4

Ingredients:

A cup of apple cider vinegar
3 tablespoons of coriander seed
5 spoons of Moringa sowing
5 spoons of cinnamon
3 tablespoons of basil
2 tablespoons of thyme
A cup of extra-virgin olive oil

Method:

- Mix all the dry herbs in a bowl.

- Add warm water, olive oil into it and mix well.

- Then, soak your hands or whole body in tub filled with this mixture every evening for 30 minutes. (Repeat it for 2 times a day).
- Prefer a bowl or tub which is non-metallic for your hands.

How to prepare Hand soak:

To best ease soreness, a hand soak should be between 92°F and 100°F. Hand soak involves immersing the hand in warm water. Follow these steps to perform a hand soak:

1. Fill a basin or a bucket with enough warm water to cover the hands up to the elbows.
2. Add any of the following ingredients mentioned above for hand soak, according to your conditions to the water.

3. Place the hand in the soak for about 20 to 30 minutes.
4. Dry thoroughly after the soak and then moisturize the hand.

An Epsom salt hand soak can dry out the hand, so it is best not to do it every night. Try soaking the hand once or twice a week to make sure it does not cause dryness. Always end your hand soak with moisturizer.

Benefits:

- It reduces toxins present in the body and lessens the pain.
- Improves blood circulation
- Clears out any congestion.
- Reduces muscle hypertonicity and also helps in stiffness.
- Nourishes the skin and make it smooth.

CHAPTER 11: HERBAL REMEDIES THAT HELPS IN TRAUMATIC BRAIN INJURY

Herbs have a significant role to play in the long-term recovery from a traumatic brain injury. It is best to cure gradually and steadily using nourishing, energising, and restoring herbs. When first utilising circulatory stimulant herbs, it is advisable to proceed with caution. Gingko biloba and even peppermint or ginger are examples of herbs that might improve blood flow to the brain. When the time is correct, this can benefit neuronal tissue greatly by supplying it with oxygen and nutrients. Excessive stimulation may not be necessary in the first few weeks or even months, depending on the circumstance. Herbs and supplements support the healing process & may also lesson symptoms over time and speed healing. The more we take care of ourselves, the more complete healing, and the less likelihood of unforeseen long-term consequences.

1. Bacopa Monnieri

Commonly known as water hyssop or Brahmi, has been used for centuries in Ayurvedic medicine, alone or in combination with other herbs, as a memory and learning enhancer, sedative, and anti-epileptic. Bacopa can be found growing wild in India, the United States, Australia, and East Asia.

Bacopa has been used for thousands of years as a brain tonic to prevent memory loss, relieve anxiety, improve concentration and to treat inflammatory conditions like arthritis, bronchitis and edema or swelling. Traditional indications include anxiety, anger, insomnia, nerve pain, nervous debility, anxiety, depression, hypothyroid, Hashimoto's thyroiditis, epilepsy, Alzheimer's, panic attacks, headaches, tremors, mental illness, stroke recovery, recovery from head trauma, muscle spasms, paralysis, anemia, and weak immune system. Bacopa is said to steady the mind and increase concentration and is used by meditators to reach higher states of consciousness.
Suggested dose is a cup of tea, 2-3 ml of tincture or liquid extract or 300 mg of standardized extract. All 2 to 3 times per day.

2. Wild Oats (Avena sativa)

One of the most beneficial plants for soothing and nourishing all levels of the nervous system, Avena or Wild Oats, has a special affinity to the central nervous system helping to cool, sooth and restore it to normal function regardless of the stressor.

This is a safe and nutrient rich herb that heals through rejuvenation and vitalization. Avena acts as a general restorative and antidepressant that helps reduce inflammation and anxiety while soothing, protecting and improving healthy nerve function.

3. Ginger – Ginger

It can help relieve nausea and reduce inflammation after a TBI. It has phytochemicals with excellent anti-inflammatory properties, which relieve pain in joints and muscles. It promotes the circulation of blood and acts as a cure for nausea, headache, and cramps. Ginger is an anti-inflammatory and antioxidant that increases circulation, improves blood viscosity and reduces the risk of blood clots.

The easiest way to incorporate ginger in your diet is to have ginger tea. You can also grate the root, wrap cheesecloth around it, soak it in hot water for 30 seconds, and place it on your back for 20 minutes. It also reduces muscle pain and soreness. A topical application of the paste of ginger, cinnamon, sesame oil, and mastic can reduce pain and stiffness in muscles. Ginger also dramatically lowers blood sugar levels.

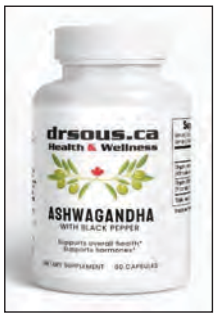
4. Ginkgo Biloba

Ginkgo leaves are a cerebrovascular trophorestorative, with antioxidant and vasodilating properties. It contains a type of flavonoids called Glycosylated flavonoids that improve circulation to the brain while it directly reduces edema or brain swelling. Gingko also has a special stabilizing effect on the smaller blood vessels helping them to pass nutrients and oxygen more efficiently.

The herb works very well; however, it is a strong circulatory stimulant and may be too much for some people depending on their level of injury.

5. Ashwagandha

The powder or extract of ashwagandha (Withania somnifera), when coupled with relaxation techniques, is quite restorative and effective for insomnia. Ashwagandha also helps with central-nervous system cognitive symptoms making it a good choice following TBI.



6. Turmeric - Turmeric has a chemical called curcumin, which helps fight pain because of its antioxidant and anti-inflammatory properties. Turmeric is a general body anti-inflammatory helpful for treating central nervous system injury and inflammation. It also helps improve motor function and the ability to learn.

According to some studies, the incorporation of curcumin increases by 2000% when you consume it with black pepper. Turmeric supplements contain not only higher percentages of curcumin but also black pepper to enhance their effectiveness.

7. Blessed thistle (Cardyuus benedictus)

Blessed thistle works wonderfully for some common symptoms like ringing of ears, blurry eyes, dizziness or a feeling of instability. 1-3 ml a few times per day acts as a nerve tonic specific for poor memory, tinnitus, poor hearing, and dizziness.

8. American Ginseng (Panax quinquefolius)

American Ginseng is a whole-body tonic that normalizes body functions helping the body, mind and spirit deal with stress of all kinds. For our purpose, this herb helps to improve concentration, memory, and insomnia. It helps relieve weakness, fatigue, and depression and shows promise as a brain rejuvenation agent, enhancing the ability to learn and retain information while preventing memory loss.

9. Valerian Root

Episodes of depression, mania, anxiety, memory loss, cognitive dysfunction and insomnia can be associated with the recovery from TBI. Insomnia can benefit from valerian root extract. This herb is a natural muscle relaxer that also reduces nerve sensitivity. Since it can make you drowsy, it is advised that you take it at night and only as directed to avoid overdose.

10. Lobelia inflata

acts quickly to effect spasming, causing the body to relax, and calming excited muscles. Lobelia also has a soothing effect on the mind and emotions helps to calm down. Drop doses are most appropriate for internal use.

Alternately, it can be applied externally to the area of discomfort.

11. Mullein tincture or tea

The entire mullein plant is beneficial for healing. The stalk, but also the leaves or flowers, have a long history of positive action on the spine. The plant is known to sooth and help heal synovial fluid around the joints. It also has anti-inflammatory demulcent, sedative, and astringent properties.

12. Oregano

Oregano is the herb found locally and widely used in the culinary arts. Besides from its taste this herb also serves in various ailments due to its anti-inflammatory and antioxidant properties. Oregano leaves are high in phenols, which are natural phytochemical compounds with beneficial antioxidant effects. The two most abundant phenols in it are thymol and carvacrol. Among these, carvacrol has antimicrobial, antitumor, ant mutagenic, analgesic, anti-inflammatory and antiparasitic properties, making it one of the most active components of oregano when infused in carrier oil.

13. Sesame

Sesame seeds are used for traditional remedy against various ailments for centuries. It has high antibacterial and antioxidant properties. Sesamol, Sesamolin and Sesamin are the antioxidant components present in its seeds. Among these, Sesamin is a lignin with anti-inflammatory properties which helps in pain relief, reduce spasm, and increase range of motion when applied to the affected area. Many studies have proved its therapeutic and healing properties that sesame seeds when infused in oil, applied to the painful area stimulate the blood flow due to its excellent emollient properties.

14. Garden cress seeds

also known as Lepidium Sativum is an edible fast-growing herb which has been used in ancient medicines for a long time. It seeds contains significant amount of plant sterols which are antioxidant and anti-inflammatory compounds. It also contains phenolic compounds which fights at molecular level and inhibits the substance involved in inflammation. The seed when infused in the carrier oil and applied to joints or muscle pain helps recover from muscle weakness, reduce muscle tension, and promotes pain relief.

15. Cramp Bark

Cramp Bark is also known as cranberry bush. It comes in the form of liquid extracts, tinctures and capsules. Native Americans con

sume cramp bark since ancient time. Most people find it challenging to identify Cramp bark and Black Haw, which is also sometimes referred to by the same name. As the name suggests, it is used to relieve pain from all sorts of cramps.

For acute pain, 30 drops of the tincture can be taken every hour until the pain subsides. Cramp bark contains chemicals that significantly reduce muscle spasms. They also decrease heart rate and lower blood pressure. The bioactive compounds are extracted from dried bark and made into tinctures.

16. Gotu Kola

A native of Asia and the Indian subcontinent, Gotu Kola has been used for 1000's of years in Ayurvedic medicine. Gotu kola is an herb known to boost brain function and is an anti-inflammatory used to treat arthritis pain. As a brain tonic and neuroprotective, Gotu Kola improves cerebral circulation, stimulates the growth of healthy brain cells and boosts plasticity and communication between neurons. Gotu Kola's analgesic action may relieve some of the other bodily aches and pains related to the injury.

Suggested dose – 4 oz of tea, 30 to 60 drops of tincture, or 50 to 250 mg of standardized extract all 3times per day.

17. Rhodiola rosea

is a versatile adaptogen that optimizes serotonin and dopamine levels and helps protect brain neurons. It is useful for mild to moderate anxiety and/or depression to increase mental alertness, improve memory, and reduce fatigue and brain fog. Rhodiola is best taken early in the day. If taken before bed, it can cause stimulation and sleeplessness.

18. Rosemary

Rosemary protects the brain from the effects of neurodegeneration, which can cause or exacerbate Alzheimer's disease and other age-linked conditions. It contains carnosic acid, an antioxidant that guards against chemical-free radicals that lead to degenerative disease. This savory herb can also protect against stroke and decrease macular degeneration and other vision problems. Rosemary has these benefits, whether consumed fresh, dried, or as an oil.

HERBAL TEAS

Herbal teas are a good way to relax the autonomic nervous system, improve sleep quality, boost cognition, and combat a few other common symptoms of brain injury. While traditional teas (such as green tea and black tea) have caffeine, most herbal teas are caffeine free such as chamomile, ginger, and peppermint varieties.

Here are a few caffeine-free herbal teas that may be helpful:

- **Chamomile:** May fight inflammation, help you sleep better, and lessen diarrhea.

- **Ginger:** May relieve nausea, fight inflammation, and help with stomach pain.
- **Lemon balm:** May combat anxiety, reduce heart palpitations, and improve memory.
- **Passionflower:** May relieve anxiety and improve sleep quality.

- **Peppermint:** May relieve stomach pain, nausea, cramping, and muscle spasms, especially in the digestive tract.
- **Rose hip:** May fight inflammation and reduce inflammation-related pain.
- **Sage:** May improve cognitive function, including mood and memory.

Brain Tonic Tea

Herbs such as hawthorn (Crategus spp.), rosemary (Rosmarinus officinalis), linden (Tilia spp.), or ginger (Zingiber officinale) can be blended and taken as tonic teas depending on the entire symptom profile of the individual. Rosemary and ginger are strong anti-inflammatory and reduce neuronal injury secondary to inflammation.

Green tea

Drink more organic green tea a well-known and widely consumed herb with broad-spectrum antioxidant and anti-inflammatory activity. Its neuroprotective properties can be attributed primarily to the power antioxidant molecule called epigallocatechin-3-gallate (EGCG), the amino acid L- theanine and caffeine to a lesser degree.

CHAPTER 12: NUTRITIONAL SUPPLEMENTS TO HELP YOU RECOVER FROM TRAUMATIC BRAIN INJURY

Listed below are some of the most studied and most beneficial supplements to assist with the healing of a brain injury. Please notice that a lot of these nutritional elements are found in everyday, easily accessible foods.

Some of the research indicates that the sooner we can begin supplementation after the initial injury the more positive the outcome, especially in cases of mild brain injuries like a concussion. When the injury is more severe, there is likely to be more pharmaceutical involvement. Always check to see if the supplement (or herb) you wish to take is compatible with your medication.

Acetyl L-Carnitine (ALC)

An amino acid with the ability to cross the blood brain barrier, ALC provides a transport mechanism for fatty acids to the neurons, nutritionally protects neurons, improves cerebral blood flow and participates in cellular energy production as well as in the maintenance and repair of neurons and receptors.

ALC can be purchased as a supplement. For the best cognitive effect, the suggested daily dose is 500-1500 mg per day. It is further suggested to start at a lower dose of 500 mg and work upwards to the higher dosages.

The best natural sources of Acetyl L-Carnitine are animal products like meat, fish, poultry, and milk. In general, the redder the meat, the higher its carnitine content.

Zinc

Zinc levels are usually depleted after a Traumatic Brain Injury. When taken for about a month after the injury, Zinc supplementation is used to reduce inflammation and prevent brain cell death.

Good food sources of Zinc include beans, nuts, crab, lobster, chicken, red meat, whole grains, nuts, oatmeal, and dairy products. You can also have zinc supplements for better absorption.

B-12

Vitamin B-12 is particularly useful after a Brain Injury. The body uses B-12 to produce a kind of insulation that coats nerve tissues that allows electrical impulses to communicate easily thus improving neural function. It also increases energy production of brain cells, making it an important element in the healing process. Good dietary sources for vitamin B-12 include meat, eggs, fish, and dairy products.

Though it may not seem important, the time of day when you take your vitamin B12 supplement can have an impact on your supplement experience. Since B12 is a water-soluble vitamin, it should be taken with a glass of water to facilitate better absorption. Whether you add your B12 liquid drops directly into your water or wash them down with a glass, try to hydrate alongside them so that your body can absorb the entire dosage properly.

Vitamin D

Vitamin D is a fat-soluble vitamin that is found in cod liver oil, fish like salmon, swordfish, tuna and sardines. It is also found in egg yolks and beef liver. One of the most beneficial ways to maintain a healthy level of vitamin D is through sun exposure on the skin.

With neuroprotective benefits, Vitamin D supports recovery from TBIs because it regulates genes important for brain function, supports the immune system, manages fatigue, and helps improves impaired memory, and regulates communication between neurons.

Omega-3

If you want to treat your brain injury, eat more omega-3 fats, as found in fish oil. The brain comprises up to 60 percent fat from omega-3 and it's almost impossible to get enough from food choices alone. A number of trials in animal models of TBI have found that omega-3 supplementation improves cognitive function, reduces nerve swelling, stabilizes cellular energy production, helps reconnect damaged neurons and prevents brain cell death. Aim to take 4,000 mg a day of omega-3 fish oil every day with a meal.

Melatonin

is a good supplement to consider if you're having trouble sleeping after head trauma. Melatonin is a hormone your body makes when it's time to sleep. Taking a small amount at bedtime may help you sleep through the night.

Choline

an essential nutrient for cell membranes and nerve protection. A major dietary component found in liver and eggs, choline is needed to produce acetylcholine, an important neurotransmitter for memory, mood and muscle control. All foods have some choline in it, but it is mostly concentrated in animal food sources. Soybeans, red skin potatoes and wheat germ have decent amounts for those that

prefer non-animal sources, although they are not ideal as animal forms of choline. You can also consider a supplement of plant-based lecithin granules, which can flavorlessly blend into smoothies, yogurt and cereals.

Magnesium

Following traumatic brain injury, magnesium is displaced by other neurotransmitters. This rapid release of compounds can be a huge contributor to neuron death and slow recovery. Magnesium has also been linked to anti-depressant effects. In addition to relaxation of muscles and mind, it's helpful for good sleep too.

Iron

Needed to deliver enough oxygen to your brain and body. Iron is a mineral that the body needs for growth and development. Your body uses iron to make hemoglobin, a protein in red blood cells that carries oxygen from the lungs to all parts of the body, and myoglobin, a protein that provides oxygen to muscles. Your body also needs iron to make some hormones.

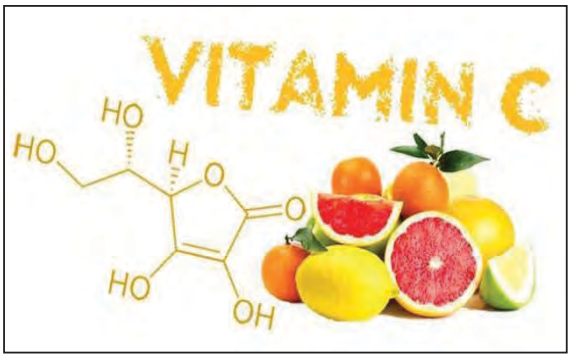
Vitamin E

Consider supplementing your vitamin E intake; it has a powerful antioxidant effect on the nervous system. It may reduce nerve damage and improve cognitive performance. In animal studies, those with higher vitamin E levels pre-injury had less brain damage and recovered faster. When choosing a supplement, a good one should provide all eight molecules of vitamin E, with the highest proportion

being the potent gamma-tocopherol, which is considered the most anti-inflammatory component. Vitamin E also works with other antioxidants, such as vitamin C and Coenzyme Q10, as part of an antioxidant network. This highlights the need to consume antioxidants together to support their proper biological function. Has a protective effect against mild cognitive impairment and dementia; helps with good vision; is an antioxidant.

Vitamin C

Supports the immune system; used to make neurotransmitters along with connective tissue throughout the body; is an antioxidant.



Sulforaphane

Obtained from cruciferous vegetables such as broccoli, brussels sprouts, and cabbages, a 2014 study showed Sulforaphane improved blood brain barrier integrity, reduced cerebral edema and improved cognition and memory retention in rats.

Neuro Plus for Brain & Focus

This supplement is specifically formulated with a blend of essential vitamins, nutrients, and minerals that helps to enhance cognitive functions, focus, concentration and alertness. This product contains specific nutrients that may help reduce the risk of dementia.

The list of essential vitamins and minerals in this supplement and their effects on our health are explained below:

1. Vitamin A

Vitamin A is the name of a group of fat-soluble retinoids, primarily retinol and retinyl esters. Vitamin A is involved in immune function, cellular communication, growth and development, and male and female reproduction. Vitamin A supports cell growth and differentiation, playing a critical role in the normal formation and maintenance of the heart, lungs, eyes, and other organs. Vitamin A is also critical for vision as it supports the normal differentiation and functioning of the conjunctival membranes and cornea.

Good sources: These include liver, cod liver oil, carrots, broccoli, sweet potatoes, butter, kale, spinach, pumpkins, collard greens, some cheeses, eggs, apricots, cantaloupe melon, and milk.

How much you need: Men: 900 micrograms per day
Women: 700 micrograms per day

2. Vitamin C

Vitamin C, also known as ascorbic acid, is a water-soluble nutrient found in some foods. In the body, it acts as an antioxidant, helping to protect cells from the damage caused by free radicals. Free radicals are compounds formed when our bodies convert the food we eat into energy. People are also exposed to free radicals in the environment from cigarette smoke, air pollution, and ultraviolet light from the sun.

The body also needs vitamin C to make collagen, a protein required to help wounds heal. In addition, vitamin C improves the absorption of iron from plant-based foods and helps the immune system work properly to protect the body from disease.

Good sources: These include fruit and vegetables like kiwi fruit, red and green peppers, strawberries, cantaloupe, broccoli, brussel sprouts, tomatoes, tomato juice and baked potatoes, but cooking destroys vitamin C.

How much you need:

- Men: 90 milligrams per day
- Women: 75 milligrams per day
- Pregnant women: 85 milligrams per day
- Breastfeeding women: 120 milligrams per day
- Smokers: Add 35 milligrams to the numbers above.

3. Vitamin D

Vitamin D is a nutrient you need for good health. It helps your body absorb calcium, one of the main building blocks for strong bones. Together with calcium, vitamin D helps protect you from developing osteoporosis, a disease that thins and weakens the bones and makes them more likely to break. Your body needs vitamin D for other functions too. Your muscles need it to move, and your nerves need it to carry messages between your brain and your body. Your immune system needs vitamin D to fight off invading bacteria and viruses.

Function: It is necessary for the healthy mineralization of bone, needed for muscles, the immune system, and communication between the brain and the rest of your body.

Good sources: Your body makes vitamin D when your bare skin is exposed to the sun. However, clouds, smog, old age, and having dark-colored skin reduce the amount of vitamin D your skin makes. Also, your skin does not make vitamin D from sunlight through a window. Fatty fish, eggs, beef liver, and mushrooms also contain the vitamin.

How much you need:

- Children 1–18 years 15 mcg (600 IU)
- Adults 19–70 years 15 mcg (600 IU)
- Adults 71 years and older20 mcg (800 IU)
- Pregnant and breastfeeding teens and women 15 mcg (600 IU)

4. Vitamin E

Vitamin E is a fat-soluble nutrient found in many foods. In the body, it acts as an antioxidant, helping to protect cells from the damage caused by free radicals. The body also needs vitamin E to boost its immune system so that it can fight off invading bacteria and viruses. It helps to widen blood vessels and keep blood from clotting within them. In addition, cells use vitamin E to interact with each other and to carry out many important functions.

Deficiency: This is rare, but it may cause hemolytic anemia in newborns. This condition destroys blood cells.

Good food sources: These include wheat germ, kiwis, almonds, eggs, nuts, leafy greens, and vegetable oils.

How much you need:

- Adults: 15 milligrams per day or 22.5 international units. That includes pregnant women.
- Breastfeeding women: 19 milligrams per day, 28.5 IU

5. Vitamin B1

Thiamin (or thiamine) is one of the water-soluble B vitamins. Thiamin (also called vitamin B1) helps turn the food you eat into the energy you need. Thiamin is important for the growth, development, and function of the cells in your body.

- **Function:** It is essential for producing various enzymes that help break down blood sugar.
- **Good sources:** These include yeast, pork, cereal grains, sunflower seeds, brown rice, whole grain rye, asparagus, kale, cauliflower, potatoes, oranges, liver, and eggs.

How much you need:

- Men: 1.2 milligrams per day
- Women: 1.1 milligrams per day, unless pregnant or breastfeeding
- Pregnant or breastfeeding women: 1.4 milligram per day

6. Vitamin B2

Riboflavin (also known as vitamin B2) is one of the B vitamins, which are all water soluble.

Function: Riboflavin is important for the growth, development, and function of the cells in your body. It also helps turn the food you eat into the energy you need.

Good sources: These include asparagus, bananas, persimmons, okra, chard, cottage cheese, milk, yogurt, meat, eggs, fish, and green beans.

How much you need:

- Men: 1.3 milligrams per day
- Women: 1.1 milligrams per day, unless pregnant or breastfeeding
- Pregnant women: 1.4 milligrams per day
- Breastfeeding women: 1.6 milligrams per day

7. Vitamin B3

Chemical names: niacin, niacinamide. It is water-soluble.

- **Function:** Helps with digestion and with making cholesterol.
- **Deficiency:** Low levels result in a health issue called pellagra, which causes diarrhea, skin changes, and intestinal upset.
- **Good sources:** Examples include chicken, beef, tuna, salmon, milk, eggs, tomatoes, leafy vegetables, broccoli, carrots, nuts and seeds, tofu, and lentils.

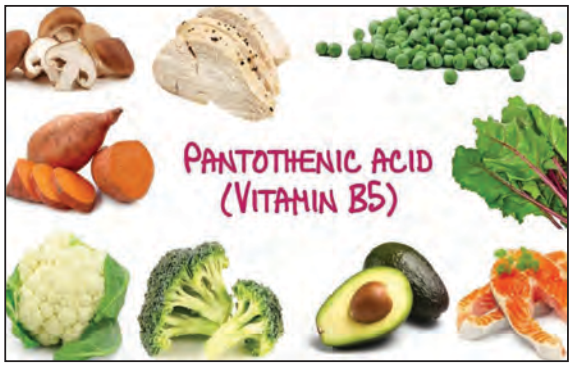
How much you need:

- Men: 16 milligrams per day
- Women: 14 mg per day if not pregnant or breastfeeding
- Pregnant women: 18 milligrams per day
- Breastfeeding women: 17 milligrams per day

8. Vitamin B5

Chemical name: pantothenic acid. It is water-soluble.

- **Function:** It is necessary for producing energy and hormones. Helps turn carbs, protein, and fat into energy.
- **Deficiency:** Symptoms include paresthesia, or "pins and needles."
- **Good sources:** These include chicken, beef, potatoes, oats, cereals, tomatoes, whole grains, broccoli, avocados, and yogurt.



How much you need:

- Adults: 5 milligrams per day
- Pregnant women: 6 milligrams per day
- Breastfeeding women: 7 milligrams per day

9. Vitamin B6

Chemical names: pyridoxine, pyridoxamine, pyridoxal. It is water-soluble.

- **Function:** It is vital for the formation of red blood cells.
- **Deficiency:** Low levels may lead to anemia and peripheral neuropathy.
- **Good sources:** These include chickpeas, beef liver, bananas, squash, and nuts. Fortified cereals, fortified soy products, chickpeas, potatoes, organ meats.

How much you need:

- Men and women ages 19-50: 1.3 milligrams per day
- Pregnant women: 1.9 milligrams per day
- Breastfeeding women: 2 milligrams per day
- Men age 51 and up: 1.7 milligrams per day
- Women age 51 and up: 1.5 milligrams per day

10. Folic Acid

Folate is a water-soluble B vitamin that is naturally present in some foods, added to others, and available as a dietary supplement. "Folate," formerly known as "folacin" and sometimes "vitamin B9".

Your body needs folate to make DNA and other genetic material. Your body also needs folate for your cells to divide. A form of folate, called folic acid, is used in fortified foods and most dietary supplements.

Good sources: These include leafy vegetables, peas, legumes, liver, fish, poultry, meat, dairy products some fortified grain products, and sunflower seeds. Also, several fruits have moderate amounts.

How much you need:

- Adults: 400 micrograms per day
- Pregnant women: 600 micrograms per day
- Breastfeeding women: 500 micrograms per day

11. Biotin

Biotin is a water soluble B-vitamin found in many foods. Biotin helps turn the carbohydrates, fats, and proteins in the food you eat into the energy you need.

How much you need: The amount of biotin you need each day depends on your age. Average daily recommended amounts are listed below in micrograms (mcg).

Life Stage	Recommended Amount
Birth to 6 months	5 mcg
Infants 7–12 months	6 mcg
Children 1–3 years	8 mcg
Children 4–8 years	12 mcg
Children 9–13 years	20 mcg
Teens 14–18 years	25 mcg
Adults 19+ years	30 mcg
Pregnant teens and women	30 mcg
Breastfeeding teens and women	35 mcg

Good Food Source

Many foods contain some biotin. You can get recommended amounts of biotin by eating a variety of foods, including the following:

- Meat, fish, eggs, and organ meats (such as liver)
- Seeds and nuts
- Certain vegetables (such as sweet potatoes, spinach, and broccoli)

12. Calcium

Calcium is a mineral your body needs to build and maintain strong bones and to carry out many important functions. Calcium is the most abundant mineral in the body. Almost all calcium in the body is stored in bones and teeth, giving them structure and hardness. Your body needs calcium for muscles to move and for nerves to carry messages between your brain and every part of your body. Calcium also helps blood vessels move blood throughout your body and helps release hormones that affect many functions in your body. Vitamin D helps your body absorb calcium.

Good Food Sources

Calcium is found in many foods. You can get recommended amounts of calcium by eating a variety of foods, including the following:

- Milk, yogurt, cheese and other dairy products.
- Canned sardines and salmon with bones contain calcium.
- Certain vegetables, such as kale, broccoli, and Chinese cabbage (Bok choi).
- Calcium is added to some beverages, including many fruit juices and milk substitutes such as soy and almond beverages, as well as tofu and ready-to-eat cereals.

How much you need:

- Adults ages 19-70: 1,000 milligrams per day
- Women age 51 and older: 1,200 milligrams per day

- Men 71 and older: 1,200 milligrams per day

Deficiency

Getting too little calcium can cause several conditions, including the following:

- Osteoporosis, which causes weak, fragile bones and increases the risk of falling.
- Rickets, a disease in children that causes soft, weak bones
- Osteomalacia, which causes soft bones in children and adults

13. Magnesium

Magnesium plays an important role in the function of more than 300 enzymes that regulate various processes in the body, including muscle and nerve function, heart rhythms and glucose control. Older adults and people with diabetes may need supplements. Magnesium maintains also supports a healthy immune system, keeps bones strong, helps regulate blood sugar levels, and promotes normal blood pressure.

Good Food Source

Green leafy vegetables, nuts, dairy, soybeans, potatoes, whole wheat, quinoa.

How much you need:

- Adult Men: 400 milligrams per day
- Adult Women: 310 milligrams per day
- Pregnant women: 350-360 milligrams per day
- Breastfeeding women: 310-320 milligrams per day

14. Zinc

Zinc is a nutrient that people need to stay healthy. Zinc is found in cells throughout the body. It helps your immune system fight off invading bacteria and viruses. It is required for the catalytic activity of hundreds of enzymes, and it plays a role in enhancing immune function, protein and DNA synthesis, wound healing, and cell signaling and division. During pregnancy, infancy, childhood, and adolescence the body needs zinc to grow and develop properly. Zinc also helps wounds heal and is important for the proper sense of taste.

Foods that have it:

- Oysters, which have very high amounts of zinc.
- Meat, fish, poultry, seafood such as crab and lobsters, and fortified breakfast cereals are also good sources of zinc.
- Beans, nuts, whole grains, eggs, and dairy products provide some zinc.

How much you need:

- Men: 11 milligrams per day
- Women: 8 milligrams per day
- Pregnant women: 11 milligrams per day
- Breastfeeding women: 12 milligrams per day

15. Selenium

Selenium is a trace element that is naturally present in many foods, added to others, and available as a dietary supplement. Selenium, which is nutritionally essential for reproduction, thyroid gland function, DNA production, and protecting the body from damage caused by free radicals and from infection.

Good Food Sources

Selenium is found naturally in many foods. You can get recommended amounts of selenium by eating a variety of foods, including the following:

- Seafood
- Meat, poultry, eggs, and dairy products
- Breads, cereals, and other grain products
- Brazil nuts (68–91 mcg per nut).

How much you need:

- Adults: 55 micrograms per day

- Pregnant women: 60 micrograms per day
- Breastfeeding women: 70 micrograms per day

16. Copper

Copper is a mineral that you need to stay healthy. Your body uses copper to carry out many important functions, including making energy, connective tissues, and blood vessels. Copper also helps maintain the nervous and immune systems, and activates genes. Your body also needs copper for brain development.

Good Food Source

You can get recommended amounts of copper by eating a variety of foods, including the following:

- Beef liver and shellfish such as oysters
- Nuts (such as cashews), seeds (such as sesame and sunflower), and chocolate
- Wheat-bran cereals and whole-grain products
- Potatoes, mushrooms, avocados, chickpeas, and tofu

How much you need:

- Adults: 900 micrograms per day, unless pregnant or breastfeeding
- Pregnant women: 1,000 micrograms per day
- Breastfeeding women: 1,300 micrograms per day

17. Manganese

Manganese is a mineral that your body needs to stay healthy. Your body uses manganese to make energy and protect your cells from damage. Your body also needs manganese for strong bones, reproduction, blood clotting, and a healthy immune system.

How much you need

The amount of manganese you need depends on your age and sex. Average daily recommended amounts are listed below in milligrams (mg).

Good Food Source

Life Stage	Recommended Amount
Birth to 6 months	0.003 mg
Infants 7–12 months	0.6 mg
Children 1–3 year	1.2 mg
Children 4–8 years	1.5 mg
Boys 9–13 years	1.9 mg
Girls 9–13 years	1.6 mg
Teen boys 14–18 years	2.2 mg
Teen girls 14–18 years	1.6 mg
Adult men	2.3 mg
Adult women	1.8 mg

Many foods contain manganese. You can get recommended amounts of manganese by eating a variety of foods, including the following:

- Whole grains, such as brown rice, oatmeal, and whole-wheat bread
- Clams, oysters, and mussels
- Nuts, such as hazelnuts and pecans
- Legumes, such as soybeans and lentils
- Leafy vegetables, such as spinach and kale
- Some fruits, such as pineapple and blueberries
- Tea
- Many spices, such as black pepper

18. Chromium

Chromium, as trivalent (+3) chromium, is a trace element that is naturally present in many foods and available as a dietary supplement. Chromium also exists as hexavalent (+6) chromium, a toxic by-product of stainless steel and other manufacturing processes.

Good Food Source

You can get recommended amounts of chromium by eating a variety of foods, including the following:

- Meats, such as ham, beef, and turkey
- Bread and other grain products
- Vegetables, such as lettuce and green beans
- Fruit, such as apples and bananas
- Juices, such as grape, orange, and tomato juices
- Brewer's yeast and nuts

Life Stage	Recommended Amount
Birth to 6 months	0.2 mcg
Infants 7–12 months	5.5 mcg
Children 1–3 years	11 mcg
Children 4–8 years	15 mcg
Boys 9–13 years	25 mcg
Girls 9–13 years	21 mcg
Teen boys 14–18 years	35 mcg
Teen girls 14–18 years	24 mcg
Adult men 19–50 years	35 mcg
Adult women 19–50 years	25 mcg
Adult men 51+ years	30 mcg
Adult women 51+ years	20 mcg
Pregnant women	30 mcg
Breastfeeding women	45 mcg

19. Molybdenum

Molybdenum is a mineral that you need to stay healthy. Your body uses molybdenum to process proteins and genetic material like DNA. Molybdenum also helps break down drugs and toxic substances that enter the body.

It works in the body to break down proteins and other substances. Molybdenum is stored in the body, particularly in the liver, kidneys, glands, and bones. It is also found in the lungs, spleen, skin, and muscles.

How much molybdenum do I need?

The amount of molybdenum you need depends on your age. Average daily recommended amounts are listed below in micrograms (mcg).

Life Stage	Recommended Amount
Birth to 6 months	2 mcg
Infants 7–12 months	3 mcg
Children 1–3 years	17 mcg
Children 4–8 years	22 mcg
Children 9–13 years	34 mcg
Teens 14–18 years	43 mcg
Adults 19 years and older	45 mcg
Pregnant teens and women	50 mcg
Breastfeeding teens and women	50 mcg

Good Food Source

The amount of molybdenum in food depends on the amount of molybdenum in the soil and in the water used for irrigation. You can get recommended amounts of molybdenum by eating a variety of foods, including the following:

- Legumes such as black-eyed peas and lima beans
- Whole grains, rice, nuts, potatoes, bananas, and leafy vegetables
- Dairy products, like milk, yogurt, and cheese
- Beef, chicken, and eggs

20. Potassium

Potassium is a mineral found in many foods. Your body needs potassium for almost everything it does, including proper kidney and heart function, muscle contraction, and nerve transmission.

Foods that have it: Potatoes, bananas, yogurt, milk, yellowfin tuna, soybeans, and a variety of fruits and vegetables.

What it does:

- Helps control
- blood pressure
- Makes kidney stones less likely.
- Plays an important role in acid-base balance
- Helps regulate osmotic pressure within body compartments
- Needed for functioning and maintenance of muscles and nerve activity.

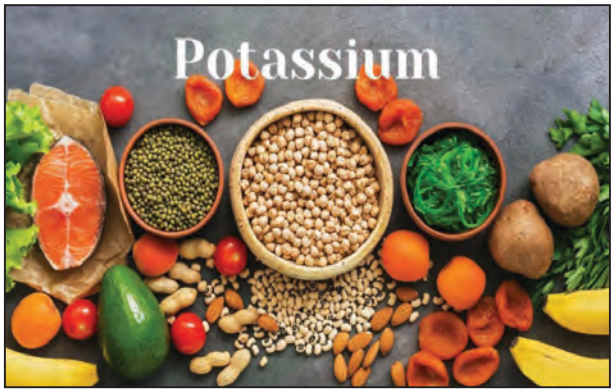
How much you need:

Life Stage	Recommended Amount
Birth to 6 months	400 mg
Infants 7–12 months	860 mg
Children 1–3 years	2,000 mg
Children 4–8 years	2,300 mg
Children 9–13 years (boys)	2,500 mg
Children 9–13 years (girls)	2,300 mg
Teens 14–18 years (boys)	3,000 mg
Teens 14–18 years (girls)	2,300 mg
Adults 19+ years (men)	3,400 mg
Adults 19+ years (women)	2,600 mg
Pregnant teens	2,600 mg
Pregnant women	2,900 mg
Breastfeeding teens	2,500 mg
Breastfeeding women	2,800 mg

Food Source

Potassium is found in many foods. You can get recommended amounts of potassium by eating a variety of foods, including the following:

- Fruits, such as dried apricots, prunes, raisins, orange juice, and bananas
- Vegetables, such as acorn squash, potatoes, spinach, tomatoes, and broccoli
- Lentils, kidney beans, soybeans, and nuts
- Milk and yogurt
- Meats, poultry, and fish



CHAPTER 13: NUTRITIONAL FACTS FOR BRAIN RECOVERY

A healthy diet after brain injury can help boost recovery. Therefore, it's important to understand what the best foods for brain injury recovery are, so that you can intentionally include them in your diet. An anti-inflammatory diet is a good place to start and vital for the days and weeks following the brain injury since the patient still needs to eat and drink in their fragile state. The goal is to prevent brain swelling or--if it does occur--reduce it as fast as possible. Swelling comes from inflammation, and simple food changes can be surprisingly powerful for healing.

What Are the Best Foods for Brain Injury Recovery?

Dark Chocolate

Dark chocolate's high levels of both magnesium and antioxidants, two nutrients essential for a healthy brain, make it a great food for TBI recovery. Of course, that doesn't mean you should add it to every meal. Even though dark chocolate has less processed sugar than milk chocolate, there is still some in it.

Fatty Fish

The omega-3 fatty acids found in certain types of fish are some of the best foods for brain injury recovery. This is because the brain is nearly 60% fat, and over half of that fat is omega 3. Thus, if you really want to fuel your brain's recovery, giving it omega-3 is critical. Plus, your brain uses omega-3 to rebuild brain cells. Omega-3 also plays a huge role in preserving the brain's plasticity. Since a big part of TBI rehabilitation revolves around engaging neuroplasticity to repair the brain, you are going to want to include omega-3 in your brain injury diet.

Flaxseed

If seafood isn't really appealing to you, there are many other foods that are rich in omega-3 that you can add to your head injury diet. Specific essential fatty acids, such as the omega-3 EFA's from flax seed known as DHA (docosahexanoic acid) serve not only as build-

ing blocks for neuronal membranes, but also participate in down-regulating pro-inflammatory signals in brain tissue. 3-5 tablespoon ground seeds daily, or 2,000mg to 4,000mg daily of oil.

Dark leafy greens

Dark, leafy greens such as kale and spinach are excellent foods for brain injury patients. Not only are they some of the most nutrient-dense foods on earth, but they also contain high levels of omega-3. Kale contains a high level of B-vitamins. B-vitamins improve communication between neurons and boost neuronal repair after TBI. Therefore, if you are looking for foods to add to your head injury diet plan, make sure it includes kale.

Beets

Beets are high in antioxidants and nitrates. The former can prevent cancer and help the liver detoxify the blood, while the latter increase blood flow to the brain. Beets help the brain to think clearly and increase attention span. Additionally, beets naturally increase energy levels and help boost athletic performance. This root vegetable can be eaten raw in salads or alone, and also makes a great addition to roasted vegetable medleys.

Broccoli

Broccoli is high in both choline and vitamin K. These nutrients contribute to memory function and focus. The veggie also has a lot of vitamin C and fiber. High levels of fiber help the body feel full quickly, reducing the amount of food it needs to be satisfied.

Walnuts

Walnuts are rich in minerals, vitamins, and antioxidants. Snacking on walnuts can increase memory, alertness, and concentration. Studies show including walnuts regularly in one's diet could help decrease the risk of Alzheimer's disease.

Pumpkin seeds

Pumpkin seeds are rich in omega-3 and omega-6 fatty acids and zinc. Data shows that these seeds consist of approximately 73 percent unsaturated fats, which play a role in reducing inflammation. Omega-3s and omega-6s are polyunsaturated fats that can't be made by the body; they help keep the fronto-parietal region, the part of the brain known for problem-solving, more fluid. Pumpkin seeds also provide over 70 percent of the recommended daily allowance of zinc, which improves communication between neurons and may help reduce memory loss.

Research indicates that too much omega-6 can increase inflammation, something that individuals should avoid during their recovery from a brain injury. Therefore, consume pumpkin seeds sparingly.

Berries: Berries are full of antioxidants, which, as we learned, are very helpful in protecting the brain from damage and reducing inflammation. Blueberries can also increase the production of BDNF, an important growth protein that acts as a fertilizer for your brain. BDNF triggers your brain to enter a process known as neurogenesis. Plant flavonoids, such as anthocyanidins from blueberry (Vaccinium macrocarpon), reduce inflammation and vasodilation helping with swelling and edema. ¼ to ½ cup frozen blueberries daily. They are also neuroprotective, acting through various intracellular pathways to reduce neuronal damage, death, and dysfunction.

Coconut Oil

Coconut oil is a diverse superfood. It has powerful anti-inflammatory properties and can boost memory and cognitive function. Replacing the fat in baking or cooking recipes with coconut oil is a simple way to incorporate it into one's diet. Applying it topically can help dry skin, stretch marks, and eczema.

Turmeric root powder

Finally, one of the best foods for brain injury recovery is technically a spice. Turmeric is a curry spice used in many dishes, and it is a rich source of curcumin, which has many benefits for TBI patients. Not only is curcumin an antioxidant, but it also stimulates the production of an essential growth factor in the brain, called BDNF. Turmeric has a long history of use as a systemic anti-inflammatory, and has received recent attention for treating central nervous system injury and inflammation, and specifically for subarachnoid hemorrhage and traumatic brain injury. Turmeric has a strong taste and can take some time getting used to. But, because it is a spice, you can add it too almost anything. You can sprinkle some on rice or add some to your tea. Chicken soup also goes great with turmeric.

Oats (Avena sativa)

are used as a traditional medicine when prepared from the unripe tops of the plant, either as an extract or as an infusion. Oats are rich in calmodulin and phosphatidylinositol. Traditionally used to improve nerve function following injury or pathological degradation; this occurs perhaps through stimulation of potassium channel expression and function. An infusion is taken at the rate of 1 quart daily, steeped overnight with 5-6 tablespoons of oat tops.

Boswellia

a resin commonly known as Frankincense, has numerous clinical trials that substantiate its use as a general anti-inflammatory. Recent pharmacological evidence points to its ability to enter neuronal tissue in the central nervous system and provide anti-inflammatory effects there. It should be taken as part of a meal containing fats for best effect.

Here are some recipes which can be added to the meal:

1. Chocolate-berries smoothie:

Ingredients:

- 1 cup frozen blueberries
- 2 teaspoons cocoa powder
- 1 cup milk of choice
- 1/4 teaspoon vanilla extract
- Dash cinnamon
- Dash nutmeg
- 2 teaspoons maple syrup (or agave)

Method: Combine all ingredients in a blender until smooth. If desired, strain through a fine-mesh strainer into a glass for a smoother texture. Garnish with fresh blueberries, if desired.

2. Carrot, Ginger and Turmeric soup:

Ingredients:

- 3 Carrots
- 1 White Onion
- 3 cloves garlic minced
- 1 inch Piece of Fresh Ginger finely grated
- 2-inch Piece of fresh Turmeric finely grated
- 4 cups (950ml) Vegetable Stock
- 1 teaspoon Lemon Juice
- Canned Coconut Milk (for topping)
- Black Sesame Seeds (for topping)

Method: Dice the onion and carrot into small chunks (no need to be precise as everything will be blended at the end) and grate the ginger and turmeric finely. Heat a small amount of olive oil in the bottom of a large stock pot and sauté the onion for 3 minutes until translucent, then add the minced garlic, turmeric and ginger and sauté for another 1 minute. Next, add the diced carrot and sauté for another 2 minutes. Then add the vegetable stock and simmer for 20-25 minutes

until the carrot is cooked through and soft. Use a stick blender to blend the soup until its smooth, or transfer into a standing blender and blend. Stir in the lemon juice, then serve with a swirl of coconut milk and some black sesame seeds.

3. Chicken Piccata:

Ingredients:

- 2 boneless chicken breasts, butterflied
- 1/3 cup almond flour
- 5 teaspoon extra virgin olive oil
- 6 teaspoon coconut oil
- 1/3 cup fresh lemon juice
- 1/2 cup low sodium chicken broth
- 1/4 cup capers
- 1/3 cup fresh parsley chopped
- salt to taste
- pepper to taste
- Half a cup of baby portabella mushrooms

Method: Season chicken with salt and pepper. Pour almond flour in a bowl and dredge both sides in almond flour, shaking off excess. In a large skillet over medium high heat, melt 2 tablespoons of coconut oil with 3 tablespoons olive oil. When mixture starts to sizzle, add 2 pieces of chicken, and cook for 3 minutes (or until browned), flip, and cook other side or until browned. Remove and transfer to plate. Melt 2 more tablespoons coconut oil and add another 2 tablespoons olive oil. When this mixture starts to sizzle, add 2 more pieces of chicken and brown both sides as with the first batch. At the same time, add mushrooms and sauté for 5 minutes (may need to add a tad more coconut and olive oil). Remove pan from heat and add chicken to the plate. In the pan, add the lemon juice, stock, and capers. Return to stove and bring to a boil, scraping up brown bits from pan for extra flavor. Taste to check for seasoning, then return all the chicken to the pan and simmer for 5 minutes. Remove chicken to a serving dish. Add 2 remaining tablespoons of coconut oil to sauce and whisk vigorously. Pour sauce over chicken and garnish with parsley.

Foods to avoid

Avoid sugar, wheat and gluten, dairy, nightshades (potatoes, tomatoes, peppers, eggplants) and alcohol. No one should be consuming artificial sweeteners like sucralose, acesulfame K, or saccharin as they hinder brain healing.

Additional things to think about: For a sufficient recuperation, get enough sleep and eat well. Additionally, when employed as a part of a continuous, targeted program, techniques like meditation and visualization can be beneficial. Little routines like making a cup of tea can act as a stabilizing force during turbulent times, while strolls through gardens and woods can relax the body and mind. The right amount of physical and mental activity is also crucial, and any rehabilitation program should incorporate it.

Dr. Mahmoud Sous – Ph.D.

During the period of 1995-1999, I went to the medical school in Poland to research about the various methods of back pain treatment. After finishing my PhD, I took variety of courses including naturopath, acupuncture, and manual techniques. This gave me an idea that exercises, and massage could be helpful in treatment of chronic pain. But my findings didn't stop me here, I also worked as a naturopath practitioner in Canada where I got familiar about treatments with Chinese medicines, osteopath techniques and some other manual therapies which helps in pain management.

Fixing injuries requires an understanding of anatomy and biomechanics. That is why my research and treatment belong to the holistic approach of using different techniques and remedies for the treatment of back pain. In 1990, I realize that there are some complex spinal aspects and issues which leads to of back pain. So, from my case studies I formulated a guideline which is clear and easy to understand and will fix your issues.

My goal is to help people visualize how the body functions and what happens inside when you experience pain. Healing requires to focus on one's action because pain results due to faulty actions and movements. This thought motivated me to work on a book which will include all home remedies where people can treat themselves to fix their pain. I have included knowledge based on my clinical research using manual massage therapy, food habits, nutrition facts, heat, sauna, hydrotherapy, cold water treatments which overall helps in pain management. It gives me pleasure to introduce this book to the community where I have shared all my experienced treatment plans.

Priyanka Yadav (Physiotherapist)

I started my career in 2011, since then I have worked as a Physiotherapist in several clinics and hospitals in India. Working mostly in the Outpatient department made me realize that Physio's role is extremely crucial in the rehabilitation and recovery process of a patient. My desire to reach out to more people motivated me to work for this book. Have worked with Dr. Mahmoud on several research books on self-pain management. We have been constantly working on curating the best suited protocol for various Musculoskeletal conditions. Additionally, we have also included approaches with alternative medicine.

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