What is Traumatic Brain injury?

Traumatic brain injury is defined as damage to the brain resulting from external mechanical force, such as rapid acceleration or deceleration impact, blast waves, or penetration by a projectile, leading to temporary or permanent impairment of brain function.

Traumatic brain injury (TBI) has a dramatic impact on the health of the nation: it accounts for 15–20% of deaths in people aged 5–35 yr old, and is responsible for 1% of all adult deaths. TBI is a major cause of death and disability worldwide, especially in children and young adults. Males sustain traumatic brain injuries more frequently than do females.

Approximately 1.4 million people in the UK suffer a head injury every year, resulting in nearly 150 000 hospital admissions per year. Of these, approximately 3500 patients require admission to ICU. The overall mortality in severe TBI, defined as a post-resuscitation Glasgow Coma Score (GCS) ≤8, is 23%. In addition to the high mortality, approximately 60% of survivors have significant ongoing deficits including cognitive competency, major activity, and leisure and recreation. This has a severe financial, emotional, and social impact on survivors left with lifelong disability and on their families.

It is well established that the major determinant of outcome from TBI is the severity of the primary injury, which is irreversible. However, secondary injury, primarily cerebral ischaemia, occurring in the post-injury phase, may be due to intracranial hypertension, systemic hypotension, hypoxia, hyperpyrexia, hypocapnia and hypoglycaemia, all of which have been shown to independently worsen survival after TBI.

Causes of TBI:

Falls, vehicle accidents, and violence. The most common causes of TBI include violence, transportation accidents, construction, and sports. Motor bikes are major causes, increasing in significance in developing countries as other causes reduce. The estimates that between 1.6 and 3.8 million traumatic brain injuries each year are a result of sports and recreation.
activities in the US. In children aged two to four, falls are the most common cause of TBI, while in older children traffic accidents compete with falls for this position. TBI is the third most common injury to result from child abuse. Abuse causes 19% of cases of pediatric brain trauma, and the death rate is higher among these cases. Domestic violence is another cause of TBI, as are work-related and industrial accidents. Firearms and blast injuries from explosions are other causes of TBI, which is the leading cause of death and disability in war zones. According to Representative Bill Pascrell (Democrat, NJ), TBI is "the signature injury of the wars in Iraq and Afghanistan."

Mechanism of injury:

The type, direction, intensity, and duration of forces all contribute to the characteristics and severity TBI. Forces that may contribute to TBI include angular, rotational, shear, and translational forces.

Even in the absence of an impact, significant acceleration or deceleration of the head can cause TBI; however in most cases a combination of impact and acceleration is probably to blame. Forces involving the head striking or being struck by something, termed contact or impact loading, are the cause of most focal injuries, and movement of the brain within the skull, termed noncontact or inertial loading, usually causes diffuse injuries. The violent shaking of an infant that causes shaken baby syndrome commonly manifests as diffuse injury. In impact loading, the force sends shock waves through the skull and brain, resulting in tissue damage. Shock waves caused by penetrating injuries can also destroy tissue along the path of a projectile, compounding the damage caused by the missile itself.

Damage may occur directly under the site of impact, or it may occur on the side opposite the impact (coup and contrecoup injury, respectively). When a moving object impacts the stationary head, coup injuries are typical, while contrecoup injuries are usually produced when the moving head strikes a stationary object.
**Fig:1. Shows the mechanism of injury.**

**Pathophysiology:**

One type of focal injury, cerebral laceration, occurs when the tissue is cut or torn. Such tearing is common in orbito frontal cortex in particular, because of bony protrusions on the interior skull ridge above the eyes. In a similar injury, cerebral contusion (bruising of brain tissue), blood is mixed among tissue. In contrast, intracranial hemorrhage involves bleeding that is not mixed with tissue.

Hematomas, also focal lesions, are collections of blood in or around the brain that can result from hemorrhage. Intra cerebral hemorrhage, with bleeding in the brain tissue itself, is an intra-axial lesion. Extra-axial lesions include epidural hematoma, subdural hematoma, subarachnoid hemorrhage, and intra-ventricular hemorrhage. Epidural hematoma involves bleeding into the area between the skull and the dura mater, the outermost of the three membranes surrounding the brain. In subdural hematoma, bleeding occurs between the dura and the arachnoid mater. Subarachnoid hemorrhage involves bleeding into the space
between the arachnoid membrane and the pia mater. Intraventricular hemorrhage occurs when there is bleeding in the ventricles.

Signs and Symptoms (Clinical features):

Symptoms are dependent on the type of TBI (diffuse or focal) and the part of the brain that is affected. Unconsciousness tends to last longer for people with injuries on the left side of the brain than for those with injuries on the right. Symptoms are also dependent on the injury's severity. With mild TBI, the patient may remain conscious or may lose consciousness for a few seconds or minutes. Other symptoms of mild TBI include headache, vomiting, nausea, lack of motor coordination, dizziness, difficulty balancing, lightheadedness, blurred vision or tired eyes, ringing in the ears, bad taste in the mouth, fatigue or lethargy, and changes in sleep patterns. Cognitive and emotional symptoms include behavioral or mood changes, confusion, and trouble with memory, concentration, attention, or thinking. Mild TBI symptoms may also be present in moderate and severe injuries.

A person with a moderate or severe TBI may have a headache that does not go away, repeated vomiting or nausea, convulsions, an inability to awaken, dilation of one or both pupils, slurred speech, aphasia (word-finding difficulties), dysarthria (muscle weakness that causes disordered speech), weakness or numbness in the limbs, loss of coordination, confusion, restlessness, or agitation. Common long-term symptoms of moderate to severe TBI are changes in appropriate social behavior, deficits in social judgment, and cognitive changes, especially problems with sustained attention, processing speed, and executive functioning. Alexithymia, a deficiency in identifying, understanding, processing, and describing emotions occurs in 60.9% of individuals with TBI. Cognitive and social deficits have long-term consequences for the daily lives of people with moderate to severe TBI, but can be improved with appropriate rehabilitation.

When the pressure within the skull (intracranial pressure, abbreviated ICP) rises too high, it can be deadly. Signs of increased ICP include decreasing level of consciousness, paralysis or weakness on one side of the body, and a blown pupil, one that fails to constrict in response to light or is slow to do so. Cushing's triad, a slow heart rate with high blood pressure and respiratory depression is a classic manifestation of significantly raised ICP. Anisocoria,
unequal pupil size, is another sign of serious TBI. Abnormal posturing, a characteristic positioning of the limbs caused by severe diffuse injury or high ICP, is an ominous sign.

Fig:2- Unequal pupil size: A sign of serious Brain injury.

Small children with moderate to severe TBI may have some of these symptoms but have difficulty communicating them. Other signs seen in young children include persistent crying, inability to be consoled, listlessness, refusal to nurse or eat, and irritability.

**Classification of TBI:**

TBI is usually classified based on severity, anatomical features of the injury, and the mechanism (the causative forces).
Severity of TBI by using Glasgow coma scale, PTA and LOC:

Classification systems for determining the severity of TBI may use duration of PTA alone or with other factors such as Glasgow Coma Scale (GCS) score and duration of loss of consciousness (LOC) to divide TBI into categories of mild, moderate, and severe (Table 1).

Table 1

<table>
<thead>
<tr>
<th>Severity level</th>
<th>GCS</th>
<th>PTA</th>
<th>LOC</th>
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<tbody>
<tr>
<td>Mild</td>
<td>13–15</td>
<td>&lt;1 day</td>
<td>0–30 minutes</td>
</tr>
<tr>
<td>Moderate</td>
<td>9–12</td>
<td>&gt;1 to &lt;7 days</td>
<td>&gt;30 min to &lt;24 hours</td>
</tr>
<tr>
<td>Severe</td>
<td>3–8</td>
<td>&gt;7 days</td>
<td>&gt;24 hours</td>
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Glasgow Coma Scale (Table 2):

Brain injuries can be classified into mild, moderate, and severe categories. The Glasgow Coma Scale (GCS), the most commonly used system for classifying TBI severity, grades a person's level of consciousness on a scale of 3–15 based on verbal, motor, and eye-opening reactions to stimuli. It is generally agreed that a TBI with a GCS of 13 or above is mild, 9–12 is moderate, and 8 or below is severe.
Table-2.

<table>
<thead>
<tr>
<th>EYE OPENING</th>
<th>VERBAL RESPONSE</th>
<th>MOTOR RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-None</td>
<td>1-None</td>
<td>1-None</td>
</tr>
<tr>
<td>2-To pain</td>
<td>2-Incomprehensible sounds</td>
<td>2-Abnormal extension</td>
</tr>
<tr>
<td>3-To voice</td>
<td>3-Inappropriate words</td>
<td>3-Abnormal flexion.</td>
</tr>
<tr>
<td>4-Spontaneously</td>
<td>4-Confused</td>
<td>4-Withdraws from pain.</td>
</tr>
<tr>
<td></td>
<td>5-Oriented</td>
<td>5-Localises to pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-Obeys commands</td>
</tr>
</tbody>
</table>

Post-traumatic amnesia (PTA): It is a state of confusion that occurs immediately following a traumatic brain injury (TBI) in which the injured person is disoriented and unable to remember events that occur after the injury. The term "posttraumatic amnesia" was first used in 1928 in a paper by Symonds to refer to the period between the injury and the return of full, continuous memory, including any time during which the patient was unconscious.

The person may be unable to state his or her name, where he or she is, and what time it is. When continuous memory returns, PTA is considered to have resolved. While PTA lasts, new events cannot be stored in the memory. About a third of patients with mild head injury are reported to have "islands of memory", in which the patient can recall only some events. During PTA, the patient's consciousness is "clouded". Because PTA involves confusion in addition to the memory loss typical of amnesia, the term "posttraumatic confusional state" has been proposed as an alternative.

There are two types of amnesia: retrograde amnesia (loss of memories that were formed shortly before the injury) and anterograde amnesia (problems with creating new memories after the injury has taken place). Both retrograde and anterograde forms may be referred to as PTA, or the term may be used to refer only to anterograde amnesia.
PTA has been proposed to be the best measure of head trauma severity, but it may not be a reliable indicator of outcome. However, PTA duration may be linked to the likelihood that psychiatric and behavioral problems will occur as consequences of TBI.

PTA is considered a hallmark of concussion, and is used as a measure of predicting its severity. It may be more reliable for determining severity of concussion than GCS because the latter may not be sensitive enough; concussion sufferers often quickly regain a GCS score of 15.

Longer periods of amnesia or loss of consciousness immediately after the injury may indicate longer recovery times from residual symptoms from concussion. Increased duration of PTA is associated with a heightened risk for TBI complications such as post-traumatic epilepsy. The severity of TBI using PTA alone is shown in table-3.

<table>
<thead>
<tr>
<th>SEVERITY</th>
<th>PTA</th>
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<tr>
<td>VERY MILD</td>
<td>&lt; 5 MINUTES</td>
</tr>
<tr>
<td>MILD</td>
<td>5-60 MINUTES</td>
</tr>
<tr>
<td>MODERATE</td>
<td>1-24 HOURS</td>
</tr>
<tr>
<td>SEVERE</td>
<td>1-7 DAYS</td>
</tr>
<tr>
<td>VERY SEVERE</td>
<td>1-4 WEEKS</td>
</tr>
<tr>
<td>EXTREMELY SEVERE</td>
<td>&gt;4WEEKS</td>
</tr>
</tbody>
</table>

Mechanism-related classification divides TBI into:

i. Closed injury: A closed (also called non penetrating, or blunt) injury occurs when the brain is not exposed.
ii. Penetrating head injury: A penetrating, or open, head injury occurs when an object pierces the skull and breaches the dura mater, the outermost membrane surrounding the brain.

Classification of TBI by its pathological (Anatomical) features:

Lesions can be extra-axial, (occurring within the skull but outside of the brain) or intra-axial (occurring within the brain tissue). Damage from TBI can be focal or diffuse, confined to specific areas or distributed in a more general manner, respectively. However, it is common for both types of injury to exist in a given case.

Diagnostic tools:

Some of the current imaging techniques used for diagnosis and treatment include CT scans and MRIs. Besides the diagnostic tools, clinical examination and use of Glasgow coma scale help to diagnose and grade the severity of the injury. The preferred radiologic test in the emergency setting is computed tomography (CT): it is quick, accurate, and widely available. Followup CT scans may be performed later to determine whether the injury has progressed.

Magnetic resonance imaging (MRI) can show more detail than CT, and can add information about expected outcome in the long term. It is more useful than CT for detecting injury characteristics such as diffuse axonal injury in the longer term. However, MRI is not used in the emergency setting for reasons including its relative inefficacy in detecting bleeds and fractures, its lengthy acquisition of images, the inaccessibility of the patient in the machine, and its incompatibility with metal items used in emergency care. A variant of MRI since 2012 is High definition fiber tracking (HDFT).

Other techniques may be used to confirm a particular diagnosis. X-rays are still used for head trauma, but evidence suggests they are not useful; head injuries are either so mild that they do not need imaging or severe enough to merit the more accurate CT. Angiography may be used to detect blood vessel pathology when risk factors such as penetrating head trauma are involved. Functional imaging can measure cerebral blood flow or metabolism, inferring neuronal activity in specific regions and potentially helping to predict outcome. Electroencephalography and transcranial doppler may also be used. The most
sensitive physical measure to date is the quantitative EEG which has documented an 80% to 100% ability in discriminating between normals and traumatic brain injured subjects.

Fig:2. CT scan of a patient with traumatic brain injury, showing cerebral contusions, hemorrhage within the hemispheres, skull fractures and sub Dural hematoma.
Fig: 3. CT Scan of brain showing spread of subdural hematoma and midline shift.
Fig: 4.A,B,C: CT scans after TBI;   A. Diffuse brain injury: 32-year old male, involved in a high speed road traffic accident. In diffuse brain injury, CT scan may look grossly normal. Noe, the small contusion at the tip of the left frontal ventricular horn and diffuse swelling.
B. Subdural haematoma: 39 year old male after fall down stairs. Note, the large biconcave opacity on the left spreading over the surface of the cortex, compressing the ipsilateral ventricle and causing midline shift.
C. Extradural haematom: 60 year old male, after a fall. Note the biconvex opacity on the right compressing the underlying brain parenchyma. Scalp contusions are also demonstrated over the extradural and opposite to the lesion.

![CT scan showing epidural hematoma](image)

Fig:5-CT scan showing epidural hematoma(marked by arrow)
Diffuse injury manifests with little apparent damage in neuroimaging studies, but lesions can be seen with microscopy techniques post-mortem and in the early 2000s, researchers discovered that diffusion tensor imaging (DTI), a way of processing MRI images that shows white matter tracts, was an effective tool for displaying the extent of diffuse axonal injury. Types of injuries considered diffuse include edema (swelling) and diffuse axonal injury, which is widespread damage to axons including white matter tracts and projections to the cortex. Types of injuries considered diffuse include concussion and diffuse axonal injury, widespread damage to axons in areas including white matter and the cerebral hemispheres.

There is a promising technology called activation database guided EEG biofeedback which has been documented to return a TBI's auditory memory ability to above the control group's performance.

Neuropsychological assessment can be performed to evaluate the long-term cognitive sequelae and to aid in the planning of the rehabilitation. Instruments range from short measures of general mental functioning to complete batteries formed of different domain-specific tests.

**Treatment of Traumatic Brain Injury:**

Depending on the injury, treatment required may be minimal or may include interventions such as medications, emergency surgery or surgery years later. Physical therapy, speech therapy, recreation therapy, occupational therapy and vision therapy are to be employed for facilitation of recovery and rehabilitation.

It is important to begin emergency treatment within the so-called "golden hour" following the injury. People with moderate to severe injuries are likely to receive treatment in an intensive care unit followed by a neurosurgical ward. Treatment depends on the recovery stage of the patient. In the acute stage the primary aim of the medical personnel is to stabilize the patient and focus on preventing further injury because little can be done to reverse the initial damage caused by trauma. Rehabilitation is the main treatment for the sub acute and chronic stages of recovery.
Treatment Acute Stage:

Certain facilities are equipped to handle TBI better than others; initial measures include transporting patients to an appropriate treatment center. Both during transport and in hospital the primary concerns are ensuring proper oxygen supply, maintaining adequate cerebral blood flow, and controlling raised intracranial pressure (ICP), since high ICP deprives the brain of badly needed blood flow and can cause deadly brain herniation. Other methods to prevent damage include management of other injuries and prevention of seizures.

Neuroimaging is helpful but not flawless in detecting raised ICP. A more accurate way to measure ICP is to place a catheter into a ventricle of the brain, which has the added benefit of allowing cerebrospinal fluid to drain, releasing pressure in the skull. Treatment of raised ICP may be as simple as tilting the patient's bed and straightening the head to promote blood flow through the veins of the neck. Sedatives, analgesics and paralytic agents are often used. Hypertonic saline can improve ICP by reducing the amount of cerebral water (swelling), though it is used with caution to avoid electrolyte imbalances or heart failure. Mannitol, an osmotic diuretic, was also studied for this purpose, but such studies have been heavily questioned. Diuretics, drugs that increase urine output to reduce excessive fluid in the system, may be used to treat high intracranial pressures, but may cause hypovolemia (insufficient blood volume). Hyperventilation (larger and/or faster breaths) reduces carbon dioxide levels and causes blood vessels to constrict; this decreases blood flow to the brain and reduces ICP, but it potentially causes ischemia and is, therefore, used only in the short term. Administration of corticosteroids is associated with an increased risk of death, and so it is recommended that they not be given routinely.

Endotracheal intubation and mechanical ventilation may be used to ensure proper oxygen supply and provide a secure airway. Hypotension (low blood pressure), which has a devastating outcome in TBI, can be prevented by giving intravenous fluids to maintain a normal blood pressure. Failing to maintain blood pressure can result in inadequate blood flow to the brain. Blood pressure may be kept at an artificially high level under controlled conditions by infusion of norepinephrine or similar drugs; this helps maintain cerebral perfusion. Body temperature is carefully regulated because increased temperature raises the brain's metabolic needs, potentially depriving it of nutrients. Seizures are common. While they can be treated with benzodiazepines, these drugs are used carefully because they can depress breathing and lower blood pressure. TBI patients are more susceptible to side effects and may react adversely or be inordinately sensitive to
some pharmacological agents. During treatment monitoring continues for signs of deterioration such as a decreasing level of consciousness.

Traumatic brain injury may cause a range of serious coincidental complications which include cardiac arrhythmias and neurogenic pulmonary edema. These conditions must be adequately treated and stabilised as part of the core care for these patients.

Surgery can be performed on mass lesions or to eliminate objects that have penetrated the brain. Mass lesions such as contusions or hematomas causing a significant mass effect (shift of intracranial structures) are considered emergencies and are removed surgically. For intracranial hematomas, the collected blood may be removed using suction or forceps or it may be floated off with water. Surgeons look for hemorrhaging blood vessels and seek to control bleeding. In penetrating brain injury, damaged tissue is surgically debrided, and craniotomy may be needed. Craniotomy, in which part of the skull is removed, may be needed to remove pieces of fractured skull or objects embedded in the brain. Decompressive craniectomy (DC) is performed routinely in the very short period following TBI during operations to treat hematomas; part of the skull is removed temporarily (primary DC). DC performed hours or days after TBI in order to control high intracranial pressures (secondary DC) has not been shown to improve outcome in some trials and may be associated with severe side effects.

Intensive care management of TBI:
Management of TBI in intensive care is targeted at optimizing cerebral perfusion, oxygenation and avoiding secondary insults. There is good evidence that protocolized management leads to improved outcome after TBI and may be further improved by treatment within a specialist neuroscience critical care unit. Most clinically adopted protocols for management of TBI are based around providing good basic intensive care and interventions to target cerebral perfusion pressure (CPP) and intracranial pressure (ICP). The following figure(Figure-6) shows an intensive care unit, where Physicians, Surgeons, Physiotherapists and Nurses work in a team approach.
Treatment Chronic Stage:

Once medically stable, patients may be transferred to a sub acute rehabilitation unit of the medical center or to an independent rehabilitation hospital. Rehabilitation aims to improve independent function at home and in society and to help adapt to disabilities and has demonstrated its general effectiveness, when conducted by a team of health professionals who specialise in head trauma. As for any patient with neurologic deficits, an interdisciplinary approach is key to optimising outcome. The interdisciplinary team include the Physiatrists or neurologists, Physiotherapy, Speech and language therapy, cognitive rehabilitation therapy, and occupational therapy etc. The aim of the team will be to assess function and design the rehabilitation activities for each patient. Treatment Neuropsychiatric symptoms such as emotional distress and clinical depression may involve mental health professionals such as therapists, psychologists, and psychiatrists, while neuropsychologists can help to evaluate and manage cognitive deficits.

Physiotherapy for Traumatic Brain Injury:

Physiotherapy to TBI patients is employed both in the Acute and Chronic stages of the condition. The aim of Physiotherapy in different stages of the condition are as follows:

1. Acute stage: The physiotherapist works along with the medical and nursing team in and out of ICU in the acute stage, with the following aims:
   i. Positioning and turning of the patient (if allowed) to maintain soft tissue length, and prevent pressure ulcer formation.
   ii. Regular passive movements to maintain joint range of motion.
   iii. Breathing techniques and postural drainage without head tilt, without or with suction to remove secretions (if not ventilated).
   iv. To note the vital signs and assess the conscious level periodically, to assist the Physician/Surgeon to judge prognosis and plan further management.

2. Chronic stage:

The aim of Physiotherapy in the chronic stage include:
i. To normalize muscle tone.

ii. To improve strength, endurance.

iii. To improve posture and balance.

iv. Restore function.

v. Assist in the Rehabilitation.

The following pictures demonstrate some therapeutic exercises applied to the patients of TBI.

Fig: 7- Facilitation of movement in anti spastic pattern.
Fig:8 - Facilitation of movement in anti spastic pattern.

Fig:9 - Facilitation of movement in anti spastic pattern.
Fig10- Development of Sitting balance.

Fig11- Development of Sitting balance.
Fig: 12- Development of sitting balance.

Fig: 13- Exercise to develop strength and endurance of trunk extensors.
The aim of rehabilitation is to improve/restore mobility with or without Orthotics and walking aids and enable to achieve ADL/IADL with or without adaptive technology. After discharge from the inpatient rehabilitation treatment unit, care may be given on an outpatient basis. Community-based rehabilitation will be required for a high proportion of patients, including vocational rehabilitation; this supportive employment matches job demands to the worker's abilities. People with TBI who cannot live independently or with family may require care in supported living facilities such as group homes. Respite care, including day centers and leisure facilities for the disabled, offers time off for caregivers, and activities for people with TBI.

Pharmacological treatment can help to manage psychiatric or behavioral problems. Medication is also used to control post-traumatic epilepsy; however the preventive use of anti-epileptics is not recommended. In those cases where the person is bedridden due to a reduction of consciousness, has to remain in a wheelchair because of mobility problems, or has any other problem heavily impacting self-caring capacities, caregiving and nursing are critical. The most effective research documented intervention approach is the activation database guided EEG biofeedback approach which has shown significant improvements in memory abilities of the TBI subject which are far superior than traditional approaches (strategies, computers, medication intervention).

**Outcome of TBI:**

It can cause a host of physical, cognitive, social, emotional, and behavioral effects, and outcome can range from complete recovery to permanent disability or death.

**Prevention measures:**

Prevention measures include use of technology to protect those suffering from automobile accidents, such as seat belts and sports or motorcycle helmets, as well as efforts to reduce the number of automobile accidents, such as safety education programs and enforcement of traffic laws.
Role of Occupational therapy in management of Cognitive and perceptual dysfunction of head injured patients

Cognitive and perceptual problems are two most puzzling and disabling difficulties that a person can experience. Thinking, remembering, reasoning and making sense of the world around us are fundamental to carrying out everyday living activities. Problem with these may create devastating effect on individual’s life and the lives of his or her family.

What is it

Cognition is the process of knowing including awareness, reasoning, judgment, intuition and memory.

Perception is the integration of sensory impression into information i.e. psychologically meaningful.

Clinical indicators

It causes diminished level of functioning in all patients experienced brain damage. Patients may show the following characteristics,

- Inability to do simple task independently and safely.
- Difficulty in initiating or completing a task.
- Difficulty in switching from one task to another.
- Unable to follow instructions or imitate movements.
- May repeat same mistake.
- Activities take inordinately long time to complete or may be done impulsively.
- Patient may appear distracted and frustrated and exhibit poor planning.
- Patient may be inattentive to one side of the body and extra personal space.
- May deny the presence or extent of disability.
- Patient may be uncooperative, intellectually inferior or confused.
- Difficulty in perceiving relationship between self and two or more objects or one object to another.
- Difficulty in remembering the co relation of one place to another.
- Difficulty in recalling old or remembering recent memories.
How an occupational therapist can help

Occupational therapist is the member of rehabilitation team who are specially trained to examine and treat cognitive and perceptual deficits in relation to functional adaptation. There are step by step approaches to make the patient maximally independent in his or her life.

An occupational therapist leads a person to be not only physically fit but also emotionally and socially well adjustable to re-integrate him or her in the society.

The different steps of occupational therapy intervention includes,

- Design different activities which can simulate the functions needed to enhance performance.
- Use different treatment techniques to facilitate sensory input to create an adaptive motor response and thus facilitate the improvement of cognitive and perceptual dysfunction.
- Practicing real life activities through repetitive movements which were been lost due to illness to recover functional abilities.
- Design compensatory techniques and fabricate splints and assistive devices to make the person maximally independent where any deficit persists.
- Educate patient, family and caregivers about the illness and necessary safety procedures.
- Enhance community awareness to reintegrate these persons into the society.
- Necessary home and environmental modification.
- Work place assessment and make it accessible and safe for the patient.

Thus an occupational therapist can help a person with cognitive and perceptual impairment along with physical dysfunction, starting from acute care up to the re-integration or re-establishment of that person in the society.

Case study
There is a case study of 55 years old man belongs to west Bengal who had an RTA and was hospitalized for 10 days. After discharge from this hospital he was been admitted in a rehabilitation institute for further management.

On the initial assessment it was seen that the person had left hemi paresis along with cognitive and perceptual dysfunction. Though he had limited physical dysfunction but had many cognitive and perceptual dysfunction as,

- He was neglecting his effected side.
- He had poor memory, judgment and orientation.
- Could not able to locate the distance of any object in relation to himself.
On the first day of occupational therapy treatment the remedial therapy had started where different therapeutic activities were given to the patient to improve strength and endurance of the effected side.

By the side different simulated activities were also given to relearn functional movements to get controlled voluntary response.

He was also given training on his activities of daily living to make him independent in self care activities.
As the status of the patient had been improved, for those areas where he had persisted deficits like in case of poor memory, judgment and unilateral neglect compensatory techniques had been taught.

Compensations of feeding in unilateral neglect
Before discharging the patient counseling sessions had been taken for the patient and his family.

Survey of his job place had made and necessary environmental modification and stuff awareness had been carried out.

After a successful intervention plan by an occupational therapist the patient has been respectfully reintegrated in the society.