



# CASE STUDY: PSYCHOLOGICAL AND SPEECH PATHOLOGICAL REHABILITATION AFTER CEREBROVASCULAR ACCIDENT (STROKE)

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## ABSTRACT

**Objective:** To explain the recovery process of an ischemic stroke patient. The purpose of this case study is to acknowledge the significance of psychological, cognitive, speech and dysphagia therapeutic treatment for stroke patients in the hospital setting at CMH Rawalpindi, Pakistan.

**Background:** Patients, who suffer from ischemic stroke experience decreased cognition, swallowing function, speech and language disorders. These types of patients have the potential to restore lost function through beginning in the acute care setting with intensive psychological, speech and dysphagia therapy and continuing with rehabilitation services.

**Treatment:** This case study of an ischemic stroke patient observed between January 10 and 20, 2021 in the acute care setting. After initial evaluation, the patient was administered the psychological, cognitive, speech and dysphagia tests to improve these functions. Therapeutic treatment begins the process of retrieving the ability to swallow safely and use intelligible speech to communicate before the stroke happening.

**Conclusion:** The patient made significant progress until discharged and admitted to an intensive rehabilitation facility to more recovery through intensive therapeutic treatment.

**Keywords:** ischemic stroke, cognition, dysphagia, oral motor mechanism, psychological, speech pathology.

## 1. INTRODUCTION

According to the World Health Organization (WHO), 15 million people suffer stroke worldwide each year. Of these, 5 million die, and another 5 million are left permanently disabled. Every year roughly 795,000 Americans suffer from a stroke. Of these 795,000 individuals, 130,000 ends with death. 87% of the strokes that occur are considered ischemic strokes. In Pakistan, there was a crude age-and sex-adjusted stroke incidence of 95 per 100,000 persons per year for the years 2000 to 2016, with the highest incidence being 584,000 of 650,000, noted among individuals aged 75 to 85. Cerebrovascular accident (CVA) is the medical term for a stroke. A stroke is when blood flow to a part of your brain is stopped either by a blockage or the rupture of a blood vessel. A clot forms and blocks the flow of blood to certain areas of the brain causing the stroke to occur. Acute stroke is also commonly called a cerebrovascular accident. There is one new stroke every 40 seconds. Stroke is the 5th leading cause of death and the first leading cause of disability. There are two main types of strokes. The commoner type is an ischemic stroke, caused by interruption of blood flow to a certain area of the brain. Ischemic stroke has for 86% of all acute strokes. 16% of acute strokes are hemorrhagic strokes which are caused by bursting of a blood vessel i.e., acute hemorrhage. There are two main types of hemorrhagic strokes, intra cerebral

hemorrhage (ICH) and subarachnoid hemorrhage which accounts for about 7% of all strokes.

According to the TOAST classification, there are four main types of ischemic strokes. These are large vessel atherosclerosis, small vessel diseases (lacunar infarcts), cardioembolic strokes and cryptogenic strokes. Each of these has different causes and pathophysiology. despite of the type of stroke, it is important to know that with each minute of large vessel ischemic stroke untreated, close to two million neurons die. This is the most important "time is brain" concept in understanding acute stroke and its treatment.

There are numerous causes of stroke, such as prolonged hypertension, arteriosclerosis, and emboli that have formed in the heart as a result of atrial fibrillation or rheumatic heart disease. In younger patients, the possible list of causes may be broadened to include clotting disorders, cervical arterial dissection, and various forms of vasculitis. In the event of a possible stroke presentation, a precise history and physical must be performed alongside emergent neurological imaging before administering any form of treatment. With early, focused

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treatment based on the stroke etiology, rehabilitation programs, and long-term lifestyle changes, one can maximize his/her chances for a significant recovery.

The brain has two hemispheres, the right and left, both execution and specializing in unusual body controls and responses. The right side of the brain controls the left side of the body and left side of brain controls the right side of body. Because of this method of control, a stroke affecting the right side of the brain will harm the left side. Frequent effects resulting from a stroke affecting the right side of the brain include paralysis or weakness on the left side of the body particularly upper and lower limbs as well as facial muscles, issues of the left visual field, impulsive behavior, poor insight, memory deficits, and lack of spatial perception. Effects of a stroke also depend on the specific location in which the stroke occurred. Therefore, an important part of determining the prognosis of a stroke patient is determining the site of lesion, and location. This study focuses on an ischemic stroke affecting the Middle Cerebral Artery (MCA). The MCA supplies blood to many important execution lobes of the brain; frontal, temporal, and parietal. Most importantly it supplies the Broca's area and the Wernicke's area that responsible for language expression and comprehension. This explains why patients suffering from an ischemic stroke in the MCA experience severe communication problems and decreased language comprehension and expression. These deficits combined with the lack of muscle strength and coordination on the left side of the face greatly impair the patient's speech. The weakness of half of the body's muscles that follow a stroke also impact on psychological and cognitive impairment and swallow functioning. swallowing difficulty is called as dysphagia. It is difficulty chewing or swallowing food or liquids. There are two main types of dysphagia; oropharyngeal and esophageal. Oropharyngeal dysphagia is difficulty with the initial stage of the swallowing process. With this type of dysphagia, the patient has difficulty moving the food to the back of the mouth. Common signs of oropharyngeal dysphagia are drooling, choking, coughing during meals, pocketing food between the teeth and cheeks due to unsuccessful movement, a gurgly voice quality, and lack of ability to suck from a straw. This dysphagia is most often caused by a nerve or brain disorder such as stroke, cerebral palsy, multiple sclerosis, Parkinson's, Alzheimer's, or neck and throat cancer. In comparison, esophageal dysphagia occurs when foods and liquids stop in the esophagus and do not reach the stomach properly. The most common cause of this type of dysphagia is the backing up of stomach acid into the esophagus due to reflux problems. This eventually narrows the passageway making it harder for the esophagus to pass foods to the stomach. Oropharyngeal dysphagia is a main apprehension and risk for stroke patients and when diagnosed, a treatment plan needs to be put into place to ensure patients are getting adequate nutrition in the safest manner possible. An SLP's responsibility is to diagnose the severity of dysphagia the patient is experiencing and to prevent the patient from unsuccessful swallow functioning that can potentially lead to future problem food/liquid reaching the lungs (pneumonia). There are standard diet levels that include foods/liquids with a variety of consistency levels. After evaluating a patient's swallow function, the SLP chooses the diet level that is

safest for the patient to consume their nutrients. The cognitive, speech and diet levels will be explained further in this case study. The ultimate goal of the recovery process for stroke victims is to restore lost function and for the individual to return to their abilities prior to the stroke. Due to the loss of coordination and muscle weakness, these patients struggle with daily activities that were second nature prior to the stroke. Therapy plays a huge role in the process of treating the deficits experienced by these patients. Speech Language Pathologists (SLP's) work with stroke victims to address swallowing function, speech and language expression and comprehension, cognitive and memory ability and work closely with patients initially in the acute care setting to evaluate the patient's status and develop a treatment plan. Following therapy in the acute setting, patients often are admitted to an inpatient rehabilitation center to receive intensive and aggressive therapy to tackle their weaknesses and regain strength and maximum function. Depending on the severity of the stroke and intensity of therapy as well as length of stay in the acute settings, patients can receive therapy in outpatient settings or in the comfort of their own home. However, these individuals tend to leave acute care with higher function and level of independency than those referred to inpatient rehab. With therapy and perseverance, many stroke patients fully return to their function level prior to the incident. Though, patients who do not have experience any complications within the first week be inclined to experience stable neurological improvement. The majority of patients show improvement during the first 3 to 6 months after a stroke.

## **2. PATIENT HISTORY AND MEDICAL EVALUATION**

A 65-year-old male patient initially admitted to combine military hospital due to weakness in left upper and lower extremities and non-fluent speech, and unintelligible speech, difficulty producing or understanding language, and difficulty reading or writing. It is called aphasia in medical terminology. Aphasia is difficulty with speech and language functioning due to damage to the brain, it is very common in stroke patients. The severity of aphasia varies by patient and level and location of damage to the brain. A brain CT was done and discovered subacute densities in both the right (R) frontal and parietal areas of the brain are involved, MRI revealed complete occlusion of the right-side thrombosis of the internal carotid artery. This occlusion can lead to several typical stroke symptoms such as a decrease in motor function and ability, impaired speech and language, a change in personality, a decrease in memory function, a loss of vision and sensation, and essentially a loss of function and independence the individual had prior. Past medical history of the patient revealed hypertension, diabetes, heavy weight and long-term smoker as well. Hypertension, diabetes increases the risk for stroke. The neurologist was diagnosed the patient with an ischemic stroke and right carotid occlusion with expressive aphasia and left hemiparesis. it is weakness on one side of the body. Patient normally has the potential to move the weaker side but the lack of muscular strength makes it difficult to initiate movement. This one-sided weakness is extremely common following a stroke and can affect the legs, arms, face, hands, mouth, and feet. This makes it more difficult to perform daily activities including day-

to-day communication making it necessary for therapy after a stroke. Initial diagnostic evaluation conducted was to determine the patient's cognitive skills through MMSE, check oral motor mechanism for safety swallowing and masticating or chewing food by mouth (PO). It was noted that the patient had a decline in labial and lingual strength; he had poor range of motion of lingual movement. Protrusion and retraction moderately affected. Facial asymmetry was noted due to a significant left facial droop as a result of the stroke. It was noted that the patient suffered from significant left sided neglect including upper and lower extremities and vision. These symptoms proved the patient suffered from significant left side weakness of the body. To determine the patient's swallow function, a bedside swallow evaluation was performed. This evaluation measures the patient's ability to trigger the swallow response and initiate the reflex. The most important concern with swallowing among stroke patients is aspiration. Aspiration is the entry of food or liquid into the airway. This is common in stroke patients due to loss of coordination and strength of oral and facial muscles used in the swallowing reflex. Deficiencies in the oral, pharyngeal and laryngeal phases of swallowing all are risks for aspiration. Aspiration can lead to pneumonia or a lung infection if these contents are released into the lungs instead of the stomach or in extreme scenarios it can lead to death. Symptoms of aspiration include coughing after swallowing, difficulty breathing when eating or drinking, a change in voice, gurgly voice and fever. The ultimate goal of a dysphagia evaluation is to find out the consistency of food and liquid that will prevent aspiration from occurring and ensure a safe swallow response is triggered in the appropriate amount of time. The liquid levels for patients with dysphagia from smallest restricted to most restricted are as follows:

1. Liquids: thin (non reduced)
2. Level 1(reduced): nectar, tomato juice (mild thick)
3. Level 2 (reduced): honey (moderately thick)
4. Level 3(reduced): pudding (extra thick)

To test thin liquids such as water, the patient was given an ice chip however, showed immediate signs of aspiration after letting the chip melt and eventually attempting to swallow.

The next test performed consumption of nectar (tomato juice) thick liquids. A nectar thickening packet was added to water or juice to test the patient's response to this viscosity. The patient was given two tablespoons and responded with an immediate cough and throat clear, again suspecting signs of aspiration. The next level of honey thick liquids was conducted using a honey thickening packet mixed with water. The patient responded with a delayed cough and throat clear as well as a spoke with a wet vocal quality. Due to these responses and clear signs of aspiration at each level of viscosity, then was recommended continuing a short term nothing by mouth (NPO) diet meaning non-oral means of nutrition, hydration and medication. The patient was diagnosed with oropharyngeal dysphagia. Initial short- and long-term goals were set for the patient.

### 3. SPEECH, LANGUAGE, COGNITIVE AND PSYCHOLOGICAL EVALUATION

Auditory Comprehension: it was tested through several tests and the outcome is as

1. Close ended questions Simple yes/ no: respond 80%
2. Open ended questions: respond limited
3. Receptive identification: 80%
4. Followed 1 step simple command: 100%
5. Followed 2 step simple command: 30%

Automatic speech- it was tested through several exercises and the results are as follows.

1. Counting from 1-10: 50% accuracy; he started counting but stopped at 7 due to inability to maintain attention long enough to complete counting
2. The days of the week: he stated the first 3 days then stopped due to lack of attention
3. The months of the year: he was unable to complete all 12 months
4. Object Naming: 80%
5. Divergent Naming: This assignment focuses on the capability to name items in a particular category. He was asked to name 3 states and was able to do so. However, he was unable to name 3 vegetables and 3 animals. This shows a deficient in the flexibility in her cognitive ability.
6. Convergent Naming: this assignment focuses on the ability to name the concept that is being described. For example, described coffee as brown, hot, liquid, caffeine, he should answer coffee. But he could not understand the test sufficient to complete it.
7. Conversation Skills: Due to distraction and lack of attention the patient could not sustain a conversation for longer than 30 seconds.
8. Problem Solving: he showed poor insight of the situation and lack of executive functioning to plan/organizing, remember details, pay attention, act on previous experience, when proposed a problem to him.
9. Memory: long term memory intact but short-term memory affected that is mentioned in MMSE table in detailed

Goals

1. Improvement in cognition, aphasic symptoms, memory, language, and attention
2. Improvement in oral motor mechanism for verbal and nonverbal tasks
3. Improvement in dysphagic disorder, reduced aspiration
4. Short term goal: patient will be enrolled in speech, cognitive, dysphagia therapeutic treatment

Long term goal: Patient will be able to improve his oral motor range of motion, cognition and tolerated PO (by mouth) trials without signs & symptoms of aspiration. The speech/language therapeutic treatment was recommended 2 times per week for 2 weeks or until discharge from hospital

Table 1 Speech language skills and its severity level

Parameters/ skills	Level of severity
Problem solving	Moderately affected
Auditory comprehension	Mild affected
DDk /oral motor mechanism	Severely affected
Phonation	Severely affected
Articulation	Moderately affected
Orientation	Moderately affected
Memory deficit	Moderate to severely affected
Dysphagia	Mild to moderately affected
Respiration	Mild to moderately affected
Aspiration	Mild to moderately affected /present

**4. TREATMENT**

Oral motor, DDK, cognitive, psychological counseling and swallowing therapeutic treatment session was conducted with the patient. The patient was vigilant, conscious, and supportive for the session however, inaudible and abnormal speech was obvious. The left facial droop, drooling and left hemiparesis were shown with good improvement with buccal ice massage, massage with tongue depressor, blowing balloons, maintain air in mouth one or both sides. A left tongue deviation was noted and is common in stroke patients due to lack of strength on the affected side to keep the tongue midline. For this recommended total oral cavity exercises and massages. Before started dysphagia therapeutic treatment, super glottic swallow and supra supraglottic swallow were introduced for safe swallowing. The patient aspirated when given thin liquids, but showed no aspiration or difficulty with nectar thick liquids. The patient was also given teaspoons of pudding and did not show signs or symptoms of aspiration following these trails as well. Overall, there was an improvement in swallow function and alertness after conducting the therapies. Then recommend a PO diet or food by mouth. The levels of PO diets for dysphagia patients are as follows from most restrictive to least:

1. Solids- Regular: No restrictions
2. Level 1(reduced) soft textured foods that need little chewing
3. Level 2(reduced) Puree pudding like; requires very little chewing, a pureed diet including foods that are blended with creamy consistency. This thicker creamy consistency increases the amount of time before the patient has to initiate the swallow reflex allowing them to do so more safely and effectively. Moving up to this diet assisted the patient in reaching one of the goals set by the SLP at evaluation. Recommended to the patient that took nectar thick liquid and also took crushed medicines mix with pudding. Also recommended that took small sip of water or bites and juices with upright position and removed all distractions during meal.

**5. POST THERAPEUTIC EVALUATION OF COGNITIVE, PSYCHOLOGICAL, DYSPHAGIA, ORAL MOTOR SKILLS**

Table 2 shows the cognitive functions including orientation, attention, memory, language and visual spatial skills are significantly improved after therapeutic treatment.

Table 2 Mini Mental State Examination (pre & post testing)

Statement	Pre testing	Post testing
<b>Orientation of time</b>		
What year is this	1	1
What season of the year is it?	0	1
What is month and date	1	1
What day of the week		
<b>Orientation of place</b>		
What is the name of the place?	1	1
Which city we are in	1	1
What country is this	1	1
<b>Immediate recall</b>		
Say 3 object (apple, table, pen)	1	3
<b>Attention</b>		
Subtract 7 from 100, then subtract 7 from answer	1	3
Spell word "world" backward	1	4
<b>Delayed recall</b>		
What are the 3 words I asked you to remember	1	2
<b>Language /Naming</b>		
Show patient wrist watch and pen & ask to name them	1	1
<b>Repetition</b>		
Repeat the sentence exactly I say it ...no, if & but	0	1
<b>3 stage command</b>		
Give a piece of paper to patient, take it in your hand, use both hands, to fold it half and then put it on floor	1	3
<b>Reading</b>		
Ask pt to read a paragraph	0	0
<b>Copying</b>		
Give patient clean sheet of paper and ask him to copy a design	0	1
<b>Writing</b>		
Ask pt to write a complete sentence	0	1
	11	25

Table 3 The range of motion of oral cavity (pre & post testing) are significantly improved after therapeutic treatment

Oral motor examination	Status (pre-testing)	Status (post-testing)
Lips Closure & Rounding	poor	Good
Elevation of upper lip	poor	Good
Downward movement of lower lip	poor	Good
Hard palate	Intact	Intact
Soft palate	Poor movement	Satisfactory
Lingua range of motion	Poor	Moderately good
Protrusion	Not in mid line	In mid line
Retraction	Slow	Satisfactory
Upward movement	Poor	Satisfactory
Downward movement	Poor	Satisfactory
Movement of left	Severely poor	Moderately good
Movement of right	Severely poor	Moderately good
Licking of lips	Severely poor	Moderately good
Bulging of cheeks	Severely poor	Moderately good
Dislodging of food particles	Present	Moderately improved
Chewing	Slow	absent
Swallowing	Delayed and slow	<b>Moderately improved</b>
Aspiration	Present	Moderately improved
Sucking	Absent	Moderately improved
Production of /p/	Slow	improved
Production of /t/	Absent	improved
Production of /pataka/	Absent	Present
Drooling	Heavily	Normal
		Absent

Facial symmetry	Droopy left side /asymmetrical	symmetrical
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## CONCLUSION

Therapeutic treatment focused on three goals

1. Improvement in cognition, memory, language, and attention
2. Improvement in oral motor mechanism for verbal and nonverbal tasks
3. Improvement in dysphagic disorder, reduced aspiration

MMSE was used to assess cognition, memory, language and attention. Patient shown satisfactory improvement in these areas (table 2), on initial evaluation the patient score on MMSE was 11/30 and after 6 weeks treatment the score was 25/30, cognition, reception was significantly improved

Second goal was to restore the range of motion of oral cavity for verbal and nonverbal assignments. Patient shown drastic improvement in DDK nonverbal tasks as well as satisfactory improvement in verbal tasks (shown in table 3)

Third goal was to improve dysphagia and reduce aspiration. Even though the patient needs more recover due and is not safe to go back home and live autonomously, he established overall advancement during the time in hospital. The patient improved a pureed consistency diet (PO). She left the acute setting being proficient to consume pureed foods with goals to achieve a regular diet in the future. The patient took thin liquids during his stay in the acute setting, this was another significant achievement through dysphagia therapy. The patient left hospital with a positive prognosis of having the ability of getting back complete function. Now more focus on that the patient will now strive to achieve goal in the rehab settings such as complete improving attention, improving communication and cognitive skills such as solve simple problems, holding a longer conversation, and controlling topic maintenance. The occupational therapist (OT) noted the patient suffered from rigorous decline in self-care meaning the patient needed full support in activities such as bathing, dressing, and eating, so that the patient was able of doing without assistance as before the stroke. The physical therapist (PT) who worked closely with the patient reported poor posture such as standing balance, a decline in left side strength both arms and legs, and gait or walking impairment. Both the OT and PT suggested acute rehabilitation as the patient was not presently able to function independently and needed therapy to regain strength and mobility. This is multidisciplinary approach and set an example of how psychology, speech, occupational, and physical therapy all play an imperative role in recovery of patients. The patient will have to go through intensive therapeutic treatment to restore function but with her present prognosis this will be attainable.

## PATIENT PSYCHO EDUCATION AND RECOMMENDATION

1. Smoking cessation
2. Control blood pressure

3. Control of diabetes
4. Low salt diet
5. Weight loss
6. Regular speech therapeutic exercises
7. Cognitive & psychological exercises

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