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Case Report

Case Study: Speech and Language Recovery in Severe Traumatic Brain Injury

Rimsha Shakeel, Khalil Ahmed, Sahibzada Nasir Mansoor*, Maryam Shakeel**

Armed Forces Institute of Rehabilitation Medicine/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, *Combined Military Hospital Okara/National University of Medical Sciences (NUMS) Pakistan, **Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

We report a unique communication recovery pattern, occurring two-year post-injury in a 40-year-old patient with severe Traumatic Brain Injury, who remained comatose for 3 months. Initially, the patient presented with severe deficits in expressive and receptive language skills, with minimal neologistic verbal output and poor communicative intent. Speech interventions included Language-Activity-Resource-Kit, Sona-Speech and Oro-motor Exercises. Speech therapy was divided into two phases: in Phase-I, interventions used for 3 months followed by Phase-II, in which the speech therapy modalities were customized and added to previous regime, which led to sudden and unanticipated recovery by 25th month post-injury. Over 6 months of speech therapy, patient showed remarkable and unanticipated recovery pattern in communication. Communication skills presentation and improvement over this extended time in Traumatic Brain Injury patients is highly unpredictable but at the same time the potential of human brain and neuroplasticity cannot be undermined. More research is needed for evidence-based practice in speech therapy for severe Traumatic Brain Injury.

Keywords: Communication, Recovery, Rehabilitation, Speech Therapy, Traumatic Brain Injury.

How to Cite This Article: *Shakeel R, Ahmed K, Mansoor SN, Shakeel M. Case Study: Speech and Language Recovery in Severe Traumatic Brain Injury. Pak Armed Forces Med J 2025; 75(1): 219-222. DOI: https://doi.org/10.51253/pafmj.v75i1.8090*

INTRODUCTION

There are over 27 million cases of TBI worldwide[1] and rehabilitation involves multi-disciplinary teams to reinforce neuroplasticity. Communication impairments is a devastating consequence of TBI, and success of social interaction is dependent on communication. Speech language pathologists (SLP) can design a communication therapy plan collaboratively with TBI patients, their family and their multidisciplinary-team[2] but in severe TBI, compensatory interventions are important as complete pre-injury restoration may not be realistically possible and early focus on compensatory interventions may not augment recovery.[3] Speech therapy interventions may include Oro-motor exercises, music therapy, vowel repetition, computer-assisted therapy (SONA speech) and LARK (Language Activity Resource Kit), which is used in moderate to severe language disorders where objects are associated with specific actions, making them helpful in treating language deficiencies resulting from brain trauma.[4] The patient in our case showed a unique pattern of recovery in communication 20-25 months post-injury as generally, improvement is observed in the first year of TBI.[5] In treatment of TBI, multiple interventions have synergistic effect compared to single intervention and prognosis is often uncertain.[6] Our patient showed improvement with customized plan 3 months post-speech-therapy. Thus, this case study aims to highlight an unanticipated recovery pattern in communication and the need of customized therapeutic approach.

Correspondence: Dr Rimsha Shakeel, Armed Forces Institute of Rehabilitation Medicine, Rawalpindi Pakistan

Received: 01 Feb 2022; revision received: 08 Mar 2024; accepted: 11 Mar 2024

CASE REPORT

Our patient, a 40-year-old male, who sustained a severe TBI, was admitted 20 months post-injury to our institute, for comprehensive indoor rehabilitation. He had a history of road traffic accident with initial GCS of 7/15, CT-scan of brain showed extensive left-temporal contusion, left sub-dural hematoma and linear fracture through parieto-occipital region. He remained comatose and required ventilatory support for 3 months. Speech therapy was initiated and in Phase-I, he underwent structured Oro-motor exercises, music therapy and vowel repetition. After 3 months of regular speech therapy, customized interventions were added in Phase-II including Sona-speech, breath/phonatory drill and LARK after which he showed an unanticipated and significant response 23 months post-injury. Quantitative Communication Evaluations as compared to Phase-II showed remarkable recovery in La-trobe communication scale, disability rating scale and functional independence

measure (Table-I). Qualitative communication characteristics are highlighted in Table-II.

As for temporal course of communication response, in Phase-II of speech therapy, he elicited

Table-I: Quantitative Communication Evaluations Profile

SCALES	Items	PHASE I 20-22 months post injury	PHASE II 23-25 months post injury	Interpretation
La trobe communication scale questionnaire	Initiation/Conversation Flow Disinhibition/Impulsivity Conversation Effectiveness Partner Sensitivity	LCQ Total 103/105	LCQ Total 84/105	Low score means decreased disability.
Disability rating scale	Eye opening Best communication ability Best motor response Cognitive ability for feeding, toileting and grooming. Level of functioning	DRS Total 16	DRS Total 9	Low score means decreased disability.
Functional Independence Measurement	Self-care Sphincter Control Transfer Locomotion Communication Social Cognition Score	FIM Total 18	FIM Total 36	High score means decreased dependency

Table-II: Qualitative Communication Evaluations Profile

Categories	Initial Assessment	PHASE I	PHASE II
Intent	Non-Intentional	Non-Intentional	Functional communication elicited.
Behavior	State of low responsiveness, mood, minimal response to social cues, Impaired orientation towards time, place, person.	Non context based persistent elated mood.	context based mood and greetings elicited, with anger on a specific person, crying spills also elicited often the reason not tangible. Offer prayers in a Masjid with attendants
Verbal Output	Extremely limited verbal output	Preservative sounds (a hm o)	Imitate single words with minimal prompt, mainly concrete nouns. Use some gestures to communicate effectively e.g (pain, come, stay, look, more) Spontaneous production of names of people not known to other attendants (AHMED, USMAN)
Comprehension	Severely impaired	Simple command follow with consistent gestural prompt and inconsistent physical prompt e.g Give, place it, take it.	Response maintained with inconsistent minimal prompt. Understands: NO, do it again, good job, For auditory identification, patients look at others for clue.
Verbal Repetition	Absent	Vowel with 70% accuracy Simple bi-syllabic Word level repetition displayed with decreased precision that sounded unintelligible	Preservative neologistic verbalization e.g DADA G/ BABA G with minimal self-correction
Serial Speech	Absent	Counting till 5 elicited with prompt 50% of accuracy.	Sing initial lines of few renowned local songs with strikingly appropriate intonation, rhythm, stress and pronunciation.
Naming	Head nod inconsistently	Pointing elicited	Self-correction elicited
Feeding	Fully Dependent Oral Feeding	Fully Dependent Cough on liquids with increased oral transit time. Client often forgets about bolus in mouth.	Client eats his food/liquid by himself under supervision on table and chair and indicates when he does not want more. Concept of sharing elicited Mild dripping of thin liquids which he cleans by himself.

unanticipated attainment of the following targets in chronological order.

On Day 1 of initiation of new techniques, patient displayed matching of **LARK-03** objects with prompt with 80% accuracy. He verbalized BYE with prompt in response to therapist goodbye. On Day 2, during his session on **SONA-speech**, he showed remarkable accuracy and volubility on four phonemes(a-o-e-ae). He verbalized *pani* (water) and *aao* (come) with maximal prompt, for which he was immediately reinforced. During breath/phonatory drill patient elicited sound (duz) with gesture of gun. Activities were intensively continued with the patient in his daily routine and multidisciplinary team members were guided on effective communication strategies to be adapted during respective sessions.

After one week, patient responded appropriately to social greeting (*salam*) and (*theek ho*) "I am all ok" in response to 'how are you?'. On LARK objects, he started matching of up to five real objects with minimal prompt at 80% of accuracy. The patient verbalized (*ball/shisa/kangi/ao/ya-ball-ha*). At this stage the main strength of patient was accurate and immediate repetition of words although the concept and comprehension of word was severely impaired. This strength of imitation was initially elicited as automated copying of gestures and expression of communicative partner. On Day 31, the patient could accurately match seven LARK objects without prompt and name them with phonemic cue. Auditory Identification was severely impaired, and he used gestures to communicate to go home and crying spells were observed. On Day 37, he could repeat after therapist *ya shisha hai* (this is a mirror) with maximal prompt on all previously introduced LARK objects. Context based drill on common expression was added. Concept of self-correction elicited by holding the object, perseverance on a neo-logistic response and saying *nahi* (no). After trying for five seconds, he needed therapist's help, that was immediately reinforced. After 5 months of regular speech therapy sessions, he become more responsive to social cues, calling other person with gestures and elicited context-based words. *Bus* (no more), *aao* (come), *chup* (quiet), *nai* (no), *jee* (yes), *chaey* (tea), *pani do* (Give-water), *avi* (so what?), *haw* (surprise). Patient elicited humour by hiding the object in pocket and telling the attendant to not tell the therapist. Emotion Stimulus cards were added, which he immediately copied and intoned. Correct response to given taste were observed. Sona-Speech was also used regularly, resulting in remarkable imitation of sound with minimal to no prompt (ba-ba-ba/ta-ta-ta/pa-pa-pa/ja-ja-ja/ha-ha-ha/sha-sha-sha).

DISCUSSION

Our findings highlight the ability to regain language after severe TBI. A study suggested that speech-evoked responses in bi-hemispheric language-processing cortex re-emerges by 6 months post-injury in people who sustained severe TBI.[7] During 6 months of speech therapy, our patient had accurate copying of gestures/expressions of the communicative partner that was often misunderstood as functional communication in Phase-I but on detailed examination, the presentation was confirmed to be non-functional/automated and improvement was observed after Sona-Speech supplements therapy was added in Phase-II because of real-time processing for visual and auditory biofeedback.[8] Breath/phonatory drill also enhanced verbal output and our patient showed response to LARK-objects, accurately imitating verbal output. Discourse deficits in TBI can continue for 12 months while 3, 6, 9 and 12 month are peak recovery period.[9] A systematic review highlighted that interrelationships between therapy should be focused on in future research.[10] Hence, evidence-based practice should be enhanced to effectively customize therapy for patients with severe TBI.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

RS & KA: Data acquisition, data analysis, critical review, approval of the final version to be published.

SNM & MS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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