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APHASIA IN HINDI-ENGLISH BILINGUAL SPEAKERS: A CASE STUDY

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INTRODUCTION

Harold Goodglass (1993) defines aphasia as referring to a family of clinically diverse disorders that affect the ability to communicate by oral or written language, or both following brain damage. In some cases, speech production and comprehension are both abolished, whereas in other cases, only a single channel is affected. Thus, the term aphasia is an umbrella concept combining a multiplicity of deficits involving one or more aspects of language use. Aphasia has been defined as an acquired disorder of previously intact language ability secondary to brain disease. The words in the definition are carefully chosen to emphasize the acquired nature of the disorder, the involvement of language and not only speech, and the relationship to brain disease. While philosophers have debated whether thought can exist without symbolic language, patients with severe aphasia have been found capable of nonverbal thought.

Most aphasic patients are impaired in many aspects of language. The distinctive syndromes that occur regularly enough to have earned labels (such as Broca's aphasia) are identified by patterns of relative impairment and preservation among many dimensions of language ability such as word retrieval, articulation, auditory comprehension, and repetition. Some of the individual features that have proven the most stable for purposes of recognizing patterns of aphasia are empirically observed "positive symptoms" that are typical of people who have suffered injury in particular sites in the language zone. One such feature is non fluency of speech output, characteristic of most aphasics with anterior speech zone lesions. Another is

pragmatic paraphasia – the fluency produced, but grammatically and semantically non coherent output common after temporal lobe lesions.

LANGUAGE REPRESENTATION IN THE BRAIN

Since the middle of the 19th century, there has been a basic assumption that it is possible to find a direct relation between language and brain, and a continuous effort to discover direct centers where language capacities may be localized.

In the early part of the 19th century, F. Gall and G. Spurzheim put forth theories of localization, holding that different human abilities and behaviors are traceable to specific parts of the brain. This notion actually served as a stimulus to the scientists interested in brain function in the mid-19th century, and it gave birth to phrenology, a "theory" put forth by Spurzheim. He based his theory on the idea that personality traits and intellectual abilities could be determined by an "examination" of the bumps on the skull.

Although phrenology has long been discarded as a scientific theory, Gall's view that the brain is not a uniform mass and that some linguistic capacities are functions of localized brain areas has been upheld.

It was not until 1861 that language was specifically related to the left side of the brain. At a scientific meeting in Paris, Paul Broca stated that we speak with the left hemisphere in his report that damage to the anterior part of the left hemisphere resulted in loss of speech, whereas damage to the right side did not. Language then is said to be lateralized. Lateralization is the term used to refer to any cognitive functions that are primarily localized to one side of the brain or the other.

Today there in a consensus that the so called higher functions are greatly lateralized. Research shows that though the nervous system is generally symmetrical, the two sides of the brain form an exception. During development, the two sides of the brain become specialized for different functions: lateralization takes place.

The study of patients with language disorders caused by localized cerebral lesions is only one of the methods used to gather information about the organization of language in the human brain. To the field of first and second language acquisition, the neuroimaging techniques (PET scans, functional MRI) are of much greater significance.

A large series of recent studies led investigators to the formulation of the hypothesis currently dominating in the field of neurolinguistics, namely that different languages are organized partly in common areas and partly in specific and separate areas in the brain. The differences in cerebral representation have been attributed to a natural

variability in the linguistic experience of individuals. Specific factors such as age, manner of acquisition/ learning of a language, level of proficiency, and linguistic environment are believed to be responsible for the biological differences in language localization in the bilingual brain. A weak consensus in the field seems to be emerging to suggest that the level of proficiency is a critical determinant of brain activation patterns in language tasks. A strong body of evidence exists to suggest a common cortical representation for L1 and L2 when levels of proficiency in both languages are comparable. Kim et al (1997) argued for a single area and no spatial separation of L1 and L2 when both languages are acquired early, implying high levels of proficiency in both languages. It has been found that in fluent bilinguals who use both languages in daily life lexical search utilizes common cortical areas. Moreover, similar brain regions are active even when languages are distinct, and even when L2 is acquired later in life.

Evans et al (2002) found that for participants from a dual language environment, both early and late acquisition of a second language resulted in a left hemisphere localization of the L2. The age of exposure to the second language played a decisive role only in the case of bilinguals from a single language environment. It was suggested that an interaction between age and language environment mediates the lateralized representation of early and later learned languages. It was speculated that perhaps the left hemisphere has become adapted to select language parameters from the linguistic environment during an early period in life. If, however, a language is not learned or even heard until beyond this period, then more bilateral or even right hemisphere representation may take place.

TYPES OF APHASIA

David Crystal defines aphasia as a 'communication disorder caused by the brain damage and characterized by complete or partial impairment of language comprehension, formulation and use.' The left hemisphere is said to be the language centre for almost 90% of the right handed people and over 50% of the left handed. The left half of the brain is dominant for the perception and production of almost all aspects of non-emotional language including reading, writing, speaking, naming, and the comprehension of the grammatical, syntactical, and descriptive components of language, including time sense, verbal concept formation, analytical reasoning, and verbal memory. When this gets damaged, depending on the location of the lesions, certain or all aspects of speech and language get impaired, and the condition, as described above is called aphasia. The localization hypothesis discussed in a number of aphasia studies indicate how lesions in different cortical areas lead to interference/ disruption of one/ more of these functions sometimes all of them affected in global

aphasia. At times only the verbal production of the patient seems to have been affected and the comprehension remains intact. This happens when the lesion occurs in the front of the frontal lobe of the left hemisphere. This region is known as the Broca's region and the condition is often referred to as Broca's aphasia.

When the lesions occur at the temporal lobe, then the patient's cognition gets impaired while his production is intact. As a result of this, the patient often tends to produce grammatically correct sentences which are semantically anomalous or incorrect. Sometimes the patient is completely incoherent – is unable to understand what he/ she is saying. This condition is referred to as Wernicke's aphasia.

At times the arcuate fasciculus, that connects the Broca's and Wernicke's areas gets damaged. In this condition, although comprehension is intact, the patient cannot repeat words or read out aloud. This is known as conduction aphasia.

Various studies talk about global aphasia as essentially a total aphasia due to massive left hemisphere damage involving the entire language axis, that is, the frontal, parietal and temporal convexity. Comprehension is severely reduced as is the ability to speak, read, write, or repeat. Patients are usually but not always, paralyzed on the right side due to damage extending into the motor areas of the frontal lobe. The symptoms are a combination of those of Broca's and Wernicke's aphasia. However, what is interesting to point out is that in patients of global aphasia other cognitive skills remain functioning – such as memory and attention, reasoning, emotive communication, etc., which are mostly attributed to the right hemisphere functions.

CLINICAL ASPECTS OF APHASIA

Patients with aphasia find themselves abruptly crippled in their ability to interact with or even comprehend those around them. They are often totally or partly immobilized by paralysis. The symptoms of aphasia may be modified or even overshadowed by other behavioral changes induced by the same brain injury; these may include apathy, depression, or euphoria.

Although aphasia is most commonly seen as a result of stroke in older individuals, strokes of various types leading to aphasia occur in adults of all ages. Other types of brain lesions (trauma, tumor or infection) may also produce aphasia in young adults. (Harold Goodglass, Understanding Aphasia, 1993)

TYPES OF APHASIA ASSESSMENT

Broadly, the following parameters are assessed during an examination of speech and language skills for aphasia:

- Fluency, vocal quality and loudness, and the pronunciation and clarity of words.
- Strength and coordination of speech muscles.
- Semantics and syntax are evaluated.
- Understanding and answering both yes-no and Wh- questions.
- Understanding extended speech.
- Ability to follow simple and complex directions.
- Ability to tell an extended story (both verbal and written)
- Can the patient tell the steps required to complete a task or can he or she tell a story centering on a topic and chaining a sequence of events?
- Can he/ she describe the plot in an action picture?
- Is his/ her narrative coherent or difficult to follow?
- Can the patient recall the words required to convey an idea?
- Is the patient expressing himself/ herself in complete sentences, telegraphic sentences or phrases, single words?
- Is speech slurred and difficult to understand or is it intelligible?
- Social communication skills.
- Ability to interpret jokes, or sarcastic comments
- Proficiency with initiating conversation and conversational topics.
- Ability to clarify communication when the listener does not understand.
- Reading and writing of letter, words, phrases, sentences, paragraphs.
- Ability to use augmentative or alternative communication aid.

The Handbook of Neurological and Speech and Language Disorders mentions the following comprehensive aphasia batteries:

A. Minnesota test for differential diagnosis of aphasia (mtdda)

Based on psychometric standardization that was very sophisticated for the time, the MTDDA's classification system yielded five major profiles of language impairment and two minor profiles. Major classification includes simple aphasia, aphasia with visual involvement, aphasia with sensorimotor involvement, aphasia with scattered findings compatible with generalized brain damage, and irreversible aphasic syndrome. The two minor profiles are mild aphasia with persisting dysfluency and aphasia with intermittent auditory imperceptions. It has several strengths for clinical practice. It is the only aphasia battery that measures reading rate. It contains a much wider range of verbal tests than most assessments, including giving biographical information, retelling a paragraph, and defining words. The extensive range of subtests within the MTDDA however, make it time consuming to administer and has raised the criticism that it goes beyond the measurement of speech and language and ventures into measurements traditionally used in intelligence testing.

B. The porch index of communicative ability (pica)

The PICA is a multidimensional scoring system that describes a range of behaviors in a manageable numerical scoring system. It does not cluster its 18 subtests according to modality of response. Rather it utilizes 10 common objects throughout the subtests ad clusters the most difficult subtest for each modality at the beginning of the tests of verbal, gestural, and auditory ability. Graphic subtests are the final section, also putting the most difficult subtests first. The PICA is used for planning treatment as performance patterns indicate the areas of language function which are successful but challenging for the patient.

C. NEUROSENSORY CENTRE COMPREHENSIVE EXAMINATION FOR APHASIA (NCCEA)

The NCCEA has 20 subtests, with four extra tests to be used when visual and tactile deficits are suspected as contributing to the performance. Four arrays of eight common objects are used in eight of the subtests. It contains tests of word finding, immediate verbal memory, verbal production and fluency, decoding ability, reading and writing and articulation.

D. BOSTON DIAGNOSTIC APHASIA EXAMINATION (BDAE)

The BDAE has become one of the most frequently used aphasia batteries. It has been used by researchers and clinicians alike to classify aphasic patients into the traditional Boston classifications of Broca's, Wernicke's, conduction, anomic, transcortical motor, transcortical sensory, and global aphasia syndromes. The test consists of 27 subtests assessing fluency, auditory comprehension, oral expression, repetition, reading, and writing. It also includes suggestions for supplementary testing of verbal

and nonverbal functions divided into psycholinguistic explorations and spatial-quantitative testing. Because of limited reliability data and lack of summary scores, the BDAE has not been typically used in literature to document recovery.

E. WESTERN APHASIA BATTERY (WAB)

The WAB by Dr Andrew Kertesz minimized the subjective nature of syndrome classification with the BDAE by similar content and purpose but with specific test scores assigned to the profiles and an additional advantage of access to summary scores. Although utilized by many for studies of aphasia taxonomy and recovery for many years prior, the complete test was not published until 1982.

F. THE MULTILINGUAL APHASIA EXAMINATION

This was developed by Benton and Hamsher to meet the need for an aphasia test that not only would be translated into another language but would have equivalent content for each language, allowing real comparisons across cultures.

G. THE COMMUNICATIVE ABILITIES IN DAILY LIVING TEST (CADL)

The CADL test was authored by Dr Audrey Holland to assist the clinician in assessing a patient's functional language skills, with the primary functions of language – understanding and conveying a message – as the main skills to be assessed. The CADL focuses much less on the adequacy of the linguistic components of the message than traditional aphasia tests, as long as the substance of the message is conveyed. Holland incorporated natural language activities and natural style to offset the usual formal, unnatural testing situation. She also incorporated humor, metaphor, social conventions, and role playing into the testing situation. The test provides a useful adjunct to the formalized testing, especially when assessing strengths of a patient's retained language abilities.

H. THE BOSTON ASSESSMENT OF SEVERE APHASIA (BASA)

The BASA also attempts to look for retained language abilities upon which to build or facilitate better communication. Most of the items on the test were selected because research has shown that many of the more severely impaired aphasic patients could naturally perform some language tasks that formal testing failed to identify. Tasks such as identifying famous people, repeating emotionally loaded words, or matching numbers to coins evoke residual skills in some patients.

G. THE APHASIA DIAGNOSTIC PROFILES (ADP)

The ADP does not strictly meet the criteria for an aphasia batter in that reading and writing are minimally assessed. However, it does serve a quite useful function for assessment in allowing the clinician to document not only the nature and severity of impairment but also the degree to which certain abilities are spared and the general social emotional state of the patient.

H. BILINGUAL APHASIA TEST (BAT)

Developed by Michel Paradis and associates, BAT uses a quadrimodal, linguistically multidimensional approach. It is quadrimodal in that it examines language performance in all four modalities – hearing, speaking, reading, and writing. It is linguistically multidimensional in that, for each modality, language performance is investigated along three dimensions – linguistic level (phonological, morphological, syntactic, lexical, semantic); linguistic task (comprehension, repetition, judgment, lexical access, propositionizing); and linguistic unit (word, sentence, paragraph). The test consists of three main parts: part A for the evaluation of the patient's multilingual history; part B for the systematic and comparable assessment of language disorders in each language known by the subject; and part C for the assessment of translation abilities and interference detection in each language pair. Assessment by BAT provides a quantification and classification of language disorders for each language, thus allowing a direct comparison of performances in the different languages known by the patient.

CASE STUDY

The test conducted to assess the patient's speech condition is the Boston Diagnostic Aphasia Examination. Along with it, some free dialogues were also carried out to observe and assess the flow of speech etc. The test and dialogues took place in a domestic, informal environment.

ASSESSMENT TEST

I EXPOSITORY SPEECH AND OPEN ENDED QUESTIONS

Since the test was conducted in a comfortable, domestic setting, not too many initiating questions were asked. However, the patient was asked to describe what he did the previous day. The response (mixed in Hindi and English) is given below. It should be noted that in order to motivate the patient to speak, specific questions had to be asked at times.

Subah…utha…aur chai…thoda sa…paper…nal… aur TV…aur sone ke liye..(phir) utha…aur khana thoda sa…aur sangam…(shows ticket of the movie that he saw)

When asked how he liked the movie, the response was:

Bahut bekar hai

Shaam mein…chai…thoda sa…aur…sair…bahut sair…aur TV…aur khana…aur…sone ke liye.

Comments: Speech is very disjointed. There are no complete sentences. Mostly nouns are used. No tense markers.

II NAMING OBJECTS

The patient was asked to name objects that were pointed at.

Bed - *Room… Bed*

Pen - *pen*

Fan - *Fan*

Cup - *glass*

Spoon - *soon*

Computer - *computer*

Newspaper - *paper*

Phone - *Phone*

Table - *Table*

Door - *taala* (lock)

Yellow - no response

Blue - no response

Black - no response

White - no response

Green - *orange*

Circle - *gol* (round)

Triangle - no response

Square - no response

2 - *do* (two)

8 - *eight*

12 - *eleven*

55 - *fifty fifty*

100 - *hundred*

0 - *shoon* (shunya) (zero)

Comments: The patient can name most of the objects without any problem. The responses were very quick and spontaneous. Colour and shape recognition is completely absent. The recognition of numbers is there, but he takes time to answer, and some of them are slightly deviated like 50-50 for 55. This could be because for lower numbers like 2 and 8, he counted on his finger tips before replying, but could not do that for higher numbers like 55. However, he knew that he was wrong but also realized that he cannot say the number himself.

III AUDITORY VERBAL COMPREHENSION

The patient was asked simple yes-no/ and-or questions.

1. Did you go to Connaught Place yesterday?

   Yes

2. Is the fan on in this room?

   Yes

3. Does a bicycle go faster or a train?

   Train

4. Does Tuesday come first in a week or Monday?

Tuesday

5. Is two kilos more or four kilos more?

Four

6. Is a horse bigger or an elephant?

Elephant

7. If I put a stone in water, will it sink?

Yes

8. Do we wear sweaters in summers?

No

9. Is the colour of the sky blue?

Yes

10. Do we close a door before locking it?

Yes

Comments: Eight responses out of 10 are correct. The patient was readily able to comprehend the question asked and did not take much time to answer. For question 4, although he did go through the days on his fingertips, yet the response was incorrect. A few questions had to be repeated twice, but no cues were provided.

IV SYNTACTIC DECODING

Two short stories were narrated in Hindi (translated into English below) and questions asked on the basis of these.

A. Once a snake and mongoose had a fierce fight. The snake fought bravely but was still not killed by the mongoose.

1. Which fought bravely in the fight, snake or mongoose?

Mongoose ×

2. Which died in the fight, the snake or the mongoose?

Mongoose ×

B. Sita and Kamala were two sisters. Sita was a better student than Kamala, but Kamala was better looking.

1. Who was better in studies, Sita or Kamala?

Kamala ×

2. Who was better looking, Sita or Kamala?

Sita ×

C. You can either take a bus or a train to go from Delhi to Agra. The train leaves Delhi at 7 am and arrives at Agra at 12 noon the same day. On the other hand, the bus departs Delhi at eight in the morning and reaches Agra at 11 am the same day.

1. Which departs earlier from Delhi, the train or the bus?

Bus…train √

2. Which reaches Agra earlier, the train or the bus?

Train ×

Comments*:* Out of the six questions asked, only one is correct, and that too did not come as a direct, confident reply, but more as an after thought. In the case of A1 and A2, it was felt that perhaps tended to recall the name of that animal that came last and so gave that as the answer for both the questions. In the case of B and C, however, the patient showed some discomfort and expressed a little confusion while listening to the story.

V WORD FLUENCY

The patient was asked to name as many vegetables as he could. The time given was about a minute. Most of the responses were in Hindi. The response was as follows:

Brinjal…onion…bitter gourd…apple…beans…potato…papaya

Comments: The patient took a comparatively long time to initiate the response and at first wanted some cues. Also, he tried to use some gestures for the vegetables, the names of which he could not recollect. In between, where he mentions the name of the two fruits, he realized himself that he was wrong.

VI AUTOMATIZED EXPRESSIONS

The patient was asked to name the days of the week. The response is given below:

Counting on his finger tips he first said *7*

When asked to name them he first started by saying *January, February*…

I then told him, that we were talking about days, but he still did not seem to realise his mistake. Ultimately, a cue had to be given - Monday…

His response then was: *Monday, Tuesday, Wednesday, Thursday, Saturday, Sunday*

Comments: The fact that he promptly gave the number of days instead of the names, probably suggests that he could connect with the word 'days' but not name. However, his spontaneous response when asked to name them was the name of the months which brings out some kind of confusion in his mind. Even after the cue, when he does come up with the right response, the sounds are not very clear and he misses one of the days.

VII SENTENCE FORMATION

The patient was given an example of how he would be required to make a sentence with the two words given to him as cues. This was also conducted in Hindi, translated in English below.

Example: If I say 'chidiya' (bird) and 'udna'(to fly), then a sentence can be made like 'chidiya udti hai' (a bird flies)

A. sona (to sleep) ladka (boy)

Ladka sone ke liye

B. khana (to eat) kela (banana) ladki (girl)

No response

C. chalaana (to drive) car aadmi (man)

No response

Comments: It was difficult to explain the exercise to the patient without giving the example and that was also repeated twice. The responses show very poor sentence formation ability - almost a complete loss to put noun and verb together

meaningfully. And the patient could realise this inability. He wanted to know the answers.

VIII REPETITION

The patient was simply asked to repeat what was said. The phrases/ sentences start form simple and go on to complex. This was also conducted in Hindi, translated below in English.

A. government

B. ten thousand

C. The enemy was defeated

D. They never came back.

E. The preparations for the wedding had begun.

F. It is a crime to demand dowry.

G. Bhakara Nangal Dam was the first dam to be built after independence.

H. Ashoka was moved by seeing the destruction, in the war and thereafter, he pledged to practice non violence.

Comments: The responses for A-E were very appropriate, with the sounds also being clear. What was noticed was that the patient not only repeated the sentence, but also imitated the speed at which one said the sentence. There was almost no response for F and G. After I finished saying the sentence, he just said 'nahin' (no) to perhaps indicate that he was not able to register the sentence. H was not tried.

IX WORD MATCHING

The patient was given written words to match with the identical word out of a number of options. The responses are given as appendix A.

Comments: Out of the 5 words given, 4 responses are correct, indicating that the patient's perceptual ability to match identical words is relatively better.

X DRAWING

The patient was asked to draw five different pictures. The responses are given as Appendix B.

Comments: The only incorrect response for this was the picture of a square - he drew a circle. What should be noted is that he drew a semantically related picture - a shape for a shape. Poor recognition of shapes was also seen when he was asked to name shapes. However, he did express hesitation in drawing it.

XI LEFT RIGHT ORIENTATION

The patient was asked to point to his left ear, right hand and right eye.

Comments: Although he could point to the relevant body part, left right orientation was completely absent.

XII CALCULATION

Certain simple arithmetic exercises were given to the patient in the written form (as multiple choices)

Responses are as follows:

a.	2 + 7 = 6	5	9	3	√
b.	4 + 3 = 8	4	9	7	√
c.	9 - 5 = 53	9	4	√	
d.	5 - 2 = 63	8	5	√	
e.	7 - 3 = 34	7	9	√	
f.	9/3 = 5	3	6	8	×
g.	4/4 = 3	1	5	2	√
h.	30/5 = 15	10	6	8	√
i.	4 x 2 = 6	4	2	8	√
j.	3 x 3 = 9	7	3	5	√
k.	3 x 6 = 10	18	12	9	×

Comments: Just two incorrect responses indicate good mathematical skills. Also, the responses were very quick and no visible calculation (on the finger tips etc) was done and no cues were asked for.

ANALYSIS OF THE ASSESSMENT

Based on the test and the general interaction with the patient, the following observations were made:

- He is able to very clearly and promptly able to name himself and his family members, and those people that he meets regularly.
- He is usually very clear in his mind about what he wants to convey and so for example if he cannot name an object, he will point towards it or pick it up.
- The recognition and comprehension of shapes and colours is completely lost.
- The ability to name objects is fairly good.
- Sentences are just not a part of his speech anymore. Most of the words used are nouns, action words have to be provided by the listener.
- Comprehension is very quick and accurate for general conversation, even jokes and sarcasms are grasped easily and quickly. However, comprehension of instructions is not as good.
- During the test, it was observed that he was himself very curious to know his correct and incorrect responses. In most cases, he did realize where he was wrong, and wanted to know the correct answer.
- There is no communication that takes place without word-support from the listener.
- There is a difficulty in finding the exact word, but semantically related words are used to express ideas, like 'nal' (tap) to indicate 'bath'.
- There is no writing ability possessed on his own. He can just write his own name without any assistance.
- Reading comprehension seems to slightly present as he reads the newspaper and anything that appears on the television screen. But this only seems to be in the mind as he cannot articulate what he reads.
- Numbers are unusually good, but only in the written form. Comprehension of spoken numbers is very poor, almost nil - he wants the number to be written down. The same is the case with time. He understands the time only when told in the written form.

- There is frequent interchange between the two languages. The patient was most proficient with – English and Hindi – when he talks himself. However, when asked to translate particular words/ sentences he cannot do so.

The study helped identify three main areas of maximum deficit: auditory recognition of numbers, syntax (inability to complete sentences), colours and shapes.

The present study is an attempt to devise effective and organized assessment and rehabilitation procedures for bilingual patients of aphasia. The identified deficit areas would be studied in further detail and efforts made to strengthen these aspects through organized assessment and rehabilitative procedures.

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