LANGUAGE FOLLOWING LEFT OCCIPITAL LOBECTOMY: A CASE REPORT

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The following case provides an apparent contrast to other cases of left occipital lobectomy presented during this conference. While other cases have been observed to demonstrate rapid, extensive postsurgical improvement in language functions, this case continues at one year postonset with severe limitations on memory and visual-dependent language tasks. Detailed diagnostic procedures are described along with a possible approach to improving noted deficits.

The Patient

Our case is a 39 year old right-handed, extremely intelligent and well-educated, black male who had complained of headaches for several years. On the night of hospital admission (December 23, 1970), the patient experienced a sudden onset of sharp pain in the back of his head, became dizzy, had several seizures, vomitted, and become unresponsive.

On December 31, 1970 bilateral carotid angiograms and an archogram were performed revealing an arterialvenous malformation in the left occipital region. The malformation measured approximately three centimeters at its greatest diameter and was close to the midline. A craniotomy was performed on January 7, 1971 with subsequent removal of a portion of occipital lobe measuring 5 x 6 x 3 centimeters. Within the central white matter, there was a vascular malformation that measured two centimeters by one and one-half centimeters, extending approximately four centimeters. A hemorrhage surrounded the malformation and extended over the subarachnoid space with probable extension into the parietal lobe. On January 8, 1971, the left scalp skin flap was turned again for evacuation of a large subgaleal hematoma. Operative procedures were tolerated well and the patient became more responsive. Neurological evaluation on January 9, 1971 revealed the patient was regaining function in his extremeties, but he demonstrated right hemiparesis, right homonymous hemianopia, and aphasia complicated by apathy. Attention span was limited to a few minutes and he fatigued easily.

The patient began physical therapy on February 2, 1971 and by February 16, he was able to come to a standing position with little assistance. He was able to transfer his weight from side to side but continued to have poor balance.

Bedside language testing revealed occasional ability to spell words aloud on verbal request by the examiner. The patient demonstrated no visual naming, reading, or writing abilities. Verbal facility was present but severely restricted both in appropriateness and length of utterances. The patient would typically begin to verbalize, but the attempt would fade part way through the sentence with no further attempts being made. The patient would become essentially unresponsive and unarousable. Standard language measures were not obtainable due to the patient's limitations.

The patient was transferred to an extended care facility for continued rehabilitation. On November 10, 1971, he was rehospitalized following episodes of sudden right-sided weakness and acute mental deterioration. It was determined that the patient had hydrocephalus which required placement of a ventricular-atrial shunt. Postoperatively, the patient did extremely well. Hemiparesis subsided almost completely. His affect and general neurological condition improved however, his aphasia was unchanged.

Language Diagnostics

The patient was seen in the Hennepin County General Hospital (HCGH) Aphasia Center following dismissal from another aphasia program due to lack of notable improvement in language functions. The Porch Index of Communicative Ability (PICA) (1967) was administered, one year post onset, and revealed the patient was functioning at the 26th percentile, Overall. This compared with 22nd, 19th, and 19th Overall percentile levels obtained at nine, ten, and 11 months postonset, respectively. Modality percentile levels were gestural 17th; verbal, 40th; and graphic, 19th.

Overall performance on the PICA suggested a guarded prognosis for recovery of language functions, particularly since the patient was one year postonset. However, improvement from previous test scores was apparent, prognostic data currently available was largely based upon recovery from aphasia resulting from cerebrovascular accidents, and the patient's performance was not consistent with that typically observed in aphasia.

The patient had minimal difficulty recognizing objects (PICA subtests VIII and XI), and he demonstrated awareness of their appropriate applications (PICA subtests II and III). When required to identify and point to objects by their function (subtest VI) or by name (subtest X), only one of 20 responses were correct. Similarly, when asked to describe the functions of objects (subtest I) or name them (subtest IV), no correct responses were elicited. Attempts at writing or copying words were only partially intelligible, and they were perseverative. Copying geometric forms was somewhat better.

The contrast between the patient's test results and his informal language behavior was notable. Prior to and following

testing, the patient presented essentially normal conversation with only occasional difficulties with proper names. Additionally, when tasks similar to PICA I and IV were presented auditorily (e.g., "What do you do with a toothbrush?" and "What do you use to pound nails?") responses were immediate and accurate. Language difficulties appeared to be restricted to tasks requiring the use of the visual modality, however a more comprehensive description of the patient's language problems was deemed necessary.

A battery of perceptual and language tasks was devised and administered to the patient. Table 1 lists the tasks employed. Results are expressed in percentage correct and PICA multidimensional mean scores where available.

TABLE 1. Patient Performance on a variety of speech and language tasks.

TASKS	PICA MEAN	PERCENT CORRECT
Auditory - Verbal		
Name Object By Its Sound		100
Simple Addition		100
Provide Opposites		100
Simple Subtraction		100
Simple Division		100
Repeat Complex Sentences		100
Repeat Single Words (PICA XII)	15.0	100
Name Objects, Contextual Cue		100
State Colors of Objects Named		91
Spell Words (Through Grade 12)		90
Conversational Appropriateness, Grammatical Structure		90 100
Define Words		80
Name Items Defined By Examiner		75
Interpret Proverbs		70
Name Items Spelled By Examiner		70
Relate Premorbid Events		70
Simple Multiplication		66
Provide Associations		62
Complete Sentences (PICA IX)	8.1	40
Name Items Within Categories		25
Relate Recent Events		10
Name People of Recent Contact		0
Orientation to Time and Place		0

TABLE 1. Continued.

TASKS	PICA MEAN	PERCENT CORRECT
Auditory Gestural		
Point to Picture by Its Sound		100
Demonstrate Object Named		100
Demonstrate Action Named		100
Oral Movements/Facility		100
Demonstrate Object Heard		100
Demonstrate Use of Object Heard		90
Auditory Graphic		
Write Names to Command (PICA C)		0
Write Names Spelled by Examiner (PICA D)		0
Write Names Spelled by Examiner, Eyes Closed		0
Write Own Name		0
Visual - Verbal		
Describe Gestures of Examiner		100
Describe Environment of Examiner		80
Describe Famous Pictured Persons		70
Name Colors		40
State Function of Objects (PICA I)	5.3	0
State Function of Pictured Objects		0
Name Objects (PICA IV)	5.4	0
Name Pictured Objects		0
Name Famous Pictured Persons		0
Produce Sounds of Pictured Objects		0
Visual - Gestural		
Imitate Gestures of Examiner		100
Match Duplicate Objects (PICA XI)	14.6	100
Match Pictures to Objects (PICA VIII)	14.4	100
Match Similar Pictured Faces		100
Columbia Mental Maturity Scale (1-50)		100
Point to One of Three Letters (Tactile Input) Left	14.0	100
Right	12.1	76
Point to One of Three Pictures by Function	12.5	100
Demonstrate Function of Pictured Objects	11.5	80

TABLE 1. Continued.

TASKS	PICA MEAN	PERCENT CORRECT
Point to Body Parts in Picture	11.3	60
Peabody Picture Vocabulary Test (PPVT)		50
Match Printed Words to Picture		40
Match Colors to Objects		40
Columbia Mental Maturity Scale (51-100)		36
Memory for Designs		30
Point to Objects by Name (PICA X)	6.6	10
Point to Objects by Function (PICA VI)	5.9	0
Read Function of Objects (PICA V)	5.6	0
Read Name of Objects (PICA VII)	5.8	0
Tactile - Verbal		
Name Objects Left Hand		70
Name Objects Right Hand		60
Spell Names of Objects Left or Right Hand		40
Name Letters Held in Left Hand		0
Name Letters Held in Right Hand		0
Name Letters Printed in Left Hand		0
Name Letters Printed in Right Hand		0
Tactile - Graphic		
Write Names of Objects, Eyes Closed		0
Write Names Spelled by Examiner, Eyes Closed		0
Write Own Name, Eyes Closed		0
Tactile - Gestural		
Match Palpated Object to Duplicate		100
Demonstrate Function, Object in Hand		
PICA II	10.4	90
PICA III	11.6	80
Olfactory - Verbal		
Name Item by Its Scent		100

Test Results

Results from the battery of tasks support our initial impressions which were based upon PICA results and other observations. The input levels of reception, perception, and association for the visual, auditory, and tactile modalities are considered first. Discussion of the output stages, conceptualization, formulation, and expression, within the graphic, verbal, and gestural modalities follows. Finally, inferences drawn from test findings are applied to input integrative processes.

Input

Reception: The patient demonstrates good basic visual, auditory, tactile, olfactory receptors with two exceptions. Visually, the patient has a right, homonymous hemianopia and complains of intermittent diplopia. The first problem is easily compensated for, and the second problem is reduced with the use of an eye patch or by waiting for its remission during the performance of visual tasks.

Perception: It can be inferred that perception is accomplished within each input modality. The patient is capable of sorting incoming stimuli and differentiating them on the bases of various characteristics. Visually, he is capable of differentiating pictures, objects, and actions by color, configurations, or other distinctive features. Auditory differences are easily perceived as demonstrated by his ability to repeat words and sentences, identify animate and inanimate objects from the sounds they make, and perform tasks requiring higher-level auditory processing. Tactually, the patient can palpate objects and readily select corresponding duplicate objects with either hand, eyes closed.

Association: At the association level, a number of tasks demonstrate the patient's abilities to decode, label, and hold incoming stimuli via the auditory and tactile modalities. Visually, however, there is a consistent tendency to fail at this level. It is apparent that the input systems begin to "internalize" incoming stimuli at the Association level using linguistic symbols derived from past experiences. When required to attach linguistic symbols (as in naming objects) to incoming visual stimuli, the patient almost invariably arrives at a "mismatch." Varied, similar tasks are appropriately attempted but performances are inaccurate and frequently become perseverative, thereby indicating that visual linguistic associations are not attainable.

Reverse tasks result in similar performances. When presented with auditory stimuli which must be matched to their corresponding visual representations, such as pointing to objects named, the patient is incapable of success beyond a chance level.

Output

It is apparent from test results that the processes of conceptualization, formulation, and expression for the verbal and gestural output modalities are highly functional when auditory and tactile inputs are utilized, particularly on tasks not drawing upon recent memory. When utilizing visual input, only gestural outputs are consistently accurate. For example, when shown either a real or pictured object and requested to demonstrate its function, the patient is capable of correct conceptualization of its use, formulation of a series of acts, and relatively accurate expression. Gestural responses utilizing upper extremeties are frequently tainted by awkward, apractic-like movements but are, for the most part, clearly disernable as accurate in the concepts being conveyed. Verbal responses cannot be allowed to accompany gestural acts because of their influence upon the accuracy of gestural responses. Given the freedom to verbalize during gestural responses, the patient's gestures become consistent with what he is verbalizing about a visually presented object. The verbal reports are, however, totally inaccurate and, for the most part, perseverative. When he is instructed to terminate verbalization during the performance of gestural acts, accuracy of gestural performances recover.

The use of visual stimuli requiring verbal responses result in reasonably accurate reports under three conditions. Under the first condition, the patient was asked to describe the examiner's activities while opening a window, turning pages in a book, dialing the telephone, etc. On this task, the patient was accurate in describing the gestures but frequently misnamed the objects utilized in the task. The second condition required the patient to describe characteristics of famous pictured persons. When shown a picture of a famous actress, the patient stated "She's in showbusiness and she is married to a man who is in showbusiness." The third condition required the patient to describe gestures when the examiner demonstrated the use of common objects. The patient's responses were consistently accurate on this task.

Visual stimuli requiring graphic responses resulted in success only on copying of large, simple forms and spontaneous drawing of common objects such as a tree, automobile, or a man's face.

Interpretations

It is surmised from the obtained data that the patient's primary difficulty is in making associations between certain visual stimuli and their auditory-verbal counterparts. The patient cannot perform visual-verbal tasks but is capable of

performing visual-gestural tasks with minimal difficulty. Apparently, it is not necessary to attach verbal labels to objects or acts during the execution of purely gestural activity. On visual-verbal tasks, however, such labeling of objects and acts is the only means possible of demonstrating concepts. With the apparent disruption of visual-linguistic associations, verbal descriptions become obliterated. Similarly, as auditory or verbal components are introduced into otherwise visual-gestural tasks, the patient's performance deteriorates.

Graphic output is somewhat more difficult to analyze since no graphic productions beyond those mentioned above could be considered accurate regardless of the input being utilized. It is suggested that success is attained on visual-graphic tasks of copying because association and/or conceptualization of linguistic information is not required on such tasks. Such tasks can be accomplished utilizing visual reception and perception along with formulation and expression of elements perceived. It is proposed that graphic conceptualization, formulation and expression may be possible for this patient, utilizing either auditory or tactile inputs, except that in order to produce graphic responses, it is first necessary for the patient to revisualize a character which he must then express. In essence, the process of revisualization required in the selection and expression of visual representations is not possible even though the patient can prolifically discuss and describe the same, verbally or gesturally.

Again, failures in writing, regardless of input modality, result due to an inability in associating audiolinguistic concepts with their corresponding visual counterparts. Such an explanation may also be appropriate for the patient's failure to name block letters palpated tactually or printed in either hand. In order for him to name letters presented in such a manner, it would appear that he must first internally "visualize" the patterns being presented tactually. Even though he is probably able to do so, verbal reports are inaccurate in describing the visualized image. Immediately following an inaccurate report, however, the patient will consistently point to the correct letter when presented in a three letter matrix. On an auditory graphic task (e.g., writing names presented by the examiner), the patient will spell the name aloud correctly, then produce a minimally intelligible graphic response bearing no relationship to the stimulus item; another example of presumed difficulty in visualizing an auditory-linguistic concept.

Basic language input and output processing by the patient are capable of functioning at relatively complex levels with the exception of the visual associational stage of processing.

The effects of breakdown at the visual association level tend to be rather devastating. Graphic, verbal, and gestural outputs are affected when the input requires visual association. The patient also experiences minimal success when primary inputs are auditory or tactile, requiring verbal or graphic responses interceded by the necessity to "visualize" the linguistic concepts contained within the task. Only when tasks require visual input and gestural output is the patient capable of circumventing association and conceptualization difficulties.

The Treatment

Several observations are in order when considering treatment for this patient. PICA Theory would suggest that treatment should begin at the point (on a difficult to easy language task continuum) where the patient first experiences difficulty on given tasks. Considering PICA results for this case, retraining would be necessary on visual matching tasks if maximal efficiency were to be possible on subsequent tasks. Analysis of visual deficits for this patient reveal that problems are not of a purely perceptual nature. Rather, they are at the level of reception. As noted earlier, the patient has a right homonymous hemianopia and task performance deficits noted are in the form of slight delays during brief periods of scanning test stimuli. Because visual deficits are not perceptual, they are considered of lesser importance than other noted difficulties. Greater attention is focused on tasks which follow on the PICA task continuum; the patient's ability to point to objects by stated function or when named.

It is consistently observed in aphasic patients that, as their performance on pointing to objects improves, improvement also occurs in other areas of language function. In this case, however, the primary deficits cannot be attributed to a generalized language problem. Second, the patient is over one year postonset and primary gains in language functions should have occurred by this late date, with the greatest gains being observed on tasks discussed above. For these reasons, alternative solutions to the patient's problems are sought. At least two observations seem to be pertinent. The patient can demonstrate functions of objects accurately when items are presented visually. Also, accuracy of gestural responses is affected by accuracy of accompanying verbal responses and vice versa. These interactions are combined in the following treatment strategy.

A three-stage activity was instituted which included 1) pantomiming use of a pictured object; 2) description of function performed; and 3) naming of the pictured object for which the function and description of function had just been

performed. In essence, this constitutes a visual naming task; a task on which the patient had demonstrated no success. It was assumed that the processes of visual association and naming could be facilitated by interjecting mediating tasks on which the patient had demonstrated essentially complete success. Responses of the patient on the first five items attempted are described below:

1. Drum: The patient immediately, but with slight awkwardness, demonstrated the correct function of the drum. He was unable to describe the action which he was demonstrating without extensive assistance. The patient named the object upon request following a slight delay.

2. Key: Following a significant delay, the patient demonstrated the appropriate function of the key; stated, in part, "slide the lock;" upon presentation of the picture, correctly completed the sentence "You lock a door with a "key" (cued).

3. Broom: Following a repetition of instructions, the patient correctly demonstrated a sweeping action; stated "put altogether and collect it." Given additional cueing, the patient stated that he was brushing the floor. He named the picture as brush and improved that response to "broom" without further assistance.

4. Razor: The patient demonstrated approximate shaving action about the face which somewhat resembled more of a brushing movement. He described the action of shaving following a phonetic cue /sh/, and he correctly completed the sentence "You shave with a "razor" (cued).

5. Telephone: The patient correctly, but with motoric distortion, demonstrated picking up the receiver in the left hand and dialing of a telephone with the right hand. He was unable to describe the action, and he named the picture immediately.

Evaluation of the above procedures indicates considerable promise for a method of circumventing the visual association deficit of this patient even though a number of problems are apparent. A primary consideration is that the use of explicit gestures is somewhat unnatural during normal language usage. On certain items, the patient had apparent difficulty in initiating the gestural activity. This may result, in part, from the artificial nature of the task. Further, this is a three part activity and, considering the extent of this patient's memory loss, it may constitute a task which is too difficult. A third problem is the apparent

motor distortion in the patient's gestural responses which, in turn, tend to affect the accuracy of his verbal responses.

The problems encountered by the patient do not appear great and should be amenable to improvement with greater structuring of tasks. A possible succession of tasks appears below:

1. Demonstrate function, holding real object; state function; name object.

2. Demonstrate function, looking at real object; state function; name object.

3. Demonstrate function of a pictured object; state function; name.

4. Demonstrate function of pictured object; pause; name object.

5. Demonstrate function of pictured object; name object.

6. Imagine function of pictured object; state function; name object.

7. Imagine function of pictured object; pause; name object.

8. Imagine function of pictured object; name object.

9. Look at object; name object.

10. Look at pictured object; name object.

Certain controls will be necessary during the administration of the above tasks. These should include:

1. Clear instructions should be given at each of the three stages in order that the patient learns to initiate the terminate required behaviors at the correct intervals. For example, "Show me what you do with this;" patient's response: "good." "Tell me what you were doing;" patient's response: "good." "Tell me the name of this;" patient's response: "good."

2. The type of responses must be stringently controlled so that the patient does not verbalize during gestural responses is required. It has been observed that one will affect the other.

3. Task instructions to the patient must be designated along with criteria for repetitions of instructions and additional cueing.

4. Criterion for performance on each task must be defined in order to determine the point in treatment when the patient should be advanced to the next step. In this case, occasional delays which are probably a function of the patient's peripheral visual difficulty will be considered acceptable even though affecting responses. Delays in initiating responses or any less proficient behaviors will not be considered acceptable.

5. The patient should be tested on each of the levels prior to their administration to determine whether inclusion of all step will be necessary or if smaller steps between presently defined levels should be incorporated.

Summary

Language findings for a patient who experienced a left occipital lobectomy are described and applied to a model of language functions. A treatment approach is suggested based directly upon obtained test results and their interpretations.

References

Porch, B.E. Porch Index of Communicative Ability. Palo Alto: Consulting Psychologists Press, 1967.