SSW REPORTS . . .

Acquired Integration Problem
Absent Corpus Callosum

Vol. 23 No. 4 **November 2001**

Acquired Integration Problem?
A case history

Susan Brandner

If you are asked to test someone with a closed head injury, what approach would you take? Testing for site of lesion would be 'fun' to see if our results agree with the MRI and other medical assessments. Most of us however, are more interested in -- how the injury affected the person's life and what information can we give to improve the quality of life. That is, we interpret the results from a CAPD (educational) perspective, the same as we would for a more traditional CAPD evaluation (and not a medical, site-of-lesion approach). Are our remedial recommendations valid? Can we assume (a dangerous word) that if a person had been successful prior to the injury, that there was no existing CAP problem? Does it matter if a CAP problem existed premorbidly?

Background:
"Toni" is a 51-year-old woman, who at age 47 suffered a closed head injury as the result of an automobile accident. Both frontal lobes and the right parietal lobe were reportedly affected. Prior to the accident, she had been an attorney. "Toni" has had a great deal of medical and rehabilitation (including vestibular rehabilitation) management, however, she has never had any speech/language therapy. She has experienced some seizures and some extreme tiredness. She is currently taking several medications.

In 1993, an auditory processing deficit was diagnosed and a rehabilitative plan was initiated. Toni had difficulty focusing on soft sounds (a skill she needs as an attorney to insure client confidentiality) – a Phone Ear Easy Listener was provided and she successfully used this for group activities (church, lectures etc.). Then, in spite of her normal hearing thresholds, mild gain K-amp hearing aids were provided to improve her listening ability for television and dinners out. Custom noise filters (plugs) were also provided for those situations where loud background noise was problematic. Several communication strategies were taught and Toni continues to use all of these.

In addition, Toni is under the care of a neuro-optometrist who has her doing visual exercises on a computer at home. She regained her ability to drive about one year ago Toni reports that she uses her noise filters in large rooms and the hearing aids as needed. When she does volunteer work at a municipal court, the hearing aids are worn most efficiently. The assistive device is used at lectures and sometimes at court. She finds it necessary to use the closed-caption feature on her television and recently

enjoyed an opera where captions appeared on the back of the seat in front of her.

Despite all of this intervention, Toni is struggling to do as well as she does; she is exhausted at the end of a day and often goes to bed by 7:30 PM. She is aware of problems with processing speech that is rapid, e.g. average teenager speed, that she has problems with attention and with organization.

Results of recent testing:
Toni has normal pure tone sensitivity and word discrimination in quiet is very good but, she continues to demonstrate low tolerance for loud sound. This is consistent with her previous diagnosis of auditory perceptual weakness. Immittance testing revealed a normal Type A tympanogram with absent acoustic reflexes bilaterally. The absence of the reflex may be due to the screening intensity (105 dB HL @ 1000 Hz) used in the test.

Traditional tests used in the *Buffalo Model*, including the Competing Environmental Sounds test (CES) were administered in an effort to determine if specific auditory processing 'categories' could be identified so that additional recommendations/strategies might be implemented.

On the *Speech-in-Noise* test Toni demonstrated significant difficulty with each ear. While her scores in quiet were 92% for the right ear and 96% for the left ear, these scores plummeted to 56% for the right ear (a difference of 36%) and 72% for the left ear (a difference of 24%), demonstrating the severe problem that Toni has understanding speech in the presence of noise with her right ear

Toni had a consistent response pattern on the SSW. She had 32 delayed responses, demonstrating the extra time that she needs to "digest" what she has heard. Her 8 cardinal numbers were: 0, 1, 1, 0, 0, 4, 1, 0. In addition, she had 4 reversals and a 'tongue twister' response.

Although NOE method of scoring is usually more sensitive than the traditional method of scoring, in this case it wasn't. Using NOE, **Decoding, Tolerance/ Fading Memory** and **Organization** type CAP problems were noted. Only with Traditional scoring did a Type A pattern emerge! Then, not only was there evidence of an **Integration** problem but it was an **Integration Type 3+** problem -- that is, evidence of all four categories of CAPD!

Although people with **Integration** problems frequently have difficulty using information from two sensory modalities simultaneously, Toni finds the addition of visual clues to be most beneficial; is she substituting a stronger (although impaired) visual system to get her information, rather than processing it auditorily?

The *Competing Environmental Sounds* test was administered, Toni had two errors on sounds that were presented to her right ear. This supports the diagnosis of an **Integration** type auditory processing problem and suggests that she may be having difficulty from one side of her brain, m to the other side via the corpus callosum. A significant number of delayed responses were noted on this test as well. At the conclusion of this test Toni stated, "This is not easy."

Toni's performance on *Phonemic Synthesis was* excellent. Perhaps because

Since the phonemes are presented at a slow rate Toni had enough time to hear and process each word. Toni appeared much more relaxed and was able to achieve a perfect score qualitatively and quantitatively.

Summary and discussion:
Toni's performance suggested that she has an **Integration Type 3+** auditory processing problem; she has **Integration** problems, complicated by the combination of **Decoding, Tolerance/Fading Memory** and **Organization** difficulties. People with **Integration** type auditory processing problems have difficulty processing auditory information when it is paired with stimuli from other senses (this is likely when posterior temporal involvement extends back to the occipital region – this may not be the case for Toni). Frequently, people with **Integration**, have severe reading and spelling problems because these skills require a person to integrate visual and auditory information. Toni's problem became apparent as the result of trauma – is it possible that is why she is able to use her reading skills to enhance her auditory deficits. Likely, this is because the major damage was anterior and not posterior in the brain.

A person may have difficulty understanding directions because it takes them longer to process the information that is being presented. Toni repeatedly demonstrated her need for extra time.

Recommendations:
Toni was referred to a speech/language pathologist to assess her current receptive and expressive language abilities and to begin a program to strengthen her auditory processing skills. It is expected that this program will improve phonemic understanding to a normal presentation rate and also improve organizational skills (e.g. **Phonemic Synthesis Training**). In addition, she will need to work on auditory memory, auditory figure-ground perception and ways to get the two sides of the brain to work together more efficiently. **SSW Plus** recommends doing something that could involve listening and performing an action with each hand individually.

Research has been conducted using the **Fast ForWord** program with people who have sustained traumatic brain injury. Therefore, it was suggested that Toni enroll in a **Fast ForWord** program. To help with her **Organization** difficulties she was advised to use lists and calendars.

Of course, Toni should continue to use all of the assistive listening devices that she currently uses.

Absent Corpus Callosum: Delayed Diagnosis

Denise Kossover-Wechter

Harry was 6-years-5-months old, when he was seen for an Audiological & Central Auditory Processing evaluation. He was referred by the Speech Pathologist from a Pediatric Development Program. Although he was relatively easy to understand his speech pathologist was asked to attend the testing. She did, reducing the possibility of mis-scoring a response because of Harry's speech errors. Harry was a pleasant child and worked hard throughout the testing session.

School records indicate that Harry is about 1 ½ years delayed in language

processing -- receptive language poorer than expressive. The family and the Speech Pathologist were hoping for some help to give the school at his current IEP meeting.

Background:
Harry's was delivered via Caesarian section, two weeks before his expected due date. His mother had been placed on bed rest toward the end of her pregnancy, as a result of pre-eclampsia.

Harry's mother describes him as a happy, contented baby. His developmental milestones are reported below. It's interesting that he both crawled and walked at 14 months. He sat alone @ 10 months, dressed self @ 5yrs w/ help, cut with scissors @ 4yrs, rode a bike w/ training wheels @ 6yrs, and still cannot tie his shoes. Despite these slow milestones he spoke his first words @ 8-10 months and used 2 word sentences @ 2 years. He recently started taking 10mg of Methylphenidate (Ritalin).

When he was quite young, Harry's mother noticed that her son's speech was delayed. When he was 4-years of age, at her insistence, he was enrolled in a preschool early intervention program working with a speech-language pathologist twice a week. His preschool teacher asked Harry's mother if he had suffered a stroke – the teacher had noticed some left-sided weakness.

Harry's mother returned to their pediatrician who in the past had *not* noticed the weakness. He now reported that until age 3 most of Harry's developmental milestones 'were within cusp of normal limits'. The medical investigation revealed – his weakness to be bilateral, but much greater on the left side. Harry has been diagnosed with "porencephaly **with an absent corpus callosum**; mild left sided cerebral palsy, motor delays and delayed developmental language."

At age 5 ¾ Harry had a MRI – the report indicates "malformation of the brain schizencephaly involving the parasagittal region of the left hemisphere extending from the vertex to the left lateral ventricle & complete absence of the corpus callosum"

This year he attended Kindergarten and currently received intervention/therapy for Speech, OT, PT & cognition from his school as well as privately. Part of the day he is in 'regular ed', the rest of the day he is in 'special ed'. His teacher considers him to be an average reader for his age; he has difficulty with math, numbers, and writing. His mother reports that Harry has been successful learning and remembering things when presented through song.

Evaluation Results
Harry's mother completed the *Fisher's Auditory Problems Checklist*. Harry scored significantly below normal limits at 36%. The difficulties she identified, were consistent **Decoding** and **Tolerance/Fading Memory** problems.

As expected, hearing sensitivity for pure tones, revealed thresholds for both ears to be within normal limits.

Because of Harry's young age, the *Prosody Screening Using Drumming,* (by Carol Mayer) instead of the more typical temporal processing tests. Deficits in recognizing and using prosodic cues (stress, melody, rhythm) of speech

may interfere with the processing of rapid verbal information such as directions and instructions. Assuming good motor planning abilities, a child should be able to replicate all the rhythmic sequences (patterned beats). Harry's motor delays obviously negatively affected his performance. He was only able to copy 4 steady beats. All attempts at rhythmic pattern beating were unsuccessful.

The traditional Buffalo Battery and the Competing Environmental Sounds Test followed this. Harry is having extreme difficulty understanding speech in the presence of background noise; even normal classroom sounds are distracting for him. The SN results were:

Speech-in-Noise (SN) Discrimination

	Quiet	Noise	Difference	Norm.Lim.
Right Ear	96%	64%	32%	22%
Left Ear	92%	52%	40%	23%

Although at Harry's age we can administer the standard *Phonemic Synthesis (PS) test;* because of his speech the *Phonemic Synthesis Picture* (PST), requiring a picture pointing was given. He passed the test (14/15 items correct, with a normal limit of 9 for his age).

The *Staggered Spondaic Word* (SSW) test was then presented. It is important to note that after each item, the CD was paused to give Harry enough time to respond. Harry's total score was more than 3 standard deviations poorer than the mean, placing him in the severe range for difficulties.

SSW - NOE SCORES

	RNC	RC	LC	LNC	TOT
Harry	5*	15*	24*	5	49*
Norm	4	10	15	5	28

Harry's Total NOE score of 49 was more than 3 SDs poorer than the mean. This equates to a severe score. Based on the Buffalo Model, the type of errors Harry made on this test reflects problems in the area of **Tolerance-Fading Memory, Decoding** and **Organization.**

The *Competing Environmental Sounds Test (CES)* is a companion test to the SSW. During this test, Harry pointed to the picture response and his mother verbally reported his answers. His results were within normal limits-- RE 2 errors (10%), LE=0 errors. For his age the norms permit 2 errors in each ear.

The Auditory Figure Ground Subtest of the Test for Auditory Processing Disorders in Children (SCAN-C) was given as a test that also evaluates speech in noise. Harry again demonstrated difficulty with this task. He had a Raw Score= 23 with a Standard Score: 6 placing him in the 9th % ile, suggesting borderline difficulty.

Discussion

Harry having problems straight across the board, it is more likely that he has a multifaceted deficit and not limited to CAPD. As stated in *Gray's Anatomy*:

> The corpus callosum is a thick stratum of transversely directional nerve fibers, which connect the two hemispheres of the brain, forming the great transverse commissure and roof of the lateral ventricles, where the main body of fibers extend laterally into the temporal lobe and as such appear to function as a conduit relaying auditory information to and from the cerebral cortex."

Without a corpus callosum, the two halves of the brain will have difficulty working effectively.

The processing problems of **Decoding, Tolerance/Fading Memory** and **Organization** that were identified all need to be addressed. However, why did Harry's results not reveal an **Integration** problem? Surely with no corpus callosum he would have difficulty using both sides of his brain efficiently. Was it because the large number of errors reduced the sensitivity of the **Integration** diagnosis.

** ** **

COMMENTS ABOUT HARRY
Jack Katz

I would like to thank Denise Kossover-Wechter for writing up this fascinating case. As you know corpus callosum agenesis is rare, and in addition it offers information about which we can only speculate without testing such a child.

Denise mentioned one puzzle in this case, why was there no Type-A pattern when the prototype of Type-A is a lesion of the corpus callosum.

I believe Denise's answer was right on the money. Harry had too many other errors to show a Type-A. His 8CN were:

A	B	C	D	E	F	G	H
4	11	12	1	4	12	4	1

You can see that Harry had a very poor score in col-F, but he also had very poor scores in two other columns. We have known for a long time that Type-A is fragile because if a person has other errors that it can hide a Type-A. Only later on after further maturation or therapy do we see the Type-A coming out. For a while we tried to see if a sharp LC peak might help us to find these cases that we suspected we were missing. That probably yields too many false positives and we can't be too sure that there is not some other reason for the peak. It is also too imprecise for such an important problem.

For the most part, our concerns about missing these INT cases has been greatly reduced because the NOE scoring (at most ages) makes the test more sensitive.

Clearly with such severe scores in columns A and B the Type-A could not be demonstrated. This would suggest (not surprisingly) that he had involvement of other auditory areas. This is similar to two other corpus callosum agenesis cases that I saw in the past. It will be interesting to see if a Type-A emerges in time. On the other hand 'only' ~25% of the CC tumor that we had tested in the past had Type-A. Some did not for the same reason as Harry.

Another concern is why the PS-P was not positive although he has DEC problems. One possibility is that Harry was benefited by the multiple choices, as he did not have to generate his own answer. Another possibility is that because of his early and perhaps extensive training since age 4, he is not a naïve child. That is our norms are for naïve children who were 6-years-of-age. A third thought is that Harry might have primarily a lexical DEC problem and not so much a phonemic one. (He had only one SSW condition that was within normal limits. I wonder if this normal LC condition might be a clue that it is not a phonemic DEC problem. Just speculation.)

Susan Brandner, co-editor of SSW Reports, edited this issue.