SSW Reports

c/o Kim Tillery
29 Harwood Avenue
Snyder, NY 14226

February 2010

Here Comes the Sun!

In the pitch of night you look up at the horizon and you detect a little gray glimmer from one spot but in a little while it spreads to each side and it starts to get lighter. At this point you smile and say to all within earshot, ***Here comes the sun!***

This is such a moment for me. Last week I presented a 2-day SSW Workshop and a 1-day APD Therapy Workshop. At the end of the second day our host, Jack King, asked the SSW group if any of them would be attending the therapy program. Every single person raised their hand! There were 18 attendees, almost all were audiologists, and they were all attending a diagnostic APD conference and then would attend the APD therapy program! I could not believe it.

In the past sometimes when I asked a student why they had switched from Speech to Audiology they would say that they did not want to have an ongoing relationship with the person, they would just like to test the person and not see them over and over again!? Well this interest in therapy in so many Audiologists is a shift from that earlier philosophy. Although, a dozen or more audiologists who appear eager to do therapy or keep doing this therapy is not a seismic shift in our profession, but it's surely that little glimmer in the sky. From what I can see, I believe *here comes the sun*.

Please Note:

1. For those who do these therapies or are interested in doing them, please get in touch with Katie Teague at katie.teague@gmail.com to join the Simple & Effective web group and get the Simple Effective Therapy (SET) newsletter via email.

2. For those who may, or may not, be interested in therapy, but would like to be on a referral list for those who do the Buffalo Model diagnostic and/or therapy work, please contact Christa Reeves at creeves927@yahoo.com to get on that list.

Whatever your interests and aspirations - keep up the good work!

Jack

SSW Reports

- **Effect of Diabetes on the Auditory System**
- **Losing a Job in Hard Times**

Vol. 31 No. 1 **February 2010**

My first doctoral student was Mike Brunt who chose a difficult topic for his dissertation. I was always impressed with how carefully he controlled the conditions in order to make the diabetes results clear cut. I asked Mike to review his research here.

Auditory Sequelae of Diabetes

by Michael Brunt, Ph.D.

Diabetes mellitus or, diabetes, has received much news coverage lately. Diabetic complications include atherosclerosis, neuropathy (primarily affecting the feet, legs and hands) and nephropathy (kidney damage). It is the third leading cause of blindness in the United States, primarily resulting from retinopathy. The problem is improper control of blood sugar levels. Normal sugar content is regulated and balanced through insulin production by the body. Diabetics most likely affected by the above maladies are insulin-dependent or Type I diabetics (diabetics needing periodic insulin injections). Fewer are Type II diabetics whose diabetic control is by diet and oral medication. These individuals typically develop diabetes at a much older age than insulin dependent diabetics.

Central nervous system (CNS) effects, especially cerebral, can occur in diabetics. These are more likely for Type I diabetics - who may have insufficient insulin to reduce their high blood sugar levels which can lead to a diabetic coma. Too much insulin can cause a dramatic drop in the blood sugar level; which in turn can lead to lesions of the newer CNS structures (e.g., the cortex) which are affected first. The above physiological effects led me to consider the possibility of auditory effects of diabetes. Past literature reviews suggested that (presumably a peripheral) sensorineural hearing loss may be a complication of diabetes. Most findings were based on pure tone thresholds and a few histological cochlear studies of diabetics (Costa, 1967; Jorgenson, 1964). A few authors noted tone decay in some diabetics (Sartoris, 1962; Strubinski and Malicka, 1966). Intrigued by these limited auditory findings I thought a more detailed audiological study might present a clearer picture of the relationship between diabetes and auditory function. Of importance would be the comparison of normal control subjects to insulin dependent and non-insulin dependent diabetics.

SUBJECT GROUPS AND AUDIOLOGICAL TESTS

Accordingly, four groups of 20 subjects each were tested (10 males and 10 females per group). Twenty insulin controls (IC) were matched with 20 insulin dependent diabetics (ID) on age, sex and race. Four groups of 20 subjects each were tested (10 males and 10 females per group). Also matched were 20 controls who were paired with the diabetics whose diabetes was controlled by diet/oral medication. To examine possible effects of blood sugar

levels on test results and to truly define the "diabetic" subjects as diabetic a glucose tolerance test (the test used to establish the presence and severity of diabetes) was administered to the latter two groups. These groups were labeled as glucola controls (GC) and glucola diabetics (GD). Nine tests were selected to assess auditory function from the mechanical system up to and including the CANS. The tests were (a) pure tone air and bone conduction thresholds, (b) the Owens tone decay test (OTD), (c) the Staggered Spondaic Word Test (SSW), (d) median plane lateralization (MPL), (e) W-22 speech discrimination (W-22), (f) Rush Hughes speech discrimination (RH) , (g) speech reception threshold (SRT), (h) Bekesy fixed frequency audiometry for one-minute pulsed and continuous tone tracings for 500, 2000 and 4000 Hz (BEK) and the Short Increment Sensitivity Index test (SISI).

Test Procedures

Testing took about two hours per subject. Three blood samples were obtained from each subject: before testing began, after one hour of testing and after the final hearing test. The four test orders were used for each of the four groups. However, for each test order pure tone air conduction thresholds were collected first to obtain baseline presentation levels needed for the other test procedures. Since past results showed tone decay in some diabetics, the OTD test was administered three times - after initial pure tone thresholds, after the second blood sample taken and as the final test.

TEST RESULTS

Test result comparisons were made (1) between diabetics and non-diabetics, (2) between insulin dependent diabetics and diabetics treated through diet and/or oral medication, and (3) as a function of age and sex differences for both diabetics and controls. Blood sugar levels were compared to auditory test results as well.

Type I vs. Type II Diabetics

Overall results didn't show any differences between the two diabetic groups (i.e., insulin diabetics vs. Glucola diabetics). No significant relationship was found between blood sugar level and auditory function for either the controls or diabetics. Sex differences were seen on only two tests, pure tone and Bekesy thresholds. Males exhibited poorer thresholds than females whether comparing diabetic or control subjects. Such results are commonly reported in studies comparing thresholds of males versus females in the United States.

Diabetics vs. Controls

No significant differences were demonstrated between the diabetics and controls on pure tone thresholds, SRTs, W-22s, SISI or Bekesy results while MPL findings were equivocal. However, minor differences, favoring the controls, were observed for pure tone thresholds, SISI and Bekesy performance. The older glucola diabetics demonstrated poorer Bekesy and pure tone threshold measures than the younger insulin diabetic group. The same pattern was seen for the glucola control and insulin control subjects. These results were thought simply to reflect age effects.

Diabetics performed significantly more poorly than the controls on the Total Raw SSW score although the mean difference was not clinically significant. In addition, both groups performed within normal limits. No significant difference was seen between diabetic and control subjects on the Total Corrected SSW. This suggested no evidence for cerebral auditory dysfunction in diabetics as measured by the SSW despite the mild peripheral effect. When Ear Effect was anal-

yzed, no significant differences were found between the diabetics and their controls.

COMMENTS

The two measures where significant differences between diabetic and control groups were seen were the Owens tone decay (OTD) and the Rush Hughes (RH) speech discrimination tests. Results on OTD were poorer for the diabetic at 2000 and 4000 Hz. These findings may reflect cochlear and/or subtle retrocochlear dysfunction in diabetics. At 4000 Hz the older subjects (GD and GC) performed significantly poorer than the younger (ID and IC) on the OTD test. This was thought to reflect age effects and the greater threshold loss of older subjects at 4000 Hz.

The diabetics were significantly poorer on the RH than the controls. The same was true for the RH difference score (RHD). The latter is determined by subtracting the RH score from the W-22 score. This difference score is useful in assessing for cerebral auditory dysfunction. Comparison of RH and RHD results to other auditory measures suggested possible cochlear or subtle retrocochlear/cerebral auditory dysfunction. However, the absolute difference between the diabetics and controls was small.

In summary, diabetics tend to exhibit somewhat less efficient auditory functions than matched controls. Only the OTD and RH tests exhibited significant differences between diabetic and control subjects, favoring the controls. These findings do suggest the value of further study of auditory function in diabetics. In a positive light, there have been significant advances in audiological test procedures since this study was done. Tests now available can further assess auditory function from the cochlea to the CANS. One test would be measures using distorted speech stimuli to further assess for problems beyond the cochlea. One suggestion would be a 1500 Hz low-pass filtered SSW test. Tests either not available at the time of my study, or in their infancy, would be reflex decay and evoked auditory response measures. These measures (e.g., brainstem evoked response, middle latency response, P-300 and other late latency auditory responses) may help point out auditory changes not readily seen with tests utilized in this study. Another reason for further research is that people are living longer now than 40 years ago. Therefore, greater differences - central and otherwise - might be seen between diabetics and non-diabetics. One contaminating factor, of course, is the increase in sensorineural loss with age that will require attention. So, someone somewhere out there - get started!

My study was facilitated by Jack Katz as my dissertation director and his help in providing funding through the Gus and Mike Johl Fund of Menorah Medical Center, Kansas City, Kansas- where the research was done. The diabetic subjects were referred by Dr. Milton Katz, a private practice physician who was diabetic and Dr. Charles Sisk a University of Kansas research physician who, also, was diabetic.

References

Costa, O.A., Inner ear pathology in experimental diabetes. Larygoscope, 77. 1967, 68-75

Jorgensen, M.B. Changes of aging in the inner ear and the inner ear in diabetes mellitus. Histological studies Acta Oto-Laryngologica, Supplement 188, 1964, 125-128.

Sartoris. A., Consideraciones sobre el comportamiento dela adaptacion auditiva en el individuo diabetico. ("Hearing behavior adaptation in diabetic patients.") Acta Oto-Rino-Laringologica Ibero-Americana , 13, 1962, 65-76.

Strubinski, A., and Malicka, K., Proba lokalizacji zmian w narzadzie sluchu w cukrzycy. ("A test of localization of changes in the organ of hearing in diabetes.") Otolaryngologica Polska, 20, 1966, 443-448.

Ethical & Professional Questions
Jack Katz

I received the following email:

This may be a little vague and there may not be a real answer, but I am stumped and need some guidance! I tested a woman today who came for testing because she is in danger of losing her job. She said her boss is going to fire her because she has poor listening skills, which has apparently been documented on several previous performance reviews. She told me that she is hearing impaired and needs verification to take to her employer so she won't be fired. So I came in early to test her because I did not want anyone to lose their job due to a hearing loss.

However, when I tested her the hearing thresholds were within normal limits, with the exception of a mild loss at 6K and 8K Hz in both ears. She "struggled" during the test and I had the feeling that she was "trying too hard", if you know what I mean. Discrimination scores were 100% at 60dB.

When I explained the results to her she got upset. I suggested that she contact you to see if her difficulties could be due to CAPD.

1. What was the right thing to do? I certainly want to help someone in danger of losing their job. But, I also want them to be honest when I am trying to help. I told her that I couldn't say she had a hearing loss that impacted her job.
2. Are you able to tell if someone is not being completely truthful during your evaluation?

Thank you so much for assisting me with this. I honestly don't know what I am looking for other than guidance – is CAPD something that should be considered for her, or would I be wasting your time?

Reply: Space is limited so I'll cut to the chase.

Yes, this is a perfect referral. When the problem is not in our area of expertise, but is much more likely in someone else's, then as professionals we are obligated to refer them.

When a person believes that she has a hearing loss and she is about to lose her job because of it and then we find out that there is no commensurate hearing loss, the logical next step is an APD evaluation.

It seems that the audiologist was concerned that the woman was motivated to find a loss (and I can see why), but in my experience a non-organic problem is the last thing I consider. And when I withhold the temptation to do so I have always found that I was correct.

If she was truly non-organic she would have tried to exaggerate her responses rather than exaggerate her effort. My guess is that she wanted the audiologist to know that she was really trying and that the poor results were not for lack of trying. Because she truly believed she had a loss she thought it would show up.

Can an audiologist tell if someone is trying to feign a central problem. I know of no foolproof method to do so. But in a group of non-organic cases on the SSW we found almost all of them had reversals. This they could do in clear conscience as they were not told to say the words in the order they heard them.

On most tests a person knows how to fake a problem, but what do they do on the SSW as things are happening so quickly in both ears. The typical response is the inattention pattern: good non competing scores and mildly elevated competing in both ears.

May Lose Ones Job in Tough Times: The APD Test Results

Angela Loucks

Sue Mason has attributed hearing difficulties to acoustic trauma from a firecracker exploding near her ear when she was a teenager. She remembers not being able to hear for five minutes after the incident, but her hearing did return. Results of audiometric testing indicating normal thresholds in the speech range of sounds by the referring audiologist.

Reason for evaluation:

Despite Ms. Mason's borderline normal hearing she has complaints regarding her ability to understand others, especially if she is not facing the person or if she is in the presence of background noise. She works in sales and her job requires her to communicate effectively with coworkers and contacts who purchase supplies from her.

She feels that she has difficulties following and retaining oral directions, especially when a person is talking quickly or more than one person is talking at once. She compensates for this difficulty by taking copious notes of the conversation, which she feels may be off-putting to those trying to converse with her.

She recounted multiple incidents of misunderstandings that have taken place this week. Some of the time the words she heard were close to the original spoken message (e.g., her husband, while addressing someone else, had said, 'Martin Luther.' SM understood him to say 'Mark and Luke.') Other times the errors were not closely related (e.g., she heard a radio disc jockey say the word 'dog,' however, after he said it a few more times, she realized the word was actually 'take.') She was very frustrated that she could not understand the message because she felt she was having such a difficult time deciphering a simple word.

Miscommunications of this nature are commonplace and frustrating for her and those around her at home and at work. Ms. Mason notes that she was first aware of these issues when she was in high school, but it seems more apparent over the past two years due to her present communication demands.

Because of Ms. Mason's level of frustration she expected her hearing loss to be greater than it actually turned out to be. Ms. Mason would like to gain insight to why she struggles with these hearing events and wants to learn about therapy to improve her auditory processing abilities.

The patient reported that she has allergies and, as a child, had multiple ear infections. Ms. Mason received three years of speech therapy in school for articulation errors with r, s, l, and t. Her mother notes that she often "appeared not to hear" when she was younger. She was diagnosed with AD/HD as a child, however she has often questioned this diagnosis.

SM reports other case history information that is generally associated with an auditory processing deficit such as: being forgetful, mixes up sounds, needs quiet to study, often says 'huh' or 'what', has difficulties understanding in noise, prefers one-to-one communication, feels that speech seems unclear from other rooms, has trouble following directions, and has trouble understanding television.

Mrs. Mason had an average threshold for the speech frequencies of 16 dB in the right ear and 18 dB in the left. She did display a mild, high frequency sensorineural hearing loss from 6000-8000 Hz, bilaterally.

Significant Central Test Findings

Test	Measure	APD Category
SSW	Total NOE Score (8, NL=6)	Various
	Left Competing (5, NL=4)	TFM
	Delay (12, NL=0)	DEC
	Extreme Delay (3, NL=0)	DEC/ INT
	Reversals (3, NL=1)	ORG
PS	Qualitative Score (17, NL=22)	DEC
	Delay (5, NL=1)	DEC
SN ***W-22 words***	Right Ear Noise (60, NL=82)	TFM
	Left Ear Noise (76, NL=81)	TFM
	Right Ear Difference (40, NL=17)	TFM
	Left Ear Difference (24, NL= 17)	TFM
	Interaural Difference Score (16, NL=7)	TFM

DEC = Decoding, **TFM** = Tolerance-Fading Memory, **INT** = Integration, **ORG** = Organization

SSW Test:
Mrs. Mason had both delayed and extremely delayed responses. This would suggest that she must work extra hard to process speech in order to respond correctly. This could explain her general trend to respond slowly and carefully on most aspects of this battery. Her reversals show that on occasion she mixes up the sequence of words which may not be a major problem in connected speech because of the language structure. These problems help to explain why SM has noted difficulty keeping up with those with a fast rate of speech.

On the test battery, Mrs. Mason demonstrated at least two types of APD. There was one sign of Decoding (DEC), six signs of Tolerance-Fading Memory (TFM), one sign of Organization (ORG), and one sign of possible Integration (INT).

The patient demonstrated significant findings on the central test battery. The APD indicators provide evidence of Decoding and Tolerance-Fading Memory categories and possibly Organization, and Integration. These factors likely have a significant impact on her ability to digest speech, especially under noisy/poor acoustic conditions. This is supported by the characteristics noted on the Buffalo Model Questionnaire.

It appears that Mrs. Mason has a long standing APD that was aggravated by middle ear problems as a young child. Her slight hearing loss in the high frequencies adds to her problem with understanding speech accurately. With a bright, highly motivated person, such as Mrs. Mason, she appears to be an excellent candidate for auditory training.

Life Becomes More Complex/Challenging
Jack Katz

This week I saw a 14 year old who can say just a number of vowels. It sounds much like a grunt. He uses some ASL to communicate but his main avenue is his *iPod* that says what he enters. To make life more challenging he has Autism and ADHD and an aversion to noise. His parents feel that he is not intellectually challenged and has pretty good receptive language.

I don't remember a child that I've not been able to get any formal testing completed. I did get little pieces to form a working hypothesis so therapy could be started. I'd like to hear from Jodi Glass or others to find out what you do and recommend.