Mild Traumatic Brain Injury

What is the qEEG?—Part Four

In the simplest terms quantitative electroencephalography (qEEG) is the process in which the constant electrical activity of the brain is transformed into digital (numbers), information and pictures providing a snap shot of the brain's activity. The instrument has been widely studied and proven to be accurate and reliable. The MTBI as an instrument by itself has shown similarly high rates of specificity and sensitivity. Presently the qEEG has been utilized in over 120,000 research articles.

Mild Traumatic Brain Injury:

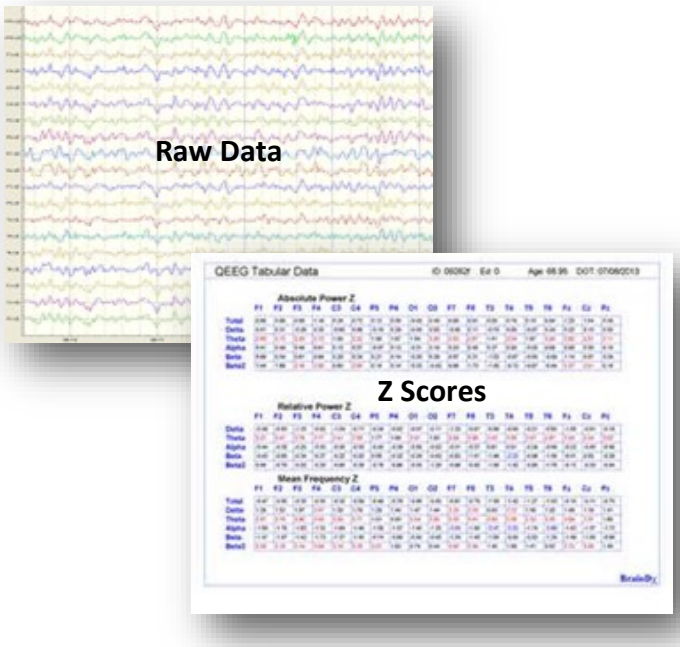
What is theqEEG

There are 4 main types of injuries that can be readily assessed following a concussion, and the qEEG analyzes all of these issues:

1. Coupe contra-coupe injury
2. Contusions of the frontal-temporal gray matter
3. Shear forces on the gray and white matter
4. Rotational forces as in a whiplash

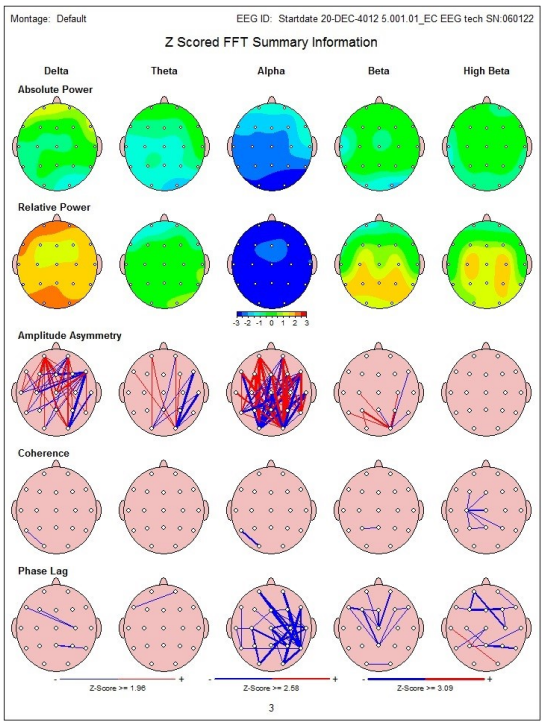
Myosymmetries

The qEEG (quantitative electroencephalograph) collects data in a manner similar to that of the medical profession, instead using computers to analyze the data. The data is statistically analyzed, compared to a database, and provides a snapshot of how the different areas of the brain are working and communicating in comparison to others. This process has allowed for the development of sub-programs such as the "Mild Traumatic Brain Injury Index or MTBI." This index allows for examination of the various areas of the brain which are most often concussed and how these areas communicate. These results have been accepted as an objective measurement of brain injury by the courts in the US.



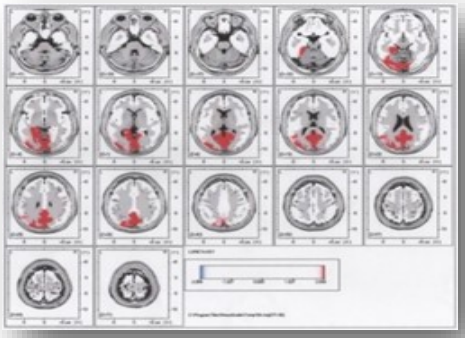
The Data

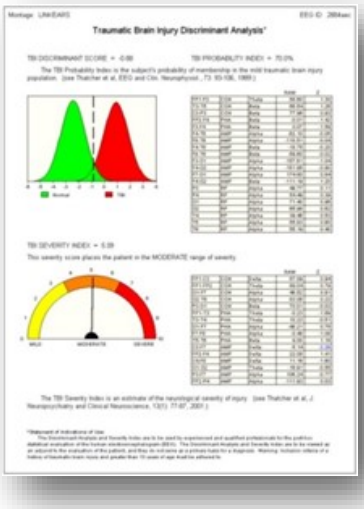
The raw signals from the qEEG (left) are converted into numbers called Z Scores (left). The Z score represents the amount of electrical power at each site. This allows for comparison to a set of established norms (database) comparing your brain to the rest of the world. Zero represents normal activity. The higher the numbers (positive or negative) reflect whether the electrical activity is hyper (too much) or hypo (too little).



Z Scores are then converted into a pictorial format for ease of understanding (left). The top row reflects the absolute power in frequencies at each site. In the upper middle there is an area of blue reflecting decreased activity in Alpha. This is associated with problems in multitasking and day to day functioning. In the second row there is an area of orange in the Delta frequencies which reflects problems with sleep and issues with depression and chronic pain. The middle row is not routinely utilized in this clinic. The fourth and fifth rows show a bunch of lines which indicate the areas not working together. This is associated with reduced cognitive efficiency and are commonly seen post trauma. **There is no other instrument on the market that can do this.**

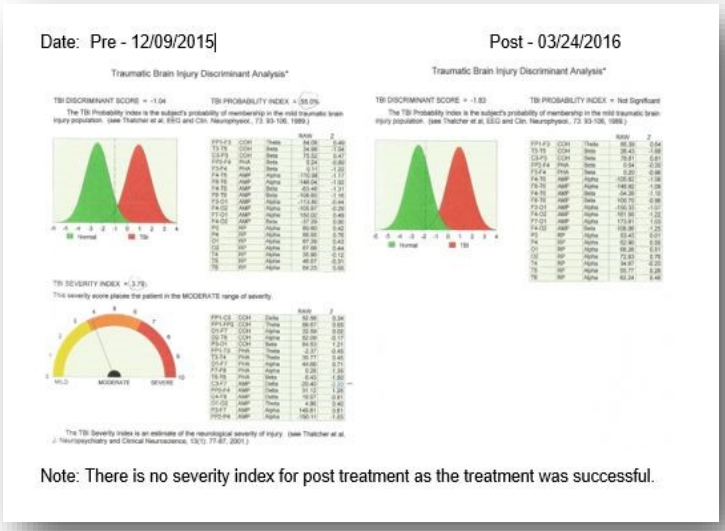
The LORETA offers a chance to explore the deeper parts of the brain. In this illustration the top of the brain is in the upper left. Moving from left to right each slice is 7mm lower than the preceding one finally arriving at the brain stem (the bottom 2 images). The red shows the maximally irritated parts of the brain.





The upper chart show the probability (95.0%) that an individual has a mild traumatic brain injury (concussion). The lower chart shows the severity of the injury (5.02 out of 10). These charts also indicate which specific sites have been injured. This information has been admitted into the courts in the US as objective evidence of a brain injury.

Case Study



Note: There is no severity index for post treatment as the treatment was successful.

To the left are qEEG illustrations of a concussed hockey player pre and post treatment, the pre assessment done on 12/09/2015 and post 03/24/2016. The player's symptoms included fatigue, headaches, lack of focus and attention, and decreased physical stamina. It is estimated that during the last year of playing her efficiency was decreased by 20%. Today she is symptom free.

sEMG & Whiplash Assessment

The SEMG (surface electromyograph) measures the electrical activity of the muscles of the neck to determine how they function. In a concussion external forces are applied to the head which stretch the muscles of the neck causing a whiplash. In addition rotational forces impact the brain producing a number of symptoms including issues of balance, sleep and vision. A whiplash should be considered when the concussed presents with these symptoms and with headaches. The SEMG allows for objective assessment of the neck and damaged muscle(s), which then can be fixed to reduce, if not eliminate that part of the concussion. An example of SEMG tracing of a whiplash is illustrated.