Dynamic Chiropractic

WHIPLASH / NECK PAIN

Brain Mapping Revisited

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In previous writings I have discussed the incidence, pathomechanics, findings, and diagnosis of postconcussion syndrome (PCS), a relatively troublesome and frequent complication of minor head injuries.[1-6] Because so little is known of the condition, and because these cases are frequently litigated, DC and MD alike have historically been reluctant to make the diagnosis. Since objectification is difficult, doctors are loath to discuss PCS on the witness stand. Brain mapping, also known as Brian Electrical Activity Mapping (BEAM) and Topographical Mapping, offered hope of showing lesions which were not visualized with high resolution CT or MRI.

Brain mapping was developed to detect more electrophysiological abnormality than could be detected by the usual EEG alone. By coupling the computer with these tests, it was hoped that they would become more precise and reliable. Due to the difficulties with artifact, normal variants, variability due to drugs or age, and other confounding variables, the human touch is still necessary.[7]

Brain mapping usually incorporates several tests. The usual combination is the EEG, brainstem auditory evoked response (BAER), visual evoked response (VER), and a cognitive test, the P-300. This latter test generally consists of an "oddball" auditory paradigm in which patients are asked to discriminate between two pseudorandomly-occurring tones which are delivered via stereo headset. Other combinations include somatosensory-evoked potentials (SSEP), VEP, P-300, and BAER without the EEG.[8]

The standard 10-20 EEG electrode placement is utilized and patients undergo, sequentially, all components of the map (BAER, EEG, P-300, and VER). Spatial analysis is possible to some degree and potentials are displayed in a series of color maps. Patients are generally compared to normative databases of age, sex, and handedness matched controls.

Current use for brain mapping includes CVA, migraine, Alzheimer's disease, seizure disorders, and head injuries including the PCS,[9,10] although Werner and Vanderzant[8] have recently offered evidence against the use of their form of topographic mapping for PCS. However, at 14 weeks postinjury, only 15 percent of their cohort complained of headaches which is generally considered one of the most prominent, if not the most prominent complaint in PCS.

Because there have been few published accounts of brain mapping and minor head trauma, and because of the technical difficulties with statistical correlation and other findings as mentioned, brain mapping remains controversial.

However, Hooshmand, et al.[10] has provided compelling evidence that it is more sensitive than CT, MRI or traditional EEG in cases of mild to moderate head injury. In 135 cases of PCS they found CT or MRI abnormalities in 11/135, EEG abnormalities in 40/135, and brain mapping abnormalities in 75/135.

They noted that psychological and mapping interpretations showed over 96 percent lateralization accuracy.

Walker and Patton9 evaluated 162 cases of head injury: 69 percent, were the result of motor vehicle accidents. Notably, one of the case studies presented was a minor head injury in which neuropsychological indices fell within the "unimpaired range." The brain map in this case was abnormal.

In comparing conventional EEG, spectral EEG, and evoked response topographical mapping, they found them to be sensitive to minor head injury in the reverse of this order (i.e., conventional EEG was least sensitive). In their study 103/162 abnormalities were found, although the authors caution that their study was not a random sampling and certain selection bias may have been present.

The most effective timing of brain mapping is probably in the early stage (within the first week). However, it is usually not feasible to perform this test at that time and, if patients are going to recover fully, any abnormalities would offer only academic interest. The flip side of the scenario is that our experience is consistent with others[9] in that partial or complete normalization of the BEAM is seen during the recovery period, despite the significant ongoing complaints typical of the PCS. Therefore, if one is to see abnormalities on BEAM, the test should be performed in the first few months. Follow-up studies can be performed to chart the patient's recovery and aid in prognosis, although the validity of this practice is unproven at this time.

Reference:

1. Croft AC: Soft tissue injuries: long and short-term effects. In Foreman SM, Croft AC (Eds), Whiplash Injuries: The Cervical Acceleration/Deceleration Syndrome. Baltimore, Williams & Wilkins, Co., pp 290, 1988.

2. Croft AC: Whiplash: the Masters' Program. Module 1: Whiplash, an Overview. Coronado, Spine Research Institute of San Diego, pp 26-28, 1992.

3. Croft AC: Whiplash: the Masters' Program. Module 2: Diagnostics. Coronado, Spine Research Institute of San Diego, pp 34-40, 1992.

4. Croft AC, Krage JS, Remsen WH: The postconcussion syndrome. Trial Bar News (SDTLA), 9(4):26, 1987.

5. Croft AC: Minor head injuries and the postconcussion syndrome. San diego County Chiropractic Society Bulletin 10(1):5-15, 1988.

6. Croft AC: Whiplash and brain injuries: cognitive defect or fertile imagination? Dynamic Chiropractic, 10(7):10,35, 1992.

7. Nuwer MR: The development of EEG brain mapping. J Clin Neurophys., 7(4)459-471, 1990.

8. Werner RA, Vanderzant CW: Multimodality evoked potential testing in acute, mild, closed head injury. Arch Phys Med Rehabil, 73:31-34, 1991.

9. Walker SH, Patton ES: Brain electrical activity mapping (BEAM) in the evaluation of traumatic brain injury. Nicolet Instrument Corp, 1988.

10. Hooshmand H, Director K, Beckner E, et al: Topographic brain mapping in head injuries. J Clin Neurophyhsiol., 4:233-234, 1987.

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Editor's Note:

For more on personal injury, consult Dr. Croft's video "Advances in Personal Injury Practice," #V-435 on the Preferred Reading and Viewing List, pages xx.

DECEMBER 1992