

Review of Literature for Treatment of Post-Concussion Syndrome/Traumatic Brain Injury; Evidence-Based Therapeutic Intervention for the Sequelae of Craniocerebral Injury, TBI, Whiplash, and mTBI

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Introduction

What is Traumatic Brain Injury

During the course of our research we came across a question posed by Giza et al., “which interventions enhance concussion recovery?” [1]. This is our focus, albeit, our research has shown that “concussion”, per se, is a limited term as brain injury happens often when concussion symptoms are not present [2, 3] (more on the challenges of terminology below).

Our goal: to find as many appropriate research papers as possible in order to offer the gamut of immediately available beneficial interventions for patients with brain injury due to trauma. This required the use of an array of nomenclature for search parameters. We utilized searches for treatments for Traumatic Brain Injury (TBI), Mild Traumatic Brain Injury (mTBI, typically closed-head injury), Sequelae of Concussion, Post-Concussion Syndrome (PCS), Craniocerebral Damage (injury, trauma), Chronic Traumatic Encephalopathy (CTE), and Chronic Sequelae of Whiplash.

The latter is a prime example of the need for agreement on medical terminology. Whiplash also overlaps symptoms with an array of diseases – all related to TBI -- such as, fibromyalgia, ADHD, and so many more discovered and likely, undiscovered [4].

According to the CDC, A TBI is caused by a blow, or bump, or even forceful jolt of the head (whiplash, baby shaking syndrome) that disrupts the normal function of the brain [2].

Symptoms can be impairments related to:

- **movement and muscle pain;**
- **sensation, memory/cognitive abilities, and neural damage/inflammation** (e.g. ADHD, brain fog, concentration, sleep disorders, nystagmus, diplopia, torticollis, burning-radiating, and all types of neurologically based painful syndromes);
- **emotional or mood disorders** (depression, personality changes, sudden lack of impulse control); [5]
- **Chronic Fatigue [2,4] and sudden onset of viral/ bacterial infection due to Lowered Immune Response.** Griffin concludes in military medicine, volume 176, “Immune

suppression in brain injury is rapid and profound” (Note: BBB, or blood brain barrier damage occurs between 1-6 hours). TBI, minimal and severe, open and closed, leads to immune suppression and infection. In closed wounds, this occurs by translocation from the gut, potentially [needs cit. 5.5 Griffin].

- **Increased Chemical Sensitivity.** A few studies, along with much anecdotal evidence links chemical sensitivities to fibromyalgia, chronic fatigue, and now brain injury [cite: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1469804/> 5.7 & 5.8 <https://www.prohealth.com/library/researchers-explore-many-uses-for-neurontin-no-chronic-fatigue-syndrome-cfids-trials-planned-15711>]

These symptoms can dissipate within days or months, but, for many – estimated to be between 20 and 40% of cases, these symptoms can persist well beyond 6 months causing persistent, life-long, consequences [5,Griffin].

A large body of work has been invested in improving early TBI care, from rescue to acute treatment, discussion of related CTE (Chronic Traumatic Encephalopathy – commonly applied to boxers and other athletes who suffer repeated blows to the head resulting in the above-mentioned symptoms), diagnosis, differentiation, statistical analysis and the like. However, fewer data, and usually on a very limited numbers of cases, are available on long-term outcomes [3,5,6].

There are 4 distinguishable types of injury to be considered that can lead to the chronic symptomology or syndrome of TBI discussed herein:

- **Concussion** is one of the most common type of TBI. It is a head injury wherein another object has forceful contact with the head. It’s marked by transient disturbance in brain function, generally, loss of consciousness or definitively altered mental status (e.g. dazed, disorientation, confusion).
- **Penetration injury** from bullet, shrapnel, glass or other objects that enter the skull
- **Contusion** is marked by internal bleeding resultant of a blow to the skull
- **Axonal Injury** is a brain injury from traumatic shearing forces that is caused by rapid deceleration or acceleration also involving rapid hyperflexion and hyperextension of the neck (e.g. whiplash, baby shaking syndrome, forceful jolt). This leads to shearing forces to gross and microscopic injury to axons at the junction of gray and white matter [3,7,8].

While there are an estimated \$2.7 million TBIs per year in the U.S. alone [2] and an estimated one quarter of the 1.5 million U.S. Military personnel that have been deployed to Iraq or Afghanistan who suffered or are suffering from TBI sequelae [6], we posit that these TBI incident numbers are low considering that many of the numbers of TBI patients and their healthcare providers are unaware that they are TBI patients.

In addition to a vast “just whiplash” category that may need to be added to these numbers, ML Etsy, PhD, states that common labels affixed to patients, such as “Fibromyalgia” are simply TBI with widespread pain as the symptom in the forefront [4]. Indeed, these authors have seen a significant correlation in the clinic with fibromyalgia and a history of TBI (the Mayo clinic defines fibromyalgia as a disorder characterized by widespread musculoskeletal pain accompanied by fatigue, sleep, memory, and mood issues – the symptoms overlap with TBI syndrome) [4,9].

ADHD, CTE, chronic migraine, PTSD, Borderline Personality Disorder, Bipolar Disorder, Alzheimer's, Dementia and more...the list of conclusive associations and possible misdiagnosis is large [9,10]. It is worthy to note the Parkinson's-TBI connection here. As early as 1989 the Southern Medical Journal published an MD's case study with very clear links between a patient who suffered multiple blows to the head, a boxer, and his development of Parkinson's [11]. In recent years there were several studies and analyses of TBI patients and links to Parkinson's and other diseases often developed in later years. These studies came from an enormous pooling of databases and were carried out by the University of Washington, Seattle, and University of CA, San Francisco: 2.8 million person Dutch database and 325,870 Veterans were studied. The results:

- Even a single mild TBI raises the risk for dementia in later life.
- Veterans with mild TBIs run at least a 50 percent higher risk for Parkinson's disease .

Several smaller studies concluded with similar findings [11,12,13,14,15]. The evidence clearly suggests there is a need for more awareness and more research for effective treatments and thus, is the main impetus for this paper.

While Western medicine poses treatment methods for the chronic sequelae of TBI that ranges from no treatment or rest ("rest" is now under scrutiny as at least one study found that longer than 3 days to one week may contribute to prolonged symptomatology)[15,16] – to behavioral therapy for mood disorders, acupuncture and medicines for pain management (for "CTE") and memory exercises [17].-- to drug therapy and cognitive behavioral therapy (for coping skills) [18]. These therapies, at best, had conflicting results leaning toward the ineffective side [15]. Meanwhile, specialists in TBI from the Western and Eastern sides of the table, as well as, PhDs and NDs are running with an array of controversial therapies, some of which have only recently been studied and proven to have potentially beneficial use in animal testing and some with only a small number of reported case study success [3,4,19]. It is presumed that the onslaught of vast numbers of those patients in need, despite the lack of insurance costs and the relatively high price some of these treatments, is the impetus to offer even those therapies that may have marginal possibility of success.

46 research papers (38 from PubMed, 2 from Hindawi, and six from other journals) were selected from 202 titles found from searches with key words from abovementioned terminology. The criteria used in choosing papers for review was to select those papers that held the greatest potential of offering an evidence-based and probable, viable treatment for healthcare providers (without regard for limited access of treatment by: Western MDs, DOs, NDs, and Eastern medical professionals) to begin utilizing in their practices immediately (or within a small timeframe) for TBI patients. As the limitations would have been too great otherwise, studies were not restricted to American research. While drug studies and studies on potentially more (relatively) lucrative end products are more extensive (yet, human trials incomplete, thus far) and available from U.S. researchers, non-drug research studies and those with relatively economical patient benefit (vs. supplier benefit) were found in greater numbers from outside the U.S. We utilized the research provided through our National Institute of Health database from those credible European Medical Universities and other countries' research Institutes. Most came from those nations with Universal healthcare (it is presumed due to an incentive toward

effective therapies that save in cost vs. provide revenue to healthcare-related businesses). The US Military/VHA was a notable exception to this generality [20].

There is, however, much promise in contemporary animal testing of Salsalate (Disalcid, a neuro-anti-inflammatory drug) on TBI-induced mice, Magnetic Laser Therapy on TBI-induced rabbits, and successful Stem Cell therapy (intranasal implantation) in animal, pre-clinical, and some small human case studies (in both China and the U.S.). Some healthcare providers are already utilizing these and other methods, both in the U.S. and abroad with purported success [3,19,21]. But, we have chosen a more conservative list of proven therapies – our conservative model necessitates criteria of having established not only human effectiveness in satisfying large quantitative subject numbers and human single or double-blind criteria if possible, but, also in plausible assurance of safety (no harm criterion) while further studies are awaited on those 3 interventions mentioned above.

Many of the therapies on our list were, only a short time ago, considered fringe. An example is: one treatment on our short list of present-day viable therapies is Low Level Laser [Light] Therapy (or Cold Laser Therapy). This was first widely introduced to the U.S. by Chiropractors and suffered a skeptical view by Western-trained doctors (so warranted at the time), but, a short approximate 10 – 15 years later, and now LLLT has enough credible research that many conventional medical clinics are welcoming it to their list of treatments for the brain injured, for sports medicine and pain management, and for psychiatric care. Some recent studies on LLLT were performed by researchers from Massachusetts General, Harvard Medical School, Harvard-MIT Division of Health Sciences and Technology, and in cooperation with Guangxi Medical University of China and others. The latter paper concludes that evidence supporting the benefits of transcranial LLLT for acute TBI is rapidly accumulating and that anti-inflammatory and neurological anti-edemic effects may also have roles to play in successful applications for Chronic TBI along with possible mechanisms of LLLT to stimulate neurogenesis and increase the ability of the brain to repair itself. Additionally, a group of researchers from University of Sao Paulo Medical School, Brazil in association with Institute of Biomedical Engineering, Anhembi Morumbi University and others, in an ongoing 3+ year study has concluded, thus far, that LLLT is a low-cost and safe intervention for improving the cognitive and memory functions for chronic TBI patients (in addition to similar pathologies in post-stroke patients, as well as depression and anxiety in psychiatric patients) [22,23].

But, the event of new research and demand for assistance to the head injured seems to have hit an exponential curve. Both could be due to the world wide attention of the recognition by the NFL that there is, indeed, a problem in football's lack of ability to protect its players from lifelong suffering and their \$100 million dollar donation to research on concussion prevention and treatment in late 2016 seemed to spearhead a momentum that is still cascading. Whatever the reason may be, for the first time in modern medical history, there are a few prescriptive-worthy treatments to offer the brain injured populace and we list our findings herein.

Transcranial Cold Laser or Low Level Laser Therapy – As mentioned above, this has so far proven to be a low-cost and effective treatment for many of the symptoms of sequelae of TBI. It seems that the LLLT decreases the inflammatory response, assisting neuroprotection after a traumatic brain injury despite the length of time post-trauma. It is surmised that it is this process

that leads to increases on ATP or cellular energy production and blood flow, thereby decreasing the metabolic process. LLLT seems to increase the intercellular synapses, thus, providing an array of improvement in cognitive processing, memory, and other symptoms [22]. Clinically, we have witnessed many patients state their headaches have lessened and their energy levels and ability to focus increase with just one 8 minute generalized cranial treatment.

Phospholipid Precursors, Vitamins, and Nutrients. Stanford and Southern Illinois Universities, and the University of British Columbia, Vancouver, merged studies and information to create a composite of clinical implications for the usefulness of nutraceutical therapies in the treatment of TBI patients as a safe adjunctive trial. While we must underscore the need for additional research to verify the effects in other models and under other laboratory conditions in addition to what they have provided, they have this to say: “Despite these concerns, given the current preclinical evidence, in particular, nicotinamide, magnesium, the flavonoids, and omega-3 acids, have a broad body of research supporting their use in the treatment of TBI”. This has been borne out through both experimental stroke and TBI studies over many years’ course. They conclude that the success of one treatment/one nutrient, outlined in this course of treatment is unlikely to be of great significance for the alleviation of symptoms on its own. However, the therapies discussed should be used in combination for the biggest potential as none of them address all of the issues involved with brain injury (Excitotoxicity, Oxidative Stress, Energy Supplementation -- ATP, mitochondria function, etc., Cell Death, Edema, Plasticity & Neuromodulation, Inflammation). They advise utilizing a complete protocol of all discussed in their paper to cover all of the known mechanisms of TBI (Vitamins B2,3,6,9, C, D, E, Herbs Ginseng and Ginkgo, Flavonoids Luteolin, Quercetin, Baicalein, Puerarin, Formononetin, 7,8-DHF, Wogonin, and Flavopiridol and Magnesium, Zinc, Carnitine, and Omega-3 Acids) [25,26].

In the discussion of the collaborative paper mentioned immediately above, it was expressed that the largest challenge facing these (non-drug) therapies and their need for (U.S.) replication and verification of effects by many other American laboratories and entities for mainstream U.S. prescription is the disinterest from pharmaceutical companies – presumably because of lack of financial remuneration [25].

Neurofeedback (EEG moderated and dictated Biofeedback). Detroit Michigan’s Wayne State Medical University, with a review of the literature in 2013 concluded that Neurofeedback was a promising treatment that warrants double-blind controlled studies to determine its potential role in the treatment of TBI. Though all 22 examples of research studied reported positive finding that neurofeedback led to improvement in measures of subjective and objective reports, there is no standard methodology to date [27]. In 2019, the landscape has appeared to change somewhat [28] and the methodology described in the research found in the last 2 years appears homogenized from the U.S. to Turkey to research from India’s Institute of Mental Health [29,30]. The latter’s research from late 2017 reports another large single-blind EEG Neurofeedback or NFT (Neurofeedback Therapy) study with good results.

Significant beneficial differences were seen in not only symptom reporting and perceived stress, but, also, in measured cortisol levels [27]. In the earlier Turkish study of 40 subjects diagnosed with PCS, overall improvement was seen in a long-term follow-up (averaging 3.1 years) in all but 2 of the subjects being stable and off medication. Their improvement was measured in the

primary measures (Symptom Assessment-45 Questionnaire, Clinical Global Impressions Scale, Hamilton Depression Scale) and secondary measures (Minnesota Multiphasic Personality Inventory, Test of Variables for Attention). The Neuroguide Traumatic Brain Index for the 95% of subjects also decreased significantly [29,30].

Diet – Intermittant Fasting or/and Ketogenic Diet. UCLA's David Geffen School of Medicine, Department of Neurosurgery, published a review of 16 papers written since 1988 on the neuroprotective benefits of a ketogenic diet following brain injury.

Altered cerebral metabolism of glucose is noted after head injury and increasing the cerebral metabolism of alternative substrates – ketones – has been shown in several models of traumatic brain injury to be neuroprotective. In fact, they note, hyperglycemia has had a long association with poor sequelae of TBI, likewise, early administration of glucose after TBI, which suppresses ketogenesis, increases insulin, and lactic acid production causes further possible damage. The TBI patients who were put on a ketogenic-like diet or fasted to minimize hyperglycemia showed a lower plasma glucose and lactate concentration, increased Beta-hydroxybutyrate and improved urinary nitrogen balance compared to the patients fed a standard diet. Previously similar beneficial changes were observed with food withheld from adult rodents for 24-hrs after controlled cortical impact injury. The starved animals showed significant brain tissue preservation, improved mitochondria bioenergetics and overall improved cognitive outcome. The association of neuroprotection and ketosis was determined (and not hypoglycemia) [31].

The paper includes the mechanisms of cerebral metabolism of ketone bodies and conclusion of the benefits providing additional fuel for ketone bodies in the form of Omega-3 Fatty acids (concurrent with other studies mentioned above). They conclude with: “whether ketosis is achieved by starvation or administration of a ketogenic diet... low plasma glucose in the presence of an alternative substrate (ketones) have consistently shown neuroprotective effects after various types of brain injury”. If TBI induces altered glucose metabolism, and it appears to do so with accumulating evidence, then maintenance for the TBI patient with a normal or standard glycemic diet would not be optimal [15,31].

It is interesting to note that a TBI patient in the authors' care, post-concussed 30+ years, recently stated that 25 years on a high-protein-low-carb (ketogenic-type) diet is what has kept her “going all these years”.

Cranio-sacral therapy and Visceral or Osteopathic Manipulations.

According to Elizabeth Sandel, M.D. a nationally recognized brain injury specialist, craniosacral therapy "can be effective at treating headaches, as well as neck and back pain that are common with post-concussion syndrome."

The Brain Injury Association of Washington states that "based on anecdotal evidence provided by those seeking services with BIAWA," craniosacral therapy "has been beneficial for some individuals throughout their recovery"[32].

While large-scale double-blind or even single-blind studies seem implausible at this time for manipulation of the cranial and sacral fascia, other soft tissue, and bone, it is worth mentioning

for the sheer number of case studies and purported successes. A quick google scholar or PubMed search reveals too numerous single case studies to mention, but, one among many, in particular is suggestive of adding this to the multi-dimensional approach for the TBI patient [1] (though Cranio-sacral therapy and Visceral Manipulations came later and are very different from the Doctor of Osteopathy manual techniques as a whole, including the level of education, we are categorizing them similarly for the purposes of this paper as the target of this therapy, with regards to cranial manipulation, is a similar physical approach). 1 preliminary trial from each discipline (Osteopathy's CranialSacral manipulations and Cranio-Sacral Therapy is included, herein) [1,32]

A single-blinded case series to discover whether the intervention of CranioSacral Therapy and Visceral Manipulation was conducted in a clinical setting with 11 retired professional football players from the American NFL and Canadian Football League. All had been medically diagnosed with post-concussion syndrome. Each subject had 2, 2-hour sessions in one day – morning and afternoon, over the course of 5 days. The testing measures used were scores on: The Impact Neurocognitive Test; Short Form – 36 Quality of Life Survey, Dynavision (reaction-time) testing; Headache Impact Test; Dizziness Handicap Inventory; a numeric pain rating scale; orthopedic range of motion tests; and vestibular testing. Hours of sleep were also noted. The outcome measures were registered at baseline, after treatment, and after a 3-month follow up [1,32].

Cervicogenic pain and overall pain rating was significantly reduced. All test measures that were statistically and significantly increased were: Average reaction time ($P=0.0332$), Memory Test ($P=0.0156$), cervical ROM scores ($P=0.0377$). Hours of sleep averaged 2 hours on day 1 and increased to 4.0 hours by day 5 and were still showing increase at the 3-month evaluation.

A research paper based on a pilot study was recently published (in 2018). Approximately 71% of participants, after one session of Osteopathic cranial manipulation, reported overall improvement of their symptoms based on the Post-Concussion Symptom Scale scores [32].

Acupuncture and Chinese Herbal Medicine. Dr. Khusid of the Deployment Health Clinical Center stated in his publication, Clinical indications for acupuncture in chronic post-traumatic headache management (2015) that chronic post-traumatic headache (PTH) is one of the most common complaints after mild traumatic brain injury, yet, needed is sufficient data to direct conventional treatment of headaches. Wanting to improve response rates and decrease the potential for the adverse effects and risk of dependency on polypharmacy, he points to nonpharmacologic options as an answer. “Current evidence shows that acupuncture is at least as effective as drug therapy for migraine prophylaxis and neurovascular and tension-type headaches. Because of its safety, cost effectiveness, and long-standing benefits, adjunctive acupuncture should be offered to patients with chronic PTHs and may be a valuable primary treatment alternative”. They called for future well-controlled randomized clinical trials[Khusid, cite here]

The military has been utilizing the benefits of acupuncture, at least in triage, since, at least, 2011 [33]. Using acupuncture for the treatment of soldiers' brain injuries had promising results in

preliminary studies: reduced anxiety, fewer headaches, less pain and better sleep for 90% of the participants in their preliminary studies. More research programs with the VA are underway. Commander, Dr. Stuessi states, “all we can say is we’ve learned from the Chinese on this... they’ve been doing this for a couple of thousand years” [34].

The call from the Deployment Health Clinical Center was answered in [A Randomized Exploratory Study to Evaluate Two Acupuncture Methods for the Treatment of Headaches Associated with Traumatic Brain Injury](#) (2016). This was conducted in conjunction with the Walter Reed National Military Medical Center in Bethesda MD. The study illuminated that 80% of the Service members with a history of traumatic brain injury have chronic or recurrent headache and their study’s objective was securing non-pharmacologic treatment. They embarked on a 5 cohort test: AA group received auricular acupuncture (it should be noted that auricular acupuncture is acupuncture in the ear and as old as Chinese medicine’s acupuncture of the body) [cite “35.5’The Yellow Emperor]; TCA group treated with traditional Chinese acupuncture; and UC received usual care alone for TBI-related headache. This was a three-armed, parallel, randomized study. All patients were previously deployed Service members with mild-to-moderate TBI and headaches. Additional intervention explored were UC alone or with AA or TCA. Standard tests were used to measure (primary outcome) Head Impact Test (HIT), (secondary) Numerical Rating Scale, Pittsburgh Sleep Quality Index, Post-Traumatic Stress Checklist, Symptom, Medical Outcome Quality of Life, Depression Inventory, Anxiety Inventory, automated NeuroPsychological Assessment Metrics and expectancy of outcome and acupuncture efficacy. The HIT scored decreased in the AA and TCA groups but increased slightly in the UC-only cohort from base to week 6 (-6.4, -2.9, and + 0.6 points, respectively). Acupuncture scored more beneficial or equally beneficial in all areas. The conclusion: “Both AA and TCA improved headache-related QoL more than UC did in Service members with TBI.[20].

Shortly after this and some other landmark studies worldwide on the efficacy of acupuncture in General (notably, a 1964 patient emergency department multicenter, randomized, equivalent and non-inferiority trial appeared in The Medical Journal of Australia in 2017 – they tested two types of acute pain at T= 1 hour. The results concluded that acupuncture was equivalent to pharmacotherapy and that Acupuncture was a safe and acceptable form of analgesia [37]. Another study 2017: 4 English and 2 Chinese ED databases reviewed 651 patients for various acute pain conditions finding that acupuncture was superior to sham acupuncture, more effective than intravenous morphine, and comparable to conventional ED pharmacotherapy – it was not comparable to conventional treatment of hypertension and cardiac issues)[38].

In a PubMed publication October 1, 2018, it was announced that the Veterans Health Administration had published a new occupation code for Acupuncturists to practice at their centers [39]

Chinese medicine encompasses acupuncture, acupuncture injection therapy (APIT or aquapuncture) tuina (a type of medical massage with similar techniques that mimic osteopathic and cranio-sacral therapies), and Chinese herbal medicine (called Kampo and prescribed by Western-trained MDs in Japan). A large research project from the Tangu Hospital of Traditional Chinese Medicine (2015) following over 400 patients (translated by author) concluded, in the

case of acute TBI, Chinese herbal medicine (involving herbal medicines chosen for the patients' particular injury and acute symptoms), acupuncture with liquid sterilized herbal injection (aquapuncture or acupuncture injection therapy), and Western medicine combined has better outcomes than just Western or Eastern (Chinese) medicine alone and that long-term subjects with no acute intervention still need to be studied [40]]. The authors are engaged in a small pre-clinical stage trial with aquapuncture and scalp acupuncture with TBI syndrome patients – post-injury 1- 40+ years.

Scalp acupuncture was first mentioned in ancient texts written, presumably, by the high impact martial artists – the Shaolin Monks. They were treating, quite likely, chronic and acute TBIs a very long time ago [41]. Modern day scalp acupuncture is said to have come from the doctor among these monks (between 500 and 700 AD) and is being used with purported success in a very large ongoing trial for brain-damaged stroke victims in San Jose at the Zhu Neuro-acupuncture and Rehabilitation Clinic [42].

Many more studies are warranted and needed. For acupuncture, potentially single-blind, multi-cohort studies could assist in optimizing the prescription for a protocol that would best help healthcare providers maximize the patient benefit.

Conclusion. Unbeknownst to many a practitioner from Western Medical to Eastern Medical disciplines and various healthcare practitioners in between, there are, at the least, 6 multi-modal evidence-based treatments and credible therapies to assist and enhance the quality of lives of those suffering from the sequelae of traumatic brain injury, right now. They are:

- LLLT or Cold Laser Therapy (a knowledgeable LLLT Professional may educate one on European Standards and can be invaluable to incorporating this into your practice, in this author's opinion)
- Nutraceuticals with emphasis on phospholipid precursors
- EEG guided Neurofeedback
- Ketogenic Diet (and avoiding dairy, wheat, or other common allergens, at first, with re-introduction to determine triggers to symptoms)
- Cranio-sacral Therapy
- Acupuncture with emphasis on auricular and scalp acupuncture

As more establishments like Neurokinetics clinic for TBI patients in Vancouver Canada and TBI Therapies, Colorado, emerge, utilizing the multi-modal approach, more warranted clinical research will evolve with optimized protocols for the TBI patient.

It is also proposed, by these authors, for streamlining and assisting the further investigations needed in this area, that we define “TBI Syndrome” as the general term and umbrella (much like ‘arthritis’ or ‘cancer’) for the array of specificities of prominent symptoms. We offer that TBI Syndrome might be defined as:

A patient suffering somatic (movement, pain), cognitive (concentration or linear thinking deficits), chronic fatigue or other autoimmune disorders, and/or other psychological or brain-related disorders (mood change, depression, sleep disorder) whose onset was

observed immediately or closely following a significant sheering, axonal, concussive or impact to the head, or otherwise traumatic injury to the brain.

This may serve the need for dissemination of information and more discussion leading to other interventions beneficial to the patient and its research furthered.

In the meantime, since the most successful research to date is in the broad spectrum of healthcare disciplines, it is indicated that a cooperative between a patient's Osteopathic and Medical Doctor (Western Doctor), Eastern Doctor, Acupuncturist, and Naturopathic Doctor (ND) occur for the best possible outcome of the individual patient.

Limitations -- This was written toward the goal of immediately helping healthcare providers by offering some viable tools and knowledgeable guidelines for referrals for their encounters with the post-concussed population. Some or all the treatments cited failed to meet the kind of quantitative, double-blind, or longitudinal studies hoped for. Nevertheless, we feel the provided 6 therapies, in a multi-modal approach, are the best that the whole of healthcare has to offer at this time.

Translation – 1 paper cited was originally written in Chinese and translated by Cynthia Sharp, an author of this paper, and a native of China.

Conflict of Interest – there is no conflict of interest

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