



Brain Injuries

& Integrative Treatments

Western Pathophysiology Presentation
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Statistics

As of 1999 The CDC reports
Traumatic brain injury (TBI) is a leading cause of death and disability
among children and young adults in the United States

Each year an estimated **1.5 million Americans sustain a TBI.**

As a consequence of these injuries:

230,000 people are hospitalized and survive.

50,000 people die.

10 percent are sports related | 21 percent of children and adolescents is due to sports

Males are nearly two times more likely to be hospitalized and
three times more likely to die from TBI than females.

People over 75 years had the highest number of hospitalization and deaths.

These do not include only being in the ER or untreated.

80,000 to 90,000 people experience the onset of long-term disability.

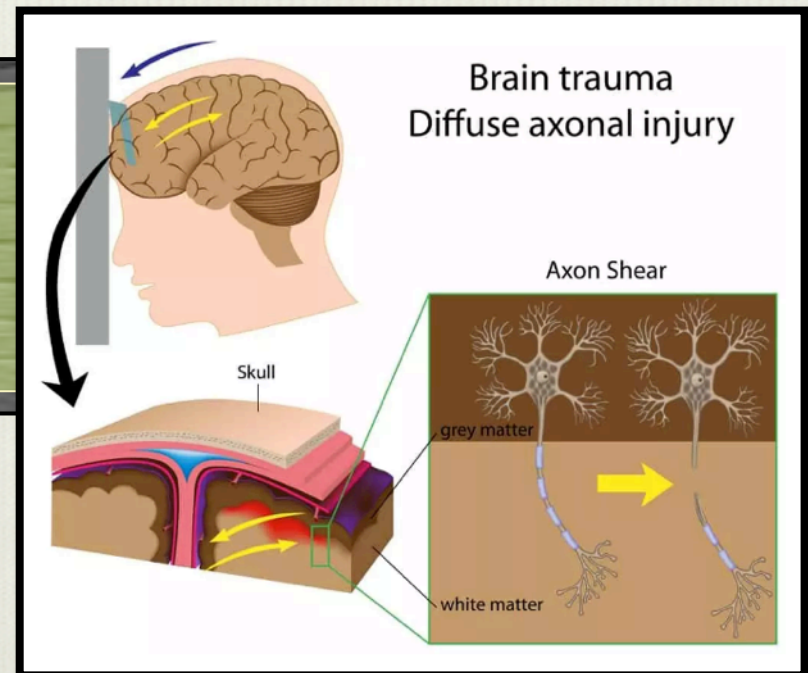
As the cumulative result of past traumatic brain injuries
an estimated 5.3 million men, women, and children are living with a permanent
TBI-related disability in the United States today.

Motorcycle Accidents | Gun Shots | Falls | Other Motor Accidents | Assaults
Sports | Babies being shaken

Diffuse Brain Injuries

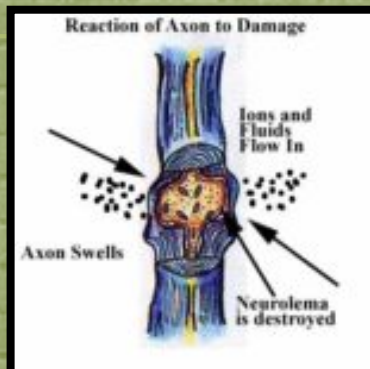
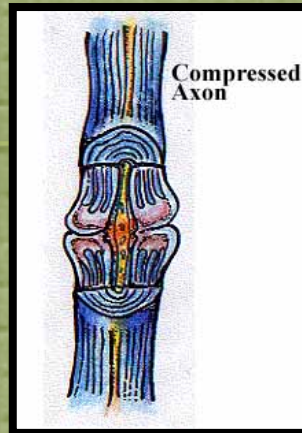
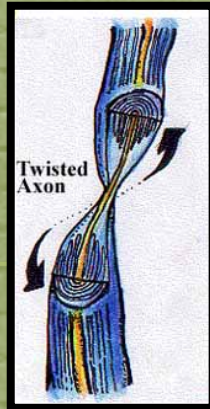
Common to other brain injuries they can occur within a spectrum of severity.

- ❖ **Mild:** Person is awake, eyes open, Symptoms can include confusion disorientation, memory loss, headache, and brief loss of consciousness. Transient physiologic disturbance in neurologic function that includes “**cerebral concussion**”
- ❖ **Moderate:** person is lethargic; eyes open to stimulation. Loss of consciousness lasting 20 minutes to 6 hours. Some brain swelling or bleeding causing sleepiness, but still arousable.
- ❖ **Severe:** uncouncious; eyes do not open, even with stimulation. Loss of consciousness lasting more than 6 hours, To progressively more damaging and lethal that is now called “**diffuse axonal injury**”



- ❖ Can produce microscopic changes that do not appear on CT scans and are scattered throughout the brain. This category of injuries, may occur with or without an associated mass lesion.
- ❖ Secondary injury occurs due to inflammation within brain, decreasing blood flow and oxygen to areas of the brain.
- ❖ They occur due to a result of energy dissipation within the substance of the brain or as a result of systemic dysfunction.

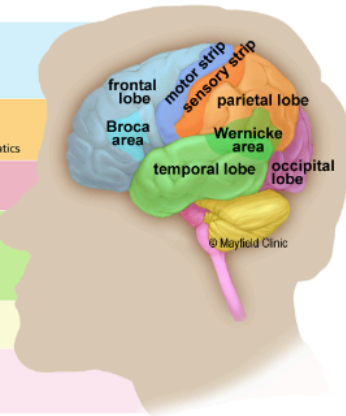
Diffuse Axon Injuries



- ❖ (Axons: Carry nerve impulses away from the cell body)
 - ❖ Shaking, Inertial effect
 - ❖ Acceleration/Deceleration
 - ❖ Axonal Structural Damage
 - ❖ Shearing, tearing, or stretching
 - ❖ compression of nerve fibers
 - ❖ Severity corresponds to the amount of shearing force applied to the brain and brain stem and/or inflammatory response
 - ❖ (We assume my son had a compressed Axon injury near his atlas and axis C1, 2. He had projectile vomiting and was incoherent for a week until it was adjusted.)

Symptoms

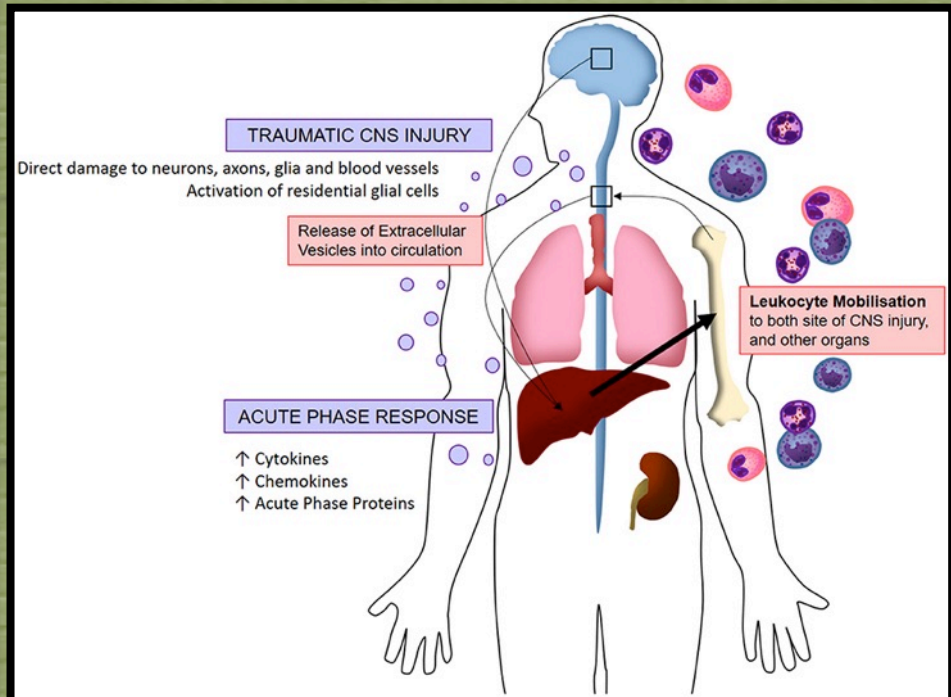
Lobe	Normal brain	Injured brain
Frontal lobe	Personality, behavior, emotions Judgment, planning, problem solving Speech: speaking and writing (Broca's area) Body movement (motor strip) Intelligence, concentration, self awareness	Behavioral and emotional changes Impaired judgment, motivation and inhibition Reduced mental abilities, memory loss Impaired sense of smell, vision loss Paralysis on one side of the body
Parietal lobe	Interprets language, words Sense of touch, pain, temperature Interprets vision, hearing, motor, memory Spatial and visual perception	Difficulty distinguishing left from right Lack of awareness or neglect of certain body parts Difficulties with eye-hand coordination Problems with reading, writing, drawing, naming, mathematics
Occipital lobe	Interprets vision (color, light, movement)	Defects in vision or blind spots (visual field cuts) Blurred vision, visual illusions / hallucinations Difficulty reading and writing
Temporal lobe	Understanding language (Wernicke's area) Memory Hearing Sequencing and organization	Problems with short-term and long-term memory Changes in sexual behavior Increased aggressive behavior Difficulty recognizing faces, identifying / naming objects Difficulty understanding language and speaking (aphasia) Common location for seizures
Cerebellum	Balance Coordination Posture	Difficulty coordinating fine movements Difficulty walking, tremors, dizziness (vertigo) Slurred speech
Brainstem	Automatic functions such as breathing, heart rate, body temperature, wake and sleep cycles, digestion, sneezing, coughing, vomiting, and swallowing	Changes in breathing Difficulty swallowing food and water (dysphagia) Problems with balance and movement Dizziness and nausea (vertigo)



- ❖ Vomiting
- ❖ Lethargy
- ❖ Headache
- ❖ Confusion
- ❖ Paralysis
- ❖ Difficult swallowing
- ❖ Dilated Pupils

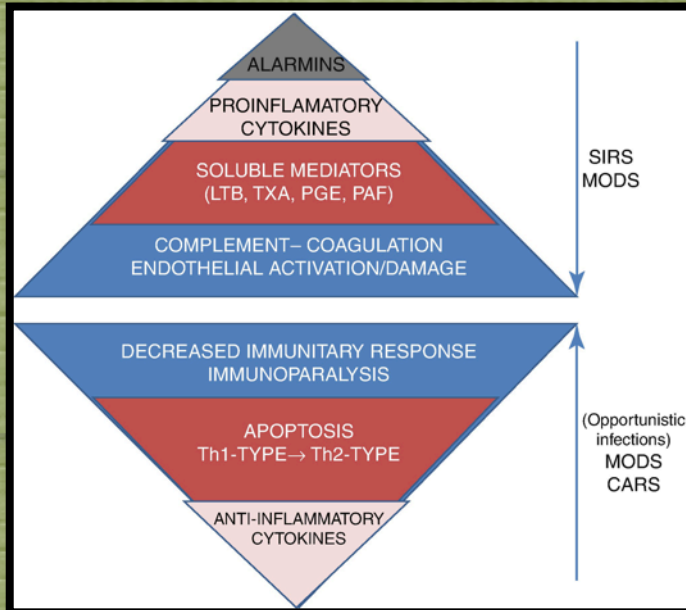
- ❖ Vision Changes (blurred, seeing double, unable to tolerate light, loss of eye movement, blindness)
- ❖ Drooping eye
- ❖ Cerebrospinal fluid clear or blood tinged appear from ears or nose.
- ❖ Dizziness and balance concerns
- ❖ Sleeping longer/less/ Drowsiness

- ❖ Loss of bladder and bowel control
- ❖ Facial Weakness
- ❖ Ringing in Ears
- ❖ Speech changes
- ❖ Breathing changes: Slow breathing with increase blood pressure
- ❖ Mood/Behavioral Changes



Primary Injury: Systemic Inflammatory Response Syndrome (SIRS)

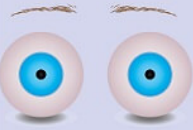


- ❖ Instant within seconds/minutes of trauma
 - ❖ Coagulation, Hypoxia, excitotoxicity, free radical formation, breakdown of blood-barrier, release of proteases
 - ❖ Microglia and astrocytes, leukocytes from periphery release cytokines and chemokines.
 - ❖ Hyperinflammation
 - ❖ Structural Damage
- ❖ EVs Extracellular Vesicles are elevated and initiate the acute phase response (intercellular communicator, mediator of normal physiology and pathology) all cell types neurons, microglia, astrocytes and CNS endothelial cells.
 - ❖ Tumor EV cells can communicate distally in other cells to metastasize
 - ❖ Stem Cell EV's have been used as a therapeutic agent to decrease inflammation) (mesenchymal stem cells (MSCs)



Secondary Injury: Compenesatory Anti-inflammatory Response Syndrome (CARS)

- ❖ Inflammatory Mediators: significantly increase as early as 2 hours post-injury
- ❖ Liver expression of prime leucocytes from bone marrow and translocate to site of injury as well as uninvolved peripheral organs. Spleen releases its reservoir of pro-inflammatory monocytes and increases expression of
 - ❖ IFN- γ , Tumour Necrosis Factor
 - ❖ Interleukin (IL)-1 beta- (stimulates heart, slow down kidneys)
 - ❖ Interleukin-6 IL-6 (Induces CRP, fibrogen, hepcidin in hepatocytes)
- ❖ Hypothalamus-pituitary (HPA)-axis and sympathetic nervous system (SNS) efferent limbs in CARS provide negative feedback for the production of inflammatory mediators
- ❖ In case of acute TBI the activation of CARS leads to the complication of immunosuppression which may result in possible susceptibility to infection, Multi-organ Dysfunction Syndrome (MODS) and/or mortality

Examinations | Imaging | Labs used in Diffuse Brain Injury:

Behaviour	Response
 <p>Eye Opening Response</p>	<ol style="list-style-type: none"> 4. Spontaneously 3. To speech 2. To pain 1. No response
 <p>Verbal Response</p>	<ol style="list-style-type: none"> 5. Oriented to time, person and place 4. Confused 3. Inappropriate words 2. Incomprehensible sounds 1. No response
 <p>Motor Response</p>	<ol style="list-style-type: none"> 6. Obeys command 5. Moves to localised pain 4. Flex to withdraw from pain 3. Abnormal flexion 2. Abnormal extension 1. No response

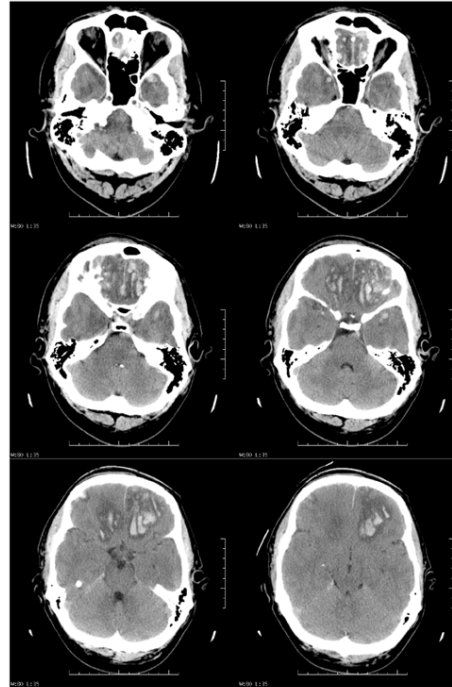
Glascow Coma Scale:

This 15-point test helps a doctor or other emergency medical personnel assess the initial severity of a brain injury by checking a person's ability to follow directions and move their eyes and limbs. The coherence of speech also provides important clues.

Information on Injury:

How, Where, Consciousness lost, Other body injuries, impact, jarring, whipped, ect.

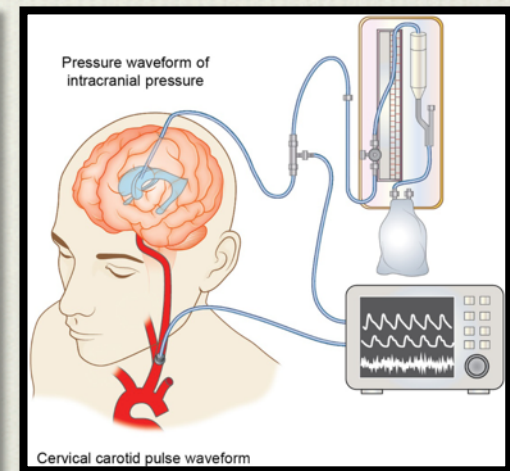
Figure 1



CT brain scans within 2 days of a head injury show multiple bilateral hemorrhagic contusions in medial orbital frontal lobe and anterior temporal lobe. The 35-year-old had been found wandering with a skull fracture. He had been disoriented and agitated for several days. He was convinced that he had pressing appointments that he needed to get to. Despite no neurological signs, the patient was disorganized, showed poor insight, and was hospitalized. He improved markedly after about 2 months and subsequently returned to work.

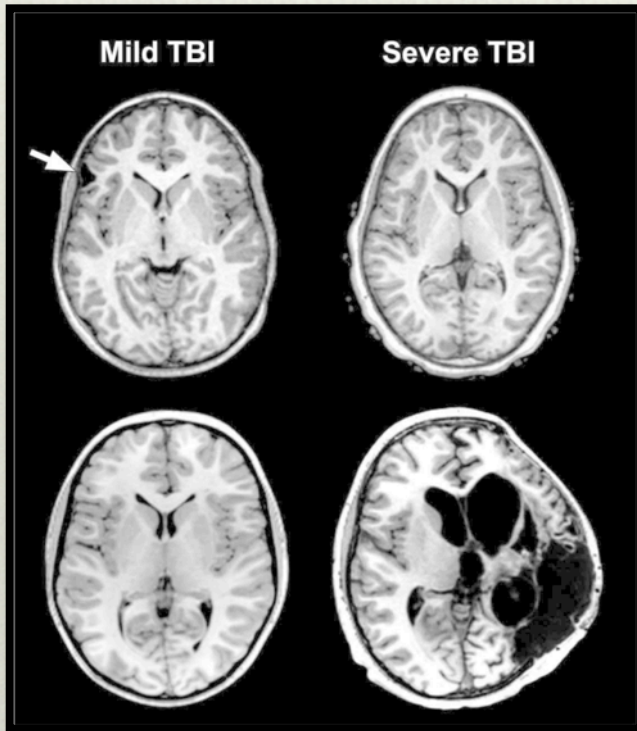
Computed Tomography:

Shows bleeding in the brain, blood clots, bruised brain tissue and brain swelling.



Intracranial Pressure Probe:
Physicians may insert a probe through skull to monitor tissue swelling inside the skull.

Examinations | Imaging | Labs used in Diffuse Brain Injury cont:



MRI: Magnetic Resonance Imaging

They all had loss of consciousness except the lower left. The upper right had an initial GCS of 14 (13-15 is mild) that turned to 3 (TBI) overtime. The lower left is a 15. So both MRI and Glasgow Coma Scale can be problematic in classification.

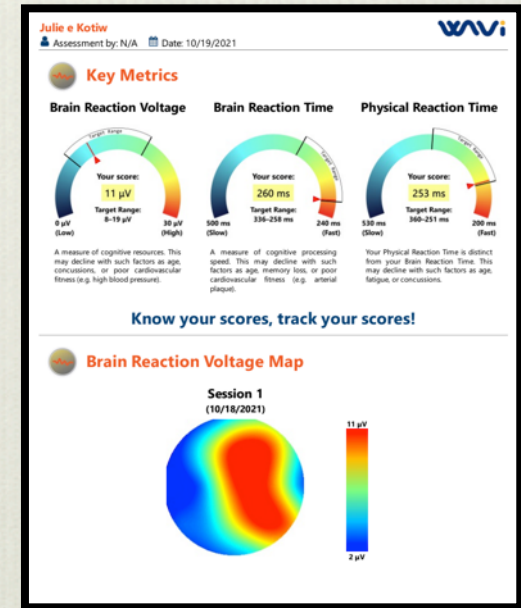


i-STAT TBI plasma test

Recently FDA approved, yet still in Clinical trials estimated completion date December 2022.

A rapid hand held live blood test that simultaneously measures glial fibrillary acidic protein (GFAP) and ubiquitin carboxyl-terminal hydrolase L1 (UCH-L1), biomarkers present in blood plasma at elevated concentrations after a brain injury. Results available in 15 minutes.

Other test for cytokines in Cerebral Spinal Fluid (serum) And saliva samples T-Tau protein (MAPT), S-100 β , neurofilament light chain (NF-L and glial fibrillary acidic protein (GFAP) could be used as biomarkers.



Electroencephalography (EEG) was the first clinical neurodiagnostic assessment that revealed **abnormal brain function** following traumatic brain injury. To detect brain injury, EEG may be more sensitive than clinical neurological examination.

This WAVI EEG machine is for Direct measurements of brain function. Track how exercise, nutrition, and lifestyle can change these performance metrics.

EMERGENCY CARE:

- ❖ Anti-Seizure medication: Avoid more damage
- ❖ Coma-Inducing medication so the brain needs less oxygen
- ❖ Diuretics medication: Reduce fluid in Tissues
- ❖ Surgery: Removing blood clots, repairing skull fractures, stop bleeding
- ❖ Opening a window in skull, shunts.

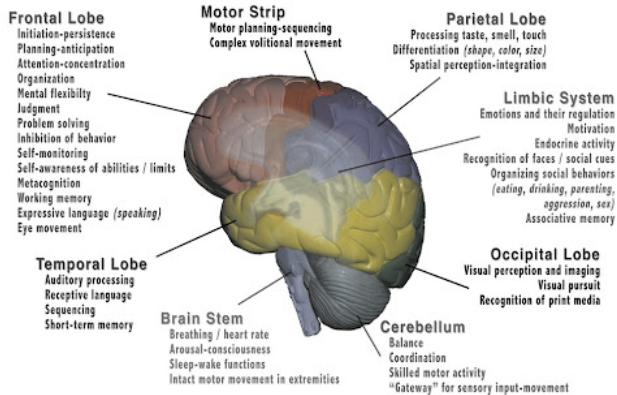


POST EMERGENCY CARE:

- ❖ Rehabilitation
- ❖ Physiatrist
- ❖ Occupational Therapist
- ❖ Physical Therapist
- ❖ Speech and language therapist
- ❖ Neuropsychologist
- ❖ Social Worker
- ❖ Rehabilitation Nurse
- ❖ Traumatic brain injury nurse specialist
- ❖ Recreational therapist
- ❖ Vocational therapist



Brain-Behavior Relationships



Cognitive Deficits

Cognitive deficits such as trouble with memory, attention, and processing can also lead to problems with personality changes that change mood and behavior, even in mild and moderate injuries. Pharmaceuticals are used in sub-acute and chronic disorders.

COMMON MEDICATIONS:

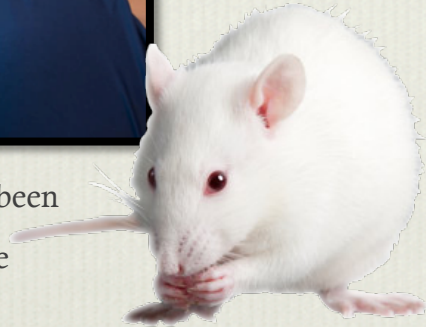
- Psychostimulants : ADHD
- Antidepressants: SSRIs
- Antiparkinsonian: Enhancing dopamine receptors
- Anticonvulsants: Aggression, memory, restless
- Beta Blockers: Aggression and agitation.
- Antiandrogenic: Estrogen and medroxyprogesterone inappropriate sexual behavior
- Neuroleptics: Delirium, recalibrate neurotransmitters.
- Modafinil: Narcolepsy may inhibit GABA and increase Glutamate

- ❖ Depression
- ❖ Anxiety
- ❖ Manic Episodes
- ❖ Violent Temper
- ❖ Attention Deficit Disorders
- ❖ Emotional | Non-emotional
- ❖ Learning Disabilities
- ❖ Defiant
- ❖ Hypersomnia
- ❖ Memory and Attention
- ❖ Inappropriate (Sexual and Other)

Acupuncture decreases volume of brain lesions and inflammatory mediators in the blood



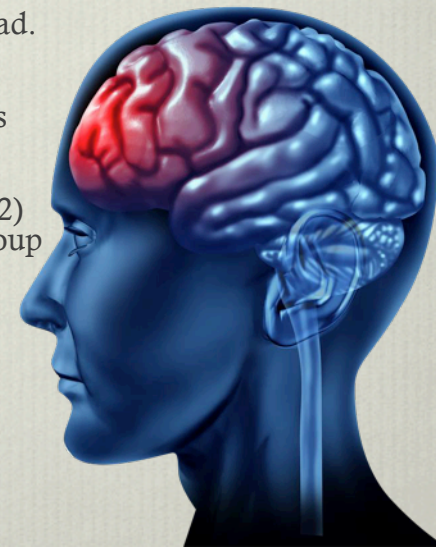
- ❖ Neurotrophic factors had been verified to activate repair mechanisms and stimulate neuroregeneration.
- ❖ One of the most important neurotrophic factors, brain derived neurotrophic factor (BDNF) is a key regulator of synaptic connections, synaptic plasticity and neural survival and growth, playing an important role in rebuilding construction and function.
- ❖ After combined stimulation at the acupoints of in a clinical study with brain injured rats **Baihui DU 20, Renzhong DU 26, Hegu LI4, and Zusanli ST36**, they found that BDNF and TrkB were significantly elevated
- ❖ From the TCM point of view, the overall principle of treatment is to promote **blood circulation to remove blood stasis, phlegming resuscitation, and dredging the channel**. As one of the most important treatments, acupuncture could stimulate the surface acupoint and regulate the function of Qi, blood, and organs, which could strengthen the body resistance to eliminate pathogenic factors and equilibrium between yin and yang.



- ❖ When treating 60 patients with acupuncture in conjunction with cranial pressure (oxicracetam with sodium chloride IV was administered to improve brain metabolism) the levels of plasma IL-6 were and focal lesions (CT scan) significantly decreased compared to those only on medication. These patients also showed to increase plasma BDNF and NGF significantly than those not receiving acupuncture.

The average age was 52.3 and GCS score was 9.5.
Acupuncture points used: **SP 10, KI3, ST40, SP9, ST36, SP6, CV9, CV4, ST25, ST28, GV20, GV26, GB20 and Yin Tang**

- ❖ This treatment drains dampness, boost qi and blood and calms shen. Addressing the Du and Yang Qiao channel of the head.
- ❖ The effective survival rate was 81.3% (26/32) in the combination group, which was higher than 59.4% (19/32) in the western medication group (P<0.05). Acupuncture mechanism may be related to reducing the expression of inflammatory response.



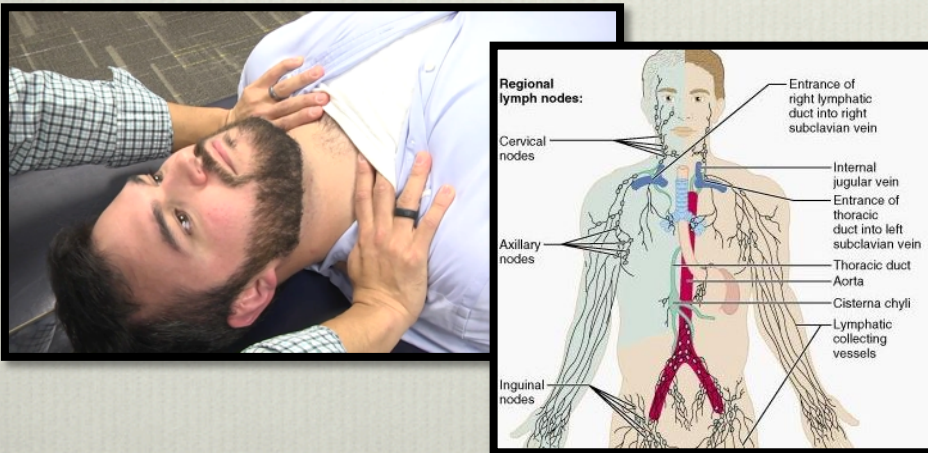


21 Year Old Amateur Skateboarder

Injury to back of head and neck

Injury and Primary Treatment History

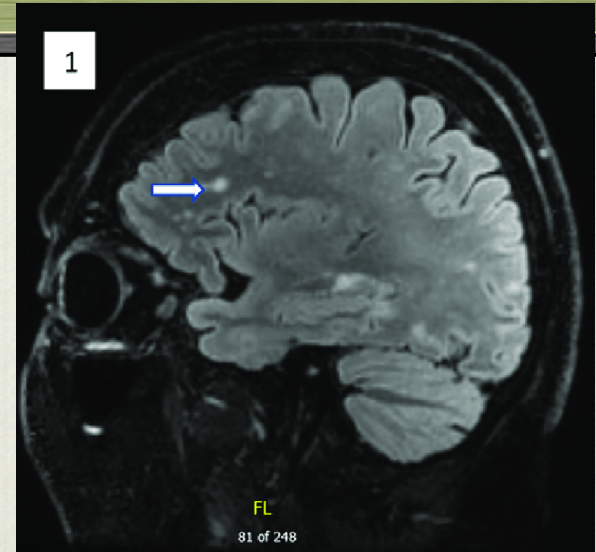
- ❖ Skateboarding injury 12/2013-hit posterior head. Attending ASU and living in Arizona. Did not seek medical care, had had multiple injuries in the past, didn't find it necessary.
- ❖ Came to my office in Illinois because he had severe neck pain. During the session I felt he had increased use of vocabulary. Intercostals on upper right near thoracic inlet area were congested and swollen. He thought it was whiplash.
- ❖ Right, Sternocleidomastoid, Suboccipital was twice as swollen as left. Used manipulative techniques to release these areas. It sounded like a gallon of fluid started to move within the upper body. The right suboccibital decreased to normal size.
- ❖ Picture below shows Myofascial release to thoracic inlet



- ❖ I informed mother of patient of personality change and possible brain disorder.
- ❖ He received a Kundalini healing from SWIHA instead of medical attention which then started a tailspin of paranoia and that others were trying to manipulate his mind. He felt enlightened and did not want to change his feeling, he was happy to die, if it meant to surrender. I think it would of helped but they didn't take the thoracic inlet and suboccipital obstruction into effect,so the energy was brought up the the head and did not cycle.
- ❖ Started forcing these philosophical theories on friends, family and the dean of ASU. DIY skatepark at ASU.
- ❖ ASU Red flagged him as a terrorist. CT Scan showed no signs of injury, so he was institutionalized and diagnosed with schizophrenia. He was put on medication and discharged.
- ❖ He lived in a tent and started speaking with words that only started with a certain letter, changing the letter every day. He did call people in his circle often
- ❖ I communicated with pictures to reflect his dreams and speech, until his mom could travel (She had surgical complications)
- ❖ His mom picked him up in March of 2014 and took him to a nuerologist in Texas.

Revised Diagnosis

- ❖ Skateboarding accident 12/2013-hit posterior head with memory loss and psychosis. 4/24/14
- ❖ Traumatic brain injury [239200]Psychosis [193198]
- ❖ Findings: Several punctate T2 hyperintense, nonenhancing foci are in bilateral frontal lobe subcortical white matter. The brain parenchyma shows otherwise normal gray-white matter differentiation without any mass, hemorrhage, acute infarct, abnormal enhancement, edema, or herniation. The sulci, ventricles, and cisterns show normal size and shape. No extra-axial fluid collection or skull lesion is present.
- ❖ A 7 mm oval signal void is adjacent to the right orbital
Possible aneurysm
- ❖ Although newly diagnosed, actual findings were non-specific, he received medical treatment to reverse Schizophrenia Drug
- ❖ Placed on Zoloft (SSRI) and started Cognitive Behavioral Therapy (CBT)



Above photo is an example of several punctate bilateral frontal lobe subcortical white matter lesions probably represent non-specific gliosis.

Road to Recovery

- ❖ Returned to Arizona in the Summer and tried to reenter social and economic circles. Reconnection with verbal and communication.
- ❖ Severe foggy headed, insomnia, anxiety, slightly manic or introverted. Balance issues compared to his former balance. Weakened muscles. Atrophy inner left calf.
- ❖ Treated a few times with acupuncture, SWIHA therapists (Kundalini made him more manic)
- ❖ I had him send me tongue pictures to get a herbal prescription (Bahia my clinic owner and I agreed and sent Compassionate Sage)
- ❖ I had him work on his own lymphatic system for his head since it was long distance, keeping the fluids moving. I eventually came to Arizona and treated him with acupuncture, cupping and craniosacral.
- ❖ Julie Kotiw DC (nueroanatomy professor LACC) created nueroplasticity exercises for him to do and had him add progesterone cream and Omegas3.
- ❖ 1 year to reenter society with functional cognitive function. 2 years for full cognitive and skate boarding function.
- ❖ Full Cognitive function, yet with an “enlightenment experience”.
Has a teaching degree from ASU, teaches Montessori classes and tutors the un-tunable.

Complimentary Alternative Modalities included

- ❖ **Progesterone Cream-Topical**

Progesterone is produced not only by the ovaries and placenta in females but also by the adrenal glands and the brain of both sexes. Its production in the brain, by oligodendrocytes and other cell types, provides clues to its critical role in neural homeostasis. Indeed, the 10-fold increase of progesterone during fetal growth thought by some experts to be primarily of neuronal development. Within the last 20 years, pre-clinical research has repeatedly shown that progesterone has potent neuroprotective properties. At both the central and systemic levels, progesterone suppresses synthesis of proinflammatory cytokines such as TNF- α , IL-1, and IL-6, limiting inflammation, microglial activation and further neural injury.
- ❖ In a clinical trial there was a 50% reduction in 30-day mortality and GCS score lowered 47%. Intravenous progesterone were used in these studies.
- ❖ **Omega-3 polyunsaturated fatty acids (PUFAs) 16.2 g 2x day**

These omegas exhibit neuroprotective properties and represent a potential treatment for a variety of neurodegenerative and neurological disorders. (Proven to lower GCS scores by a few points.)
- ❖ **Yoga (2 x week)**
- ❖ **Meditation (3 times a week)**
- ❖ **Lymphatic Drainage Self-Care**
- ❖ **Neuroplasticity exercises**
 - ❖ Vagus Nerve
 - ❖ Balance

TCM Herbal Formula



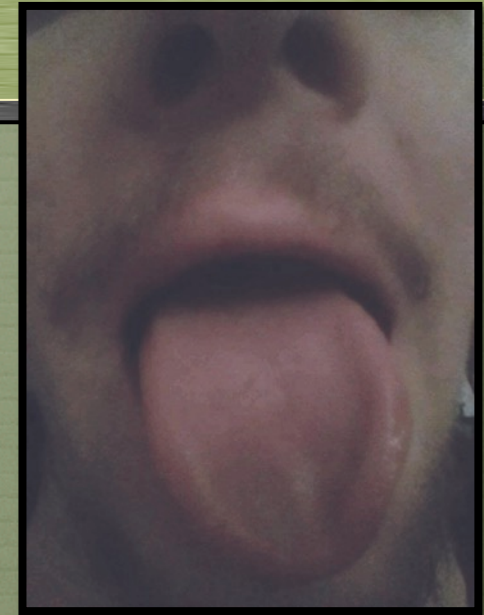
Before Herbal formula

Deficient area with strain
in Chest and heart area
Sticky Coat: Phlegm
Pale to Purple tip: Stasis,
heart qi and blood deficiency



Compassionate Sage

1 week 3 dropper fulls
2x a day



1 Week after Formula

Less Phlegm
Pinker more blood flow
Less strain
A little wind

Amber Nourishing the Heart Pill: Hu Po Yang Xin Dan
Heart unable to store Spirit (Shen), Heart Blood and Qi Deficiency

INGREDIENTS PINYIN:

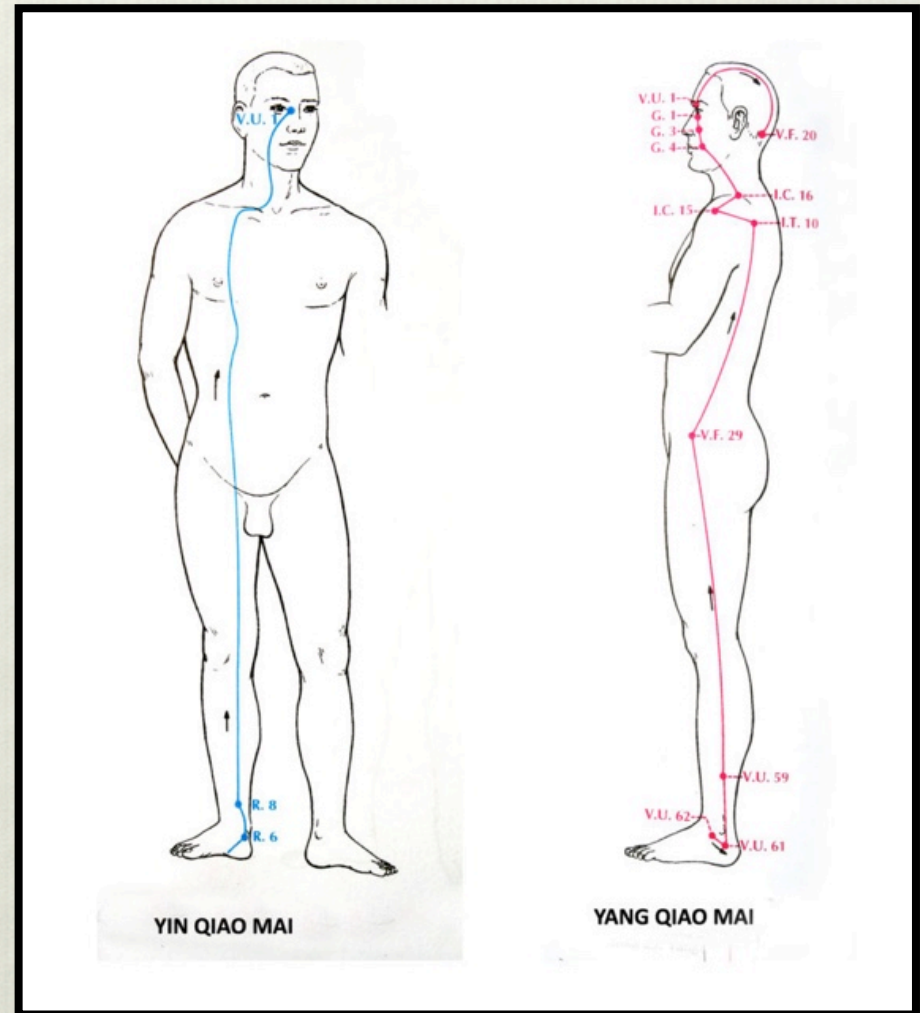
Long gu, Bai zi ren, Fu ling, Chao suan zao ren, Yuan zhi, Dan shen, He huan pi, Bai ren shen rhizome rhizoma,
Jiu jie chang pu, Long yan rou, Hu po, Huang lian, Dang gui shen, Gan cao, Ling zhi

TCM | Bodywork

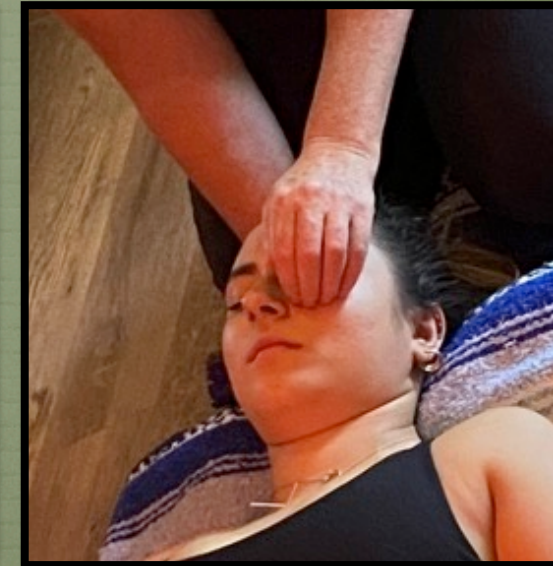
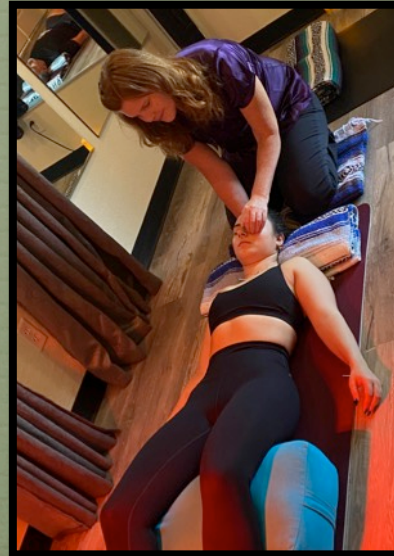
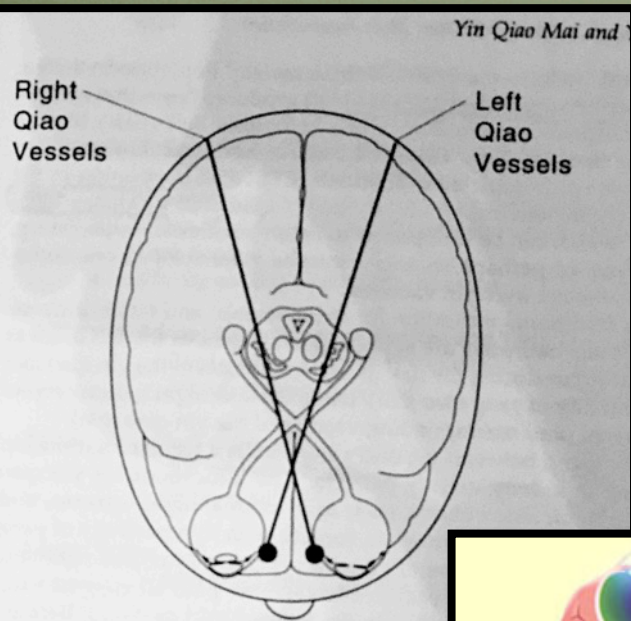
- ❖ Acupuncture, Cupping, Craniosacral (Yin Tuina), Lymph drainage
- ❖ Rx: Phlegm excess, Heart and blood qi deficiency with stasis. The heart failing to house the (mind) shen.
- ❖ Yin Qiao and Yang Qiao imbalance.
 - ❖ Insomnia, symptoms worse at night
 - ❖ Posterolateral pain and tension in limbs
 - ❖ Hit his head post lateral UB channel
 - ❖ Limpness in antero-medial extremities

Acupuncture treatment:

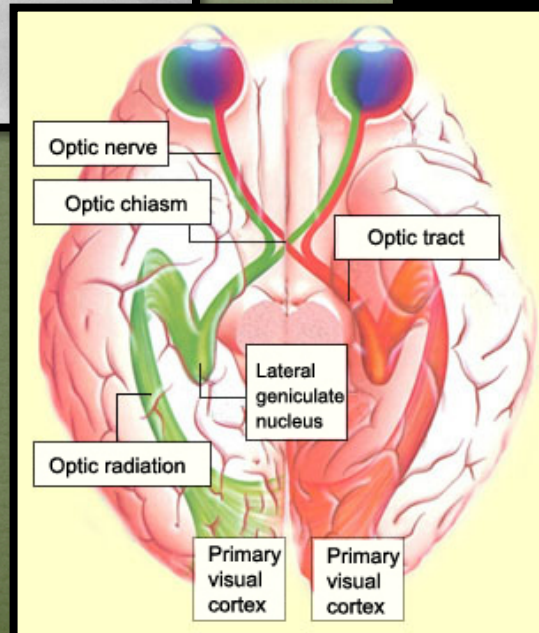
- ❖ Yang Qiao Yin Qiao Balance:
UB 62 SI 3 LU 7 KD 6
Move Blood and Qi: LI 4 LV3
Nourish Sp.ST clear Phlegm: ST, 36, 40
Clear wind and local pts of injury:
DU 20, 19, 18 15
Scalp: Shi Shen Cong,
Ear Pointts: Ear Shen Men, Occipital
- ❖ Due to time constraints 6 treatments in a year.
Yet patient used acupressure throughout the year to help.



Cranio Sacral | Yin Tuina



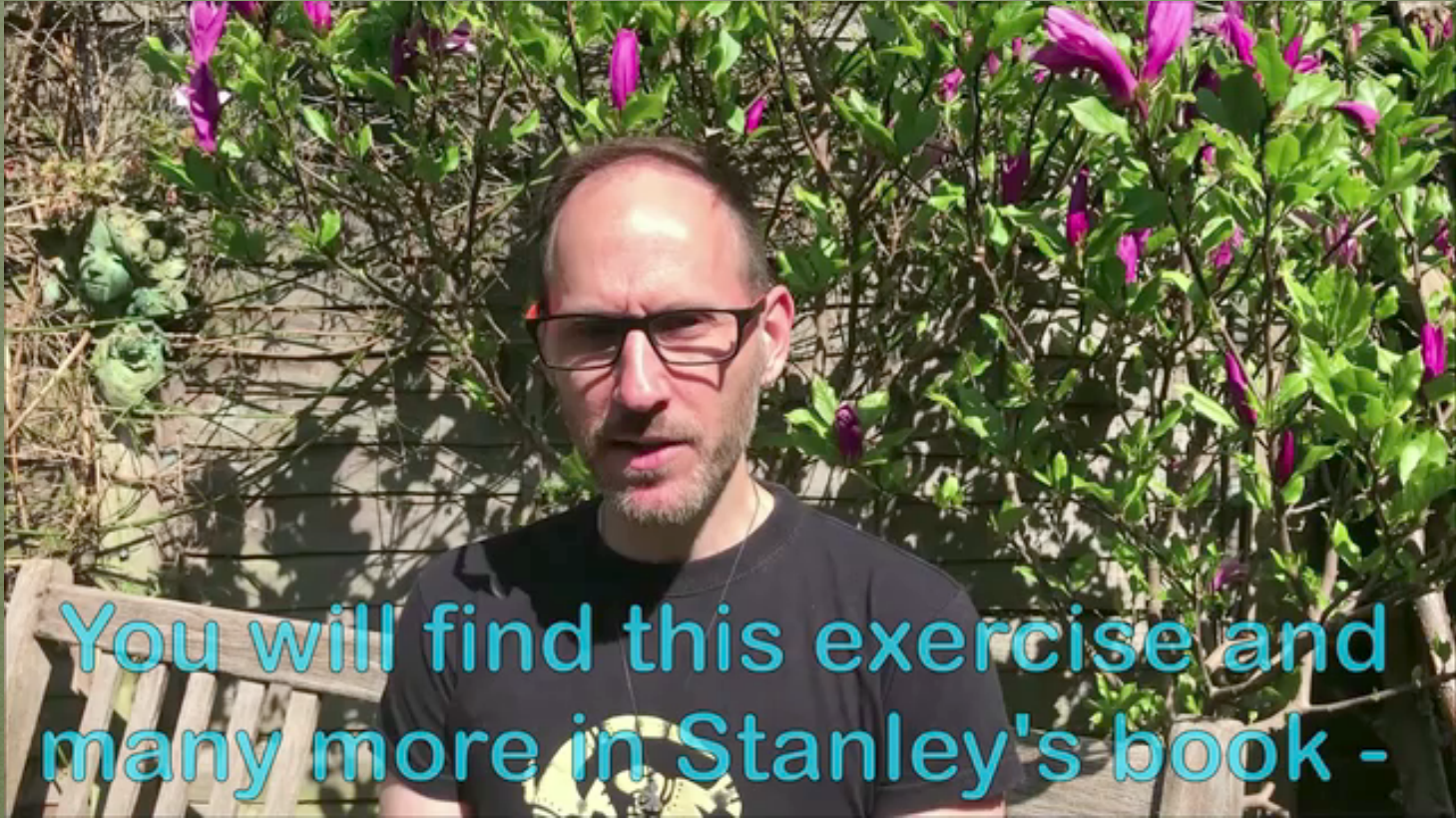
Yin Qiao
&
Yang Qiao



Acupoint pressure on GB 20
Suboccipital protrusion and
Hand cupping opposing eye with
gentle pressure on outside orbital area

Gentle hold until congestion
decreases at GB 20.

Gently feel neck to see if rigid
ischemia has softened and cervical area
have released in congested areas.



You will find this exercise and many more in Stanley's book -

Nueroplasticity exercise

Vagus Nerve: Reduce stress.

References

B cell, Germinal Center, Bone Marrow. Pinterest. (n.d.). Retrieved November 27, 2021, from <https://www.pinterest.co.uk/pin/335799715944382182/>.

The basic exercise by Stanley Rosenberg. YouTube. (2020, April 14). Retrieved November 28, 2021, from <https://youtu.be/rbowIy6kONY>.

The Brain From Top To Bottom. The brain from top to bottom. (n.d.). Retrieved November 27, 2021, from https://thebrain.mcgill.ca/flash/d/d_02/d_02_cr/d_02_cr_vis/d_02_cr_vis.html.

Centers for Disease Control and Prevention. (2016, January 22). *Report to congress: Traumatic brain injury in the United States*. Centers for Disease Control and Prevention. Retrieved November 28, 2021, from https://www.cdc.gov/traumaticbraininjury/pubs/tbi_report_to_congress.html.

Changes to behavior and personality after Brain Injury. Therapy Insights. (n.d.). Retrieved November 27, 2021, from <https://therapyinsights.com/products/changes-to-behavior-and-personality-after-brain-injury?variant=29428937064542>.

Clinical evaluation of the I-stat tbi test - full text view. Full Text View - ClinicalTrials.gov. (n.d.). Retrieved November 27, 2021, from <https://clinicaltrials.gov/ct2/show/NCT04171960>.

Espinoza, T. R., & Wright, D. W. (2011). *The role of progesterone in Traumatic Brain Injury*. The Journal of head trauma rehabilitation. Retrieved November 27, 2021, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6025750/>.

How the brain is injured: Nebraska brain injury attorney. Nebraska Brain Injury Attorney | Brain Injury | Personal Injury | Attorney. (2021, March 4). Retrieved November 27, 2021, from <https://nebraskabraininjurylawyer.com/aboutbi/how/>.

Hunt, T. (2021, September 8). *The hard problem of consciousness has an easy part we can solve - facts so romantic*. Nautilus. Retrieved November 27, 2021, from <https://nautil.us/blog/the-hard-problem-of-consciousness-has-an-easy-part-we-can-solve>.

Li, X., Chen, C., Yang, X., Wang, J., Zhao, M.-L., Sun, H., Zhang, S., & Tu, Y. (2017). *Acupuncture improved neurological recovery after traumatic brain injury by activating BDNF/TrkB pathway*. Evidence-based complementary and alternative medicine : eCAM. Retrieved November 27, 2021, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5294361/>.

Mayo Foundation for Medical Education and Research. (2021, February 4). *Traumatic brain injury*. Mayo Clinic. Retrieved November 27, 2021, from <https://www.mayoclinic.org/diseases-conditions/traumatic-brain-injury/diagnosis-treatment/drc-20378561>.

Mayo Foundation for Medical Education and Research. (2021, February 4). *Traumatic brain injury*. Mayo Clinic. Retrieved November 27, 2021, from <https://www.mayoclinic.org/diseases-conditions/traumatic-brain-injury/diagnosis-treatment/drc-20378561>.

Medicine, W. U. E. (2018, November 8). *A 40 y.o. male who had a claviclectomy for thoracic outlet presents with drainage from the wound*. Everyday E(B)M. Retrieved November 27, 2021, from <https://everydayebm.org/naunheim-files/2018/11/5/a-40-yo-male-who-had-a-claviclectomy-for-thoracic-outlet-presents-with-drainage-from-the-wound>.

Mileski, K. (2021, March 9). *Diffuse axonal brain injury: Causes, symptoms, treatment*. Propel Physiotherapy. Retrieved November 27, 2021, from <https://propelphysiotherapy.com/neurological-injuries/traumatic-brain-injury/diffuse-axonal-brain-injury/>.

Neuropsychiatric effects of traumatic brain injury. Psychiatric Times. (n.d.). Retrieved November 27, 2021, from <https://www.psychiatrictimes.com/view/neuropsychiatric-effects-traumatic-brain-injury>.

New York Infant Brain Injury Attorneys: Glk lawyers. GLK Law. (2019, March 28). Retrieved November 27, 2021, from <https://www.lawyertime.com/practice-areas/traumatic-brain-injury/>.

Park, B. (2021, January 12). *FDA clears rapid blood test for mild traumatic brain injury*. MPR. Retrieved November 27, 2021, from <https://www.empr.com/home/news/suspected-mild-traumatic-brain-injuries-diagnostics-i-stat-alinity-plasma-test/>.

Pirog, J. E. (1996). *The Practical Application of Meridian Style Acupuncture*. Amazon. Retrieved November 27, 2021, from <https://www.amazon.com/Practical-Application-Meridian-Style-Acupuncture/dp/B00ENKIOXI>.

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PM; N. M. R. H. D. A. S. L. M. V. (n.d.). *Routine and quantitative EEG in mild traumatic brain injury*. Clinical neurophysiology : official journal of the International Federation of Clinical Neurophysiology. Retrieved November 27, 2021, from <https://pubmed.ncbi.nlm.nih.gov/16029958/>.

Principles of neurological surgery. ScienceDirect. (n.d.). Retrieved November 28, 2021, from <https://www.sciencedirect.com/book/9780323431408/principles-of-neurological-surgery>.

The problem of Traumatic Brain Injury (TBI) severity ... (n.d.). Retrieved November 27, 2021, from https://www.researchgate.net/figure/The-problem-of-traumatic-brain-injury-TBI-severity-classification-by-using-the-Glasgow_fig2_306009035.

Robert, S. (2020, November 1). *Traumatic brain injury and mood disorders*. Mental Health Clinician. Retrieved November 27, 2021, from <https://meridian.allenpress.com/mhc/article/10/6/335/447067/Traumatic-brain-injury-and-mood-disorders>.

T2 flair sagittal section of MRI showing hyperintense foci ... (n.d.). Retrieved November 27, 2021, from https://researchgate.net/figure/T2-flair-sagittal-section-of-MRI-showing-hyperintense-foci-involving-frontal-lobe-arrow_fig1_343799976.

W;, G. Z. H. Y. J. H. W. (n.d.). *[early acupuncture for traumatic intracerebral hematoma: A randomized controlled trial]*. Zhongguo zhen jiu = Chinese acupuncture & moxibustion. Retrieved November 27, 2021, from <https://pubmed.ncbi.nlm.nih.gov/29797913/>.

YouTube. (2017, December 13). *Scalene/Thoracic Inlet Release - OMM lymphatics techniques for chronic pain*. YouTube. Retrieved November 27, 2021, from <https://www.youtube.com/watch?v=caNkfxGIPMU>.