The Treatment of Temporal Lobe Injury With Acupuncture and Traditional East Asian Medicine

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The Temporal Lobes – Functional Overview

The temporal lobes are unique in terms of brain regions. These are the only areas of the brain that subserves personalized, subjective emotional and social experience and can store and recall this information from memory. The temporal lobes also have very prominent emotional and cognitive affiliations encompassing a wide range of emotional states, normal and aberrant. Much of this is in correlation with the limbic system, specifically the amygdala and hippocampus with which the temporal lobes are intimately related and are involved in emotion and memory, respectively. This makes sense as evolutionarily the temporal lobes developed out of the deeper limbic system [1]

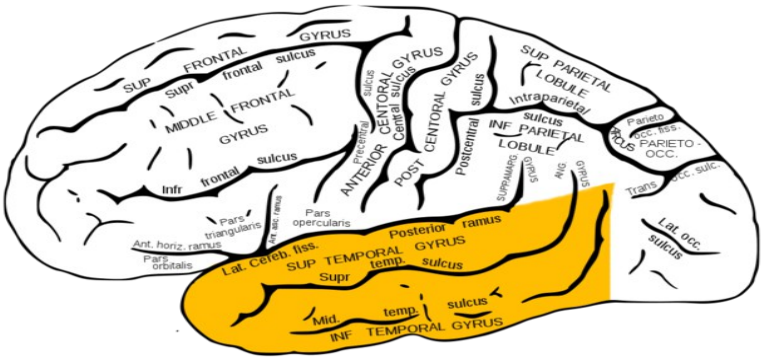
The temporal neocortex can be loosely divided into three subdivisions -superior, middle and inferior. The superior temporal lobe, aka, the auditory neocortex acts as the last processing and filtering of sounds before being transferred to Broca's area of the frontal lobe for associations with responsive speaking. In this way the auditory and language areas of the brain are linked: from the amygdala which houses emotional components to the superior frontal lobe, to the inferior parietal lobe and to Broca's area and then back again and may be called the auditory association area. The signals in the superior temporal lobe have already been highly processed and analyzed by the auditory cortices for a number of components such as temporal sequencing and distinguishing non-random sounds from noise. Injury to the superior temporal lobe can show a number of deficits in auditory processing and association with verbal language.

The middle temporal lobe processes visual input and also much of the information has already been processed by older brain structures, in this case, the visual cortices. In this manner the middle temporal lobe groups many of the previously processed elements into higher order units that include depth, segmenting foreground from background, and integration of information into full gestalts. Damage to this area can result in disorders called agnosias in which certain objects or types of objects cannot be perceived, processed, or an inability to associate the information with any meaning or memory. The right lobe is particularly adept at distinguishing speed and direction of objects.

The inferior temporal lobe appears to be involved in the highest level of visual integration and contain highly developed neurons that mediate the perception and recognition of specific shapes and forms. The anterior portion of the inferior temporal lobe can be considered part of the auditory cortex as well as receiving visual input. Additionally there are strong connections with the limbic system, in particular, the amygdala and hippocampus. Thus, the inferior temporal lobe responds to auditory, visual and emotional stimuli. This region is particularly involved in visual attention (the ability to hold focus) and other visually-guided behavior, the recognition and learning of visual discrimination, and memory of objects and spatial locations. Cells are sensitive to a variety of components including direction of movement, color, contrast, size, shape, orientation, and the overall processing of three-dimensionality. Damage to this area can result in visual deficits including prosopagnosia, or inability to discern and recognize faces, visual learning and in performing visual closure in which the brain “fills in the gaps” if only part of an object is visible.

Hallucinations can develop from injury to the temporal lobes. Type and intensity of the hallucinations vary on the specific regions affected. Less specific auditory hallucinations such as buzzing, clicking, humming, and whispering can be associated with Heschyl's Gyrus along the transverse temporal lobe. Abnormal activity in the superior temporal lobe, particularly the right lobe, can develop musical hallucinations including a repetitious melody, singing, or individual instruments playing. Hallucinations of single words, full sentences, comments, advice, and distant conversations that can't quite be made out are associated with both the right and left superior temporal lobe. The middle and inferior temporal lobes can elicit visual hallucinations when damaged or stimulated. The anterior inferior temporal lobe specifically tends to have the most vivid and complex forms of imagery due to its specialization in recognizing specific forms. When this abnormal activity effects the amygdala and hippocampus emotions and memories can also be evoked such as involving real people or events from memory including dream-like hallucinations and feelings of deja vu.

The temporal lobes are highly susceptible to injury from a variety of causes, including head injury, stroke, tumor, and epilepsy. In part, this susceptibility is due to the position of the temporal lobe within the skull. With whiplash injuries, or if the skull is struck from the back or the front, the temporal lobes may hit the inside of the skull and be ripped, torn, or sheared. The inferior temporal lobes are also slow to mature which in turn increases the likelihood that abnormal neural networks may be formed in response to adverse early experience. Hence, abnormal early environmental influences, including profound traumatic stress, can induce language, emotional, and memory disorders including repression for childhood experiences, as well as severe psychiatric abnormalities including schizophrenia and dissociative phenomenon and can implicate the temporal lobes as well as the amygdala and hippocampus.



The Temporal Lobes – Pathology & Symptoms

Left Superior Temporal Lobe (Auditory Neocortex)	Right Superior Temporal Lobe (Auditory Neocortex)
Difficulty with: -perception of real words -word lists -numbers -backwards speech -morse code, consonants -consonant vowel syllables -nonsense syllables -transitional elements of speech -single phonemes -rhymes	Difficulty with: -acoustically related sounds -non-verbal environmental acoustics (e.g. wind, rain, animal noises) -prosodic-melodic nuances -sounds which convey emotional meaning -most aspects of music including temp and meter -determining location of sounds

Middle Temporal Lobe	Inferior Temporal Lobe
-Associated Visual Agnosia -Word finding difficulty-possible aphasic abnormalities -Naming deficits -Abnormalities in maintenance of temporal order and sequence -Verbal memory impairments -Reading and naming deficits (phonological alexia) -Difficulty determining speed and direction of objects (right lobe) patients with developmental dyslexia have been found to have abnormalities in this area	-Difficulty in visual attention/fixation - loss of the ability to recognize faces (prosopagnosia) -Severe disturbances involving visual discrimination learning and retention -Difficulty performing visual closure and recognizing incomplete figural stimuli (different shapes and patterns and objects which differ in regard to size or color)

Wernicke's Area (left Lobe)	Inferior Temporal Lobe, Amygdala, Hippocampus
“Receptive Aphasia” -Severe comprehension deficits -Difficulty with expressive speech, reading, writing, repeating, word finding, etc. -Spontaneous speech may be fluent: increased rate and may seem unable to bring sentences to an end -Spoken words may be contaminated by neologistic and paraphasic distortions making it incomprehensible -Unable to perceive spoken words in their correct order -Cannot identify the pattern of presentation (e.g. two short and three long taps) and become easily overwhelmed	-Memory Deficits in short term emotional, visual and cognitive memory -visual-auditory hallucinations and dream-like mental states -Temporal lobe epilepsy -Ability to sing affected (right amygdala) -Ability to properly intonate altered (right amygdala) -Anterograde amnesia (hippocampus)

Temporal Lobe Epilepsy

Abnormal electrical activity in the temporal lobe, as in epileptic episodes, may not necessarily include any involuntary movements and the individual may simply seem to cease responding to their environment and stare blankly straight ahead. While this may not appear as much externally, internally the person may be going through a wide range of experiences or emotions. Another noteworthy cause may be severe and repeated early emotional trauma which can injure the immature hippocampus and temporal lobe, giving rise to a propensity to develop abnormal neural networks making individuals more likely to develop psychotic and severe emotional and dissociative disorders.

Automatisms - in 75-95% of temporal lobe seizures, about double the rate of any other brain region epilepsy. May include:

-staring -searching -groping -lip smacking -spitting -salivation -laughing	-crying -hissing -gritting/gnashing teeth -clenching fist -confused talking -screaming -shouting	-standing -running -walking -kissing -picking at one's clothes as if picking at lint etc.

Possible Body sensations/symptoms	
-Numbness -Tenseness -Pressure -Heaviness -Visual sensations such as things be very near or far. -Feelings of strangeness or familiarity -Deja vu (~20% of cases, esp. right lobe) -Desire to be alone -Wanting something but not knowing what. -Olfactory hallucinations: usually quite disagreeable and include smells like burning meat, fish, lime, acid fumes, burning feces. -There may also be gustatory sensations: usually disagreeable with with very bad and bitter or metallic and sour tastes	**Symptoms of possible amygdala activation** -Fear -Remembrance of a fearful or traumatic memories -Chest or epigastric sensations -Nausea -Heart palpitations -Feelings of cold or warmth, shivering -Pallor or flushing of the face -Respiratory changes including apnea -Salivation -Belching -Farting -Sweating -Vaginal secretions accompanied by sexual feelings/behaviors -Feelings of deja vu--the feeling of familiarity/reminiscence

Physical and Emotional Symptoms	
-Laughing (gelastic epilepsy), crying (dacrystic epilepsy), and/or running seizures (cursive epilepsy). -Fear/Anxiety -Depression -Depersonalization -Pleasure -Unpleasure -Familiarity -”Out-of body experiences: often with feelings of elation, security, eternal harmony, immense joy, paradisiacal happiness, euphoria, and a “completeness"	-Sexuality changes:-Continuous masturbation, indiscriminate hypersexuality, may expose and manipulate their genitals in public, attempts to have sex with family members. Amygdala involvement can develop previously absent hyposexuality, hypersexuality, homosexuality, transvestism, confusion over sexual orientation, or may even engage in "sexual intercourse" even in the absence of a partner. -Religious experiences: dissociative states, feelings and hallucinogenic and dream-like recollections involving threatening men, naked women, sexual intercourse, religion, direct experience of god, demons, ghosts, etc. -Some report communing with spirits or receiving profound knowledge from the Hereafter.

Possible between seizure psychoses - The range of disturbances among those with temporal lobe epilepsy can include:	
-High rate of sexual aberration as well as hyposexuality -Aggressiveness -Paranoia -Depression -Deepening of emotion -Intensification of religious concerns -Disorders of thought	-Intensification of religious concerns -Disorders of thought -Depersonalization -Hypergraphia -Complex visual and auditory hallucinations -Schizophrenia

East Asian Medicine: A note on the "mystery" of the medicine

The foundations of East Asian medicine are quite different from those of Western biomedicine. While both are approaching the same physical body and the same occurrences therein, the lens through which disease is looked at varies significantly. Both The formation and development of East Asian medical theory was greatly influenced by ancient Chinese philosophy and much of the unique terminology that is still used is reliant on metaphor and what borders on poetic descriptions of systemic effects and functions rather than the compartmentalization of individual pieces and their actions. East Asian medicine is a functional, systems-based medical paradigm, which basically means it is looking at all parts of the body and how they are interacting, influencing each other and where normal function has gone awry. Due to the difference in phrasing and cultural perspectives there has developed an air of mystical components which may deter individuals from looking any farther into it despite a significant amount of literature supporting not only that it is effective, but also, how it is doing so.

Terms such as "Yin" and "Yang" which are still used in almost all texts were used from observation that objects or phenomena in nature, the human body included, as broad concepts consisted of two opposite yet interdependent relative properties. An example of this can be thought of in the body as the sympathetic (fight/flight response) and parasympathetic (rest/digest) nervous system which are opposite functions with which the dynamic of the two regulate the body. This sort of dynamic however is involved on multiple levels of scale from the cellular to organ systems and hormone secretions. Yin generally is referring to the more substantial or dense components of something, in the above example, the parasympathetic system, and Yang to the more motive and functional properties, the sympathetic nervous system. These phenomena being in a state of constant change between them based on external and internal stimuli.

East Asian medical practitioners held that the natural world was integrated into the human body and phenomena in the body reflected that which was found elsewhere in nature. Thus, diseases were viewed as and named after imbalances found elsewhere in nature - conditions were described as "dampness" or "heat" disorders. These can be brought into a modern Western context with a thorough understanding of the intended meaning, dampness loosely being correlated with things such as poor water metabolism and heat as febrile diseases and inflammation. The term "Qi" is one of the terms most shrouded in mystery within the medicine's lexicon and alone is likely the biggest hindrance to it's larger use and integration into the medical institutions. It is a sticky one, and multiple books have been dedicated to exploring this word alone. The foundational tenant that the body has an animating force which "flows" throughout and when it is obstructed one's health degrades is not built into biomedicine and yet there are still a number of functions within the body that sound much like the descriptions of "Qi" in traditional texts. I often use "intelligent metabolism" taken from Daniel Keown[4], a western medical doctor and East Asian medicine practitioner, to try to keep it's broad meaning but use terms a little more palatable to the western lens. In it's essence it seems to correlate with most functional units of the body including ATP production (which is directly effected by acupuncture and cited later), action potential of the nerves, hormone secretions and means of intercellular communication among others.

The East Asian medical views of the body are in line with modern anatomy, however the terminology of the internal organs differ in meaning from conventional definition, conveying a generalization of the physiological functions. The channel or meridian doctrine is also heavily emphasized in East Asian medical theory and are essentially the pathways of information, energy, blood and fluid circulation which extend throughout the body, and have remarkable correlations to a component often given little emphasis in biomedicine – the fascia – which extends along trajectories from the tips of the fingers through the limbs and surrounding all internal organs much the way the meridian pathways are described. A thorough comparison between the fascia of the body and the meridian descriptions and organ system associations reveals a significant overlap and would likely change many minds the use of acupuncture.[5] Acupuncture is a means of stimulating and eliciting a bioelectrical and biochemical response along these trajectories to restore proper functioning throughout the body.

Acupuncture Actions on the Brain Following Injury:

East Asian medicine practitioners differentiate and classify aspects of brain injury into different syndromes or patterns according to their clinical symptoms. Traumatic brain injury is said to risk rupture of the integrity of the body's natural protection system, permitting the invasion of external disease, leaking of essential intelligent metabolism, energy, blood and fluids and introducing blood extravasation. All of these will directly disturb normal intelligent metabolism, blood circulation and induce pain. It is not hard to extrapolate these descriptions into relating to the blood-brain barrier, inflammation, and tissue and nerve damage. Traditionally the brain performs thinking and memorization functions, however physicians attributed the heart as the organ which regulates the whole system, superseding the mental activity of the brain. This may simply metaphorically reflect the large emphasis that was placed on emotional states and health, however, modern research in the field of neurocardiology has shown some interesting developments that lend some credence to this idea. The brain also is considered to be the "cleanest" organ within the body. Should It become polluted by trauma, the rest of the body becomes more prone to disease. After severe head trauma, these factors may affect the organ systems, blocking the "aperture of the Heart" - our emotional well-being and clarity- and hurting the body's primary force for life activities.

More and more evidence is supporting acupuncture's ability to stimulate and regulate the central nervous system and the brain. The release of endorphins within the system and produce an analgesic effect has been well documented. Acupuncture can also create the release of other chemicals and hormones, which influence the body's self-regulating systems and promote natural healing abilities. A 2010 study demonstrated acupuncture to effectively trigger a local increase in the extracellular concentration of ATP, ADP, AMP and adenosine[6] a key component in energy exchange in metabolic processes. By increasing ATP the body is better able to create not only a well-recognized analgesic effect but also contribute more usable energy and innate healing potential within the body. A recent study also demonstrated acupuncture's ability to increase glucose metabolism and improve cerebral blood flow in the brain areas related to cognition and memory by increasing the expression of glucose transporter 1 (GLUT1) which is involved in cellular respiration, regulation of glucose levels and vitamin C uptake. The laboratory results indicated that upregulation of GLUT1 by acupuncture alleviates ischemia and anoxia related cognitive impairment[7].

Specific brain regions have also been shown by using fMRI techniques to be influenced by acupuncture points. Points were either activating, deactivating or regulating of different brain regions and specific points having influence in specific areas of the brain.[8-10] In a meta-analysis of fMRI studies done mapping areas of the brain influenced by acupuncture it concluded "Two third (64%) of 25 studies showed that acupuncture treatments were associated with more activation, mainly in the somatosensory areas, motor areas, basal ganglia, cerebellum, limbic system and higher cognitive areas (e.g. prefrontal cortex). Three studies showed also more deactivations in the limbic system in response to acupuncture."[11] The limbic system is associated with most of the body's emotional processing and acupuncture's regulatory effect on this region is likely the reason it can be helpful in mental-emotional conditions or concerns following a brain injury. An example of these brain region activations being point dependent was shown in a study that found the point KI-3, located posterior to the medial malleolus was shown to enhance connectivity between the superior temporal gyrus and postcentral gyrus, while GB-40, located anterior to the lateral malleolus, enhanced connectivity between the superior temporal gyrus and anterior insula[12]. These studies are limited however, and further research seems essential to create a thorough map of these influences.

A number of points have demonstrated by fMRI studies a correlation to brain activity in the temporal lobes[10]

Activating:

Temporal Lobe General:	PC-6 (electrical acupuncture)
Superior Temporal Gyrus:	LR-3 left side
Inferior Temporal Gyrus:	LI-4 right side
Temporal Pole:	LI-4 right side
Parietal-Temporal Cortex:	GB-37

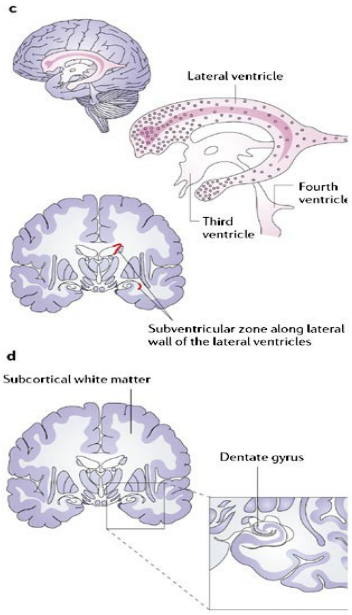
Deactivating:

Temporal Lobe General:	LI-4 right side (ipsilaterally)
Superior Temporal Gyrus:	LI-4 left side
Transverse Temporal Gyri:	BL-60, 65, 66, 67 (in combination) right side

George Soulie De Morant[13] notes indications for brain regions according to his extensive studies of the medicine in China prior to the communist revolution when much of the information was either politically streamlined or lost. According to his studies points had been found to influence both the temporal and parietal lobes in conjunction and not individually.
Points acting on the temporal-parietal lobes: HT-3, PC-6, LI-9, GV-22

Points for specific brain centers
Odor-taste affected: LI-20, GV-20
Hearing affected: TW-21, GB-2, SI-19
Language/speech affected: GV-15

Role of Acupuncture in Neuroplasticity and Neurogenesis:



Acupuncture has been shown to have a direct influence on neuroplasticity and neurogenesis within the brain. This is the ability to create new neural connections and even generate new nerve cells. Until recently it was thought that any neuron loss due to injury or aging in adults was permanent. It is now known that neural stem cells are still active in certain parts of the adult brain, the dentate gyrus of the hippocampus and the subventricular zones. In neurogenesis stem cells are capable of developing into all major types of neural cells: Neurons, astrocytes, and oligodendrocytes. While we now know this ability exists in adults it is at a significantly slower rate than in children.

A recent study showed that acupuncture induces cell and neuroblast differentiation in the hippocampus, providing evidence that it may be useful as a neurogenesis-stimulating therapy. There has also been a demonstrated effect on cAMP signaling, a transcription factor important in proliferation, differentiation, and survival of neural precursor cells, as well as regulating neurotrophic factor that supports the growth, differentiation and survival of neurons. The following acupuncture points have been shown to influence neuronal proliferation:

-ST36 -GV20 -PC6 -HT7 -CV17	-CV12 -CV6 -SP10 -GV16	-GV8 -LI11 -SJ5 -GB30

One of the most studied and clinically used points among these is ST36, located on the superior tibialis anterior muscle. Simulation of ST36 is used for a wide range of conditions affecting digestive system, cardiovascular system, the immune system, the nervous system, and has been widely used for brain disorders. In addition to the above listed actions, ST36 upregulated the expression of neuropeptide Y, which promotes the proliferation of neuronal precursor cells and appeared to lessen the neuropathologic effects of stress in rats.[14]

A recent study examined the role of acupuncture on brain tissue after cerebral ischemia (loss of blood supply to an area of the brain). This study showed a greater proliferation and differentiation of neural stem cells in the brain and an ability to increase blood flow and decrease cell death. Two points on the head, GV-20 and GV-26, regulate cells which “increase the release of nerve growth factors (NGFs) to make nerve cells survive and axons grow, synthesize neurotransmitters, (and) metabolize toxic substances.” While the use of GV-20 and GV-14 increased neural repair after ischemic damage. These points also activate bodily self-protection and reduction of nerve cell death in and near the site of injury. Needling points along the midline of the torso, often referred to as the conception vessel, also showed to increase growth factors [basic fibroblast growth factor, epidermal growth factor and NGF messenger RNA] in the subventricular zones and dentate gyrus[15]

Pattern Differentiation: One Disease With Many Patterns and Treatments

In East Asian medicine theory a single disease can have multiple means by which it came to be or ways in which it occurs. In order to effectively treat, a thorough history of the person to determine exactly what symptoms are present and their inter-relation as well as verification of these by diagnostic tools should be done and treatment based on the findings. Each pattern has a different set of acupuncture points and/or herbal medicinals used. These may be complimented by points that have an effect on the effected area of trauma. You may also note that the same "pattern" can relate to multiple "diseases". In this case the pattern treatment points would be similar but symptomatic points would vary. In this article examples are given of common "patterns" found for the conditions Tinnitus ("Er Ming") and Epilepsy ("Xian Zheng") as they provide relevant examples that can may correlate to symptoms or broader elements of temporal lobe lobe injury.

Tinnitus (Er Ming)

Blood Stasis Pattern

-Persistent tinnitus and/or hearing loss -Possible dark discharge from the ear or mixed with ear wax -Earache	-Dark complexion -Possible headache

One would typically find the person's tongue to have a purplish color and purple spots with a thin coat. Their pulse may be wiry or choppy and thready. The treatment approach would be to quicken the blood, eliminate stasis, and open the ears. Using this pattern as an example, common points used for this pattern would be TW-3, TW-21, SI-19, GB-2, SP-10, SP-6, and BL-17 with a base herbal formula of Tong Qiao Huo Xue Tang.

Wind-Heat Invasion Pattern

-Sore throat -Fever -Aversion to cold -Headache	-Dry mouth -Distention and obstruction within the ears with possible earache leading to tinnitus and impairment of hearing

One would typically find the person's tongue to have a red tip and a thin yellow coat. Their pulse may be floating and rapid. The treatment approach would be to disperse wind, clear heat and open the ears

Liver and Gallbladder Fire Pattern

-Sudden onset of loud tinnitus or deafness -Resembles ocean waves or claps of thunder -Onset of or increase of symptoms with anger or frustration -Headache -Dizziness and vertigo -Epistaxis (nosebleeds) -Earache or distending sensation of the ears -Flushed complexion	-Red eyes -Dry mouth or bitter taste in mouth -Irritability/irascibility -Restlessness -Insomnia -Distention and pain of the chest and hypochondria, -Constipation -Dark Urine

The tongue would likely be red with a yellow coat. Their pulse may be rapid, wiry and forceful. The treatment principles would be to drain the liver and gallbladder fire and open the ears.

Heart and Kidney not Communicating Pattern

-Gradual onset of tinnitus or hearing loss/deafness associated with aging or chronic illness -Resembles buzzing of cicadas -May be intermittent and is often worse at night	-Dizziness and vertigo -Insomnia -Weak, aching low back and knees -Seminal emission

The tongue would likely be red with a scanty coat. Their pulse may be thin or rapid. The treatment principles would be to supplement the Kidneys/Adrenals and secure the essence.

Spleen/Pancreas and Stomach Qi Vacuity Pattern

-Tinnitus and deafness aggravated by overwork -Sensation of emptiness and coolness within the ears -Tiredness/Fatigue -Poor Appetite	-Loose stools -Epigastric distention after eating -Sallow, withered complexion

The tongue would likely be pale with a white coat. Their pulse may be weak. The treatment principles would be to strengthen the Spleen/Pancreas and Stomach and to boost Qi

Epileptic Wind (Xian Zheng)

Many neurological disorders, especially those involving involuntary movements or actions are traditionally characterized as "wind" disorders. The epilepsy patterns correspond to both idiopathic and symptomatic epilepsies in western medicine, including grand mal, petit mal, psychomotor and focal epilepsies

Obstruction by Wind-Phlegm Pattern

Mild Presentation	**Severe Presentation**
-Stopping activities abruptly; dropping objects suddenly -Forward bending of the neck -Staring upward -After consciousness returns no recollection of incident	-Falling down suddenly, sometimes preceded by a scream -Loss of consciousness -Convulsions -Frothing mouth -After consciousness returns there is fatigue, may have headache, and does not recall incident

One would expect the person's tongue to have a white slimy coating. Their pulse may be wiry and slippery. The treatment approach would be to expel phlegm, extinguish wind, and open the orifices

Internal Profusion of Phlegm-Fire Pattern

Mild Presentation: same as obstruction by wind-phlegm pattern **Severe Presentation:** same as obstruction by wind-phlegm pattern	**Additional Symptoms** -Constipation -Agitated emotional state -Irritability -Insomnia -Dry mouth -Bitter taste

The tongue would likely be red with a slimy yellow coat. Their pulse may be rapid, wiry, and slippery. The treatment principles would be to clear the liver, drain fire, transform phlegm, and open the orifices

Vacuity of Liver and Kidney Yin Pattern

-Chronic epilepsy -Dizziness and vertigo -Insomnia -Poor memory and concentration -Weak/achy low back and knees	-Dry stools -Irritability -Tinnitus -Dry eyes

The tongue would likely be red with a scanty coat. Their pulse may be rapid and thready. The treatment principles would be to nourish and supplement the Liver and Kidney Yin, subdue Yang, and quiet the spirit

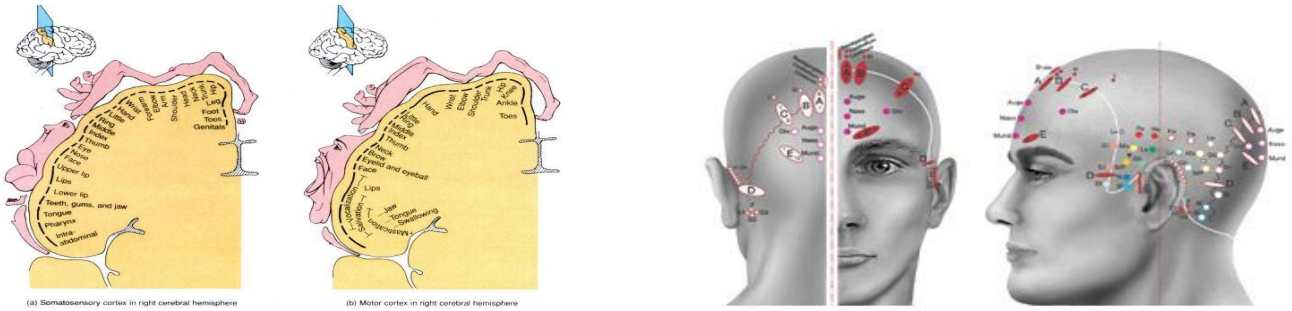
Vacuity of Spleen/Pancreas and Stomach Qi Pattern

-Chronic epilepsy -Fatigue and tiredness -Dizziness and vertigo -Poor appetite -Lusterless complexion	-Loose stools -Nausea -Vomiting -Bloating and distention of chest and epigastrium

The tongue would likely be pale with a greasy coat. Their pulse may be soft and weak. The treatment principles would be to strengthen the spleen/pancreas, boost Qi, calm the Stomach, and transform turbid phlegm

Scalp Acupuncture

Most acupuncture points are located on the trunk and limbs. However, the points over the head play an important place in brain injury management with acupuncture. Specific scalp acupuncture systems and protocols are a relatively newly development yet promising method to treat brain injury and its related symptoms[17-19]. Several scalp "systems" exist, including needling over the sensory-motor humunculi along the parietal and frontal lobes to increase both movement and sensory feedback. Often some immediate benefit can be found from this method. A system known as "Yamamoto New Scalp Acupuncture" has a system of reflex points located over the temporal region that have influence on the functional integrity of the internal organ systems.[23] Future research may be aimed at scalp acupuncture and its effects on the release of neurotransmitters and neurohormones.



Acupuncture Points located over the temporal lobes:
Points physically located over the temporal lobes have a range of indications. Many are beneficial for disorders of the eyes, ears and nose as well as other indications. Explanations of these uses can be found in the source texts.[13, 20]

TW-18: Tinnitus, deafness, pain behind the ear, headache, "head wind", vomiting, diarrhea, seminal emission, discharge from the eye, dimness of vision, infantile fright epilepsy, clonic spasm, fright and fear
TW-19: deafness, tinnitus, ear pain, discharge of pus from ear, itching of the face, redness and swelling in the region of ST-8, headache, heavy head, heat in the body with headache and inability to sleep, dizziness, childhood epilepsy, tetany, fright and fear, childhood vomiting of foamy (watery) saliva, vomiting and drooling, pain of the chest and lateral costal region, dyspnea, seminal emission
TW-20: Tinnitus, deafness, discharge of pus from the ear, redness and swelling of the back of the ear and/or auricle, toothache, tooth decay, swelling and pain of the gums with inability to masticate, stiffness of the lips, dryness of the lips, superficial visual obstruction, stiffness of the nape of the neck with inability to turn the head

GB-3: Deafness, tinnitus, purulent discharge from the ear, dimness of vision, pain of the face, toothache of the upper jaw, stiffness of lips, headache, aversion to wind and cold, chills and fever, hemiplegia, deviation of the mouth and eye, lockjaw, tetany leading to bone pain, clonic spasm, weakness of the optic nerve, achloropsia (does not perceive color), hemianopia
GB-4: One-sided headache, "head wind", headache with heat in the body, visual dizziness, pain and redness of the outer canthus, tinnitus, earache, clonic spasm, lockjaw, epilepsy, deviation of the mouth and eye, toothache, sneezing, neck pain, wrist pain, inability to flex the wrist, "joint wind" with sweating, giddiness, "see's nothing"
GB-5: One-sided headache extending to the outer canthus, pain of the outer canthus, headache, toothache, pain swelling and redness of the skin of the face, nosebleed, incessant turbid nasal discharge, rhinitis, febrile disease with agitation and fullness, weakness of brain and nerves, excessive thirst, cerebral congestion
GB-6: One-sided headache extending to outer canthus, pain of the outer canthus, sneezing, tinnitus, swelling & redness of the skin of the face, febrile disease with absence of sweating, agitation of the heart with no desire to eat, heat in middle Jiao
GB-7: headache, swelling of the cheek and submandibular region, lockjaw, loss of speech, deviation of the mouth and eye, vomiting, stiff neck with inability to turn head, shock, depression
GB-8: One-sided headache, heaviness of the head, "head wind", pain in ST-8 region, deviation of the mouth and eye, acute and chronic childhood fright wind [seizure], dizziness, eye disorders, incessant vomiting, cold stomach, "phlegm qi" diaphragm pain, inability to eat, agitation and fullness on eating or drinking, injury by alcohol and vomiting, phlegm dizziness, edema, any kind of intoxication (alcohol, poisons), drug addiction, headache due to drunkenness
GB-9: Headache, tinnitus, damp itching of the ear, toothache, swelling and pain of the gums, goitre, propensity to fear or fright, fright palpitations, epilepsy, tetany, madness, children: cerebral congestion, hemiplegia
GB-10: Headache, heaviness of the head, chills and fever, toothache, deafness, tinnitus, stiffness and pain of the neck, throat painful obstruction, fullness of the chest with dyspnea, chest pain, cough with expectoration of phlegm and foam, pain in the shoulder and arm, inability to raise the arm, flaccidity of the legs with inability to walk, massaging warms opposite limbs
GB-11: Headache, dizziness, eye pain, ear pain, tinnitus, deafness, stiff tongue, bleeding from the root of the tongue, nauseating bitter taste in the mouth, stiffness and pain of the neck, goitre, throat painful obstruction, pain of the lateral costal region, cough, absence of sweating, contraction of sinews of the four limbs, bone taxation, agitation and heat of the hands and feet, cerebral congestion. Cerebral hemorrhage, sudden stroke, grinding of teeth

Discussion

The treatment of temporal lobe injury with acupuncture and East Asian medicine is as individualized as the person who sustained the injury. Many factors are taken into account beyond site of injury, also taken into account are the primary symptoms and underlying states of the person's body and mind. All of these are considered and then prioritized and formed into a treatment plan that is always evolving based on any progress made. In this way acupuncture and East Asian medicine has much to offer in the treatment of frontal lobe injury and more broadly, traumatic brain injury. While there are points that have been indicated for, or demonstrated to influence the temporal lobes specifically and fMRI imaging is allowing these to be known with more specificity and precision, a significant amount of research still remains to be done in this capacity to realize the extent to which this approach can be used.

Only a small number of points have been tested and they should additionally be tested in both healthy individuals and those with a known brain injury to determine if there is significant differences as a recent study showed the effect on points for insomnia activated brain regions that were wider, larger and with greater intensity in those who were sleep-deprived versus those well rested[22]. Additionally studies should be done over time to determine the extended effects on injured regions using these points. Until such time much of the treatment must be based off of physical and cognitive symptoms which is how East Asian has been used for thousands of years and thus able to work quite well under these circumstances.

The development of East Asian Medicine is based on the empirical experience on clinical applications of natural products and acupuncture. Acupuncture has been used effectively for at least 3,000 years and has accumulated rich clinical application experience. Although there are increasing number of patients and physicians in the United States and other Western countries accepting acupuncture as a complementary form of medical treatment, there have been no large-scale, well-controlled studies done evaluating acupuncture's management of brain injury.

Acupuncture is a safe treatment modality which seems to have no obvious side effects; however, there are no large-scale controlled studies done yet on acupuncture management of brain injury related problems. It is additionally a very cost-effective treatment strategy that can easily be implemented into rehabilitative programs. Clearly, this is an area of research that can meld East Asian medicine and Western medicine in an attempt to best optimize patient outcome following a brain injury.

How ultimately East Asian medicine will be integrated into the rehabilitative management of persons with brain injury is yet to be seen. Though patients could undoubtedly benefit from such an integration. Practitioners should remain open to treatment strategies such as acupuncture and natural medicinals that potentially assist their patients' recovery and/or function and commensurately advocate for these areas of intervention to be more critically assessed through high quality controlled research studies.[21]

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