Hyperstimulation of the sympathetic nervous system in response to anxiety: Chinese and Western Medical Perspectives with Case Review Comparison

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Abstract
Anxiety disorders are the most common mental illness in the United States, affecting 40 million adults age 18 and older or approximately 18% of the population (1). Anxiety disorders are highly treatable yet only 30% of persons suffering from anxiety receive treatment (1). Treatments range from psychotherapy, medications such as antidepressants/anxiolytics/benzodiazepines, exercise, massage, and forms of complementary medicine such as acupuncture. Acupuncturists commonly treat anxiety disorders of many etiologies from generalized anxiety to secondary anxiety due to physiological changes. Anxiety disorders develop from a complex set of risk factors including genetics, brain chemistry, personality, and life events (1). This paper explores both Chinese and Western medical perspectives and how anxiety can be triggered by physiological changes in the body.

Introduction
Anxiety is a normal reaction to stress. By definition, it is an apprehensive uneasiness or nervousness usually over an impending illness. Medically defined, it is an abnormal and overwhelming sense of apprehension and fear often marked by physical signs, such as tension, sweating, and increased pulse rate, and psychological symptoms like uneasiness concerning the reality and nature of the threat, and self-doubt. The American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* classifies anxiety as the following:

"Anxiety disorders include generalized anxiety disorder, social anxiety..."
disorder, specific phobias, panic disorder with and without agoraphobia, obsessive-compulsive disorder, posttraumatic stress disorder, anxiety secondary to medical condition, acute stress disorder, and substance-induced anxiety disorder. Further, anxiety disorders share features of excessive fear and anxiety and related behavior disturbances. Fear is the emotional response to real or perceived imminent threat, whereas anxiety is anticipation of future threat. Anxiety is more often associated with muscle tension and vigilance in preparation for future danger and cautious or avoidant behaviors. Fear is more autonomic arousal necessary for fight or flight, immediate danger, and escape behaviors” (2).

The Centers for Disease Control and Prevention estimates a lifetime prevalence of anxiety disorders over 15%, while the 12-month prevalence is more than 10% (3). Practitioners of both western and eastern traditions must understand and be aware of the likelihood of encountering anxiety in their clinics. One study estimated the annual cost of treating anxiety disorders in the United States at approximately $42.3 billion dollars in the 1990’s - a majority of which was due to non-psychiatric medical treatment costs (1).

The following paper briefly describes philosophy, biomedical perspectives, and the possible parallels in which Chinese Medicine offers in the diagnosis and treatment of anxiety. The case reports described, herein, contain a clinical snapshot of patients who sought care for anxiety from licensed acupuncturists in the State of California.

Theory

In the 1880s, James-Lange found correlation between stress and emotion: emotions do not immediately succeed the perception of the stressor or stressful event - they become present after the body’s response to the stress (4). For instance, external stimuli like
that of a growling dog may cause physiological responses such as a tachycardia, tachypnea, or weakened limbs. Thus, the James-Lange theory suggests the emotion of fear or anxiety begins after experiencing physiological changes in the body.

In 1920, Cannon-Bard offered an opposing theory in which emotions and bodily changes do not share a cause-and-effect relationship. Rather, they occur simultaneously following a stimulating event. An emotional response signals the thalamus to engage the sympathetic nervous system (SNS) to initiate a physiological response to a stressor.

These opposing theories manifest in the study of *shen* in Chinese Medicine. The interplay of spirit and the role internal organs play includes all mental and bodily phenomena. The union of the physical body and spirit is essential to Chinese Medicine. Maciocia writes, “both spirit and body are manifestations of Qi, the spirit being the most rarefied form” (5).

Traditional Chinese medicine (TCM) theory does not always follow a cause-and-effect relationship like that of western philosophies, but more a mutual interdependence of nature, mind, and our internal organ systems. According to, Zhu Xi, “human nature is the principle of the mind; emotions are the mind in action. Human nature is passive, emotions are active and the mind is both active and passive; the mind is the most intellectual. The mind is the controlling ruler” (5). TCM considers emotions to be the product of human nature’s effect on the mind, where the Heart organ is responsible for
consciousness, cognition, thinking, and emotional life. In essence, the mind/shen rules nature, emotions, and talents. This theory suggests that the mind is the source of emotions rather external stimuli.

In modern practice of Chinese Medicine, different organ systems, which include the Lung, Heart, Spleen, Liver, and Kidney interplay with different levels of emotions and all have connections to some form of anxiety. If an organ system is deficient, it may lead to more severe emotional trauma or shen disturbances (6). By contrast, if organ systems are affected by an excess pathology then different disturbances will present.

**Western Medicine Pathophysiology**

The autonomic nervous system (ANS) has two divisions: sympathetic and parasympathetic. The ANS assists in functions of the internal organs such as the blood vessels, heart, lungs, liver, kidneys, bladder, stomach, intestines, genitals, and glands (7). The sympathetic nervous system (SNS) allows for the body to go into “fight-or-flight” mode to respond to danger or stress whereas the parasympathetic nervous system allows the body to “rest-and-digest” during ordinary situations.

The amygdala initially receives the message of danger, sending a signal to the hypothalamus. The hypothalamus controls the ANS, activating the sympathetic nervous system so the body can react to the perceived threat by entering “fight-or-flight” mode. The adrenal glands are then triggered by the SNS, releasing epinephrine, and then directing the blood to the muscles and heart. Heart rate, blood pressure, and breathing
rate increase, and senses sharpen to ensure the body is reactive to threats. Epinephrine also releases glucose into the bloodstream to be utilized by the muscles as energy.

Ideally, after the immediate danger has passed, the hypothalamic pituitary adrenal axis is deactivated. Perpetual activation of “fight or flight” stimulating neurotransmitters and hormones affect long-term health. Corticotrophin-releasing hormone (CRH) is released from the hypothalamus to the pituitary gland, signaling a release of adrenocorticotropic hormone (ACTH). ACTH causes the adrenals to release cortisol forcing the body to stay in “fight-or-flight” mode to respond to threats. The peripheral nervous system (PNS) activates after the perceived danger passes, ending the hormone cascade (8).

Inflammation triggers the release of cytokines, which communicate with the SNS and HPA-axis. Sedation of the SNS greatly reduces inflammatory markers and studies have shown the effects on stimulation of the SNS and inflammation on different body systems as well as on immune cells (9,10). Additionally, norepinephrine released by the adrenal glands during SNS activation of the HPA-axis has been shown to play a role in some cancers (11).

If the mind is in a state of stress or anxiety, the sympathetic nervous system remains activated, stimulating the hormone cascade and generating systemic problems in the body. When the muscles are perpetually poised to flee from danger, they never relax, resulting in chronic pain, headache, and tension migraines. The rate and strength of
heart contractions increase to pump adequate blood to the muscles eventually causing chronic inflammation, hypertension, coronary artery disease, heart attack, and stroke (13). Because the energy to the parasympathetic nervous system is being diverted elsewhere during periods of stress, the digestive function slows down. Digestive enzymes and saliva are not produced adequately. The metabolism is halted. This metabolic dysregulation affects the bowels causing diarrhea, constipation, or irritable bowel syndrome. As stress affects blood glucose levels, this can lead to type 2 diabetes in some individuals.

By measuring the blood CRH levels in rats exposed to stress, a 2013 study shows how acupuncture plays a role in the HPA-axis. When the HPA-axis is stimulated by the sympathetic nervous system, CRH is the first hormone released, causing the cascade of other hormones, driving the body into a state of heightened anxiety. The rats were placed in an ice bath one hour each day for ten days to simulate chronic stress. The control group was not exposed to an ice bath, and the experimental groups are as follows: a) no acupuncture b) sham acupuncture for four days prior to stress and c) electroacupuncture at ST-36 (zu san li) for four days prior to the exposure of stressors. Blood samples are taken on days one, seven, and fourteen. Higher levels of CRH were found in the no acupuncture and sham acupuncture groups. The rats given electroacupuncture for the four days prior to the ice baths showed the same CRH levels as those who were part of the control group. Levels of cortisol were also tested showing similarly low levels between the control group and the electroacupuncture group, as well as heightened levels in the sham and no acupuncture groups. The research
demonstrates that in rats, acupuncture inhibits the stress response and down regulates the hormone cascade (12).

Wang et al. (2005) set out to determine the importance of acupuncture point specificity utilizing electro acupuncture. The researchers discovered that acupuncture increases the gene expression of the glucocorticoid receptor (GR) in the hippocampus, pituitary gland, and the hypothalamic paraventricular nucleus, while simultaneously decreasing the expression in the adrenal cortex. It is through this mechanism that acupuncture reduces stress, which is a reversal of how the body normally responds to what the researchers call “unpredictable chronic mild stress” (UCMS). The experiment measured hormone levels of rats after different acupuncture points were stimulated in order to determine if specific points are more or less effective in the treatment or prevention of UCMS. The experiment consisted of five groups, a) no acupuncture, no stress b) electroacupuncture of LV-14 (qi men) and UB-23 (shen shu), no stress c) no acupuncture, with stress d) electroacupuncture of Sp-6 (san yin jiao) and KD-9 (zhu bin), with stress e) electroacupuncture of LV-14 (qi men) and UB-23 (shen shu), with stress. The rats were exposed to stress every day for 21 days and those receiving electroacupuncture were treated for six days post stressor. Blood tests were done to measure levels of corticosterone, CRH, and GR proteins. Results show that stress hormones are acupuncture point specific. The subjects that received electroacupuncture at LV-14 (qi men) and UB-23 (shen shu) had a larger reduction in adrenocorticotropic hormone receptors than the groups receiving SP-6 (san yin jiao) and KD-9 (zhu bin) or no acupuncture at all. Acupuncture was found to have a
significant inhibitory effect in the release of the CRH and lowers HPA-axis excitability in response to stress (14).

**Chinese Medicine and Pathophysiology**

In TCM, the word 'emotion' is translated from the Chinese word *qing*. More often, it is translated from the word *qingzhi* meaning ‘emotional-related’ (15). The Chinese describe seven major emotions (*qiqing*) – happiness (*xi*), anger (*nu*), worry or anxiety (*you*), thinking and obsession (*si*), sadness and grief (*bei*), fear (*kong*), and fright (*jing*) (15). In order to correspond seven emotions to the five *zang*, worry and obsession are often combined, as are fear and fright. An imbalance in any emotion causes injury to its corresponding organ. When in excess, anger injures the Liver, joy injures the Heart, overthinking injures the Spleen, grief injures the Lung, and fear injures the Kidney. In differentiating fear and anxiety, Chinese medicine states that fear descends to the kidneys and anxiety ascends to the heart (16). According to Maclean & Lyttleton, “in TCM, anxiety is the emotion most frequently associated with disorders of the Heart and instability of the *shen*” (17). We can analyze the causes of anxiety, its manifestation and diagnosis, and also potential courses of treatment in the traditional Chinese medical model.

The causes of anxiety in TCM are a bit more subtle and diverse. According to Leon Hammer, “traditionally the emotions are regarded as dangerous only in the extreme” (16). For example, one possible cause of anxiety could be excessive joy. When excessive, joy injures the mind, controlled by the Heart, and creates too much fire
leading to “excitement or overtaxing of mental energy” (16). This causes symptoms of palpitations, anxiety, insomnia, and irritability. At a certain level of intensity, all these emotions are considered normal or healthy. Only when they become excessive do pathologies arise, and similarly pathologies to the organs can cause changes in the emotions (15).

Hammer discusses five causes of anxiety as viewed through the classical model. They are Heart qi deficiency, Heart blood deficiency, Heart and Kidney yin deficiency, Kidney and Spleen yang deficiency, and Phlegm-Fire due to dampness. To this list, Maclean & Lyttleton discard Kidney and Spleen yang deficiency, but add Heart and Gallbladder deficiency in its place (17). For the purpose of this paper, only Hammer’s and Maclean & Lyttleton’s etiologies will be taken into account.

Heart qi deficiency can result from multiple pathologies, so care must be taken to not only right the correct qi, but to also treat the underlying cause. For example, the Spleen is responsible for the transforming and transporting function in the body, which produces the blood and qi of the body. If the function of the Spleen is impaired, it will not produce adequate qi for the Heart. In this instance, one must not only nourish the Heart qi, but also nourish the Spleen qi. Other causes of Heart qi deficiency can stem from “prolonged or excessive sadness, depression or grief” (17). TCM medical theory considers bitter flavors to be dispersing, which can scatter the qi if consumed to excess. Some practitioners counsel that excess caffeine consumption can damage the Heart qi. Sweat or perspiration is designated as the fluid of the heart while the pores are
regulated by the Lungs. Profuse sweating will damage not only the Heart qi, but also the blood, yin, and yang (17).

One of the most fundamental relationships in TCM is the relationship between the Heart and Kidneys, reflecting the relationship between the body and the mind. This can be viewed as both a physical connection and mental connection. Maclean & Lyttleton summarize this relationship rather succinctly:

“On the physical level, Kidney Water (yin) keeps Heart Fire in check, preventing a runaway blaze and overheating, and Heart Fire catalyses Kidney Water, preventing stagnation and accumulation of fluids. On the mental level, the Fire of shen arises from a stable base of Kidney jing (summed up in the sparkle of jing shen in the eyes), and jing and shen rely on each other for clear expression of mental consciousness.” (17)

Anxiety is most commonly associated with the Heart and instability of the shen. Any imbalance between the Heart and the Kidneys will cause a pathological emotional response. There are multiple factors that may damage either the Heart or Kidney yin. Heart yin is damaged by stimulants, recreational drugs, excessive mental stress, and as mentioned before, excessive sweating (17). Kidney yin may also be damaged by overwork, excessive sexual activity, insufficient sleep, or aging. Additionally, the connection between the two organs may be damaged by major shock or trauma.

The fourth cause is Phlegm-Heat or Phlegm-Fire. Phlegm is due to an accumulation of damp that can be attributed to Spleen deficiency (16). Phlegm most often manifests as mucus, but can also be seen in the channels, stools, or formed under the skin as goiter
or nodules. It most often pairs with other pathogenic factors. In the case of excess Heat or Fire due to Liver qi stagnation, fluids in the body congeal forming Phlegm-Heat. Alternately, Phlegm-Heat can be a direct result of overconsumption of foods such as “rich, greasy, sweet, spicy food and alcohol” (16).

The fifth cause of anxiety may be due to Kidney and Spleen deficiency. This results in an internal retention of harmful fluid. If the Spleen is deficient, it is unable to transform and transport the water, leading to pathological dampness. If the Kidneys are deficient the yang cannot warm the water, so it slows and congeals. Kidney yang may be damaged by the same factors affecting Kidney yin or the strain of standing for long periods or prolonged exposure to cold. Spleen deficiency may be due to overwork, excessive worry or mental activity, irregular dietary habits, or prolonged illness (17).

Lastly, Heart and Gallbladder qi deficiency reflects a pattern that may have developed congenitally. According to Maclean & Littleton, when congenital, this pattern occurs due to the mother experiencing shock during pregnancy, which affects the shen of the fetus (17). Non-congenital patterns can affect children or adults, although it is more common in children due to the shen not being fully anchored. Children with this pattern are often raised in an abusive or fearful environment. It may also arise in persons of any age due to violent or extreme shock or fright, or following a debilitating illness that damages the qi.

The most difficult part of treating a patient with anxiety is not the diagnosis, nor the
treatment itself, but treating the patient gently and with care. Many of these patients may also be on anxiolytic drugs and have a desire to decrease dosage or quit entirely. The patient must be in communication with their medical doctor regarding this desire. Patients must be weaned gradually off medications while supplementing with acupuncture and herbal therapies which can alleviate symptoms of anxiety and the withdrawal effects of the medication.

The following is a table summarizing the symptoms, diagnosis, and treatment of patients presenting with anxiety:
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Additional Symptoms</th>
<th>Tongue</th>
<th>Pulse</th>
<th>Points</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Qi Deficiency or Heart &amp; Gallbladder Qi Deficiency</td>
<td>Palpitations, shortness of breath, which becomes worse on exertion, spontaneous sweating, listlessness, lassitude</td>
<td>Pale tongue with white coating</td>
<td>Thready, weak</td>
<td>HT-5, PC-6, UB-15, RN-17, RN-6</td>
<td>Ding Zhi Wan - Settle the Emotions Pill</td>
</tr>
<tr>
<td>Heart and Liver Blood Deficiency with Deficiency Heat</td>
<td>Forgetfulness, excessive dreaming, insomnia, palpitations, night sweats, thirst, dizziness and vertigo, dry mouth and throat</td>
<td>Dry, red tongue</td>
<td>Wiry, or thin, rapid</td>
<td>HT-7, PC-6, RN-14, RN-15, UD-17, UB-18, LV-8, SP-6, ST-36</td>
<td>Suan Zao Ren Tang - Sour Jujube Decoction</td>
</tr>
<tr>
<td>Spleen Qi Deficiency and Heart Blood Deficiency, Chronic Bleeding due to Spleen Qi Deficiency</td>
<td>Sallow complexion, general lassitude, palpitations, poor memory, insomnia, dream-disturbed sleep, reduced appetite, abdominal distension, loose stools; irregular menstruation in women</td>
<td>Pale tongue with thin, white coat</td>
<td>Thin, frail</td>
<td>HT-7, PC-6, RN-14, RN-15, RN-4, UB-17, UB-20, RN-12, ST-36, SP-6</td>
<td>Gui Pi Ti Tang - Restore the Spleen Decoction</td>
</tr>
<tr>
<td>Heart Blood and Kidney/Liver Yin Deficiency Heart and Kidney not Communicating</td>
<td>Mental restlessness, insomnia, palpitations, poor memory, dizziness, tinnitus, dryness of the throat, soreness of the lumbar region, spermatorrhea in dreams, tidal fever, night sweating</td>
<td>Red tongue with little coating</td>
<td>Thin, rapid</td>
<td>HT-7, HT-6, HT-5, YIN TANG, UB-15, RN-15, DU-24, KD-3, KD-6, KD-10, KD-9, RN-4, SP-6</td>
<td>Tian Wang Bu Xing Dan - Emperor of Heaven’s Special Pill to Tonify the Heart</td>
</tr>
<tr>
<td>Spleen and Kidney Yang Deficiency</td>
<td>Pallor, cold limbs; soreness and weakness of the lumbar region and knee joints; loose stools or diarrhea at dawn; facial puffiness and edema of the limbs</td>
<td>Pale, swollen delicate tongue with a thin white coat</td>
<td>Deep, weak</td>
<td>UB-23, DU-4, RN-4, KI-3, KI-7, UB-52, RN-12, RN-9, ST-36, SP-3, UB-20, UB-21, ST-37, ST-25, UB-25</td>
<td>Li Zhong Wan – Regulate the Middle Pill and Jin Gui Shen Qi Wan - Kidney Qi Pill</td>
</tr>
<tr>
<td>Heart &amp; Gallbladder Qi Deficiency due to shock or fright</td>
<td>Insomnia with extremely light sleeping and fearful waking, easily startled, wakes up early, unable to fall back asleep, excessive dreaming, timidity, shortness of breath, clear and copious urine</td>
<td>Light pink body</td>
<td>Wiry, thin body</td>
<td>HT-5, PC-6, UB-15, RN-17, RN-6, GB-40</td>
<td>An Shen Ding Zhi Wan - Calming the Spirit and Settling the Will-Power</td>
</tr>
<tr>
<td>Disorder in the Three Yang Stages (Shao yang, Tai yang, Yangming)</td>
<td>Fullness and distension in the chest, insomnia, occasional palpitations, irritability, dysuria, delirium, feeling of heaviness in the entire body with inability to rotate the trunk</td>
<td>Red Body</td>
<td>Rapid, wiry</td>
<td>SJ-5, SJ-6, GB-41, DU-13</td>
<td>Chai Hu Jia Long Gu Mu Li Tang - Bupleurum Plus Dragon Bone and Oyster Shell Decoction</td>
</tr>
<tr>
<td>Condition</td>
<td>Symptoms</td>
<td>Pulse</td>
<td>Tongue</td>
<td>TCM Formula</td>
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<tr>
<td>Plum Pit Qi – Liver Qi Stagnation with Phlegm in Throat Caused by Spleen Qi Deficiency</td>
<td>Mental depression, irritability, moodiness, a feeling of oppression in the chest, a feeling of a lump in the throat which cannot be expectorated or swallowed, difficulty in swallowing, sighing, cough with expectoration of phlegm, hypochondriac distension, premenstrual breast distention, swelling, and pain</td>
<td>Moist or greasy, white tongue coating</td>
<td>LV-3, ST-40, LI-4, DU-24, GB-13, PC-7, PC-6</td>
<td>Ban Xia Hou Po Tang - Pinella and Magnolia Bark Decoction</td>
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<tr>
<td>Liver Qi Congestion with Blood Deficiency (Spleen Deficiency)</td>
<td>Distension, fullness and pain in the costal and hypochondriac regions; mental depression or irritability; poor appetite, abdominal distension, loose stools</td>
<td>Pale-red tongue</td>
<td>Wiry, deficient</td>
<td>LV-13, LV-14, LV-3, GB-34, RN-6, ST-25, SP-15, RN-12, SJ-6, ST-36, SP-6, PC-6</td>
<td>Xiao Yao Wan - Rambling Power (Free and Easy Wanderer)</td>
</tr>
<tr>
<td>Liver Qi Congestion with Blood Deficiency Causing Heat/Fire</td>
<td>Irritability, propensity to outbursts of anger, tinnitus/deafness, temporal headache, dizziness, red face and eyes, thirst, bitter taste, dream-disturbed sleep, constipation with dry stools,</td>
<td>Red, normal size, possible yellow fur</td>
<td>Bowstring, fast</td>
<td>LV-2, LV-3, GN-20, TAI YANG, GB-13, LI-11, GB-1, GB-9, GB-8, GB-6, DU-24, SP-6, LV-1</td>
<td>Jia Wei Xiao Yao San - Augmented Rambling Powder</td>
</tr>
<tr>
<td>Spleen Qi and Liver Blood Deficiency</td>
<td>Poor appetite, slight abdominal distension after eating, fatigue, lassitude, dull-pale complexion, weakness of the limbs, loose stools, scanty periods or amenorrhea, insomnia, dizziness, numbness of the limbs, blurred vision, floaters in eyes, pale lips, dry hair and skin, brittle nails</td>
<td>Pale, thin white coat</td>
<td>Thin and frail or large and deficient and without strength</td>
<td>LV-8, SP-6, RN-4, UB-18, UB-23, RN-12, ST-36, SP-3, UB-20, UB-21, UB-17</td>
<td>Gui Pi Tang – Restore the Spleen Decoction and Ba Zhen Tang - Eight Treasures Decoction</td>
</tr>
<tr>
<td>Liver and Kidney Yin Deficiencies with Deficiency Fire Rising Upward</td>
<td>Dizziness, blurring of vision, dryness of the throat, tinnitus; heat sensation in the chest, palms and soles; soreness and weakness of the lumbar region and knee joints; malar flush, night sweating; nocturnal emissions; scanty menstrual flow</td>
<td>Red with little or no coat</td>
<td>Small, rapid, thread, rear position may be forceful</td>
<td>KD-3, KD-6, RN-4, UB-23, KD-13, SP-6, KD-2, LI-11, HT-6 LV-2</td>
<td>Da Bu Yin Wan - Great Tonify the Yin Pill and Liu Wei Di Huang Wan (plus heat clearing herbs) – Six-Ingredient Pill with Rehmannia</td>
</tr>
<tr>
<td>Internal Damp-Heat in Lower Jiao with Damage to Yin</td>
<td>Retention of urine, thirst with desire to drink only a little, constipation, hardness and fullness in the lower abdomen</td>
<td>Red tongue &amp; white or slightly yellow coating</td>
<td>Thready, rapid</td>
<td>Zhu Ling Tang - Polyporus Decoction</td>
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</tbody>
</table>

Table 1. Summarized from Hammer, Maclean & Lyttleton, Cheng, and Sionneau (16,17,18,19)
Case Report 1: Endocrine System and Insomnia

Disruptions in the HPA-axis can cause changes in the endocrine system and lead to an unhealthy cycle of poor sleep and poor metabolism (20). The HPA-axis follows a twenty four hour schedule where cortisol increases during sleep and peaks around 9:00 am then decreases throughout the day (21). If sleep is disrupted, however, cortisol output can continue to increase during the day, providing energetic support to a sleep deprived individual. This extra cortisol can have a negative impact on the endocrine system and metabolism. These changes in the HPA-axis may lead to insomnia.

Insomnia is defined as having difficulty falling asleep or staying asleep, during the typical sleep window, within a 24-hour period. Poor quality of sleep may also qualify as a type of insomnia. Patients suffering from insomnia, have higher cortisol levels at night and overall significantly higher levels of cortisol than individuals without chronic insomnia (22,23).

This is truly a vicious cycle as prolonged sleep deprivation, leading to a hyper activation of the HPA-axis, then continues to cause sleep deprivation or insomnia. Daytime fatigue caused by insomnia diminishes one’s ability to exercise. Exercise is shown to increase quality and quantity of sleep, reducing overall stress (24). If a patient with severe sleep deprivation is too tired to exercise then they are unable to reap the benefits that exercise has on sleep. The digital world has added more stress to people’s daily lives and is directly correlated with sleep deprivation. Increased screen time has a direct relationship with increased stress and anxiety and decreased sleep.
History

A 46-year-old female patient presented with prolonged insomnia and stress, seeking acupuncture for insomnia. The patient presented with trembling in her hands and foreboding thoughts. She has slept an average of 2-3 hours per night for the past four months, and will suffer frequent panic attacks throughout the day. She rates her anxiety as a 10/10 and describes experiencing a constant tight, pressing feeling on her chest. Daily tasks such as driving, preparing food, and meeting daily challenges have become difficult. She is originally from Germany and feels her anxiety is heightened without support close. The patient is perimenopausal with hot flashes and night sweats. She feels her menopausal symptoms are exacerbated by her stress and anxiety regarding her divorce.

Treatment

Acupuncture points used focused on calming the spirit, nourishing the mind and blood, and smoothing the Liver qi. A combination of the following points was used throughout the three treatments: LU-9 (tai yuan), yin tang, PC-6 (nei guan), Ren-6 (qi hai), SP-6 (san yin jiao), Ren-17 (shan zhong), LV-3 (tai chong). She reported sleeping 7 hours after her first treatment, slept very well again after her second treatment, and the tremors in her hands dissipated. She was able to meet her daily challenges following her second treatment. The tremble in her hands returned by the third treatment which was three weeks following the second. The tremble did dissipate by the end of this third and final treatment and she felt a great sense of relief afterwards.
Discussion

As demonstrated, stress and anxiety directly impacted her sleep. Her stress caused a disruption in the HPA-axis (20) and her symptoms such as lack of sleep, chest pressure, and hand trembling indicated a physical response to stress (26). Acupuncture helped to greatly reduce these symptoms. This case is a thorough demonstration of how stress and anxiety can impact the HPA-axis, disrupting the normal endocrine cascade, resulting in insomnia.

CASE REPORT 2: Gastro-Intestinal System and Irritable Bowel Syndrome

The amygdala plays an important role in regulating anxiety by helping to facilitate the activation of the HPA-axis and the autonomic nervous system in response to stress. Studies show a strong correlation between the role of the emotional brain and the regulation of enteric function (25). Irritable bowel syndrome (IBS) is commonly characterized by symptoms which include abdominal pain and abnormal bowel habits, often triggered or exacerbated during periods of stress and anxiety.

When the stressor becomes chronic, exceeding an individual’s ability to maintain a healthy stress response, it can cause long-term harm on the ability to naturally terminate the stress response and bring the body back to basal homeostasis. Approximately 40-60% of patients with IBS who seek medical care also report psychiatric symptoms such as depression, anxiety or somatization (27). Stress also alters gastrointestinal (GI) function. In a study completed on animal subjects, the
release of corticotropin-releasing factor (CRF) was shown to increase colonic motility.

In addition to the limbic system’s role in IBS, intestinal microbiota has also been shown to play a primary role in the pathogenesis of IBS. Chronic stress can induce dysbiosis and enhance bacteria’s ability to adhere to intestinal walls. This abnormal GI microbiota then interacts with the immune and nervous systems causing a disturbance in the brain-gut axis (28).

**History**

A female patient presented with a chief complaint of digestive issues that began one year ago. She had a cholecystectomy two years prior due to enlarged gallstones. From the time the patient began coming in for acupuncture, she has had a colonoscopy and a capsule endoscopy which ruled out celiac and Crohn’s disease. As the exams showed signs of inflammation and gastritis, the patient was given a diagnosis of irritable bowel syndrome. She reported having 10-12 bowel movements per day, waking with an urgent need to eliminate, accompanied by abdominal cramping. Currently she is using cannabidiol oil, which helps reduce bowel movements to four times per day.

The patient reports drinking two cups of coffee per day, and typically has a low appetite. For fear of having an accident, she avoids eating when she has plans to leave the house. An elimination diet helped to curb accidents and the strong urgencies to have a bowel movement. The diet excluded dairy, sugar, wheat, coffee, fried foods, and mostly included a plant-based protein shake, almonds, fruits and vegetables. The patient
cycles between the diet and eating normally. When she eats less healthy choices, she expects to have IBS episodes, which comes on about 70% of the time. There have been times during her diet when she has had accidents, leaving her to question the exact cause.

The patient reports a history of digestive issues as a child and was told she was colicky. She was not nursed as an infant and reports having a stressful relationship with her parents. She is a mother of two girls, ages six and four, and reports a happy marriage.

The patient recently moved back to California with her family from a more rural setting in Washington. Since the move, she reports not having social support and spends most of her time with her family. She recently began substitute teaching an art class, which sparked new excitement in her life. On teaching days, the patient avoids eating anything but raw almonds, claiming it keeps her from having an accident.

The patient’s tongue shows signs of Heart blood and *yin* deficiency along with Spleen *qi* Deficiency. There are also signs of heat and stagnation in the Liver channel. Her pulse indicates signs of weakness in the middle *jiao* and the Kidneys. The above patterns indicated a form of anxiety and digestive conditions and their disharmonies. She is an only child and reports being the only member of her family with digestive issues.

**Treatment**

The patient came for weekly treatments, with an occasional two-week break.
Treatments were focused on nourishing Heart qi and blood, tonifying yin, smoothing Liver qi, and nourishing her metal and earth elements. The following points were utilized to raise qi, calm spirit and energy, strengthen the middle jiao, and nourish and support the GI tract: GV-20 (bai hui), yin tang, RN-17 (shan zhong), RN-4 (guan yuan), Kl-16 (huang shu), Li-4 (he gu), LV-3 (tai chong), ST-36 (zu san li), SP-6 (san yin jiao), LU-7 (lie que), Kl-6 (zhao hai), HT-7 (shen men), SP-3 (tai bai).

Discussion

In this case, there are multiple factors contributing to the patient’s IBS. Her symptoms are associated with an imbalance between her Heart and Kidneys. Because her Heart qi is weak, it is reliant on the Spleen to produce adequate qi through its roll of transforming and transporting food. According to Leon Hammer, if the Spleen is impaired, it cannot produce enough qi to supplement what is lacking from the Heart (16). The patient also tends to overthink and overstress, which damages the Spleen.

Acupuncture has been helpful in balancing her emotions, and the patient reports having less overall anxiety and stress when she is consistent with treatments. This may be due to a down regulation of the sympathetic nervous system and an upregulation of the parasympathetic nervous system. Acupuncture helps to balance the autonomic nervous system and deactivate the HPA-axis, helping to improve enteric function. Acupuncture has also been shown to decrease inflammation, so with continued treatment, the patient’s condition will likely continue to improve.
CASE REPORT 3: Cardiovascular System and Palpitations

Anxiety can cause physiological changes such as increased heart rate, increased blood pressure and changes in hormone secretion (4). Dr. Una McCann, professor of Psychiatry and Behavioral Sciences at John Hopkins School of Medicine believes that “when someone is anxious, their body reacts in ways that can put an extra strain on their heart” (29). The physical manifestations of a rapid heart rate can interfere with normal heart function, weaken heart function, and result in additional heart pathologies. Severe cases of heart dysfunction, such as myocardial infarction, may present with similar symptoms as panic attacks which include sudden and severe chest pain. In this scenario, a patient must be admitted to the emergency room for a cardiac evaluation and prevention of progressive heart disease.

History

A 41-year-old male patient of Indian descent came for acupuncture for anxiety induced chest pains. He is a husband and father of two children. He has held a position in information technology for many years and is quite happy with his current career and job placement. He reports being “very stressed” and feels anxious in addition to palpitations, random chest pain, and persistent insomnia. He has had basic lab work, multiple electrocardiograms, chest x-rays, and a 24-hour sleep study to investigate for further pathologies. The patient reports “all tests came back normal.” He has worked with a physical therapist to release the pectoral and upper body regional muscles with no change in anxiety or palpitations.
Treatment

The following acupuncture points were used to calm spirit, reduce heart rate, and improve sleep: PC-6 (nei guan), HT-7 (shen men), SP-6 (san yin jiao), GB-20 (feng chi), SP-4 (gong sun), and HT-3 (shao hai). In addition to acupuncture, the patent medicine Gui Pi Tang (Restore the Spleen Decoction) was prescribed at 8 pills, three times daily to assist in treatment of the insomnia and the disharmony of Spleen qi and Heart blood deficiencies.

Discussion

While acupuncture and herbs have helped improve the patients sleep, he experienced only minimal improvement in his anxiety and palpitations. If the patient continues his course of treatment, it is expected that his will show a continued trend towards improvement of his anxiety and palpitations. This case highlights the importance of lifestyle as much as treatment. Acupuncture and TCM can treat the symptoms such as physiological changes due to anxiety, but the root of his problem, the stress, must be dealt with as well.

Conclusion

Anxiety is a normal reaction to stress. There is a direct relationship between stress and emotion, thus external stimuli may cause a physiological response seen in multiple body systems such as cardiovascular, digestive, and endocrine. In each case example, fear and anxiety generally begins after experiencing bodily changes, physiological changes, or from experiencing external stimuli. These changes often cause a cascade of
symptoms that further feed into the anxiety. As shown through the case studies, the root of the physical symptoms is often seeded in a patient's stress and anxiety. Therefore, when treating a patient with complaints stemming from stress and anxiety, it is crucial to address the underlying cause along with the presenting symptoms. Because 50% of the adult population experiences anxiety, medical professionals of all modalities should be aware of anxiety and the underlying pathophysiological symptoms that occur as a result.
References


(13) American Psychological Association website, http://www.apa.org/helpcenter/stress-


