

# Postural Orthostatic Tachycardia Syndrome (POTS)

Dr. John Bergman

# What is POTS?

“Postural orthostatic tachycardia syndrome (POTS) is one of a group of disorders that have **orthostatic intolerance (OI)** as their primary symptom.

OI describes a condition in which an excessively reduced volume of blood returns to the heart after an individual stands up from a lying down position.”

# What are the symptoms of POTS?

- Lightheadedness
- Fatigue
- Sweating
- Tremor
- Anxiety
- Palpitation
- Exercise intolerance
- Headache
- Sleep disorder
- Weakness
- Hyperventilation/  
dyspnoea (shortness of  
breath)
- Dizziness/vertigo
- Pre-syncope/syncope

-Note: Most of these symptoms are relieved by lying down

# Who is affected by POTS?

**“Anyone at any age can develop POTS, but the majority of individuals affected (between 75 and 80 percent) are women between the ages of 15 to 50 years of age. Some women report an increase in episodes of POTS right before their menstrual periods. POTS often begins after a pregnancy, major surgery, trauma, or a viral illness.”**

National Institute of Health <sup>1</sup>

**“Postural Orthostatic Tachycardia Syndrome (POTS) is a form of dysautonomia that is estimated to impact between 1,000,000 and 3,000,000 Americans, and millions more around the world.”**

Dysautonomia International <sup>27</sup>

# What causes POTS?

**“Doctors aren't sure yet what causes the reduced return of blood to the heart that occurs in OI, or why the heart begins to beat so rapidly in POTS. Current thinking is that there are a number of mechanisms.**

**Some individuals have peripheral denervation (neuropathic POTS); some have symptoms that are due to sustained or paroxysmal overactivity of the sympathetic nervous system (hyperadrenergic POTS); and many individuals with POTS have significant deconditioning.”**

# What Medical treatments are available?

“Therapies for POTS are targeted at relieving low blood volume or regulating circulatory problems that could be causing the disorder. No single treatment has been found to be effective for all. A number of drugs seem to be effective in the short term. Whether they help in long term is uncertain.”

“Simple interventions such as adding extra salt to the diet and attention to adequate fluid intake are often effective. Drinking 16 ounces of water (2 glassfuls) before getting up can also help raise blood pressure. There is some evidence that an exercise program can gradually improve orthostatic tolerance.”

# The Pathogenesis of POTS

- “Impaired innervation of the veins or their response to sympathetic stimulation plays a key role in the etiopathogenesis of POTS.”
- “There is sympathetic cardiac activity without vasoconstriction, inducing a fall in central venous pressure.”
- “Partial dysautonomia can be caused by various stresses and has an immune mediated pathogenesis. The partial dysautonomic form can also affect adolescents. Symptoms initially worsen until the patient reaches 16 years of age and then gradually fade away. This is thought to be due to autonomic imbalance.”

# The Pathogenesis of POTS

“In some primary cases there is an hyperadrenergic state leading to increased norepinephrine, which could be due to impaired clearance or decreased uptake by the synaptic cleft. These variants cause profuse sweating, anxiety and tremulousness and the diastolic pressure is high.

**Postgraduate Medical Journal <sup>2</sup>**

# Other factors involved with POTS

“It is suggested that the disturbances in central serotonin production and regulation affects the blood pressure and heart rate. Selective serotonin reuptake inhibitors (SSRIs) increase nerve communication and stimulation of the standing vasoconstriction reflex. This reduces venous blood pooling and increases orthostatic tolerance. This effect is beneficial in controlling the symptoms in patients with POTS.”

# Medications Directly linked to POTS

“Review all the drugs which the patient is taking. Drugs which can aggravate the symptoms of POTS are **angiotensin-converting enzyme inhibitors,  $\alpha$ - and  $\beta$ -blockers, calcium channel blockers, diuretics, monoamine oxidase inhibitors, tricyclic antidepressants and phenothiazines.**

Any such drugs should be stopped first. Once the diagnosis is confirmed **aggravating factors such as dehydration, extreme heat and excess consumption of alcohol should be avoided.”**

# Side Effects of ACE Inhibitors

- feeling like you might pass out;
- urinating less than usual or not at all;
- swelling, rapid weight gain;
- fever, chills, body aches, flu symptoms;
- tired feeling, muscle weakness, and pounding or uneven heartbeats;
- psoriasis (raised, silvery flaking of the skin);
- chest pain; or
- high potassium (slow heart rate, weak pulse, muscle weakness, tingly feeling);

# Side Effects of Beta Blockers

- slow or uneven heartbeats;
- feeling light-headed, fainting;
- feeling short of breath, even with mild exertion;
- swelling of your ankles or feet;
- nausea, stomach pain, low fever, loss of appetite, dark urine, clay-colored stools, jaundice (yellowing of the skin or eyes);
- Depression, anxiety, nervousness.
- cold feeling in your hands and feet.
- decreased sex drive, impotence, or difficulty having an orgasm;
- sleep problems (insomnia), fatigue

# Side Effects of Calcium Channel Blockers

- feeling like you might pass out;
- swelling in your hands, ankles, or feet;
- pounding heartbeats or fluttering in your chest; or
- chest pain or heavy feeling, pain spreading to the arm or shoulder, nausea, sweating, general ill feeling
- headache;
- dizziness, drowsiness;
- tired feeling;
- stomach pain; or
- flushing (warmth, redness, or tingly feeling)

# Side Effects of Diuretics

- feeling like you might pass out;
- low potassium (confusion, uneven heart rate, extreme thirst, increased urination, leg discomfort, muscle weakness or limp feeling)
- severe pain in your upper stomach spreading to your back, nausea and vomiting;
- headache, trouble concentrating, memory problems, weakness, loss of appetite, feeling unsteady, hallucinations, seizure, shallow breathing or breathing that stops;
- easy bruising, unusual bleeding (nose, mouth, vagina, or rectum), purple or red pinpoint spots under your skin;
- fever, sore throat, and headache with a severe blistering, peeling, and red skin rash; or
- ringing in your ears, hearing problems, hearing loss

# Side Effects of Tricyclic Antidepressants

- **Cardiovascular:** Myocardial infarction; stroke; nonspecific ECG changes and changes in AV conduction; heart block; arrhythmias; hypotension, particularly orthostatic hypotension; syncope; hypertension; tachycardia; palpitation
- **CNS and Neuromuscular:** Coma; seizures; hallucinations; delusions; confusional states; disorientation; incoordination; ataxia; tremors; peripheral neuropathy; numbness, tingling, and paresthesias of the extremities; extrapyramidal symptoms including abnormal involuntary movements and tardive dyskinesia; dysarthria; disturbed concentration; excitement; anxiety; insomnia; restlessness; nightmares; drowsiness; dizziness; weakness; fatigue; headache; syndrome of inappropriate ADH (antidiuretic hormone) secretion; tinnitus; alteration in EEG patterns.

# Side Effects of Tricyclic Antidepressants

- **Anticholinergic:** Paralytic ileus; hyperpyrexia; urinary retention; dilatation of the urinary tract; constipation; blurred vision, disturbance of accommodation, increased ocular pressure, mydriasis; dry mouth.
- **Allergic:** Skin rash; urticaria; photosensitization; edema of face and tongue.
- **Hematologic:** Bone marrow depression including agranulocytosis, leukopenia, thrombocytopenia; purpura; eosinophilia.

# Side Effects of Tricyclic Antidepressants

- **Gastrointestinal:** Rarely hepatitis (including altered liver function and jaundice); nausea; epigastric distress; vomiting; anorexia; stomatitis; peculiar taste; diarrhea; parotid swelling; black tongue.
- **Endocrine:** Testicular swelling and gynecomastia in the male; breast enlargement and galactorrhea in the female; increased or decreased libido; impotence; elevation and lowering of blood sugar levels.

# Review of POTS so Far

- Occurs before menstrual cycle and after pregnancies
- Can be caused by surgery, trauma, or viral illness
- Associated with “Overactivity of the Sympathetic Nervous system”
- The Autonomic nervous system is out of balance
- Associated with a lack of proper nerve supply
- Associated with a weakened immune system
- Associated with a lack of conditioning (sedentary lifestyle)
- Adequate salt and water intake are very effective treatments
- Associated with a hyperadrenergic state (chronically stressed)
- Serotonin production and regulation plays a role
- Several medications can cause POTS

# The Stress Response- First Stage

## 1. The Amygdala

- Area of emotional processing in the brain
- Interprets images and sounds
- **Perceives** danger and instantly sends a distress signal to the **hypothalamus**

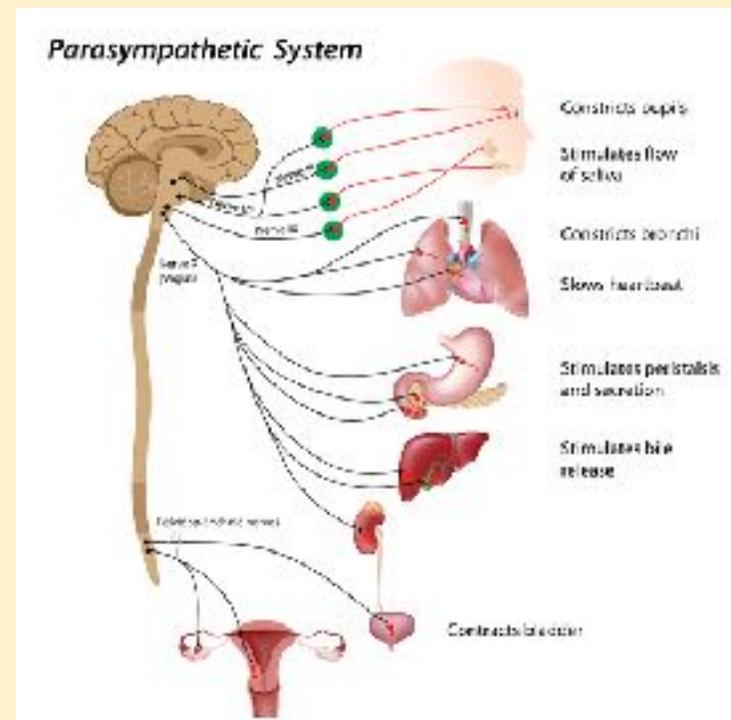
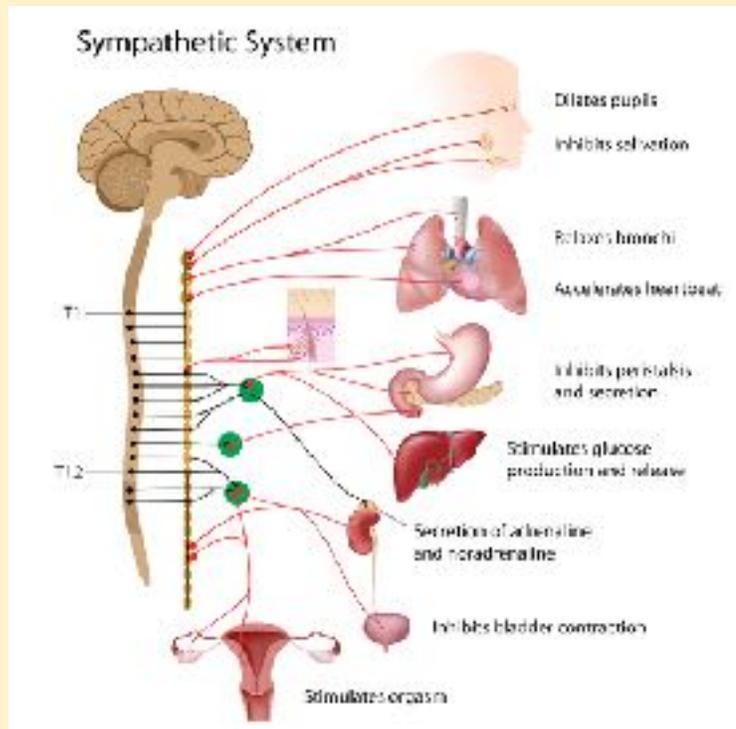
## 2. Hypothalamus

- The Command center of the Body
- Controls breathing, blood pressure, heartbeat, and blood vessel dilation/constriction
- Communications with the Autonomic Nervous system
- Activates the **Sympathetic Nervous System**

# The Stress Response- First Stage

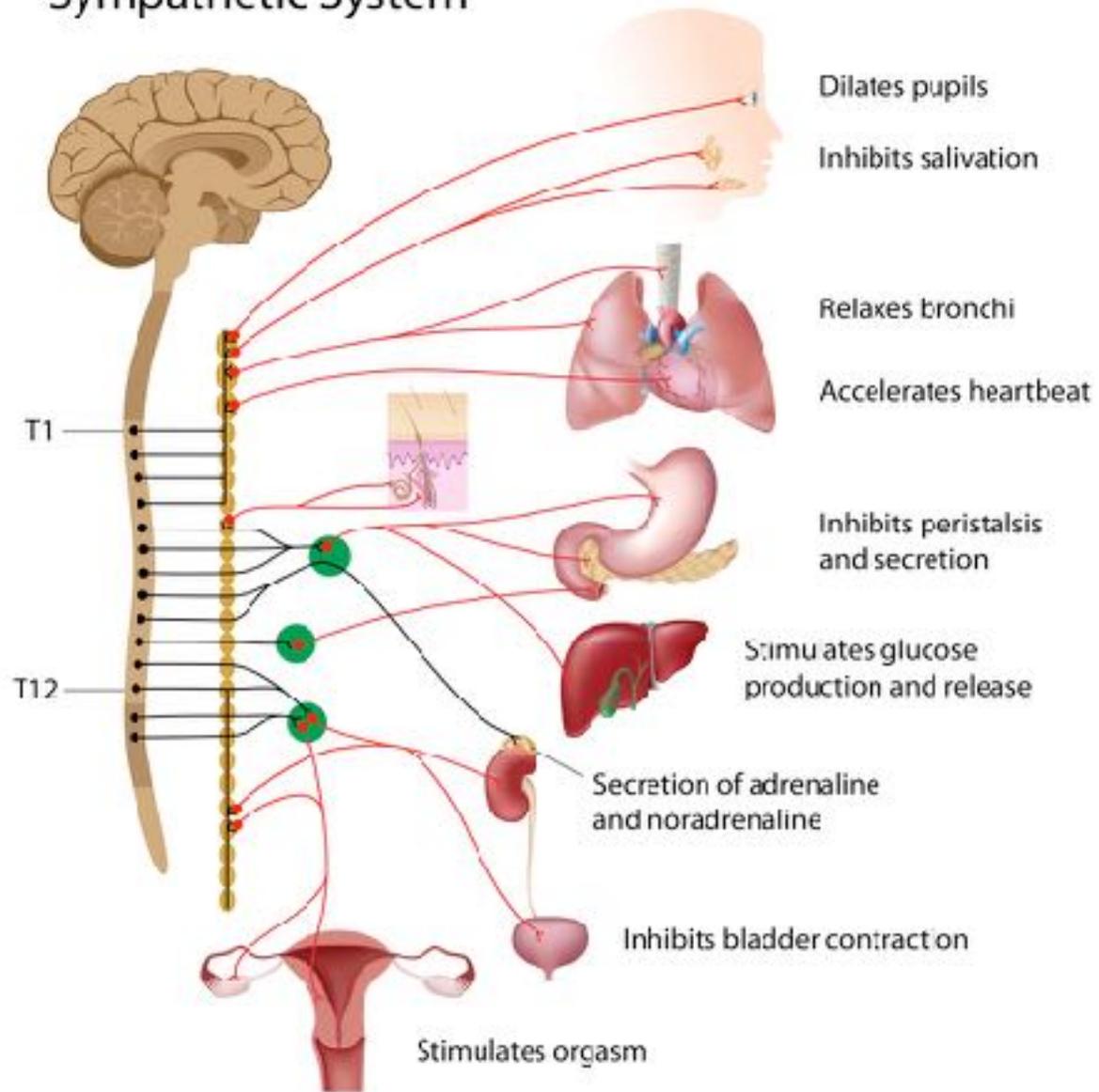
## 3. Autonomic Nervous System

- Sympathetic: “Fight or Flight”
- Parasympathetic: “Rest and Digest”
- Stress activates Sympathetic response
- The SNS sends signals to the adrenal glands

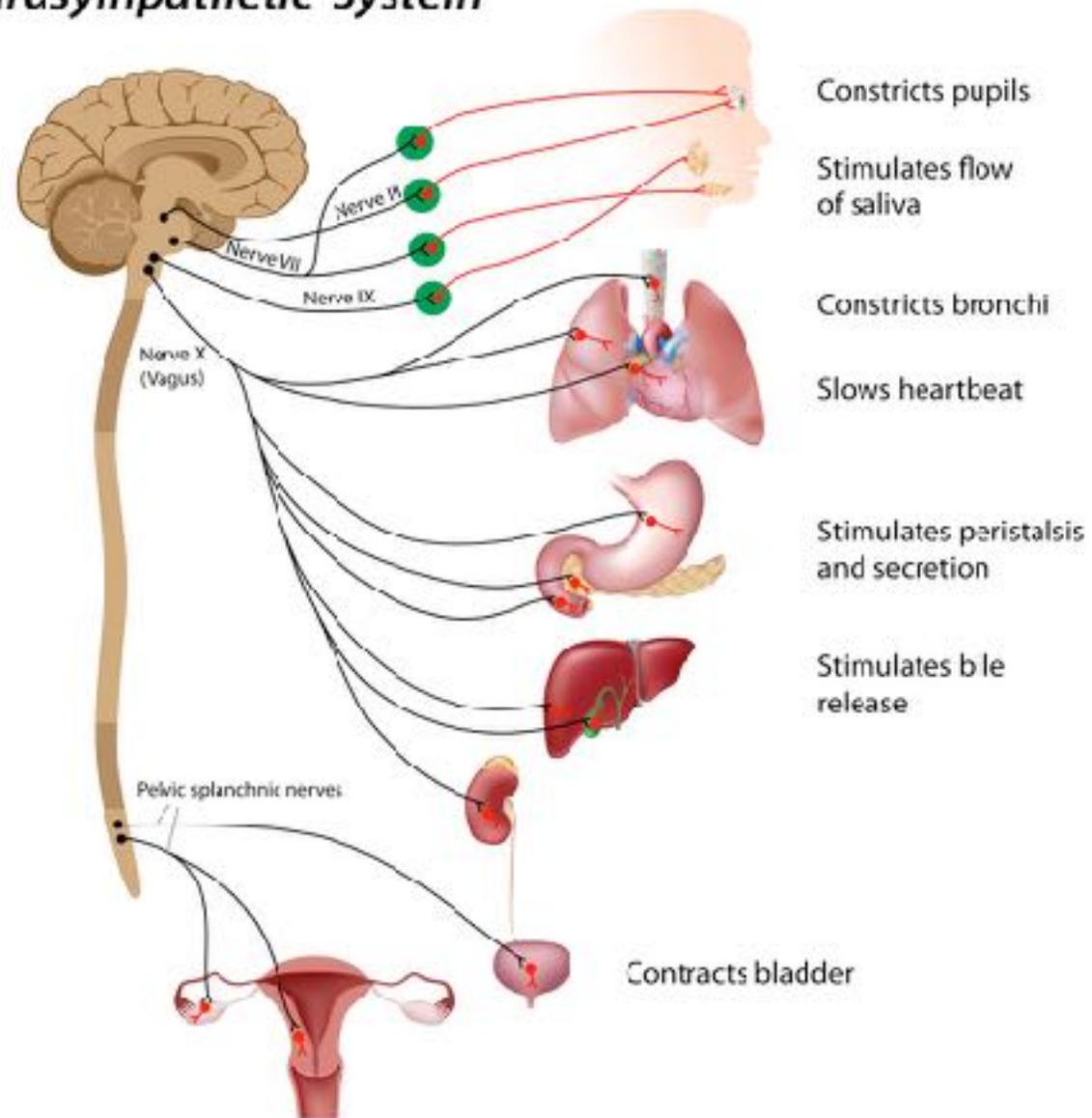


# The Autonomic Nervous System

## Sympathetic System



## Parasympathetic System



# The Adrenal Glands

## 4. Adrenal Glands

- **Secrete Adrenaline (epinephrine)**
  - Increases heart rate
  - Increases blood flow to muscles, heart, and other vital organs
  - Increases pulse rate and blood pressure
  - Increases Breathing rate and Bronchodilation
  - Oxygen is sent to the brain to keep it alert
  - Sight, hearing and other senses become sharper
  - Triggers release of blood sugar from fat storage

### Important Note:

- Adrenaline unlike most hormones, has no enzyme “switch” to turn it off

# The Second Stage of the Stress Response

## Hypothalamus-Pituitary-Adrenal Axis

- Relies on a series of hormonal signals to keep the SNS active if the brain continues to perceive stress

1. Hypothalamus Releases corticotropin-releasing hormone (CRH)
2. Triggers release of Adrenocorticotrophic hormone (ACTH) from the **pituitary**
3. Triggers release of cortisol from the **adrenal glands**
4. When the threat passes cortisol levels fall and the **parasympathetic nervous system** decreases the stress response

# Are we under Chronic Stress?



# Effects of Chronical Elevated Cortisol

- Diminishes cellular utilization of glucose
- Increases **blood sugar levels**
- Decreases **protein synthesis**
- Increases protein breakdown that can lead to **muscle wasting**
- Causes demineralization of bone that can lead to **osteoporosis**
- Interferes with **skin regeneration** and healing
- Causes shrinking of **lymphatic tissue**
- Diminishes **lymphocyte** numbers and functions

# Stress and the Adrenals: Adrenal Fatigue

If the Adrenals are depleted from chronic stress these are the consequences:

- Low body temperature
- **Nervousness**
- Depression
- Hypoglycemia
- Memory loss
- Osteoporosis
- **Weak Immune system**
- Inflammatory conditions
- **Vertigo and dizziness**
- Dry and thin skin
- **Weakness**
- **Chronic fatigue**

- Difficulty gaining weight
- Difficulty building muscle
- Irritability
- Confusion and Cognitive Impairment
- Autoimmune hepatitis
- **Palpitations**
- **Low blood pressure**
- PMS
- **Headaches**
- Unexplained hair loss
- Excessive hunger
- Indigestion
- Alternating diarrhea and constipation
- Autoimmune diseases
- **Insomnia**

# The First Step: Avoid the Following

- Vaccinations
- Antibiotics
- Medications
- Environmental Toxins
- Non-Organic, GMO Food
- Nutritional Deficiencies
- Chronic Stress



# The 5 Keys to Health and Healing



Proper nerve supply



Regular Exercise



Proper Nutrition



Sufficient Rest

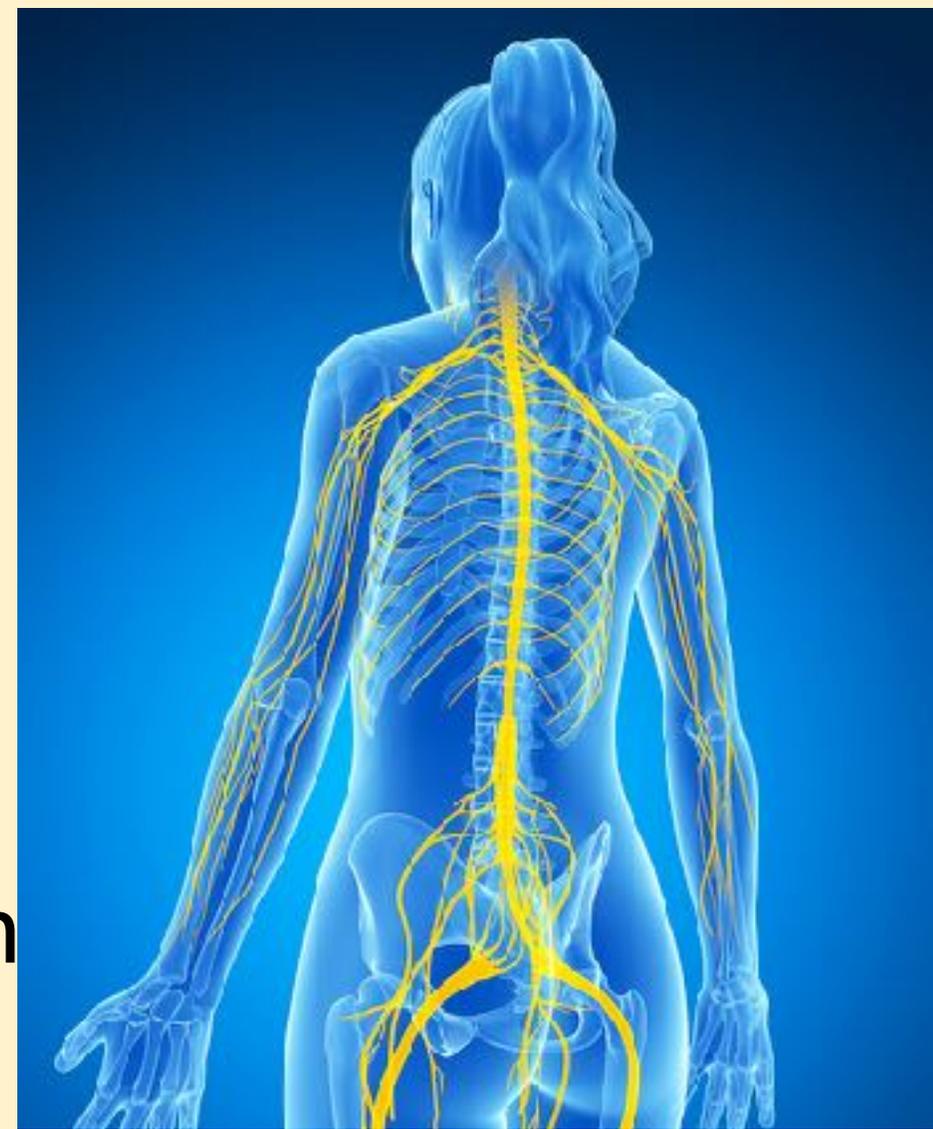


Prayer and Meditation

# Proper Nerve Supply

## **Benefits of Chiropractic Care**

- Alleviates pain
- Boosts Productivity
- Improves quality of life
- Improves Cognitive Function
- Reduces Dependency on Medication
- Improves quality of Sleep
- Reduces stress
- Boosts your Immunity



**According to:**

The Spine Journal

Journal of Vertebral Subluxation Research

Journal of Manipulative and Physiological Therapeu

# Chiropractic Care and the Autonomic Nervous System

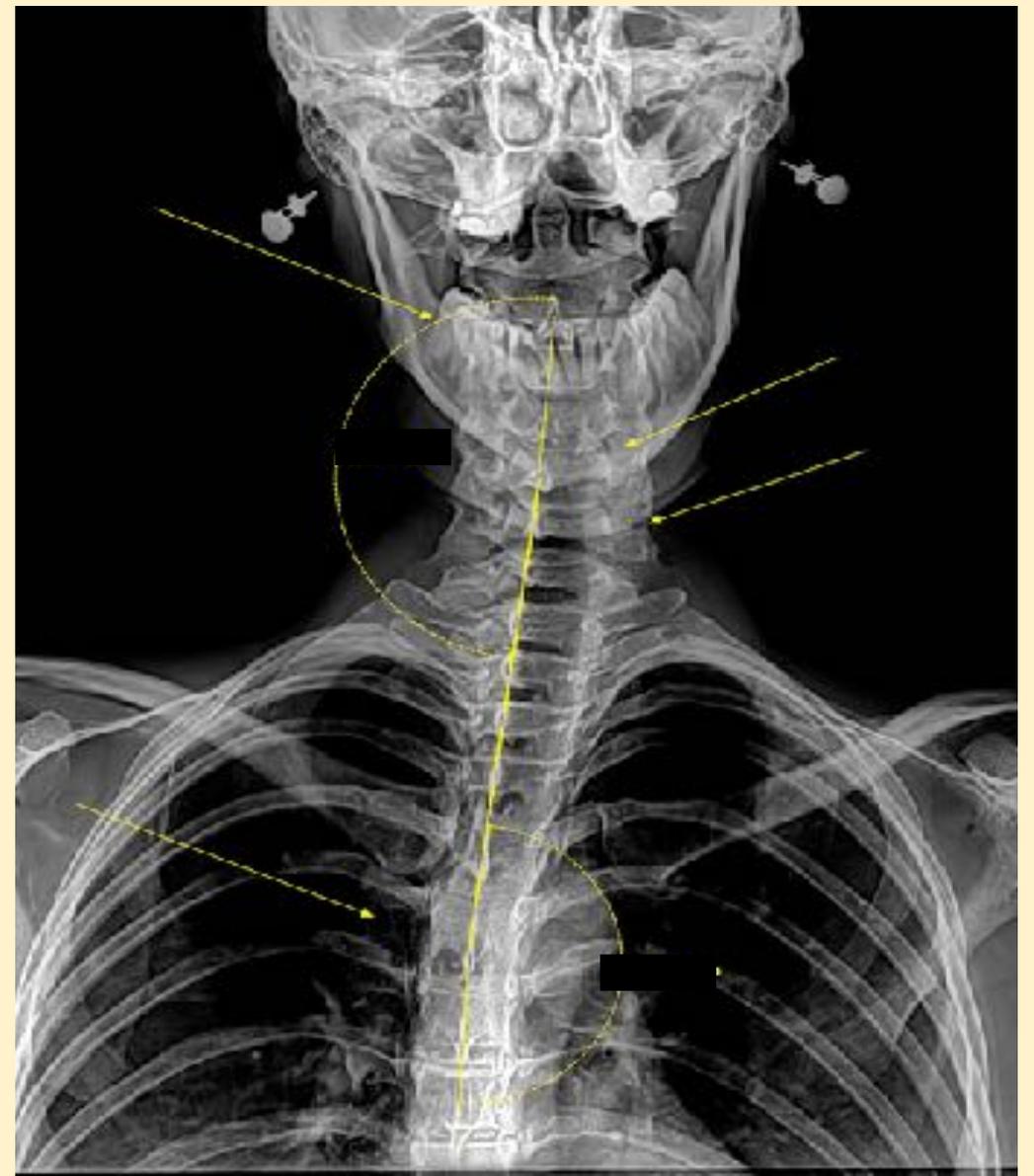
“Recent neuroscience research supports a neurophysiologic rationale for the concept that aberrant stimulation of spinal or paraspinal structures may lead to segmentally organized reflex responses of the autonomic nervous system, which in turn may alter visceral function.”

Journal of Manipulative and Physiological Therapeutics <sup>20</sup>

“High-velocity and low-amplitude manipulation of the thoracic spine appears to be able to influence autonomic output to the heart”

Journal of Manipulative and Physiological Therapeutics <sup>21</sup>

# Altered structure causes Altered Function



# Proper Exercise

## Regular Exercise helps you:

- **Get high-quality sleep**
- Lose, gain, or maintain weight
- Improve your resistance to infection
- **Improve your brain function**
- Prevent and relieve chronic pain
- Improve your Emotional health
- **Lower your risk of cancer, heart d**



# How breathing affects your Health

- **Reduces mental and physical fatigue**
- Improves blood circulation and cell oxygenation
- **Stimulates the Parasympathetic Nervous System**
- Breathing acts as a pump to massage internal organs
- The action of your diaphragm helps push lymph throughout your body, which **helps eliminate toxic waste and strengthen your immune system**
- Toxic CO<sub>2</sub> waste is eliminated directly through your breath

# Exercise and POTS

“Exercise training increased cardiac size and mass, expanded blood volume, and thus improved or even cured POTS syndrome.

These results suggest that POTS per se is indeed a consequence of deconditioning (i.e., cardiac atrophy and hypovolemia) and that carefully prescribed exercise training can be used as a nondrug treatment for patients with POTS.”

Journal of the American College of Cardiology <sup>24</sup>

# Proper Water Intake

- **Drink 50% of your body weight in Ounces**
- A 200lb person needs at least 100 ounces of water daily
- Increase your daily intake of water if it's your  
ac



# Filter your Water

- Harmful chemicals like **Fluoride** and **Chlorine** are added to most water supplies
- **These chemicals disrupt thyroid function**
- Avoid plastic bottled water because these could contain endocrine disrupting chemicals like **Bisphenol (BPA)**
- My favorite water filter: **Doulton USA**



# Salt (Healthy Salt vs Table Salt)

Table “salt” is manufactured by taking natural salt (such as crude oil flake leftovers) and heating it to 1200° Fahrenheit. During this extreme process, the chemical composition is completely altered and all of the nutritional benefits are destroyed.

Generic table “salt” ends up being about 97.5% sodium chloride and a 2.5% balance containing an array of ingredients including:

- Anti-caking chemicals.
- MSG and/or white processed sugar
- And aluminum derivatives such as sodium solo-co-aluminate.

# Healthy Salt (Celtic Sea Salt and Himalayan Salt)

- Contains 60 trace minerals which help you stay hydrated.
- Sufficient sodium levels that help balance your sodium-potassium ratios.
- Powerful electrolytes like magnesium.
- Trace elements required for proper adrenal, immune and thyroid function.
- Digestive enzyme enhancers, which help your body absorb more nutrients from the foods that you eat.

# Benefits of Himalayan Salt

- contains all of the 84 elements found in your body
- Regulate the water content throughout your body
- Promote healthy pH balance in your cells (particularly your brain cells)
- Promote blood sugar health and can help reduce the signs of aging
- Assist in the generation of hydroelectric energy in cells in your body
- Absorb food particles through your intestinal tract
- Support respiratory health
- Promote sinus health
- Prevent of muscle cramps
- Promote bone strength
- Regulate your sleep
- Support your libido
- Promote vascular health
- Regulate your blood pressure with sufficient water and potassium intake.

# Benefits of Celtic Sea Salt

- Alkalize the body
- Balance blood sugars
- Eliminate mucus buildup
- Build immunity
- Improve brain function
- Increase energy
- Provide electrolyte balance
- Promote restful sleep
- Prevent muscle cramps
- Regulate heartbeat and blood pressure



# Vitamin D

- **Helps produce serotonin in the brain**
- **Activated Vitamin D receptors increase nerve growth in your brain**
- **The combination of Vitamin D, Tryptophan and Omega-3 fats can naturally elevate concentration of brain serotonin without side effects**



# Vitamin D and POTS

**“Our research results demonstrated that Postural Orthostatic Tachycardia Syndrome (POTS) patients have a higher rate of vitamin D3 deficiency (51% have Vitamin D3 less than 20 ng/mL).**

**Vitamin D3 levels are low in more than half of POTS patients (56% had less than 30 ng/mL )”**

**American Heart Association <sup>26</sup>**

# Vitamin D

**Vitamin D Deficiency is linked to:**

- Digestive disorders
- Skeletal disorder including osteoporosis
- Depression, mental disorders
- Neurodevelopmental disorders (Autism)
- Brain Dysfunction, dementia and Alzheimer
- Chronic infections
- Cardiovascular disease
- All types of Cancer
- Autoimmune Diseases
- Premature Aging



# Optimize Your Vitamin D levels

- **UVB exposure** from the Sun is the best way to optimize your vitamin D levels
  - At least 20 minutes of **sun exposure daily** during mid day
  - Your shadow shouldn't be longer than your height
- Most regions of the planet don't get proper sunlight for **6 months** out of the year
- Vitamin D3 supplementation during the winter
- Adults required about **8,000 IUs per day**





# Magnesium

- A mineral used by every organ in your body, especially your heart, muscles, and kidneys
  - **80% of Americans are magnesium deficient**
- 
- Magnesium is found in more than **300 different enzymes** in your body and plays a role in the body's detoxification process
  - Researchers have detected **3,751 magnesium-binding sites on human proteins**
- 
- Calcium, vitamin K2 and Vitamin D must be balanced with Magnesium in order to utilize it properly

# Magnesium is necessary for:

- Activating muscles and nerves
- **Creating energy** in your body by activating Adenosine Triphosphate
- Helping digest proteins, carbohydrates and fats
- Serving as a **building block** for RNA and DNA synthesis
- Acting as a precursor for neurotransmitters like Serotonin



# Consequences of Magnesium Deficiency:

- Hormone imbalance and PMS
- Unexplained fatigue and Chronic Fatigue
- Weakness
- Abnormal heart rhythms
- Muscle spasms and twitching
- Depression, anxiety, panic attacks
- Bowel disorders
- Heart disease
- Insomnia
- Headaches and Migraines
- Tooth decay
- Blood Clots
- Osteoporosis
- Raynaud's syndrome
- Musculoskeletal conditions
- Neurological disorders
- Kidney Disease
- Diabetes
- Fibromyalgia
- Asthma
- Hypertension
- Seizures
- Coronary Spasms
- Personality changes

# Sources of Magnesium

- Dark Leafy Greens (Raw Spinach)
- Nuts and Seeds (Squash/Pumpkin Seeds)
- Fish (Mackerel)
- Beans and Lentils
- Whole Grains (Brown Rice)
- Avocados
- Bananas
- Dried Fruit (Figs, prunes, dates, raisins)
- Cacao (Dark Chocolate)



# Optimize Your Gut Flora

- Organic plant based diet (Locally grown, seasonal foods)
- Healthy fats such as coconut oil and olive oil
- Fermented Vegetables
- Probiotic Supplements
- Juice Vegetables
- Blend Fruits
- Raw Dairy
- Reduce Omega 6 and Increase Animal based Omega 3



# Functions of your Gut Flora

- Digestion and absorption of carbohydrates
- Production of vitamins
- Absorption of minerals
- Elimination of toxins
- Distinguish between pathogens and non-harmful antigens
- Keep harmful bacteria under control
- Aid in production of antibodies to pathogens
- Provide support to the Immune System

# Fermented Foods

- Help promote growth of beneficial bacteria, supports healthy immune function
- Help increase vitamin b, omega 3, digestive enzyme, and lactase/lactic acid

- Kefir (fermented milk)
- Kombucha
- Sauerkraut
- Pickles
- Miso
- Kimchi



# Vitamin B12 and POTS

“Vitamin B12 is involved in the production of adrenaline from noradrenaline. It is the cofactor involved in catecholamine degradation and plays a role in myelin synthesis.

“CONCLUSIONS: Studies have shown dysfunction in the baroreflex mechanism and the autonomic nervous system, particularly in the sympathetic nervous system, in the pathophysiology of CFS, POTS, and syncope. Our study shows the association between the etiopathogenesis of POTS and the vitamin B12 deficiency–induced sympathetic nervous system-baroreceptor dysfunction.”

# Natural Sources For Vitamin B12

- Beef Liver
- Sardines
- Beef (grass-fed)
- Raw Cheese
- Cottage cheese
- Lamb
- Raw Milk
- Eggs
- Wild caught Salmon



# The 5 Keys to Health and Healing



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Sufficient Rest



Prayer and Meditation

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