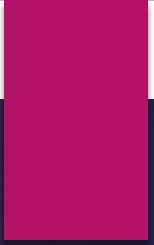


POTS – Evaluation and Management

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No disclosures

POTS Definition

- ▶ Heart rate increment ≥ 30 bpm (or increase over 120 bpm) (≥ 40 bpm under age 19) with standing

AND

- ▶ Symptoms of orthostatic intolerance without orthostatic hypotension

POTS Clinical Characteristics

Demographics

Female: male = 5:1

Reproductive years

Antecedent event in ~50%

Prevalence

~ 170/100000

Probably much higher as many undiagnosed or misdiagnosed

Symptoms

Syncope 60%

GI 49%

Migraine 46%

Hyperadrenal symptoms
36%

Vasomotor symptoms 31%

Brain fog and fatigue
almost universally most
disabling complaints

POTS subtypes (not mutually exclusive)

Neuropathic

Autoimmune
Post viral
Nutritional
Heavy metals
Idiopathic
Post vaccine

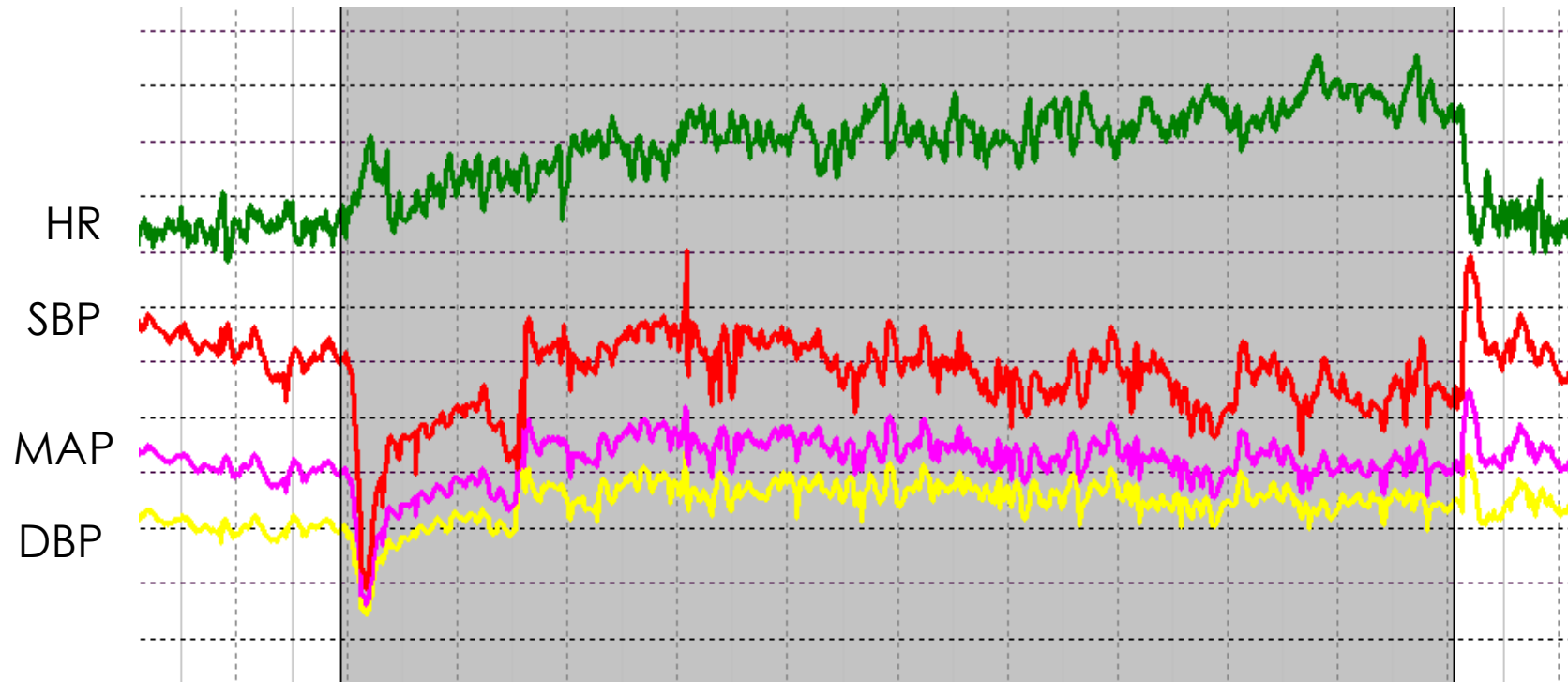
Hyperadrenergic

Hypovolemia
Venous pooling
Splanchnic pooling
Arcuate ligament syndrome
Elevated cerebral venous pressure
Intracranial hypotension (CSF leak)
M. pneumoniae?
Mitochondrial disorders?

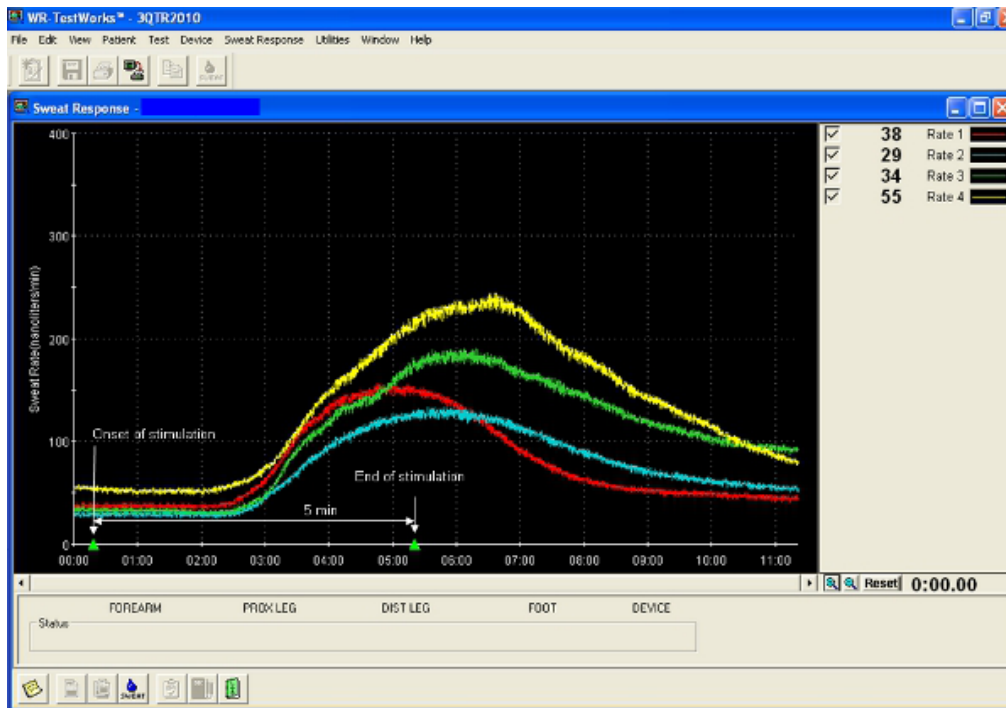
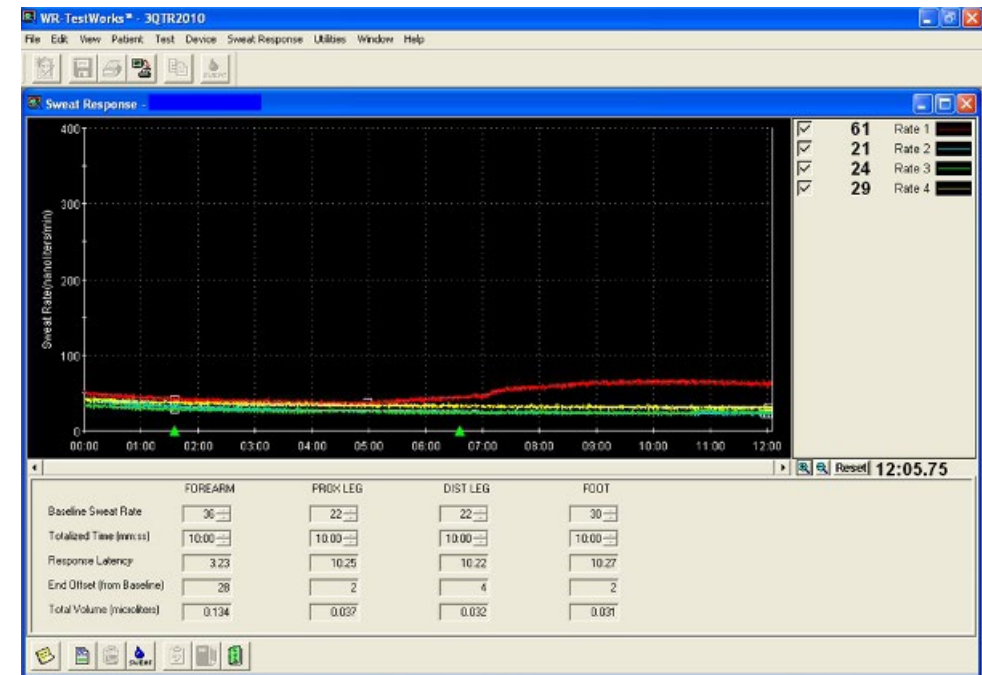
Deconditioning

Injury
Prolonged illness
Chronic pain
Space flight

POTS and Autonomic Testing

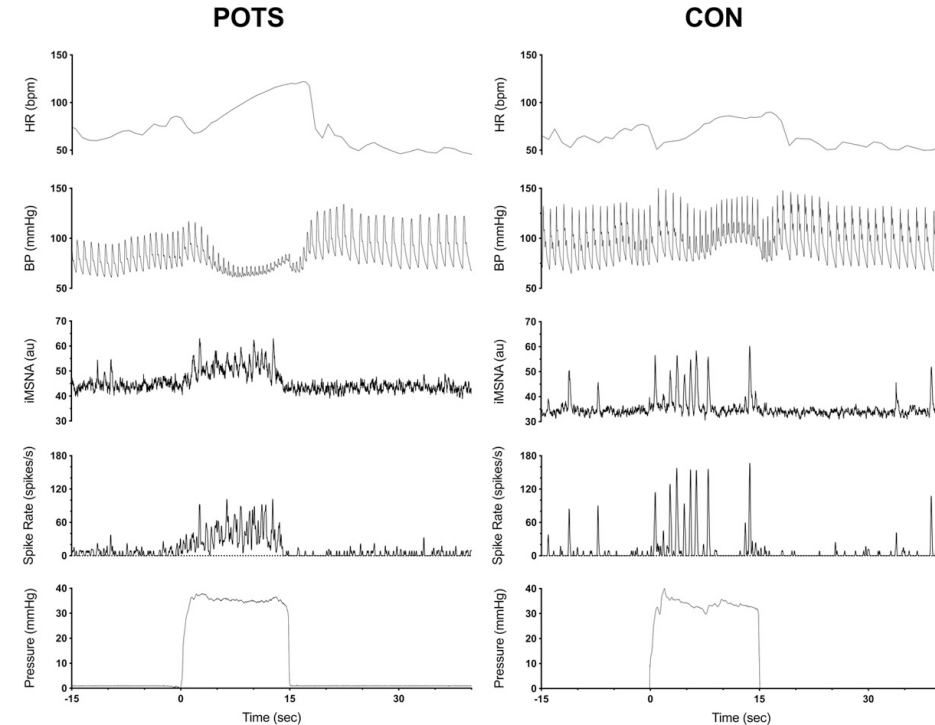


Role of autonomic testing: Neuropathic type: sudomotor denervation



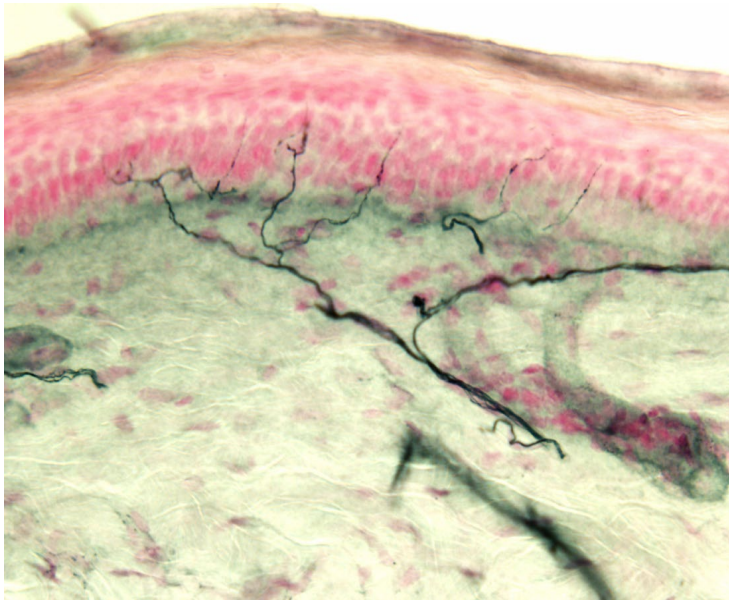
Adrenergic denervation

- ▶ Reduced norepinephrine release in legs (blunted norepinephrine release with standing)
- ▶ Reduced muscle sympathetic nerve activity (MSNA) on microneurography
- ▶ Loss of epidermal nerve fiber on skin biopsy

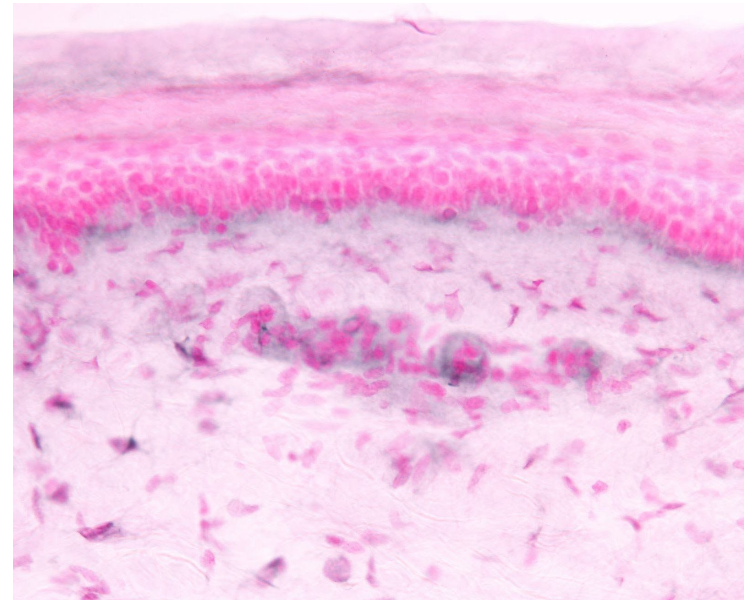


Epidermal Punch Biopsy

Normal skin biopsy

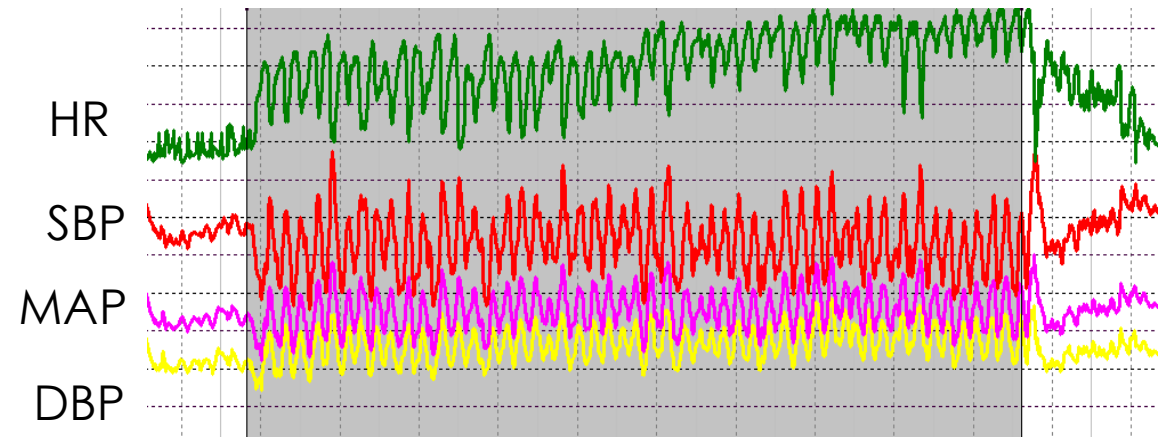


Decreased nerve fiber density



Hyperadrenergic type

- ▶ Standing norepinephrine levels > 600 pg/mL
 - ▶ Increased spillover and decreased clearance
- ▶ Autonomic storms
 - ▶ Increased heart rate, blood pressure, palpitations, tremulousness, sweating
 - ▶ Variable posture, duration, frequency and severity



Excessive HR rise and BP oscillations

Possible causes

Hypovolemia common, but not universal

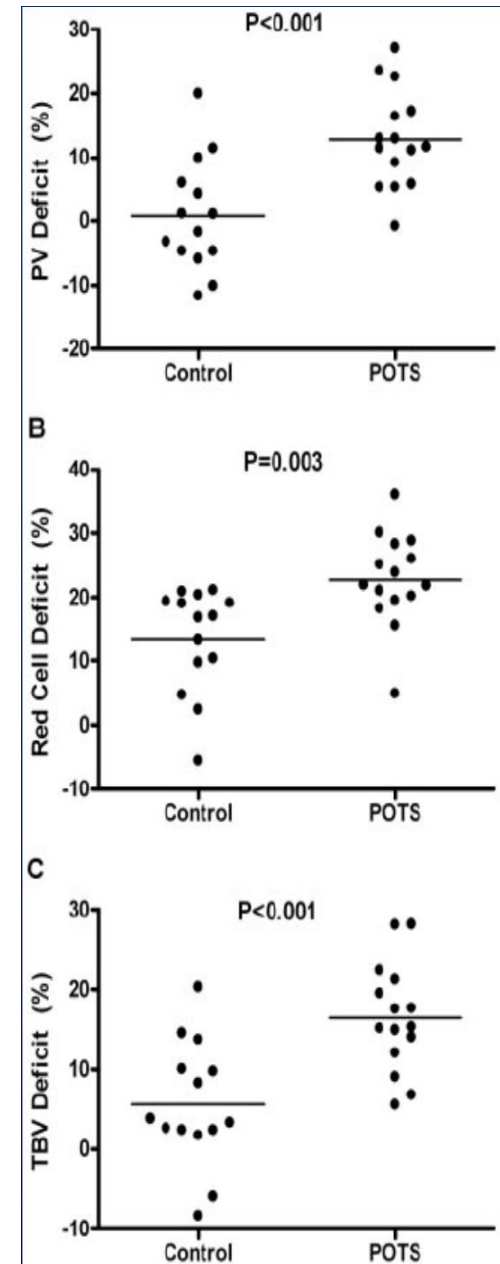
Plasma volume, red cell mass, total blood volume all reduced

Blood pooling?

Decreased cerebral blood flow?

Beta-receptor antibodies?

Increased/decreased intracranial pressure?

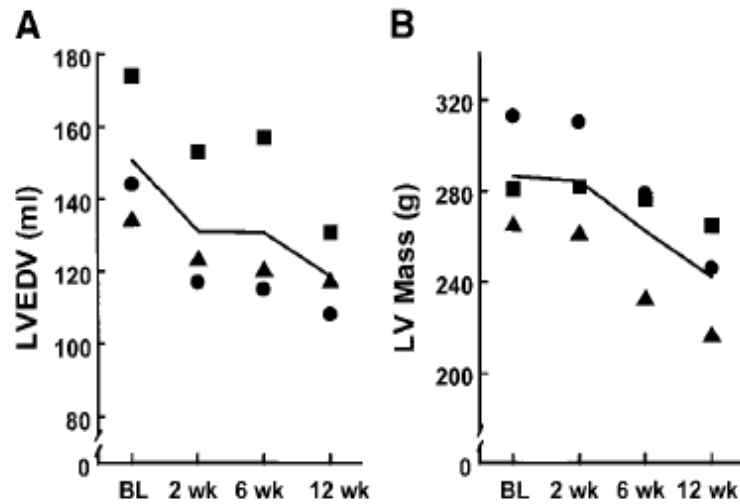




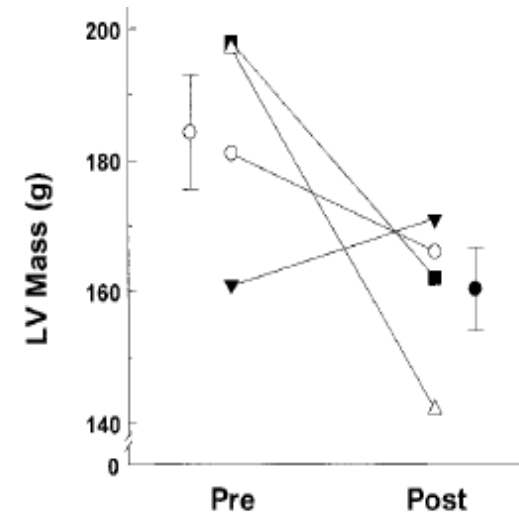
Deconditioning:

LESSONS FROM
SPACEFLIGHT

Both bedrest and spaceflight result in cardiac atrophy

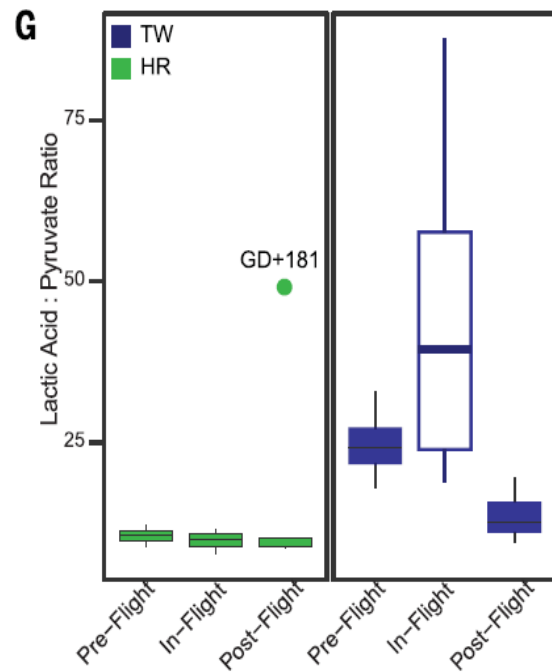
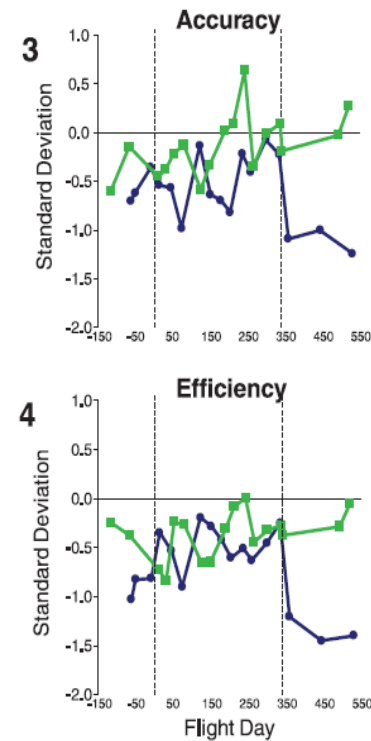


Bedrest



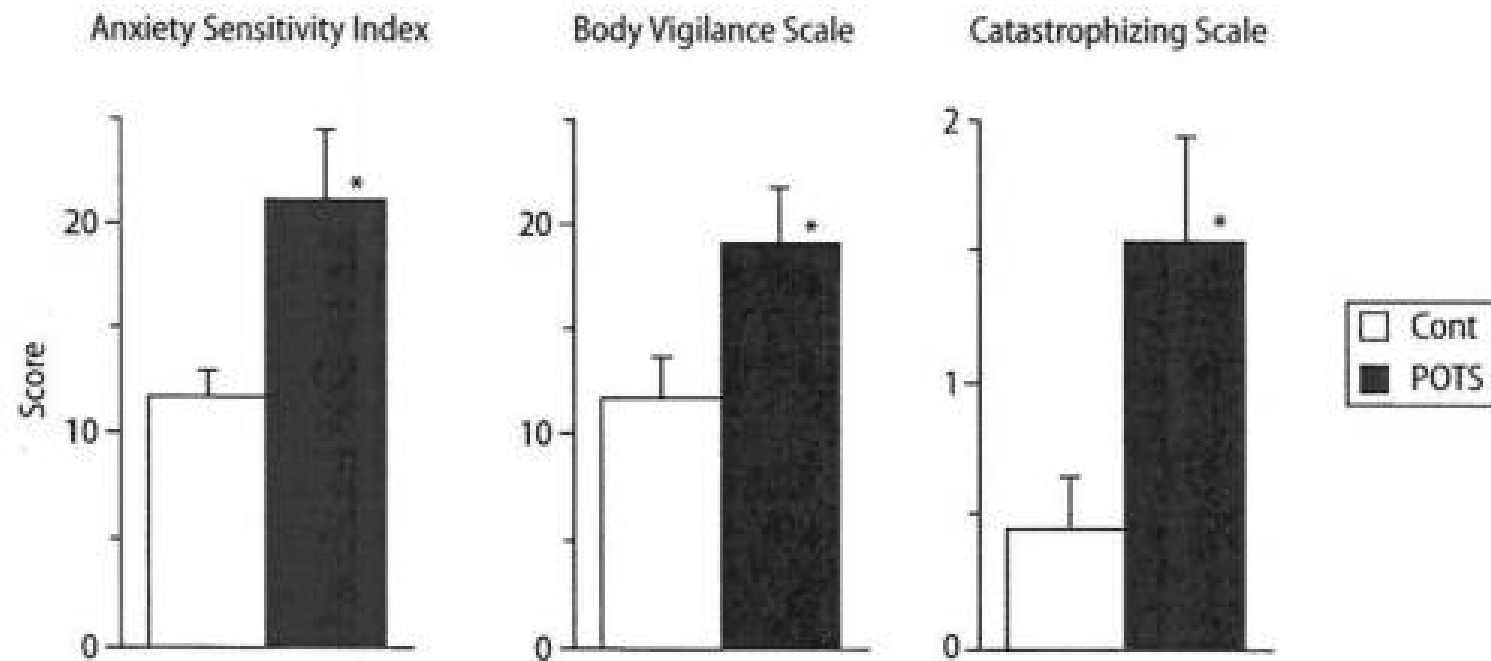
Spaceflight

The NASA Twins Study¹



1. Garrett-Bakelman et al., Science 364, 144 (2019)

Somatic Hypervigilance



Treatment of POTS

“

The art of medicine is to entertain
the patient while nature takes
care of the disease.

”

VOLTAIRE

Treatment by Subtype

Neuropathic

Diagnose and treat underlying condition

Supportive care

IVIg (not covered)

Plasmapheresis (not covered)

Salivary gland biopsy

Volume expansion

Pentoxifylline

Hyperadrenergic

Beta-blockers

Clonidine

Ivabradine (not covered)

Abdominal compression

Volume expansion

CSF leak?

Pentoxifylline

Correct iron deficiency

Deconditioning

Rehabilitation (not covered)

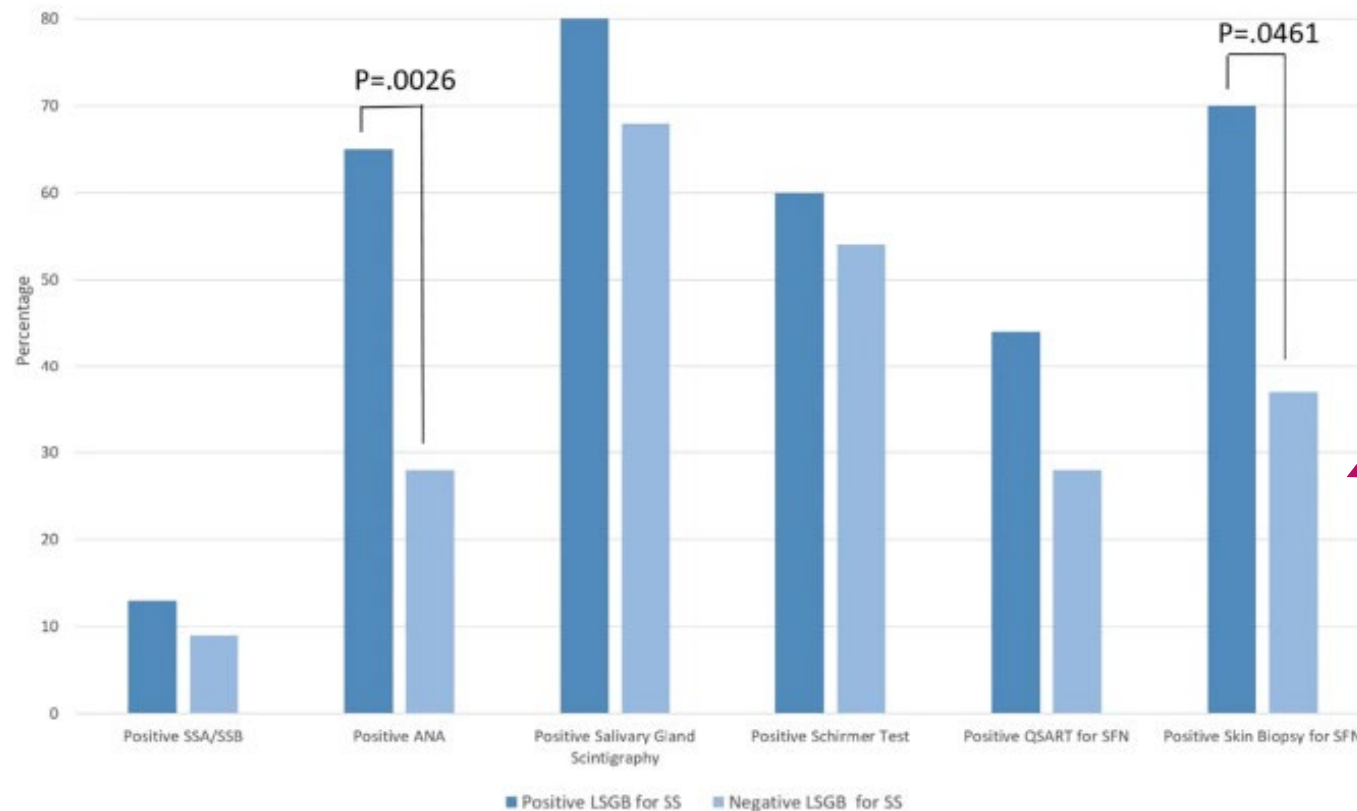
Volume expansion

Pain control

Exercise training

Pentoxifylline

Role of Minor Salivary Gland Biopsy



Positive skin biopsy for SFN

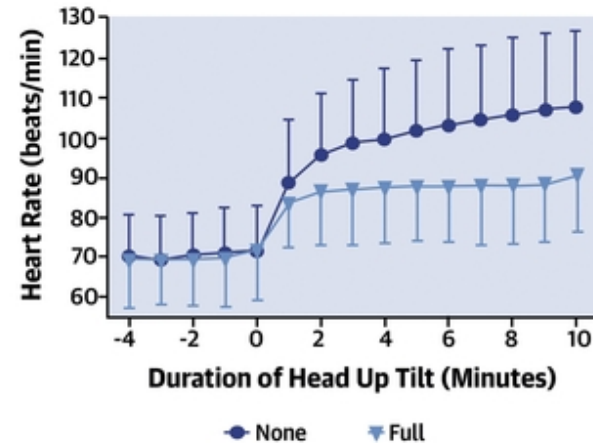
Splanchnic compression

CENTRAL ILLUSTRATION: Body Compression Reduces Head-Up Tilt Heart Rate in Patients Diagnosed With Postural Orthostatic Tachycardia Syndrome

No Compression

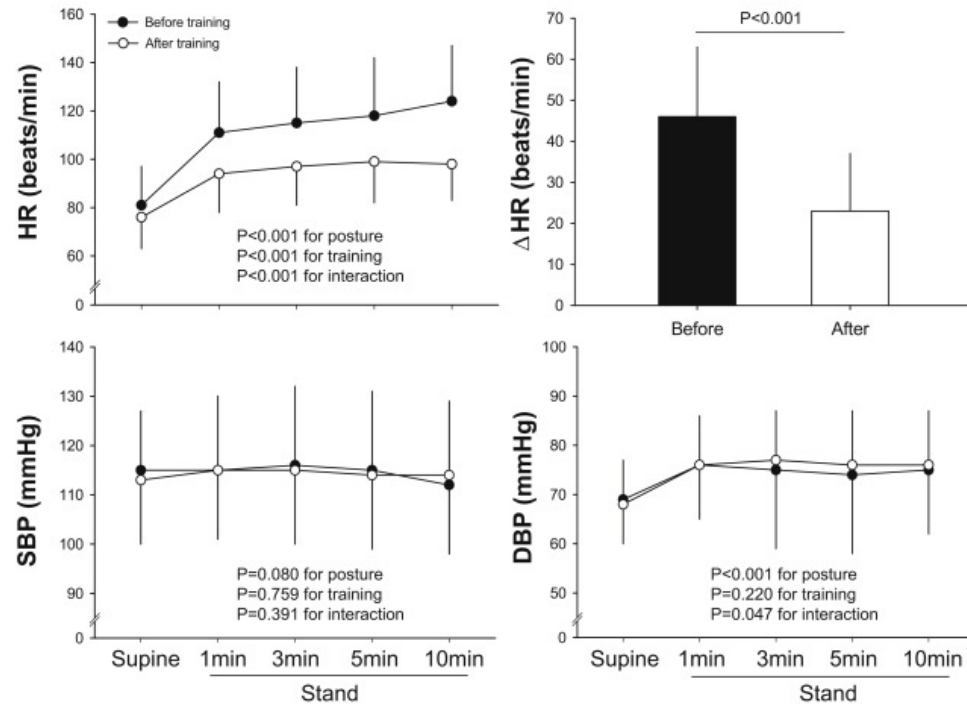
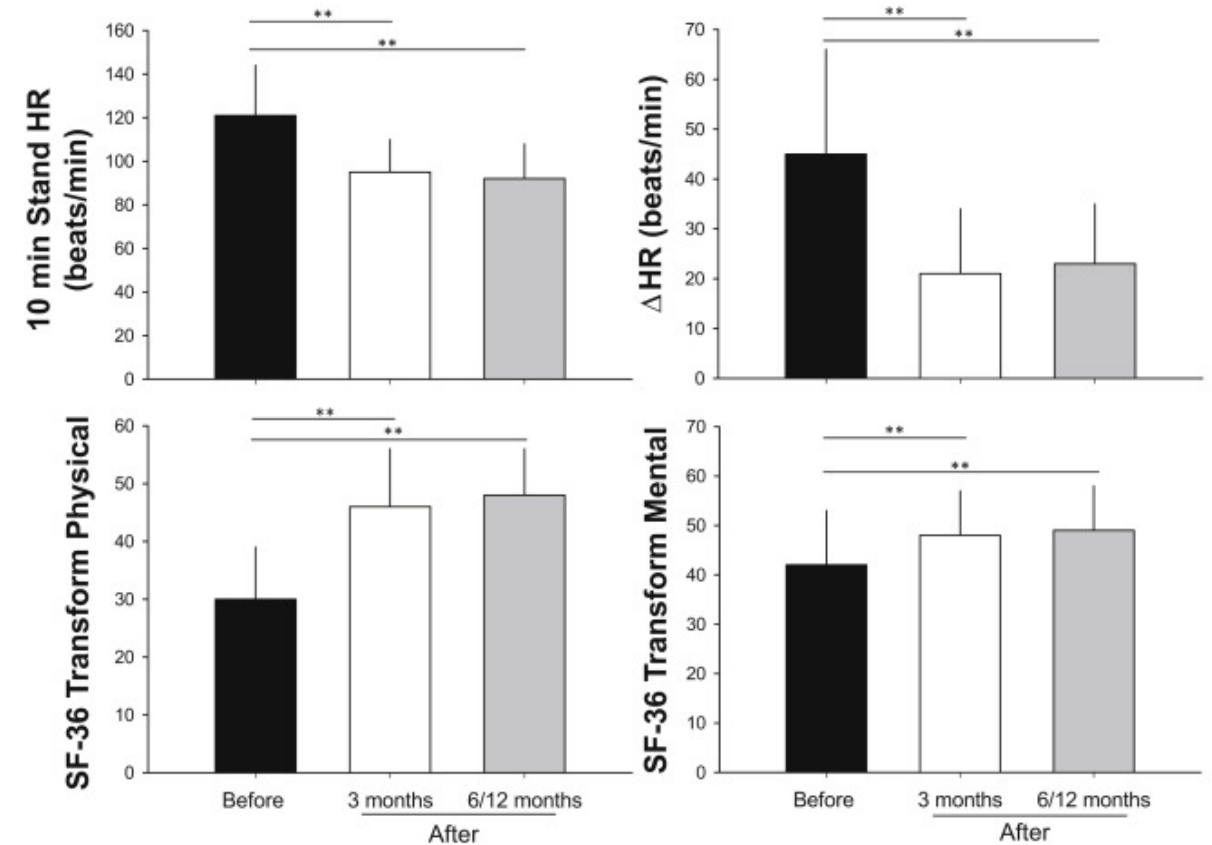


Full Compression



Bourne, K.M. et al. J Am Coll Cardiol. 2021;77(3):285-96.

Exercise Training



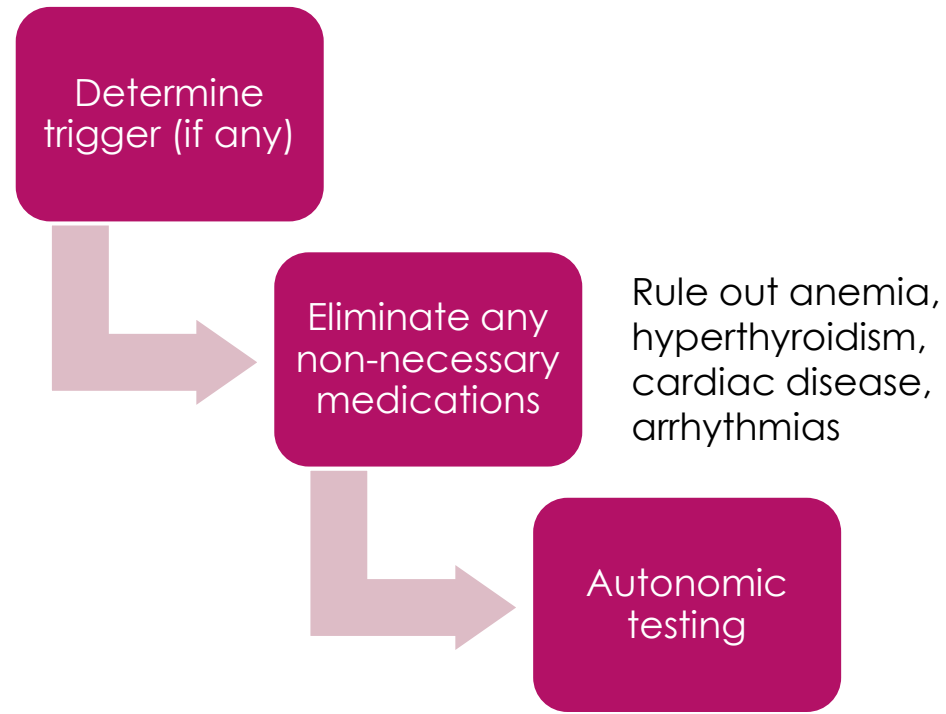
Volume loading

- ▶ 5-10 g salt daily
- ▶ 2-3 L of fluid daily (in 500 mL aliquots)
- ▶ Bed in 30° reverse Trendelenburg
- ▶ Avoid salt tablets
- ▶ Saline infusions very helpful (no clinical trial data)
 - ▶ Variable duration of benefit
- ▶ Fludrocortisone/desmopressin
- ▶ Erythropoietin?

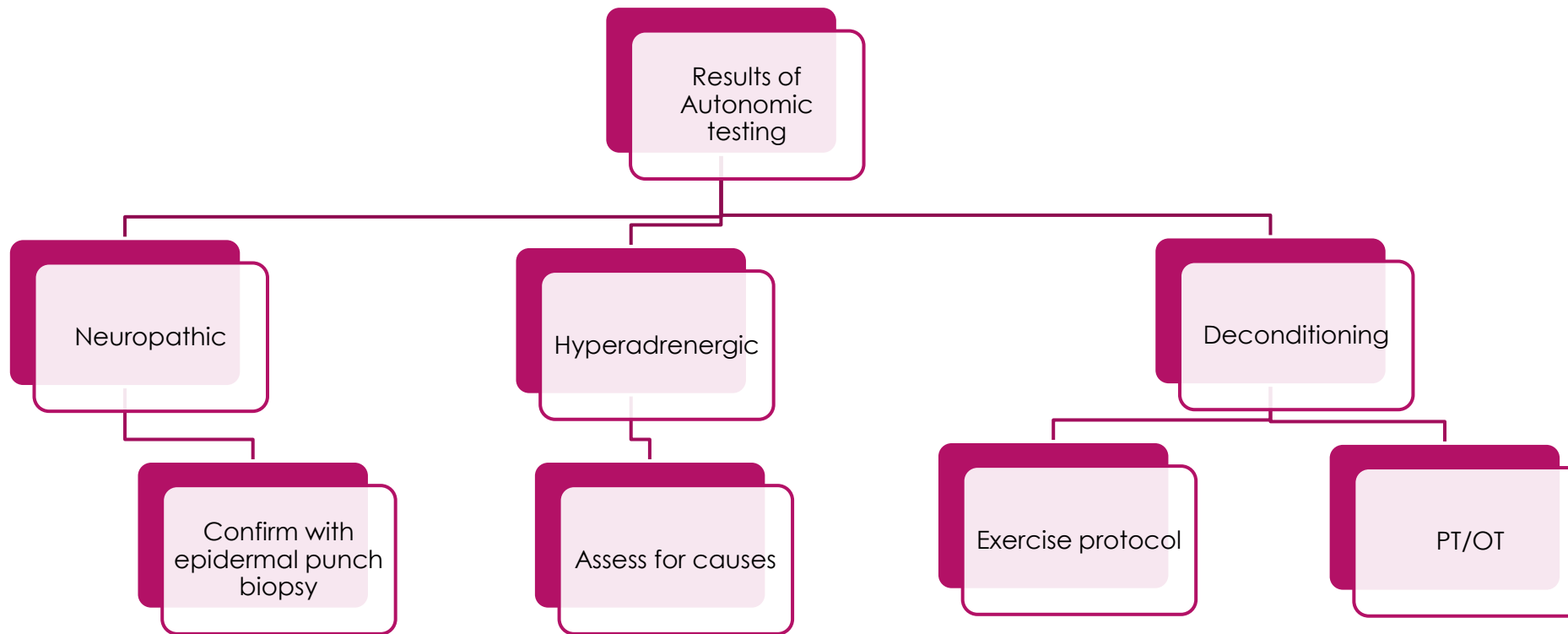
Brain Fog and Fatigue

- ▶ Usually the most significant complaint of patients
- ▶ The most frequently reported brain fog triggers were fatigue (91%), lack of sleep (90%), prolonged standing (87%), dehydration (86%), and feeling faint (85%).
- ▶ Although aggravated by upright posture, brain fog often reported to persist after assuming a recumbent posture.
- ▶ The most frequently reported interventions for the treatment of brain fog were intravenous saline (77%), stimulant medications (67%), salt (54%), intra-muscular vitamin B-12 injections (48%), and midodrine (45%).
- ▶ Low dose naltrexone
- ▶ Colchicine?

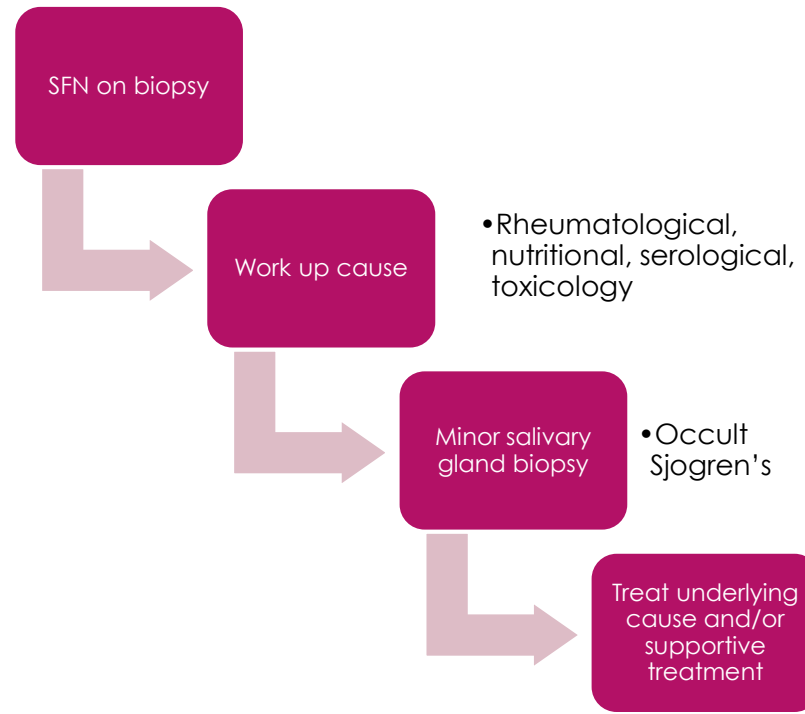
Summary of Diagnosis and Treatment



Summary of Diagnosis and Treatment



Summary of Diagnosis and Treatment



Good Luck!

