DISFUNCION AUTONÓMICA
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OBJETIVOS

- **Compresión de**
  1. La fisiopatología
  2. Espectros clínicos
  3. Abordaje diagnostico
  4. Manejo terapéutico

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Caso clinico

Paciente de 20 años con el siguiente cuadro clinico

MAREO?

GIRO CEFALICO---------- Vertigo----------Sistema vestibular
DESEQUILIBRIO---------- Ataxia---------- --------Cerebelo y conecciones
DESMAYO ---------- Lipotimia/sincope-------CV/SNA
MAL DEFINIDO---------- Hiperventilación?-------SNA/MD/Psicogenico,

Martin A. Samuels, MD, DSc(hon), FAAN, MACP, FRCP
Brigham and Women's Hospital
Harvard Medical School
Boston, MA

DISCUSION

- QUE INFORMACION ES UTIL?
- COMO SE PUEDE EVALUAR A ESTA PACIENTE?
- LA TAQUICARDIA SOSTENIDA TARDIA
- LA CAIDA DE PRESION ARTERIAL

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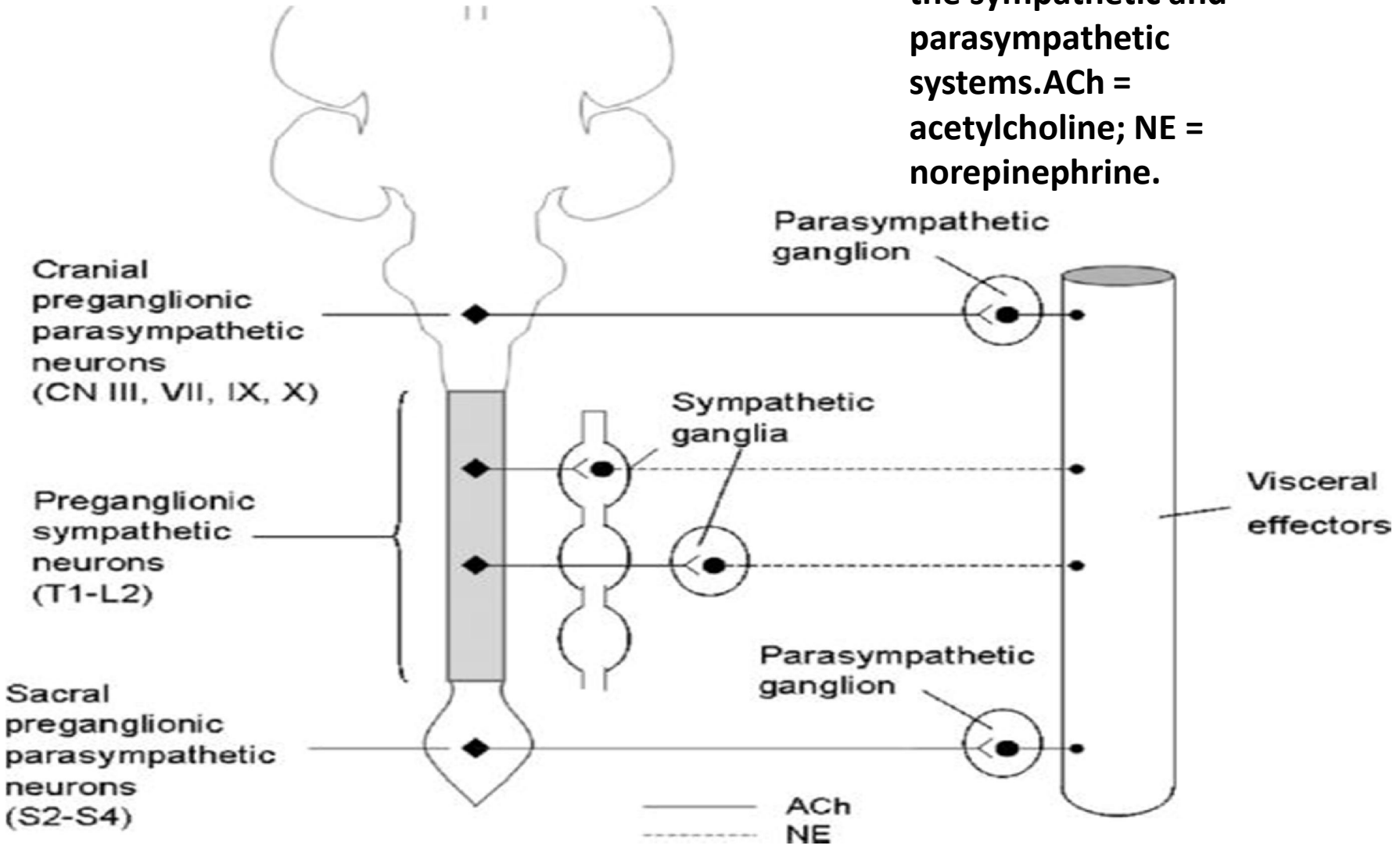
Fisiología de la presión arterial

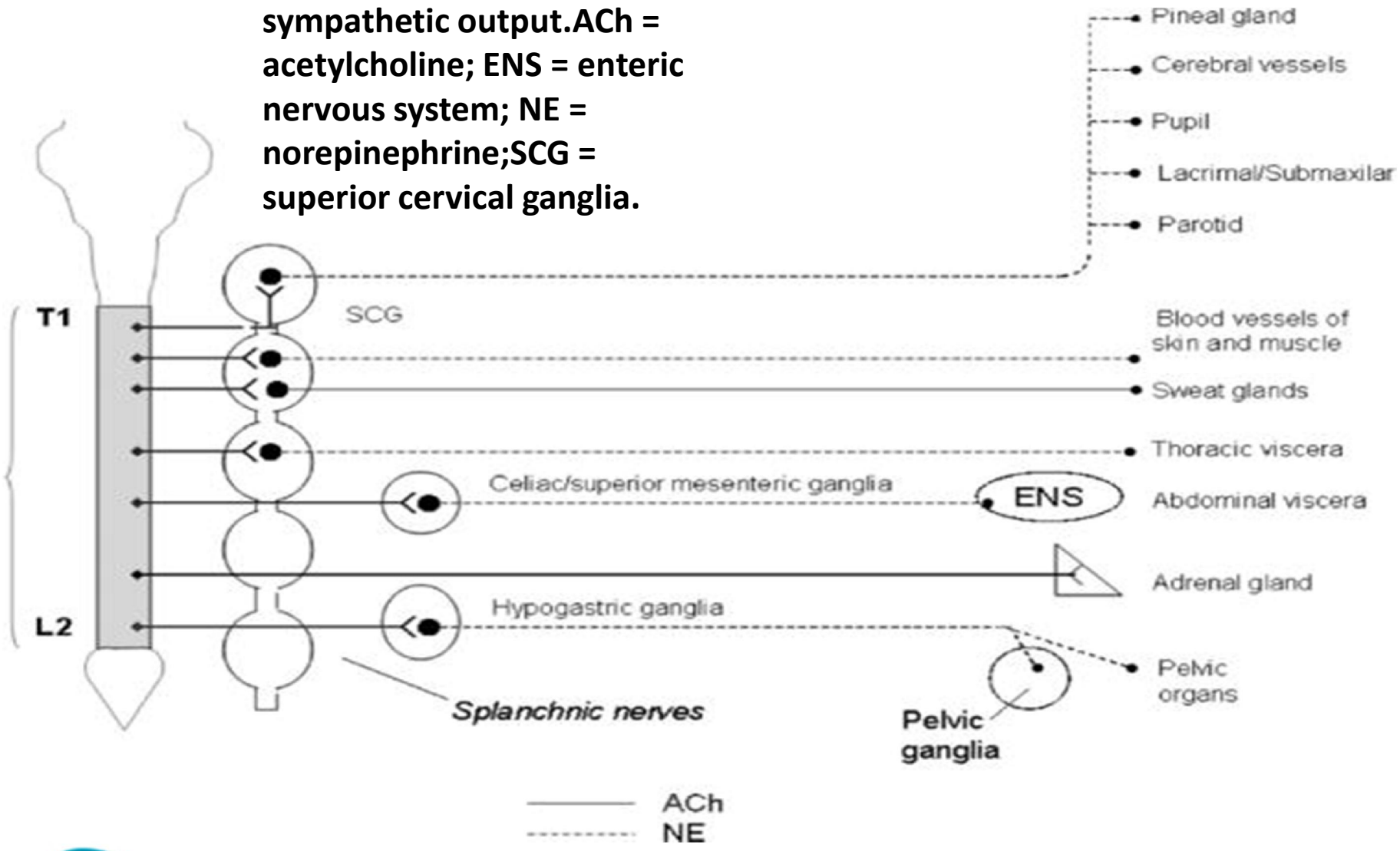
- **Órganos**
  - Bomba
  - Resistencia: arterias
  - Capacitancia: venas volumen
- **Signos cardinales**
  - **Aferente:**
    - Receptores de presión aurícula derecha al n. vago
  - **Integrativas:**
    - Núcleo del tracto solitario
    - Núcleos del tronco cerebral catecolaminérgicos
  - **Eferente**
    - Sistema simpático a los vasos y corazón

FIGURE 1

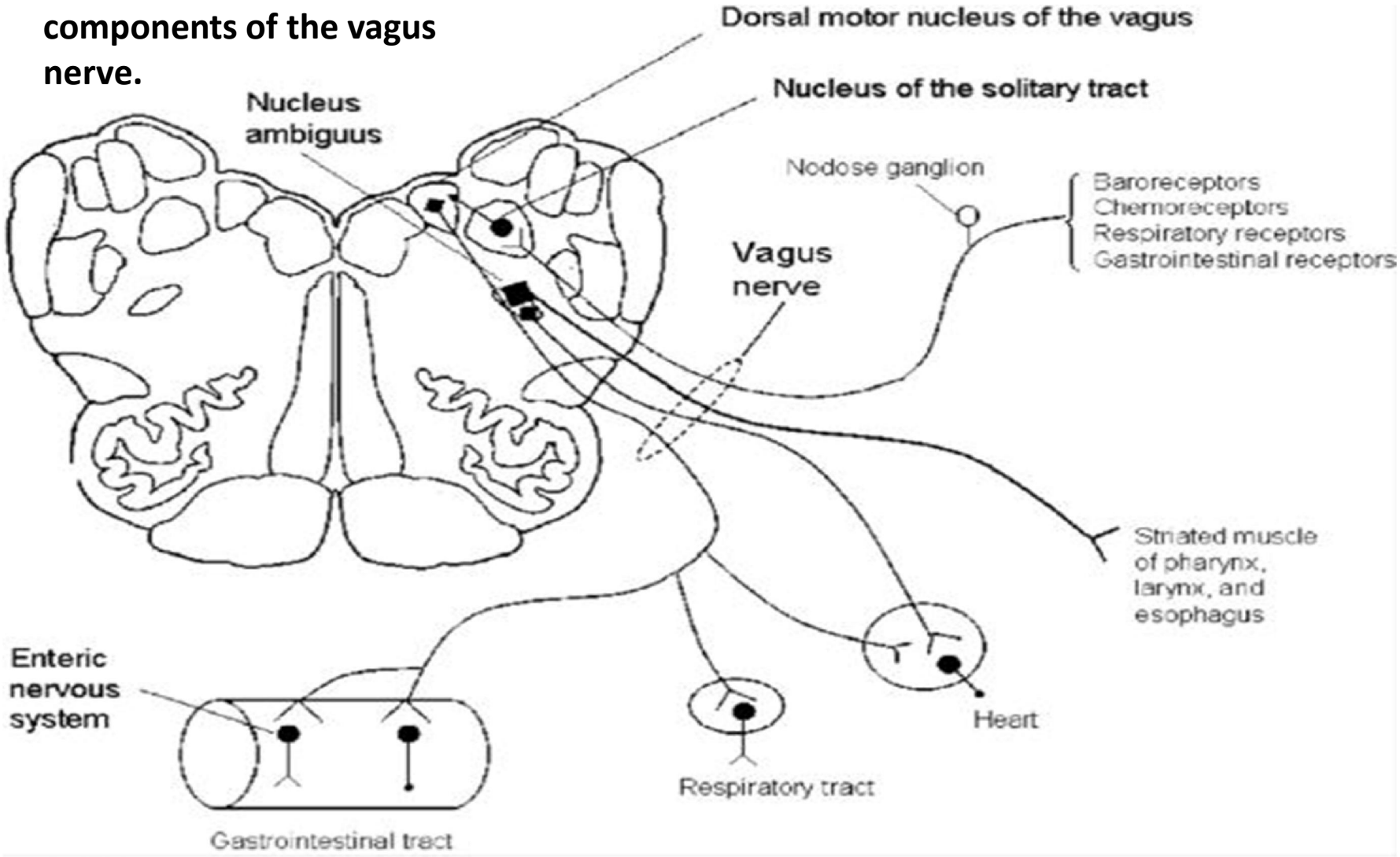
-1 General organization of the sympathetic and parasympathetic systems.ACh = acetylcholine; NE = norepinephrine.

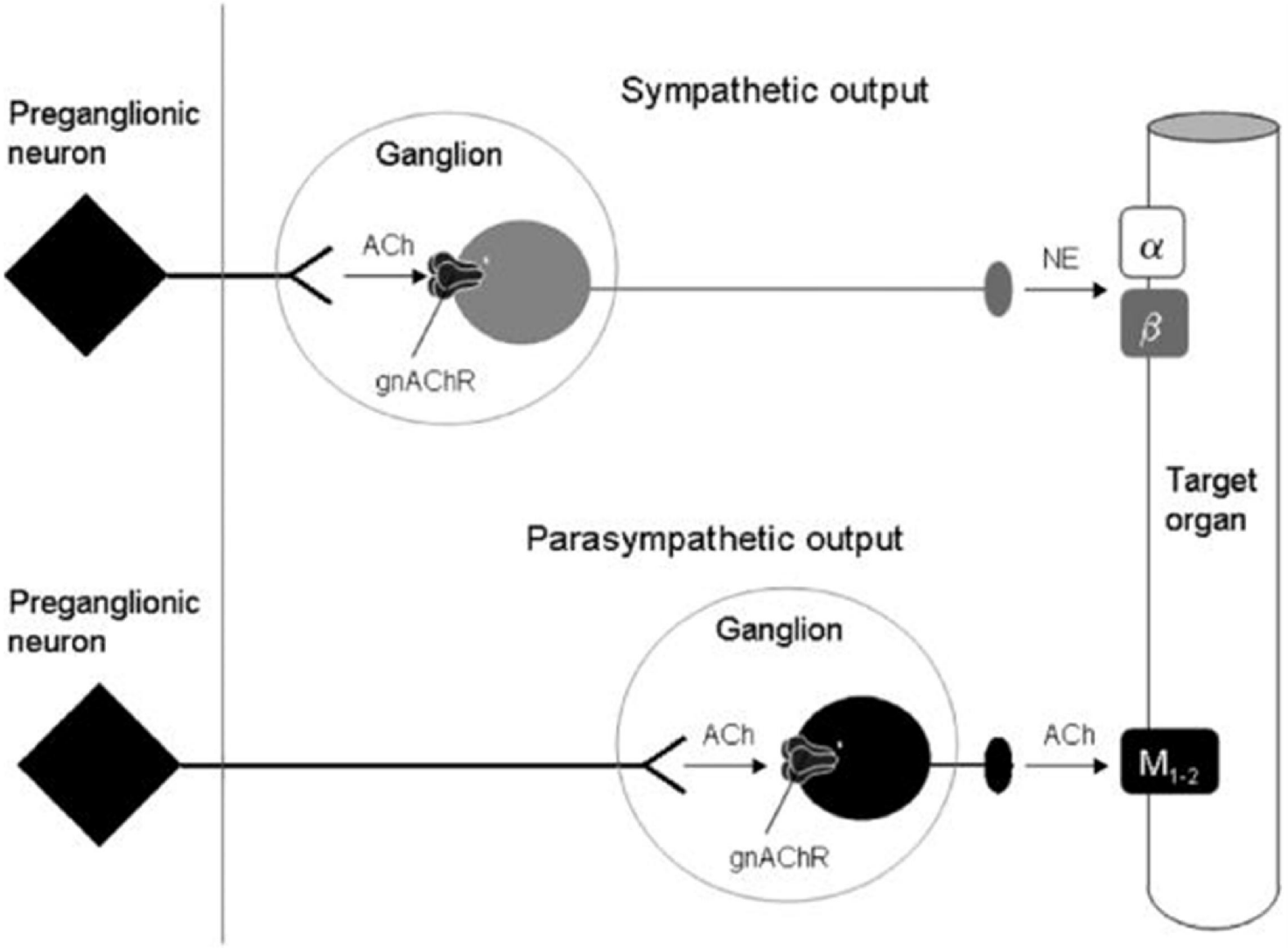


-2 Organization of the sympathetic output.ACh = acetylcholine; ENS = enteric nervous system; NE = norepinephrine;SCG = superior cervical ganglia.



-3 Afferents and efferent components of the vagus nerve.





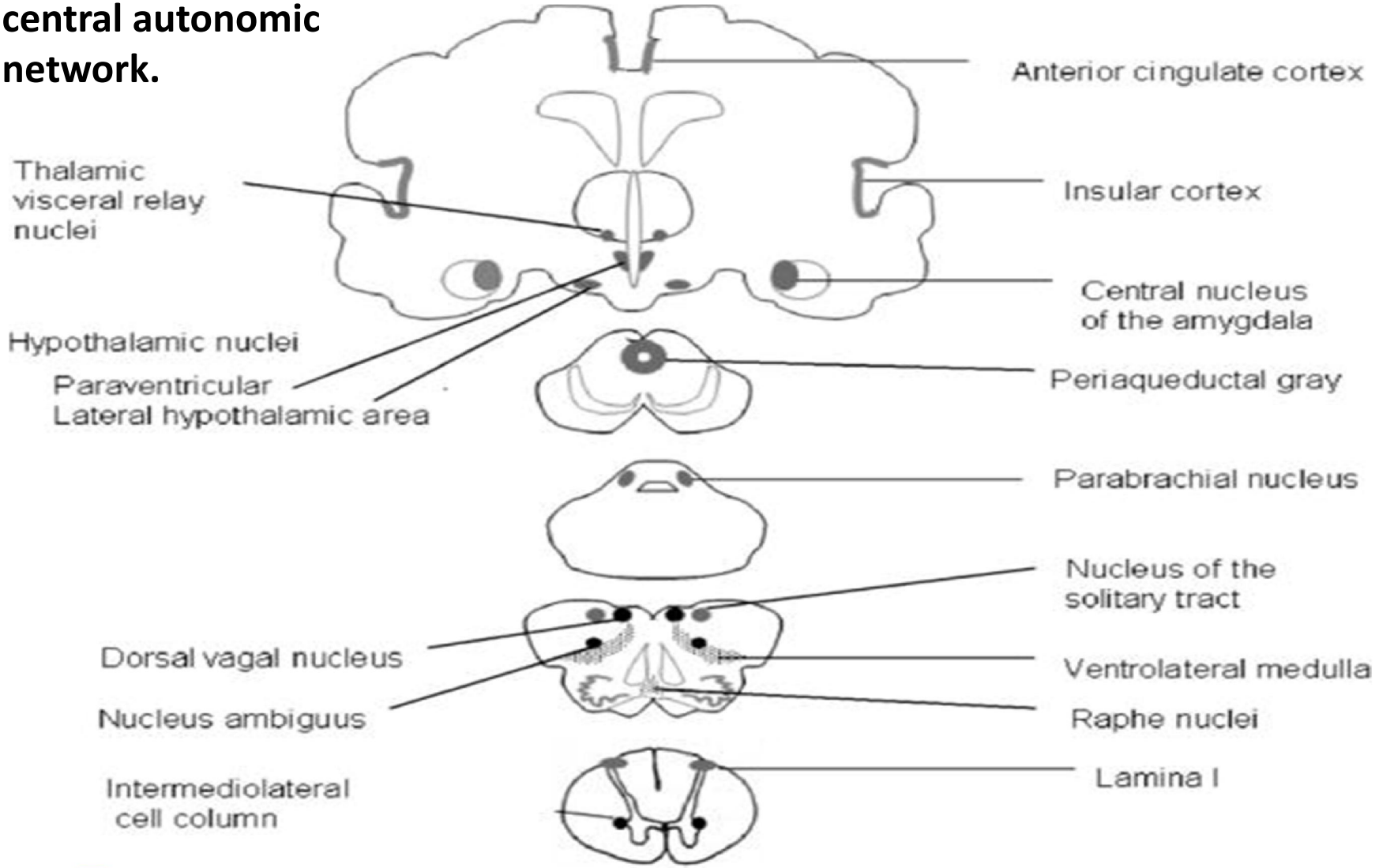
-4 Primary neurotransmission in the sympathetic and parasympathetic systems.ACh = acetylcholine; [alpha] = [alpha]-adrenoceptors; [beta] = [beta]-adrenoceptors; gnAChR = ganglion-type nicotinic acetylcholine receptors; M = muscarinic; NE = norepinephrine.

-1 Effects of the Sympathetic and Parasympathetic Systems on Different Targets and the Neurotransmitter Receptor Involved

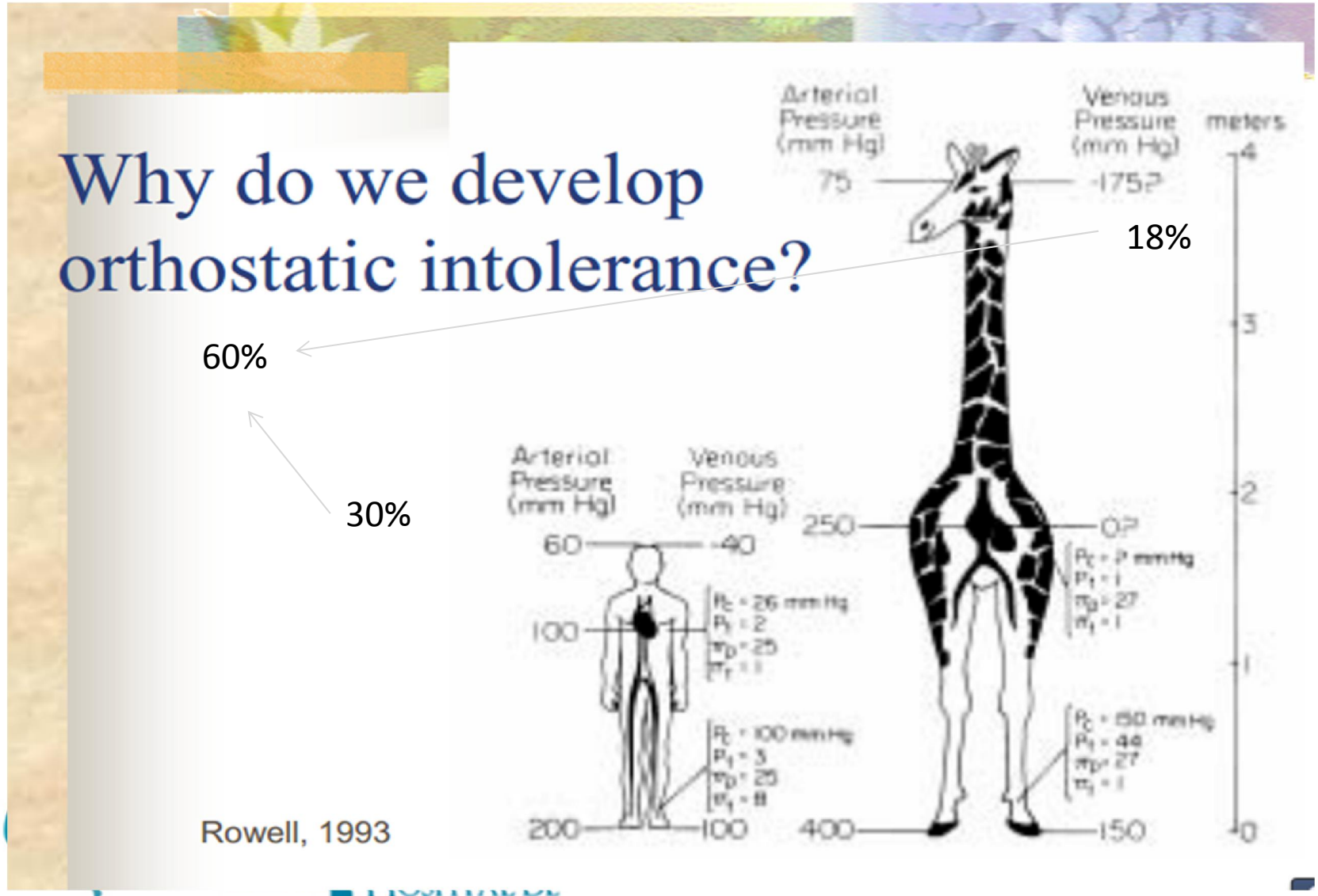
Target	Sympathetic (Receptor)	Parasympathetic (Receptor)
Pupil	Dilatation (α_1)	Constriction (M_3)
Ciliary muscle	. . .	Accommodation (M_3)
Salivary and lacrimal glands	Inhibition (presynaptic [α_2?])	Stimulation (M_3)
Heart	Stimulation (β_1)	Inhibition (M_2)
Bronchi	Dilatation (β_2)	Constriction (M_3)
Muscle vessels	Constriction (α_1) (α_2) Dilatation (β_2)	. . .
Skin vessels	Constriction (α_1) Dilatation (NO?)	. . .
Visceral vessels	Constriction (α_1)	Dilatation (M_3 via NO; VIP)
Sweat glands	Stimulation (M_3)	. . .
Gastrointestinal motility	Inhibition (β_2)	Contraction (M_3,) Relaxation (NO, VIP)
Gastrointestinal secretion	Inhibition (α_2)	Gastric stimulation (M_1) Gut and glands (M_3, VIP)
Bladder detrusor	Inhibition (β_2)	Stimulation (M_3, M_2; ATP)
Bladder neck	Stimulation (α_1)	Inhibition?
Rectal smooth muscle	Inhibition (β_2)	Stimulation (M_3)
Erectile tissue	Constriction (α_1)	Dilatation (NO)
Vas deferens	Contraction (α_1)	. . .
Endocrine secretion	Stimulation of epinephrine, glucagon, renin, and thyroxine (β_2)	Stimulation of insulin, gastrin, secretin, cholecystokinin, and pancreatic polypeptide (M_3?)
Glycogenolysis Lipolysis	Stimulation (β_2) Stimulation (β_3)	. . .

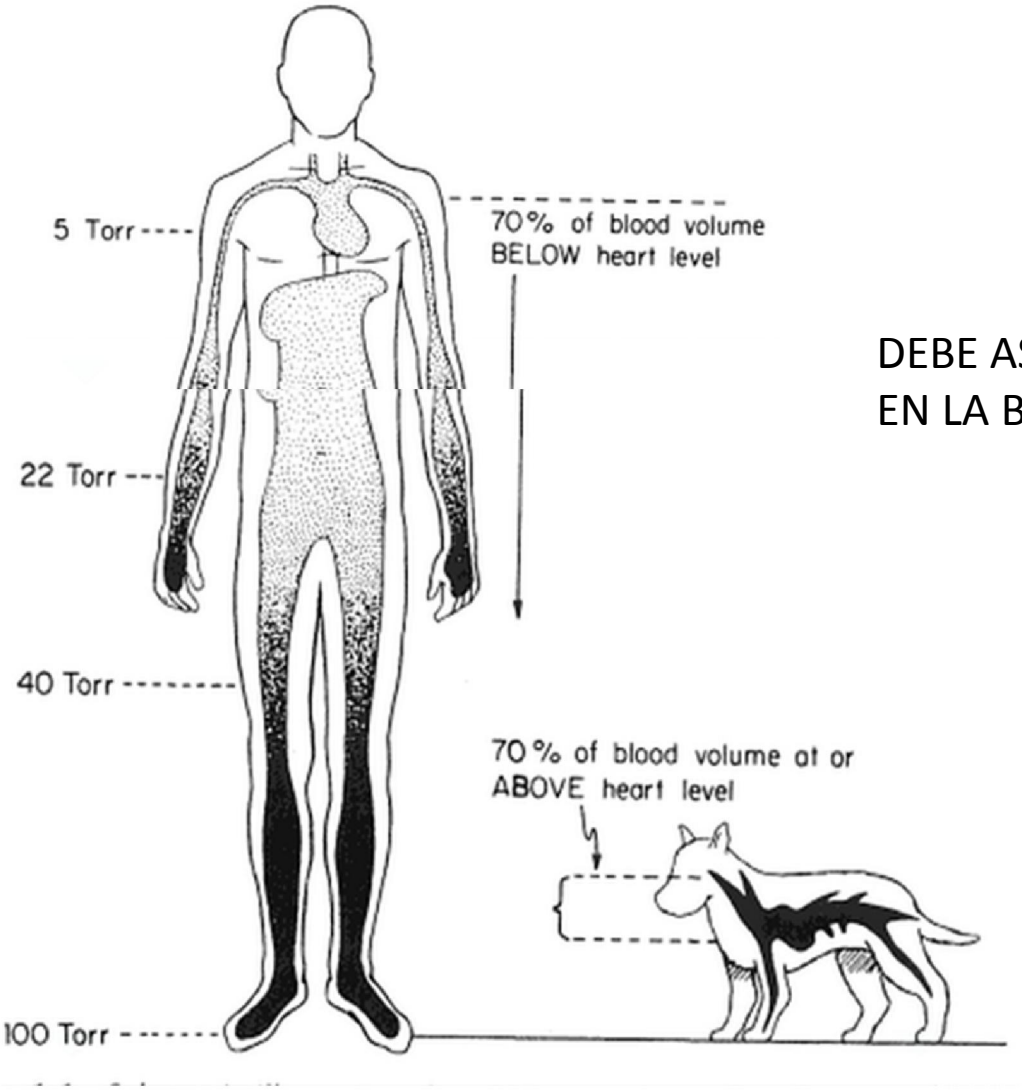
ATP = adenosine triphosphate; NO = nitric oxide; VIP = vasoactive intestinal neuropeptide.

-5 Components of the central autonomic network.



Requerimientos cerebrales





DEBE ASCENDER 750 ML
EN LA BIPEDESTACION ACTIVA

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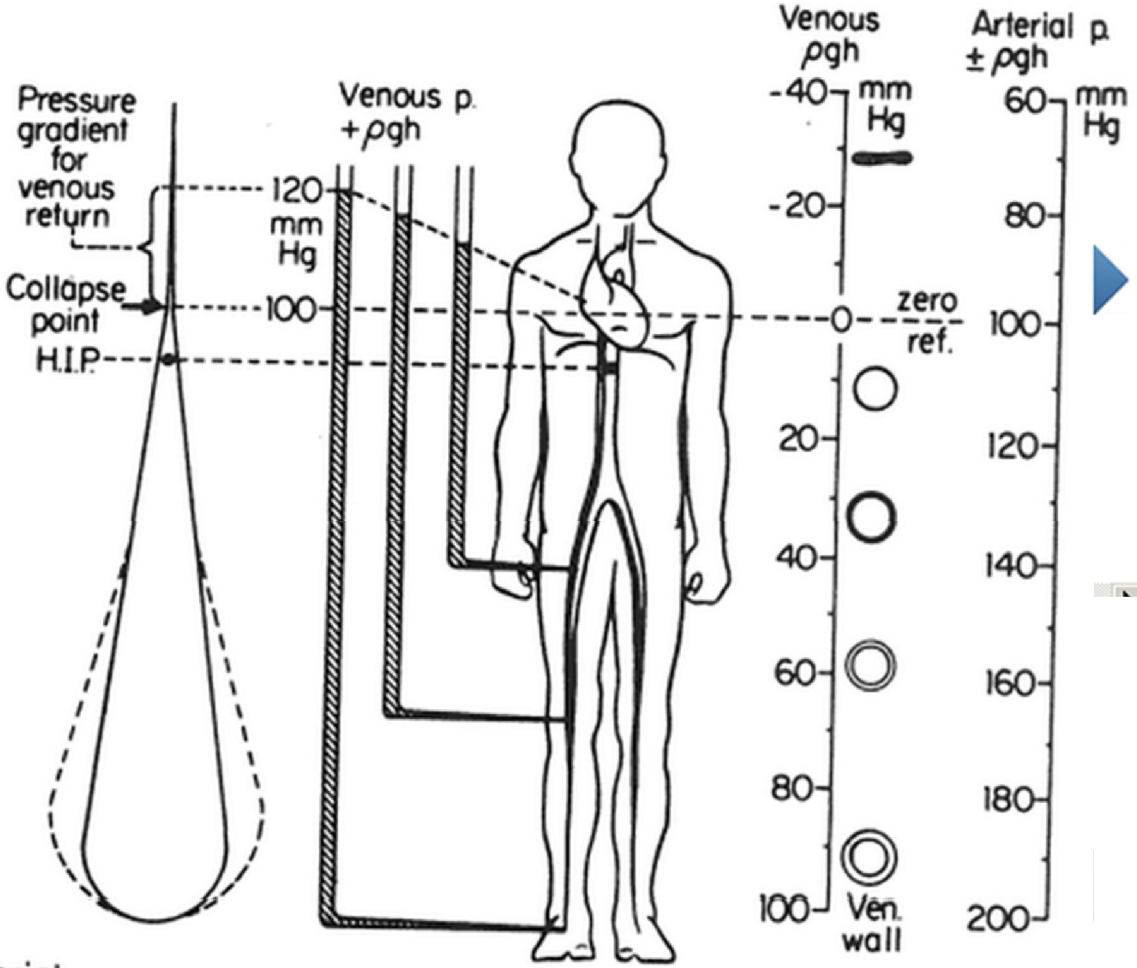
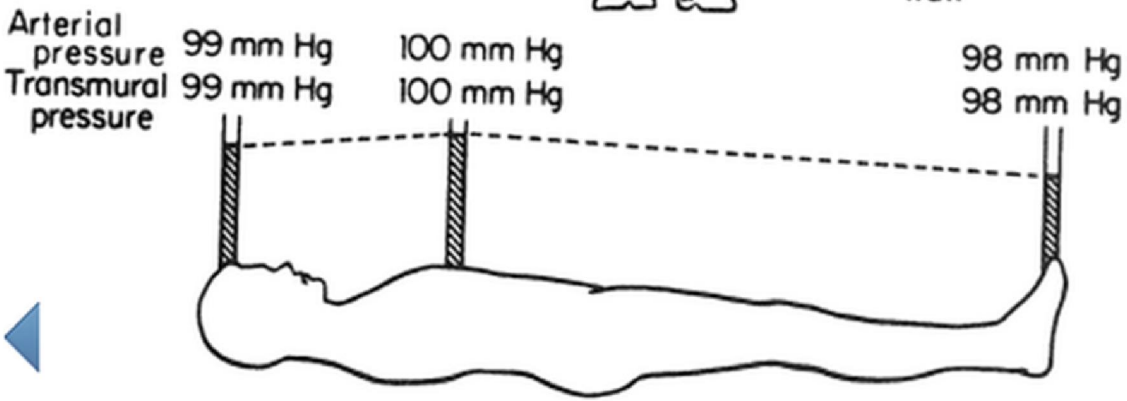
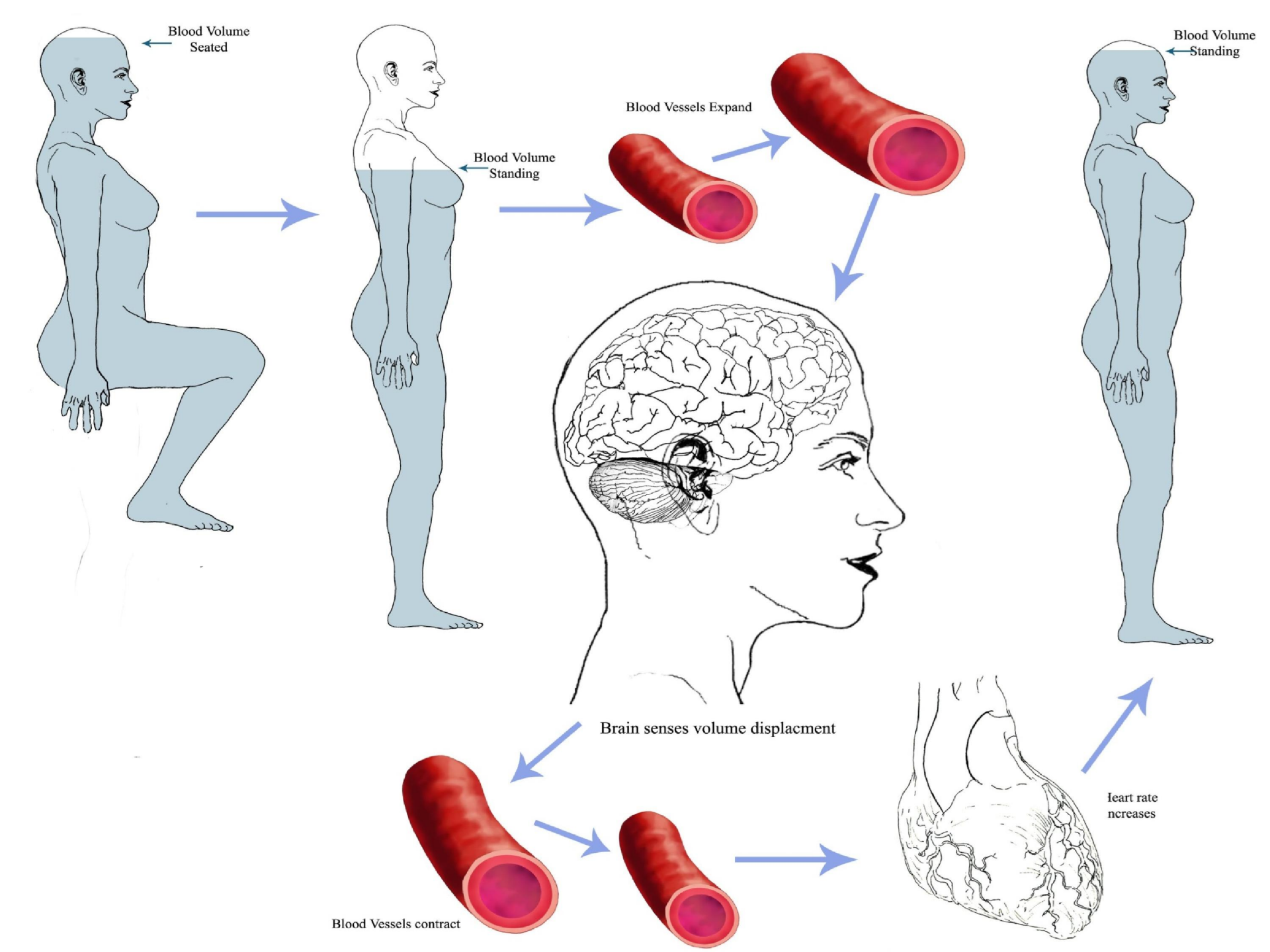

Pressure gradient for venous return
Collapse point
H.I.P.
Venous p. +ρgh
120 mm Hg
100
Venous ρgh
-40
mm Hg
-20
zero ref.
0
20
40
60
80
100
Ven. wall
Arterial p. ± ρgh
60
mm Hg
80
100
120
140
160
180
200


Arterial pressure
99 mm Hg
100 mm Hg
98 mm Hg
Transmural pressure
99 mm Hg
100 mm Hg
98 mm Hg


Blood Volume
Seated
Blood Volume
Standing
Blood Vessels Expand
Blood Volume
Standing
Brain senses volume displacment
Blood Vessels contract
Heart rate
Increases

Fisiología de la presión arterial

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Hainsworth, 2004

PUNTOS CRÍTICOS

- **En jóvenes la autorregulación cerebral cesa con una presión debajo de 60 mm de hg (sistólica)**
- **El reflejo de hiperventilación puede reducir el CO2 y puede reducir a la mitad la circulación**
- **La debilidad ocurre con presión de sistólica inferiores a 50**
- **En pacientes mayores el punto de inadecuada oxigenación (déficit de perfusión) puede ocurrir en HTA**

Hainsworth, 2004

Distinguiendo los síndromes de intolerancia postural Cae la presión y como?

- **5 entidades:** vasovagal syncope, postural orthostatic tachycardia syndrome (POTS), chronic autonomic failure, initial orthostatic hypotension, or persistently low supine systolic blood pressure (Vaddadi et al 2007)
- **Síndrome de taquicardia postural**
- **Síndrome vasovagal:**
  - **Forma barodepresor**
    - Cae la presión súbitamente
    - Cae la presión y frecuencia cardiaca
  - **Forma cardioinhibidor**
    - Cae la frecuencia cardiaca desproporcionadamente a la presión, asistolia mas de 2 segundos, frecuencia inferiores a 40 por min
- **Hipotensión ortostática**
  - Progresiva caída gradual de presión arterial
  - No incremento de frecuencia cardiaca compensador

Síndrome disautonómico o síndrome de intolerancia ortostática?

- **Síndrome de taquicardia postural:**
  - **Problema venoso**
- **Síndrome vasovagal (barodepresor/cardioinhibidor)**
  - **Defecto de integración central**
- **Síndrome de hipotensión ortostática**
  - **Problema de inervación arterial**

Thomas Chelimsky, MD
Case Western Reserve University
Cleveland, OH , HW 2011

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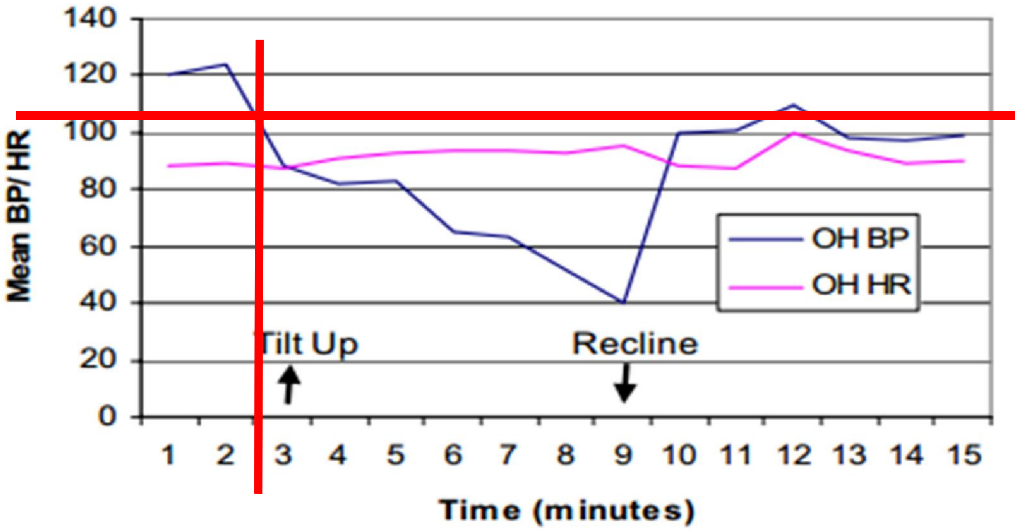
Tilt Table: Orthostatic Hypotension

Figure 1: 90 degree tilt table in OH



15 mm cut-off

Cambios EEG

(Duncan et al 2010)

postictal generalized EEG suppression (PGES) duration (Bozorgi et al 2013)

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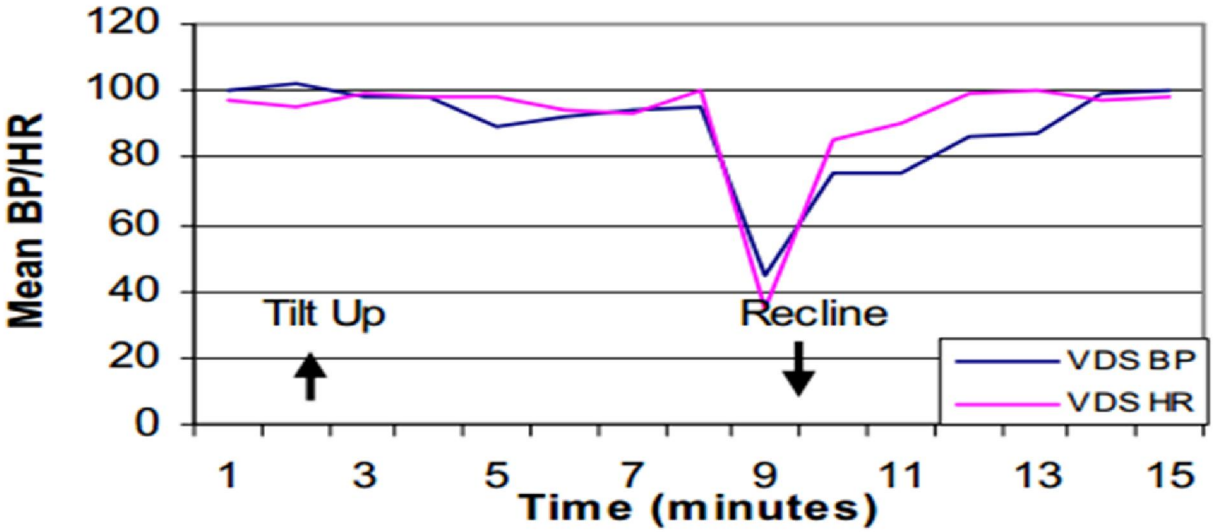
Tilt Table: Vasodepressor Syncope

Figure 3: 90 degree tilt table in VDS



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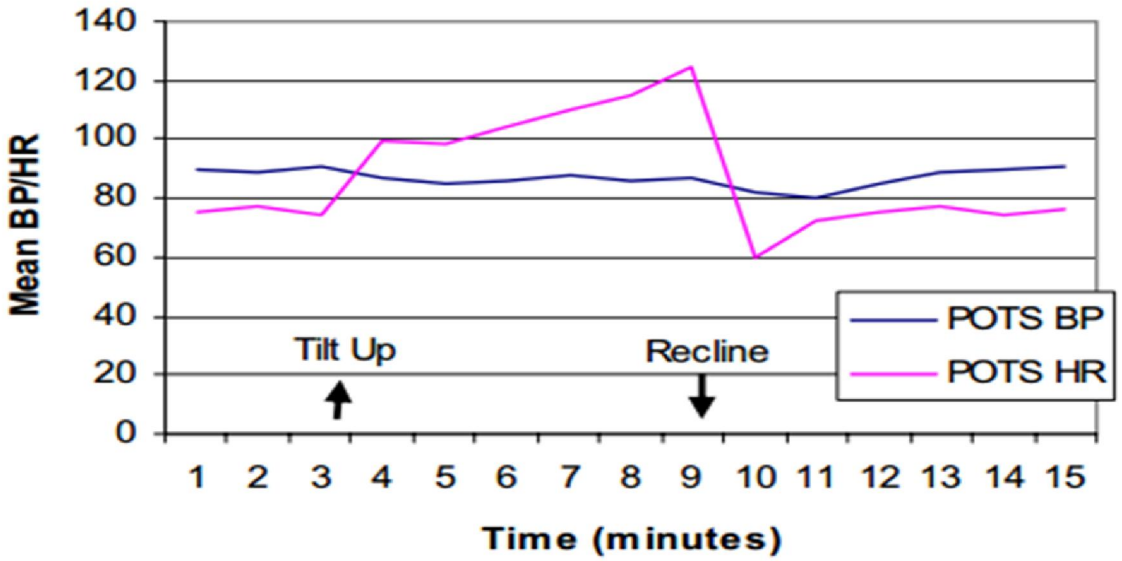
Tilt Table: Postural Tachycardia Syndrome

Figure 2: 90 degree tilt table in POTS



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Espectro de síndromes de intolerancia ortostática

Hipotensión ortostática

- Disautonomía primaria
- Pobre pronostico
- Reflejos anormales autonómicos
- Gradual caída de la presión arterial con mínimo incremento de fc en la mesa basculante

Síndrome de taquicardia postural (POST) y VDS

- Disautonomía secundaria
- Mejor pronostico
- Reflejos autonómicos normales
- POST: No hipotensión, pero elevación de fc en la mesa
- VDS: Súbita caída de TA con FC con caída proporcional

Tipos de Disautonomía

- Primarias: Cambios bien definidos en la estructura del SNA
  - MSA
  - Neuropatía diabética autonómica

- Secundaria: Cambios funcionales del SNA involucrados en la producción pero es:
  - 1) Menos definida
  - 2) Ligado a una cadena patogenica (no primaria)
    - POTS
    - SVG
    - Distrofia simpática refleja

Disautonomía Primarias

- **SNC**
- **SNP**
- **COMBINADAS**
- El punto de división es el ganglio
- El esfuerzo esta en localizar la lesion debido a que el pronostico y tratamiento difieren

DISAUTONOMIAS PRIMARIAS

- SNC
  - **MSA**
  - **Enf. difusa por cuerpos de Lewy**
- SNP
  - **FAP**
  - **Neuropatía autonómica**

CAUSAS DE NEUROPATIA AUTONOMICA

- DM 1 & 2
- Amiloidosis primaria y secundaria
- Desordenes mediados de forma inmune
- **Porfiria, Enfermedad de Fabry, Deficiencia de B12 (asociada o no a enfermedad celiaca o intolerancia al Gluten)**

PORQUE DIAGNOSTICAR DISAUTONOMIA?

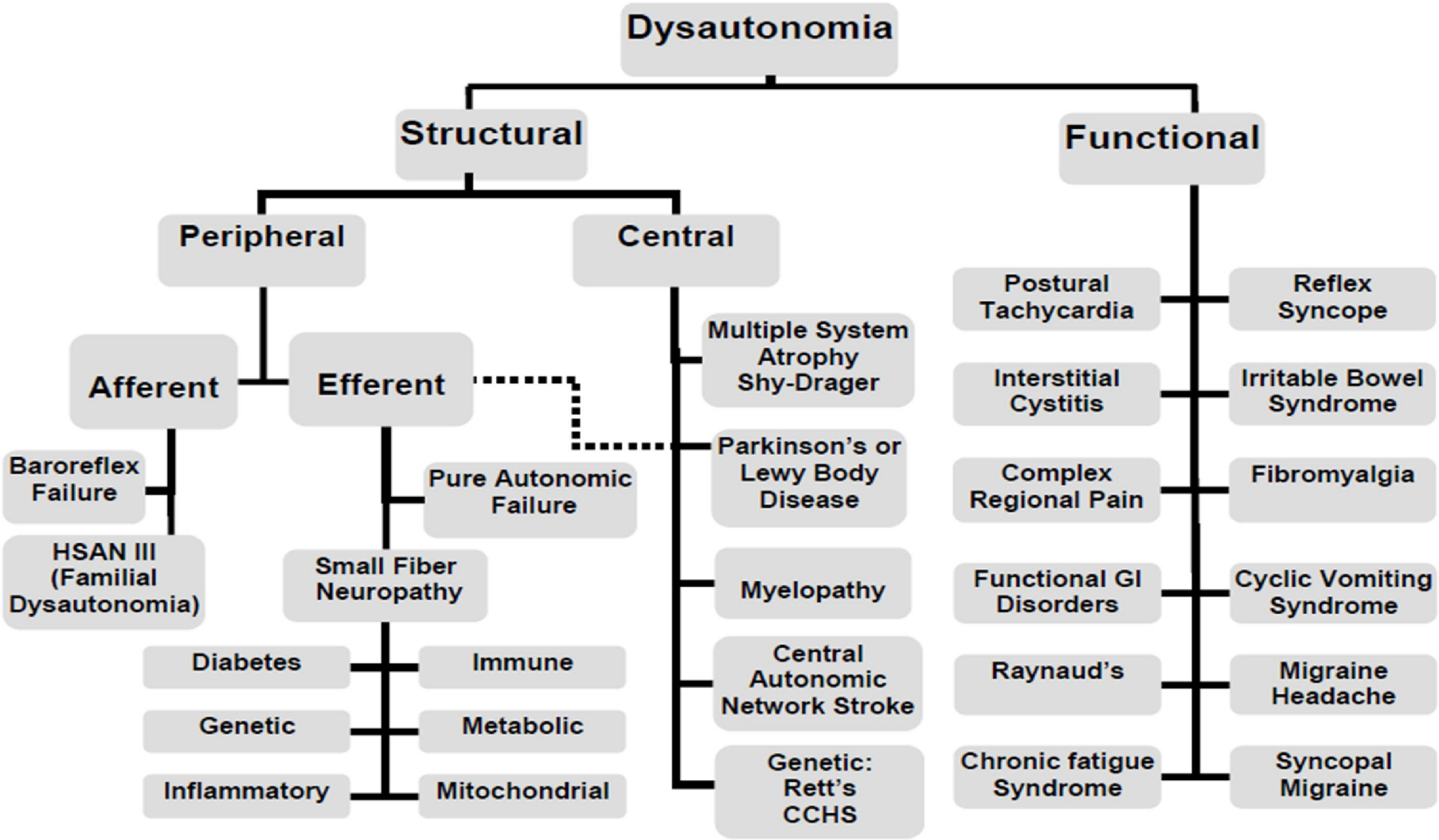
- **Diagnostico**
  - **Diferenciar entre central periférico**
- Prognosis
  - **Primario: MSA, DM es Prognosis pobre**
  - **Secundario: POST no es de mal pronostico (Gral.)**
  - **La mortalidad a 5 años con neuropatía autonómica es 50% (Edwing, 1980)**

TEST AUTONOMICOS

- 4 PREGUNTAS
- LOCALIZAR LA LESION EN EL NEUROEJE
  - Test de sudor
- IDENTIFICAR LA RAMA AFECTADA
  - Test cardiovasculares
- SUGERIR UNA FORMULACION DE DIAGNOSTICO DIFERENCIAL
  - Combinación de todos
- MANEJO DIRECTO DE SINCOPE Y IO (intolerancia ortostática)
  - Test de la mesa basculante

Examen autonomicos: (A donde?)

- Donde está la afección en el neuroeje?
- SNC
  - Cerebro
  - Medula espina
  - Raíces
- SNP
  - Pre ganglionar
  - Post ganglionar
- Test de sudor es útil


Dysautonomia
Structural
Functional
Peripheral
Central
Afferent
Efferent
Baroreflex Failure
HSAN III (Familial Dysautonomia)
Pure Autonomic Failure
Small Fiber Neuropathy
Diabetes
Immune
Genetic
Metabolic
Inflammatory
Mitochondrial
Multiple System Atrophy Shy-Drager
Parkinson's or Lewy Body Disease
Myelopathy
Central Autonomic Network Stroke
Genetic: Rett's CCHS
Postural Tachycardia
Reflex Syncope
Interstitial Cystitis
Irritable Bowel Syndrome
Complex Regional Pain
Fibromyalgia
Functional GI Disorders
Cyclic Vomiting Syndrome
Raynaud's
Migraine Headache
Chronic fatigue Syndrome
Syncopal Migraine

TEST AUTONOMICOS CUALES?

- **AR-6**
  - Inervación parasimpática cardiaca
  - Anormal en DM temprana
- **VALSALVA**
  - Inervación simpática y parasimpática cardiaca
  - Inervación simpática y parasimpática vasomotora
- **HANDGRIP**
  - Inervación simpática vasomotora
- **MESA BASCULANTE CON O SIN MASAJE DEL SENO CAROTIDEO**
  - Distingue entre inervación simpática venomotora y arteriomotor
- **TEST DE SUDOR**
  - Localización de lesión en el neroeje

TEST PARASIMPATICOS

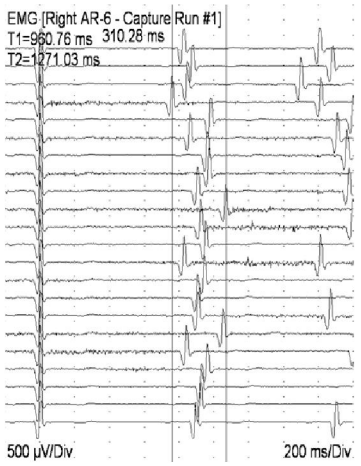
AR-6

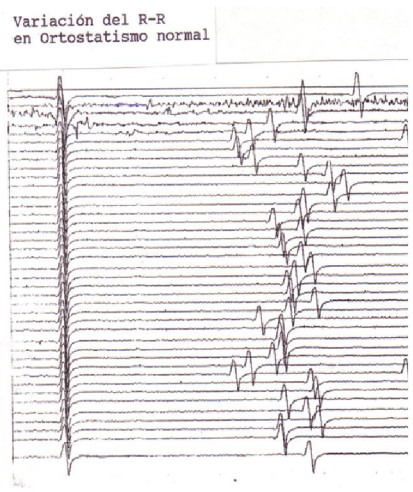
Orotostatico

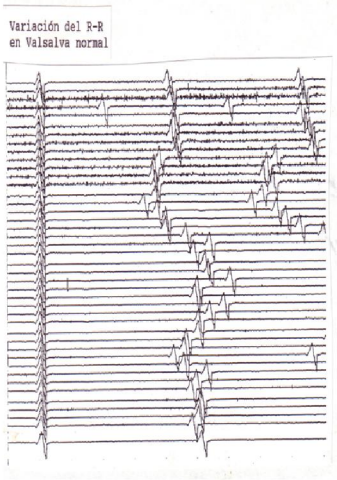
Valsalva

Mesa basculante

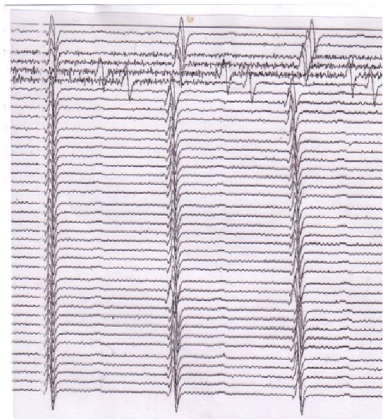
NL

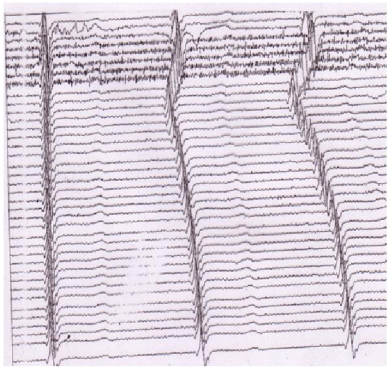


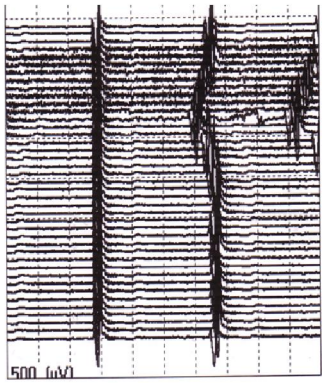


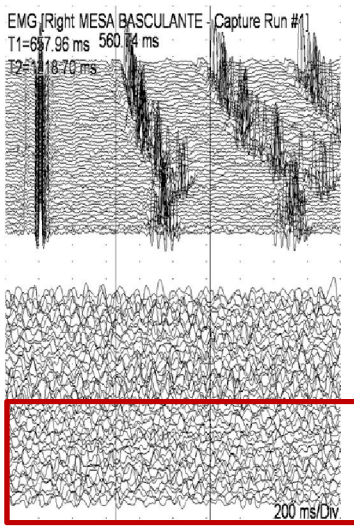


ANL









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Orthostatic hypotension

tilt-table test

Result

beat-to-beat recordings of blood pressure and heart rate reveal an immediate and progressive decline in blood pressure with a small increase in heart rate on head-up tilt

Test Details

- Can be useful when orthostatic hypotension is not detected during the posture test and the patient gives a history suggestive of orthostatic hypotension.
- Blood pressure and heart rate (by means of RR intervals on ECG) are measured continuously in the supine position and during passive head-up tilt (usually at 60°).

- In patients with impaired autonomic cardiovascular reflexes, there is a progressive fall in blood pressure. The increase in heart rate is either absent or abnormally low considering the magnitude of the blood pressure fall.
- A fall in blood pressure on head-up tilt accompanied by a large rise (>25 bpm) in heart rate suggests dehydration or impaired vasomotor tone, frequently as a result of the use of antihypertensive drugs.

- Maintenance of blood pressure on upright posture rules out chronic severe orthostatic hypotension (i.e., autonomic failure). It does not, however, rule out the possibility of orthostatic hypotension that occurs only with aggravating factors such as eating (postprandial hypotension) or exercise.

Orthostatic hypotension

plasma norepinephrine

Result

blunted increase in norepinephrine on standing

Test Details

- Patients with autonomic disorders that affect postganglionic sympathetic nerves, such as pure autonomic failure and diabetic neuropathy, frequently have low plasma norepinephrine levels in the supine position. In contrast, patients with autonomic disorders that selectively affect preganglionic sympathetic neurons (e.g., multiple system atrophy) typically have normal plasma norepinephrine levels in the supine position.
- In normal people, plasma

Orthostatic hypotension

autoimmune antibodies

Result

high antibody titers

Test Details

- The presence of paraneoplastic antibodies (anti-Hu, anti-Yo, anti-Ri, antiamphiphysin, anti-CV2, anti-Ma2) suggests a paraneoplastic disorder.
- In patients with acute or subacute onset of orthostatic hypotension who have risk factors for breast or lung cancer or have had sudden weight loss, the autoimmune antibody panel should be used to rule out a paraneoplastic syndrome.
- Autoantibodies against the nicotinic ganglionic receptors occur in some patients and result in severe orthostatic hypotension. These patients have an autoimmune autonomic ganglionopathy.

Orthostatic hypotension

fat-pad biopsy

Result

amyloid deposits in fat

Test Details

- Amyloid deposits can result in a polyneuropathy and orthostatic hypotension.

Orthostatic hypotension

- Neurally mediated (vasovagal) syncope
- Vertigo
- Nonspecific falls in older people
- Psychogenic syncope (pseudo-syncope)

Orthostatic hypotension

Diagnostic Approach

Determination of autonomic neuropathy

Measuring the heart rate is crucial. Orthostatic hypotension caused by volume depletion is associated with orthostatic tachycardia. Lack of an adequate compensatory heart rate increase (>20 bpm) in the face of profound orthostatic hypotension (>30 mmHg fall in systolic blood pressure) is characteristic of autonomic failure, and few conditions other than autonomic failure can explain severe orthostatic hypotension that is unaccompanied by an adequate heart rate increase (<20 bpm). In autonomic failure, the decrease in blood pressure is usually seen immediately upon standing and the heart rate fails to increase appropriately. This situation is in contrast to that seen in neurally mediated (i.e., vasovagal) syncope, in which the initial response to standing is normal, but after a variable period the patient experiences a sudden onset of hypotension together with a decrease in heart rate.

Other signs of autonomic neuropathy include erectile dysfunction (an early but nonspecific sign), worsening of constipation, urinary retention, gastroparesis, and decreased

Orthostatic hypotension

Diagnostic Approach

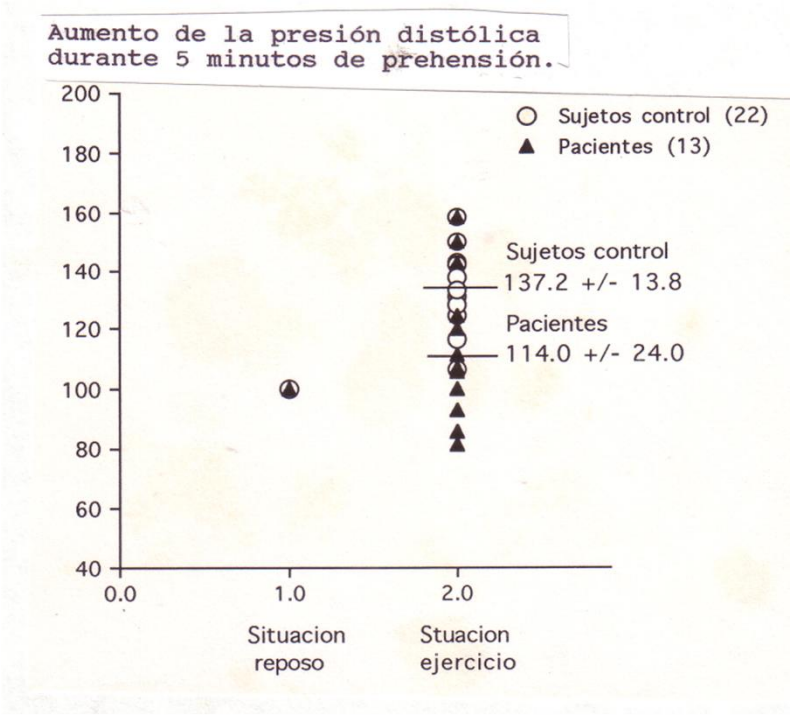
Other signs of autonomic neuropathy include erectile dysfunction (an early but nonspecific sign), worsening of constipation, urinary retention, gastroparesis, and decreased sweating (in some cases with compensatory focal hyperhidrosis).

Physical exam

There may be a fixed heart rate that does not fluctuate during deep breathing. Parkinsonian features may be present in patients with multiple system atrophy (MSA, or Shy-Drager syndrome), although the typical parkinsonian pill-rolling tremor is usually absent. Gait abnormalities and truncal ataxia are present in patients with MSA of the cerebellar type. Symmetric distal sensory loss occurs

Test simpáticos

- Handgrip



González-Sánchez le, 1995

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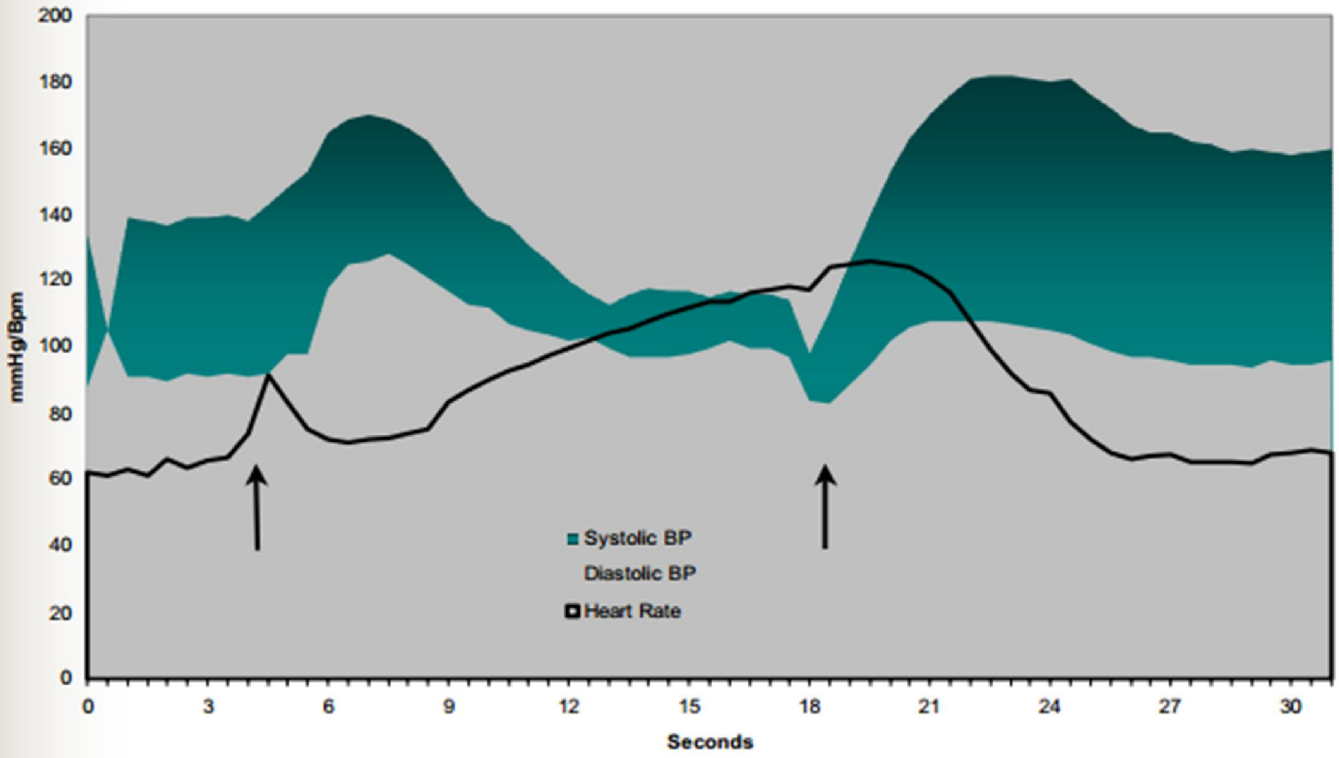
Cardiac Response to the Valsalva Maneuver



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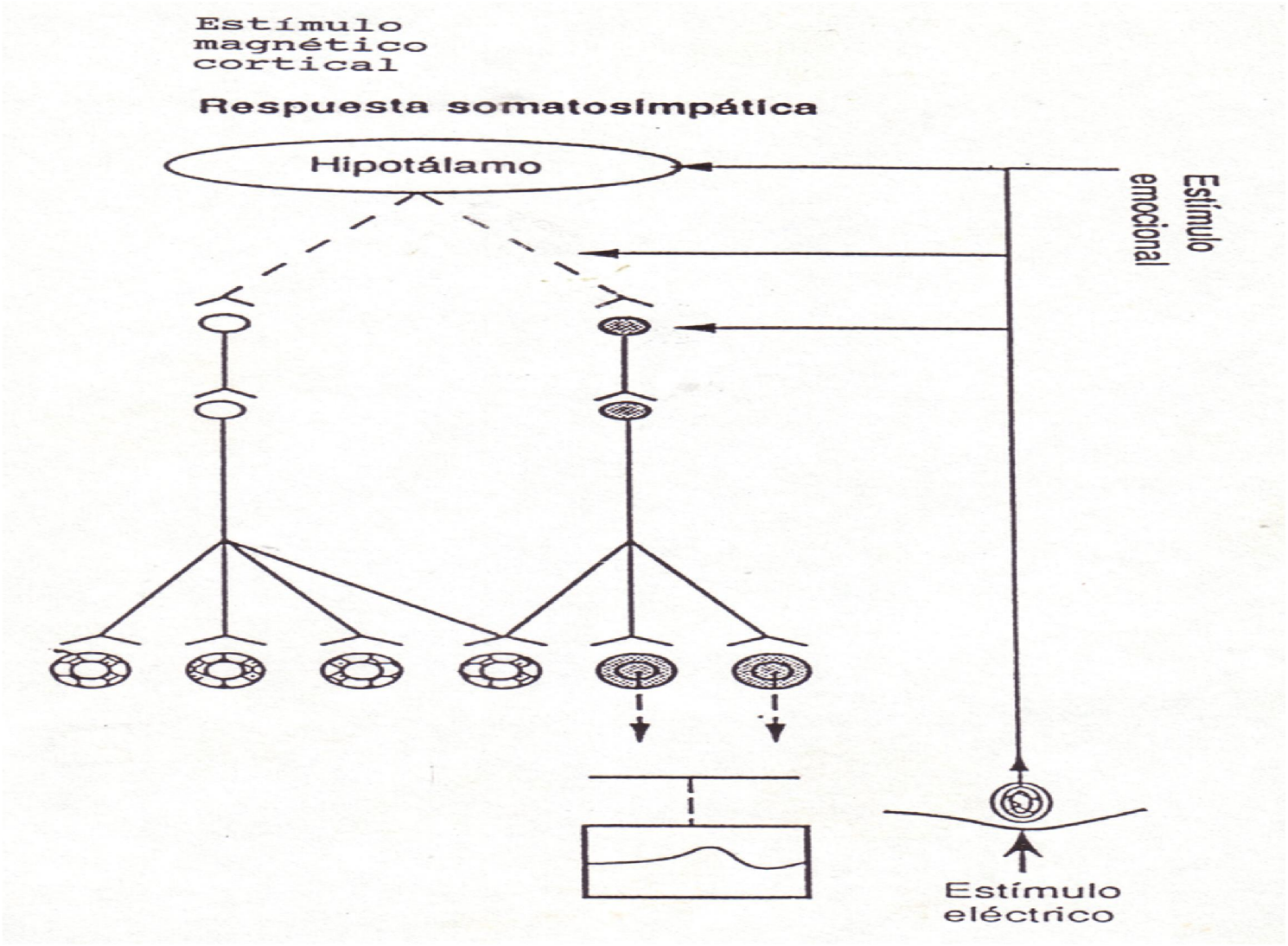
Respuesta sudomotora simpática cutánea



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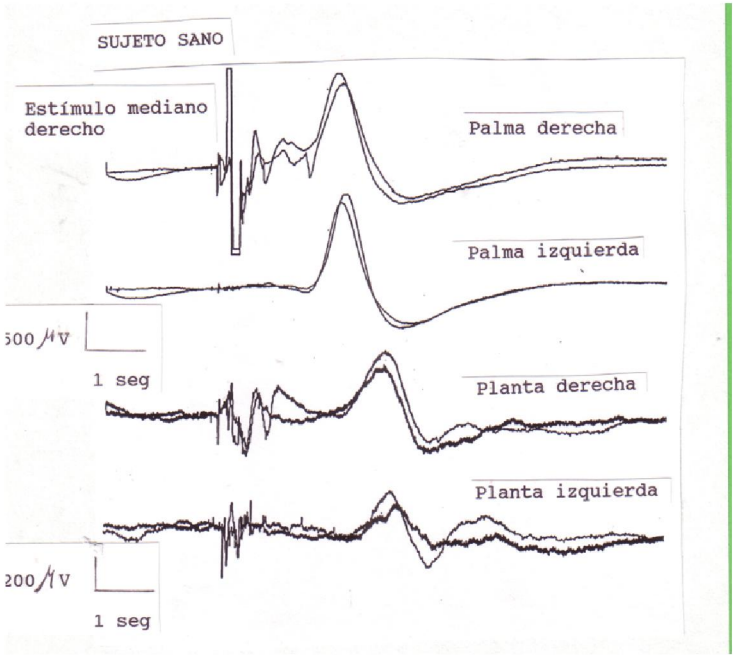
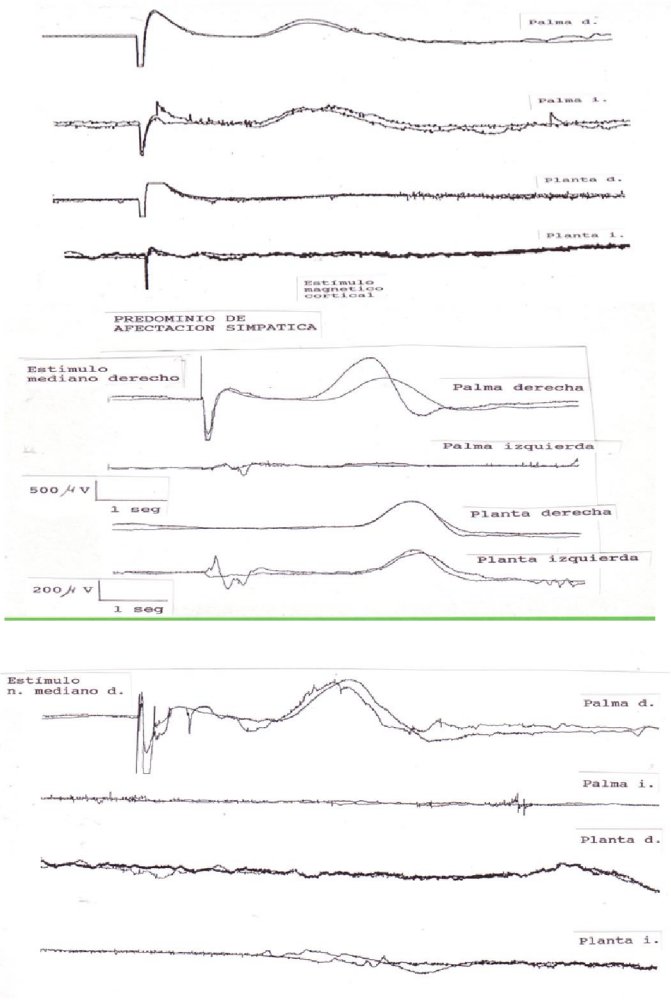
TEST SIMPATICOS

- **Respuesta sudomotora simpática cutánea (SSR)**





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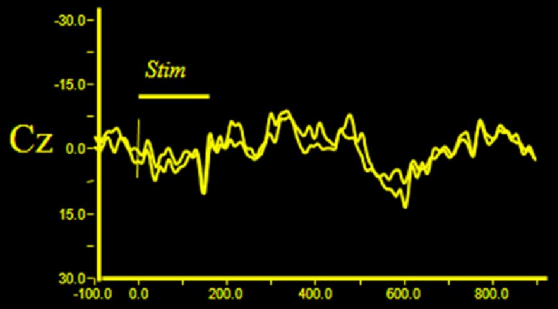
CHEPS



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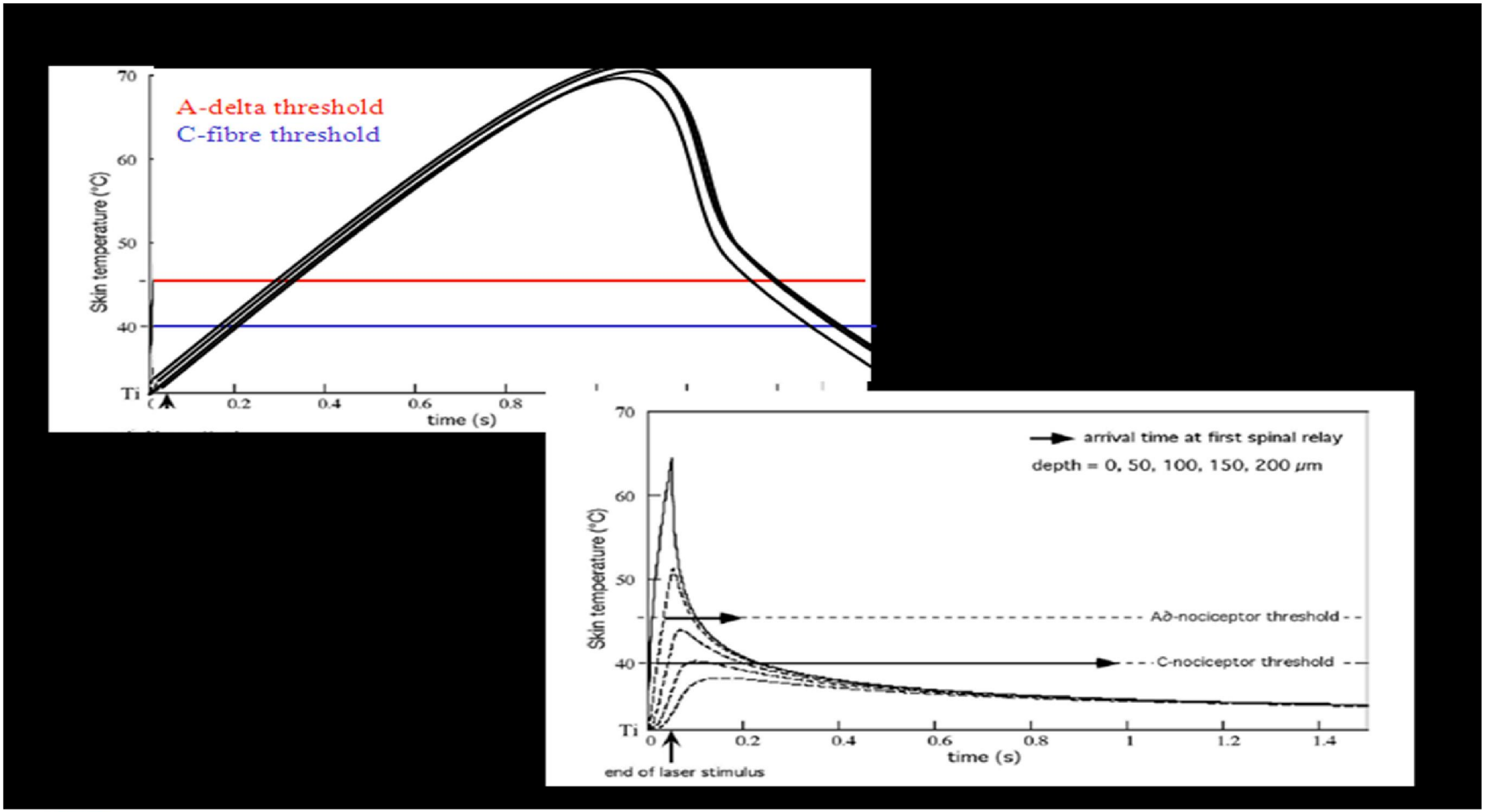
PATRON DE REGISTROS DE CHEPS



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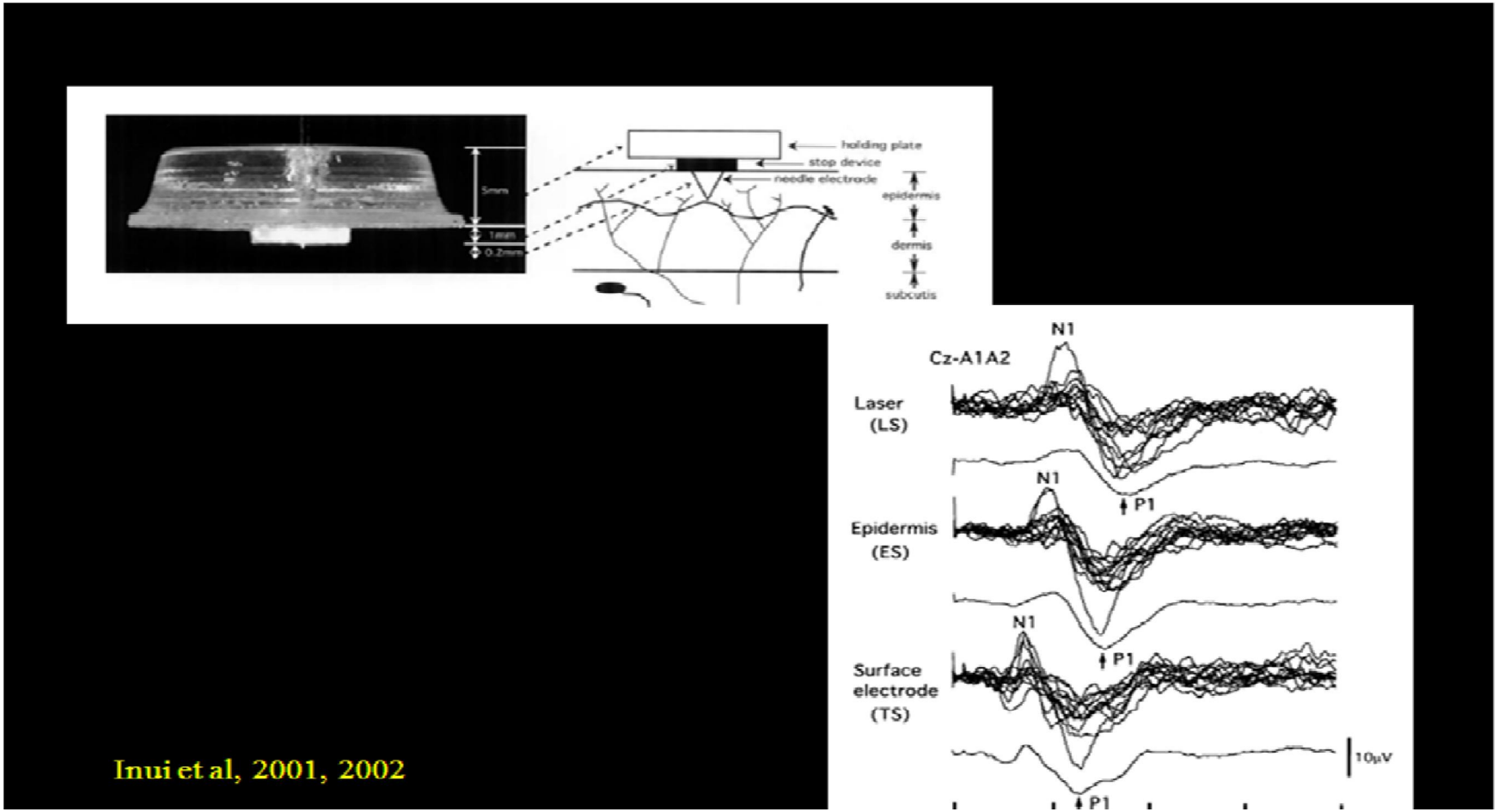
QSART



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ESTUDIOS AUTONOMICOS DE SUDOR

TEST	SNP	SNC
SSR	AFERENTE	EFERENTE
CHEPS	ANL: MI/MS NL: TRONCO	INVERTIDO
QSART	ANL	NL
TST	ANL: MI/MS NL: TRONCO	INVERTIDO

- Axon reflex testing (QSART - Low, 1983)
  - Tests the post-ganglionic segment only
- Thermoregulatory sweat test (Fealey, 1989)

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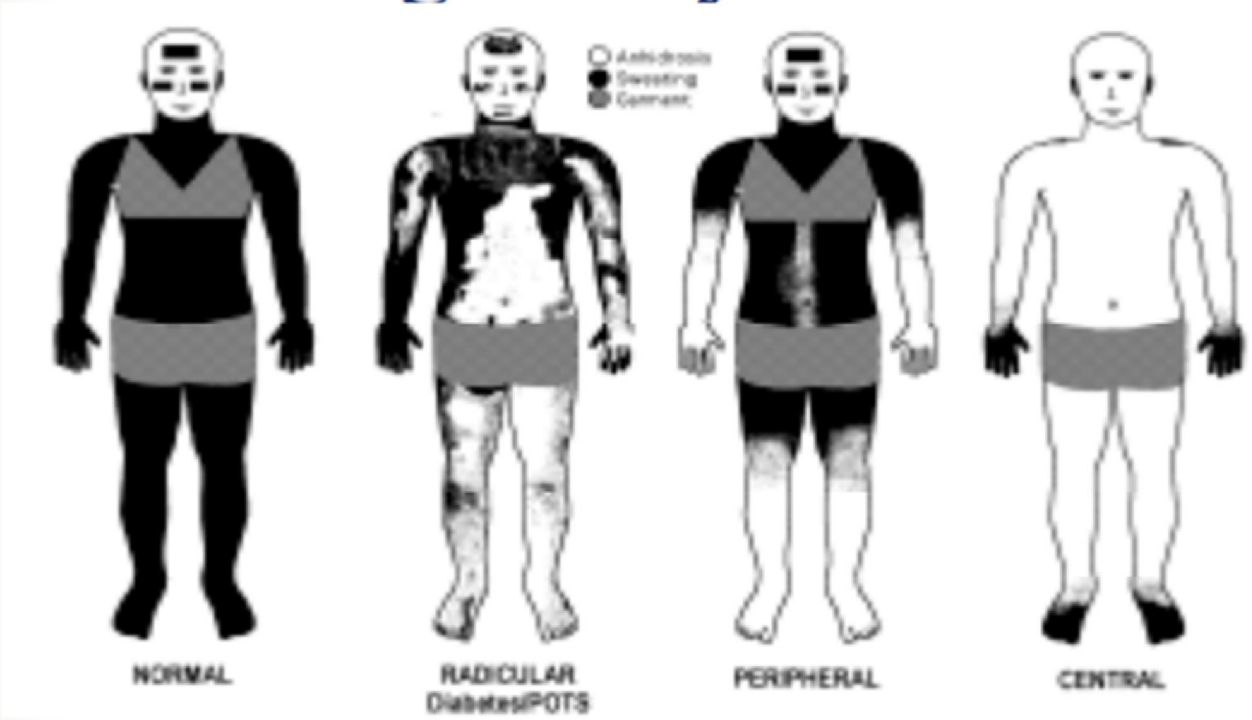
Thermoregulatory Sweat Test



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CASO 2

- Pte de 78 años que acudió a la UE por cauda ha tenido varias caída en los últimos 3 meses usualmente cuando se pone de pies desde una silla
- No tiene sensación de cabeza vacía, su marcha es lenta desde hace 1 año con una escritura pequeña
- Tiene problemas de memoria, TAC, BHC y química con tsh, ekg normales.

RESULTADOS AUTONICOS

- AR-6 1.04 (normal1.24)
- Válsalva: 1.06 (Normal >1.25)
- Mesa Basculante: Moderada OH
- SSR: Ausente en pies,
- laser termotest: anormal periférico
- QSART: Ausente en pies, ok manos y pies

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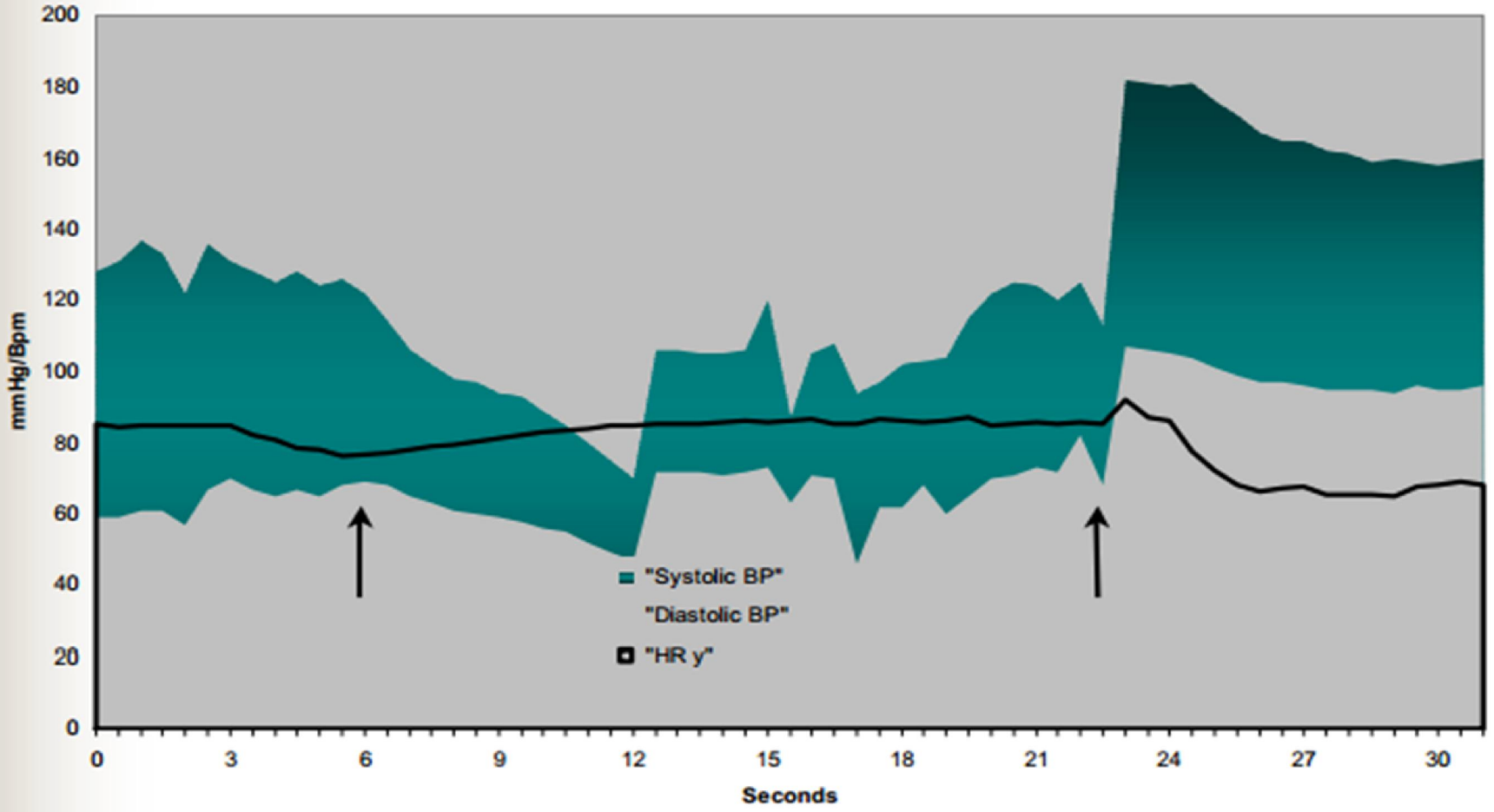
Valsalva Maneuver



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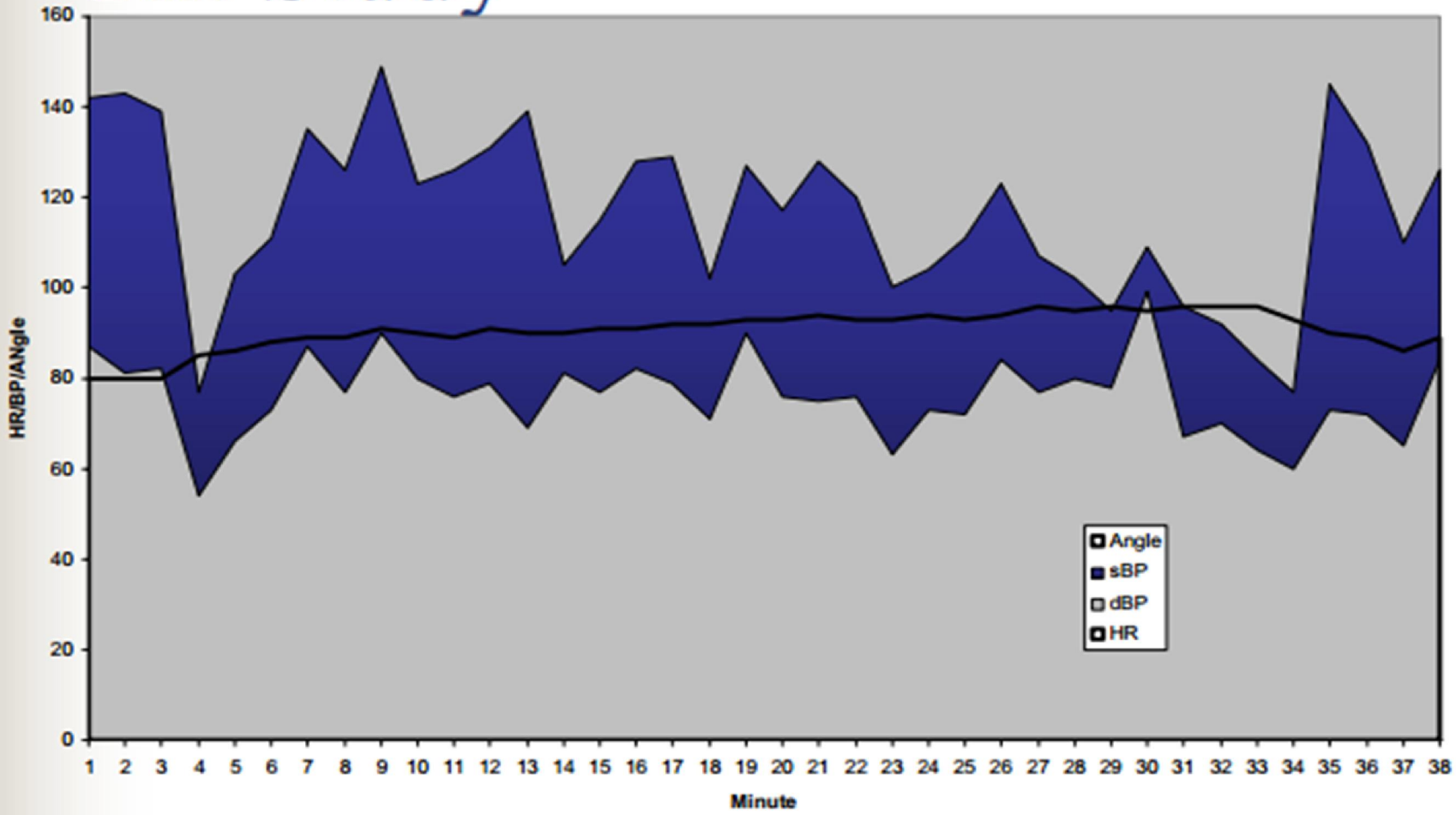
Tilt Study



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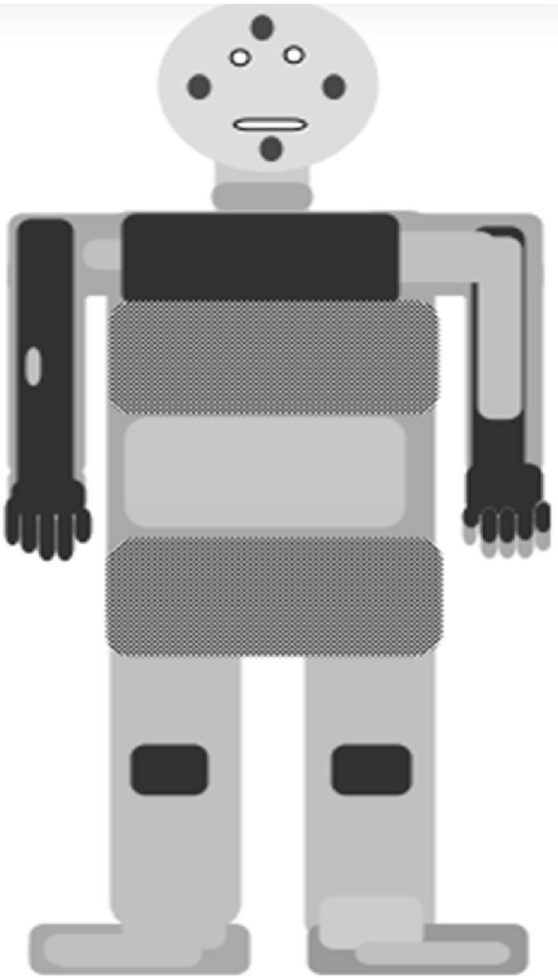
Thermoregulatory Sweat Test



Sweating

Increased:
Normal:
Reduced:
Absent:
Garment:

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Diagnostico Final

- B12 = 131
- B12 = 400 unidades mensuales
- Homocisteína Elevada
- Ac anti factor intrínseco: Positivo
- Gliadinas (DGP Ig G, Ig A): Títulos anormales
- Dx: Disautonomía multifactorial, con deficiencia B12 por intolerancia al gluten

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Ortostatismo en ancianos

- Incidencia 25%
- Predictivo de caídas subsecuentes en quienes han caído una vez

Ooi et al. Am J Med 2000 108:106

Ortostatismo en ancianos

- Estudio australiano:
  - 70 pacientes 50% mostraron ritmo de caídas
  - Prevalencia de OH del 14%
  - Promedio de caídas mayor con OH en la mesa quienes (+6/-21 mm hg vs 0.5+/-18 mmhg)
  - OH es mas probable post pradial (12% antes vs 22% después) (Maurer, AIM 2000)
  - Mesa basculante es superior que la TA de pie

Heitterachi et al. Age and Ageing 2002 108:106

Síntomas predominantes en ancianos

- 30% de los pacientes cognitivamente normales seno pueden recordar una caída evidente en los últimos 3 meses
- El sincope es negado en el 50% de ptes con hipersensibilidad documentada de seno carotideo
- El mareo y la cabeza ligera pueden no estar presentes en pacientes con ortostatismo documentado

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Shaw FE, Kenny RA, Postgrad Med J 1997

Gap en ancianos deteriorados

- Que ocurre en DCM/AD, DMRA?
- Que ocurre con la autorregulación deteriorada?
- La Hx es de menos valor cuando la historia de cuidador es menos efectiva
- Esto es lo que exactamente pasa en el proceso de lipotimia y sincope

- DCM/EA: Deterioro cognitivo mínimo/Alzheimer
- DMRA: Deterioro de la memoria relacionado con la edad

Aspectos integrativos

- Cerebelo
  - Órgano que integra los ejes motor-sensitivo
- Sistema vestibular
  - Un órgano que mantiene en centro de la gravedad en mantenimiento
- Ganglios basales
  - Sistema de marcapaso motor inconciente

Mecanismos de caídas-Dx diferencial

- Fallo de sistemas motores
  - Cerebelo
  - Ganglios basales
  - Vía motora: Córtex, Cordón espinal, nervios
- Fallo de sistemas sensitivo
  - Vestibular
  - Visual
  - Propioceptivo

Mecanismos de caídas

- Fallo ortostático de la presión arterial
  - Medicamentos
  - Deshidratación
  - OH
- El fallo de la presión arterial lleva al fallo de los componente neuronales
- Puede haber coexistencia de causas motoras y sensitivas con procesos ortostáticos

EVALUACION

- Cada paciente anciano que cae necesita una valoración autonómica integral

TRATAMIENTO EN DISAUTONÓMIA

Orthostatic hypotension

Risk Factors
Details
Key Diagnostic Factors - common
older adult age
use of high-risk medications
underlying medical condition
postural lightheadedness, syncope, and other symptoms of cerebral hypoperfusion
Other Diagnostic Factors - common
parkinsonian features
cerebellar ataxia

PROGRAMA de disfuncion autonomica.
Hoja de diagnostico, plan y tratamiento.

	Antes	Después	Mejoria
Puntajes:			
Calidad de vida	32 /82	50/82	21%
Mini-Mental:	17 /30	20/30	10%
Tinetti:	12 /40	23/40	27%

Mejoria Hay posibilidad de que sea:HNTS (Hidrocéfalo Normotensivo Secundario)

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Orthostatic hypotension

Strong
frailty and physical deconditioning
medications that affect sympathetic tone
volume depletion
autonomic neuropathy (e.g., diabetes mellitus, multiple system atrophy)
Parkinson disease
Lewy body dementia
Weak
older adult age

all patients

1st	elimination of aggravating factors, and lifestyle changes
adj.	mineralocorticoid therapy and volume expansion
adj.	short-acting pressors or droxidopa
adj.	correction of anemia

Orthostatic hypotension

elimination of aggravating factors, and lifestyle changes

Comments

- Medications that induce or aggravate orthostatic hypotension (e.g., amitriptyline and other antidepressants, diuretics and other antihypertensive agents, alpha-blockers, sildenafil and other phosphodiesterase-5 inhibitors) should be carefully reviewed and eliminated, if appropriate.
- Hypertension is a risk factor for orthostatic hypotension, and both conditions commonly coexist in older patients. Although certain antihypertensive agents can trigger or worsen orthostatic hypotension, complete withdrawal of

Orthostatic hypotension

elimination of aggravating factors, and lifestyle changes

antihypertensives is not appropriate as this will lead to pressure diuresis and worsening of orthostatic hypotension. Judicious use of antihypertensives (e.g., ACE inhibitors, angiotensin-II receptor antagonists) and avoiding use of agents more likely to cause orthostatic hypotension (e.g., alpha-blockers, diuretics) is therefore recommended.

- Patients should first sit when going from supine to standing. Straining during bowel movements or performing Valsalva-like maneuvers should be avoided. Eating frequent, small meals is often effective in lessening postprandial hypotension.
- Physical counter-maneuvers when upright, such as leg-crossing, standing on tiptoes, and muscle-tensing, enhance orthostatic tolerance. Custom-made elastic stockings or an abdominal binder help some patients.
- The head of the bed should be raised by inserting blocks 6 to 9 inches (15-22 cm) high under the headposts.

Manejo de OI

- **Ingerir agua 16 onzas am (Shannon, 2002)**
- **Ejercicios acuáticos**
- **Ejercicios “Auto tilt” (Ector, 1998)**
- **Ejercicios físicos de compresión sostenida por tiempo (Bouvette, 1996)**

INCREMENTAR EL VOLUMEN CENTRAL

- **Carga de sal: mayor de 150 meq**
  - **Puede requerir de 3 a 15 gr/día**
- **Elevar la cabeza de la cama**
  - **Reduce la micro gravedad nocturna y deshabitúa**
- **Aumentar la presión venosa, medias electicas**
- **Dieta fraccionada**
  - **La insulina es vasodilatador**

Orthostatic hypotension

mineralocorticoid therapy and volume expansion

- fludrocortisone: 0.1 to 0.2 mg orally once daily **and**
  sodium chloride : 1 g orally with each meal

Comments

- Patients who have an inadequate response to simple nonpharmacologic measures may benefit from fludrocortisone, a synthetic mineralocorticoid that raises blood pressure when given with a high salt intake.[13] (B) Evidence
- Dietary salt can be increased or sodium chloride tablets can be taken. Water intake should be at least 2 liters each day.

Manejo Farmacológico

- Fludrocortisona (Florinef, Pfizer, Bristol M&S)
- Mineralocorticoide predominante
- Altas dosis: Efecto aldosterona-like, 0.1 a 0.2 mg/qd, 0.1 mg POR 3veces por semana con aliento, Tapering generalmente mayor de 0.5 mg/dia
- Dosis bajas: 0.1mg/día taper idem generalmente hasta 0.2 mg/día sensibiliza R Alfa (Davis, 1978) casi no es efectivo arriba de 0.5.

Orthostatic hypotension

short-acting pressors or droxidopa

Primary Options

- midodrine: 2.5 mg orally three times daily when required initially, increase according to response, maximum 30 mg/day
- droxidopa: 100 mg orally three times daily initially (morning, midday, and late afternoon at least 3 hours before bedtime), increase gradually according to response, maximum 1800 mg/day

Secondary Options

- atomoxetine: 18 mg orally twice daily when required
- yohimbine: 5.4 mg orally two or three times daily when required
- pyridostigmine: 60 mg orally two or three times daily when required

Comments

- When nonpharmacologic measures and mineralocorticoids are not sufficient to alleviate symptoms, short-acting pressor agents or droxidopa can be used.[14] [15] [16] [17] [18] (B) Evidence
- Short-acting pressor agents should be used when required, within the prescribed daily frequencies, and taken about 1 hour before the factor that precipitates a hypotensive episode (e.g., upright activity, meals), so that their pressor effect coincides with the expected nadir in blood pressure.

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Manejo Farmacológico

- **Piridostigmina (Mestinón 60mg)**
- **Singer, 2003**
  - **Incrementa el trafico ganglionar simpático**
  - **Incrementa actividad eferente pre ganglionar parasimpática colinérgica al ponerse de pi**
  - **Útil en POST con o sin denervación autonómica**

- Droxidopa, a norepinephrine prodrug, is converted to norepinephrine in the body by the same enzyme that converts levodopa to dopamine.[18] It increases blood pressure, with a peak effect about 3 hours after administration, and improves symptoms associated with orthostatic hypotension. It has been FDA-approved for the treatment of neurogenic orthostatic hypotension in the US. Droxidopa should be taken upon arising in the morning, at midday, and late afternoon at least 3 hours prior to bedtime to reduce the potential for supine hypertension. However, many patients can miss out the late afternoon dose.

Orthostatic hypotension

correction of anemia

Primary Options

- epoetin alfa: 25-50 units/kg subcutaneously three times weekly initially, titrate to maintain a hematocrit of 40% to 45%

Comments

- In patients who do not respond adequately to other interventions, treatment with recombinant erythropoietin to correct anemia, which is common in chronic autonomic disorders, increases upright blood pressure and improves symptoms of orthostatic hypotension.[19] [20] (B) Evidence

- Dose is titrated against hematocrit.
- Iron supplementation may be needed to prevent or treat iron deficiency.
- The long-term safety of this approach has not been determined.

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Manejo Farmacologico

- Sistema integrador y/o venoso (POTS/VDS)
- Betabloqueadores
  - Remueve el efecto dilatador mediado por epinefrina en venas
  - Afecta el procesamiento serotoninérgico en SNC
  - Cuidado con las bradicardias
  - Nadolol y otros no-beta selectivos son mejores (Propanolol)
- SSRI

OTROS FARMACOS

- **Clonidina (desconexión central)**
- **Indometacina (expansión de volumen)**

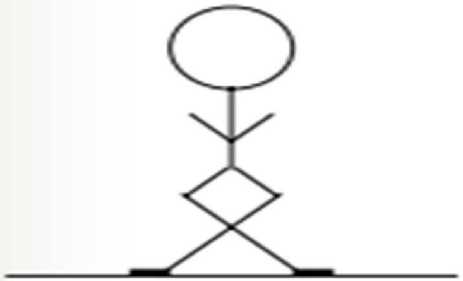
Self-tilt

Self-tilt: Stand with back against the wall for up to 10 minutes twice a day with legs out from the wall about 1-1.5 feet.

DO THIS ONLY IN A CARPETED AREA WITHOUT SHARP CORNERS OR EDGES.

Purpose: trains your vessels for better blood return to your heart.

Counter Maneuvers



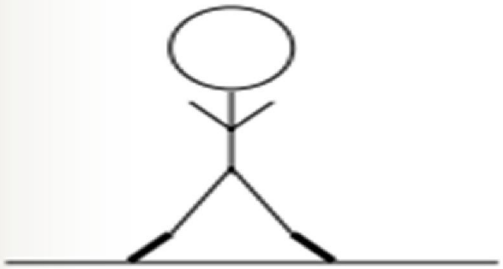
Leg crossing: Hold onto chair for support

Stand with right leg crossed in front of left leg,

squeeze legs together, hold for 45 seconds

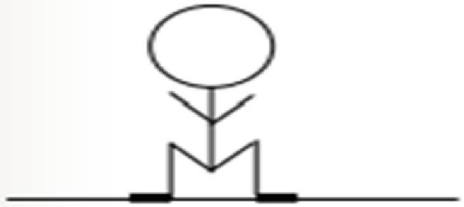
do 1 repetition three times per day AND when you have symptoms

Purpose: keeps more blood in your chest area when you need it.



Toe raise: Raise up on balls of feet, contraction the calf muscle for 5-10 seconds. Relax and repeat for a total of 10 repetitions

Purpose: helps pump venous blood back to your heart.



Squat: Transfer from a standing or sitting position to a squat

Purpose: brings your heart closer to the floor, reducing the impact of gravity.

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