ENFOQUE OSTEOPÁTICO DEL ABORDAJE DEL SISTEMA RESPIRATORIO

RAÚL SAN SEGUNDO RIESCO

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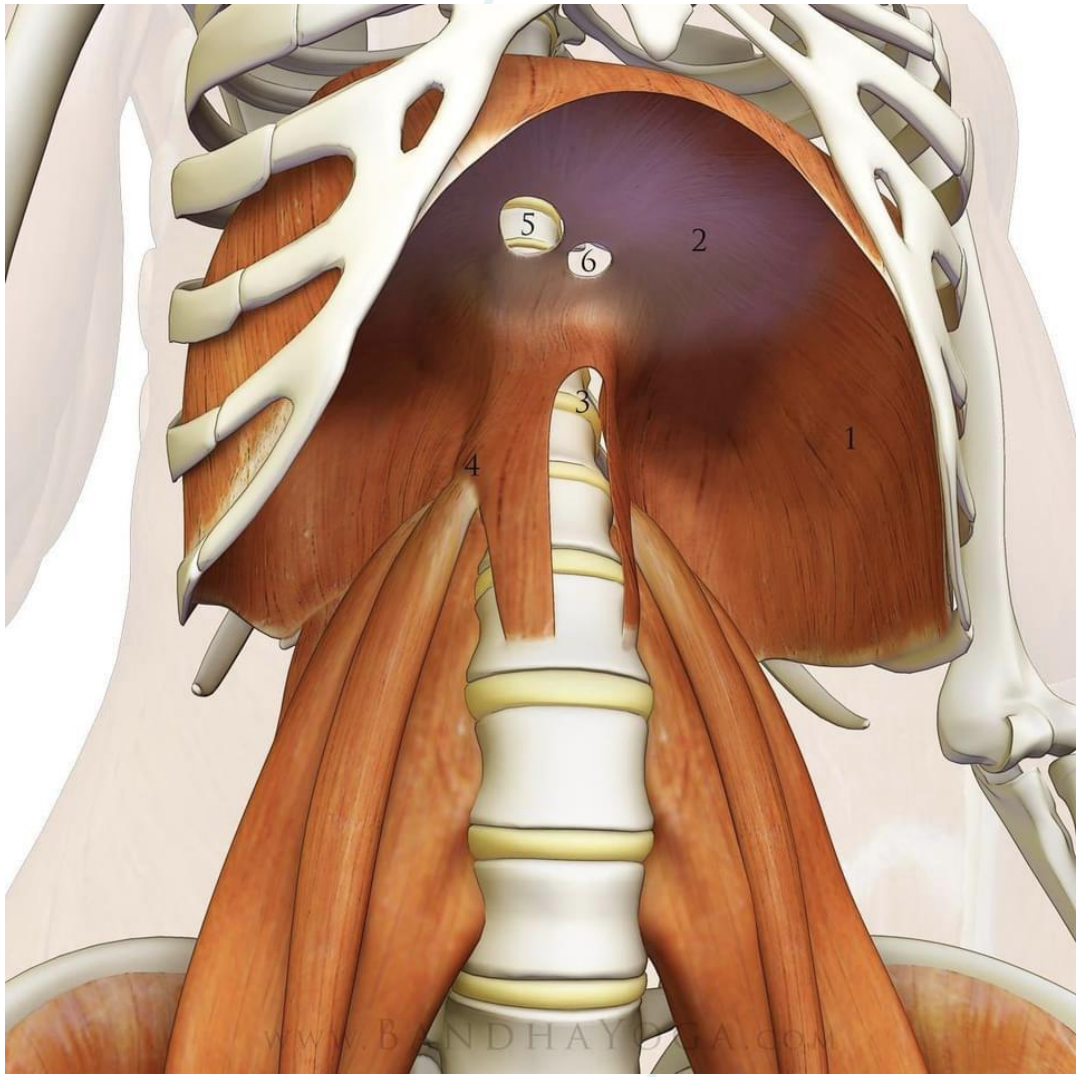

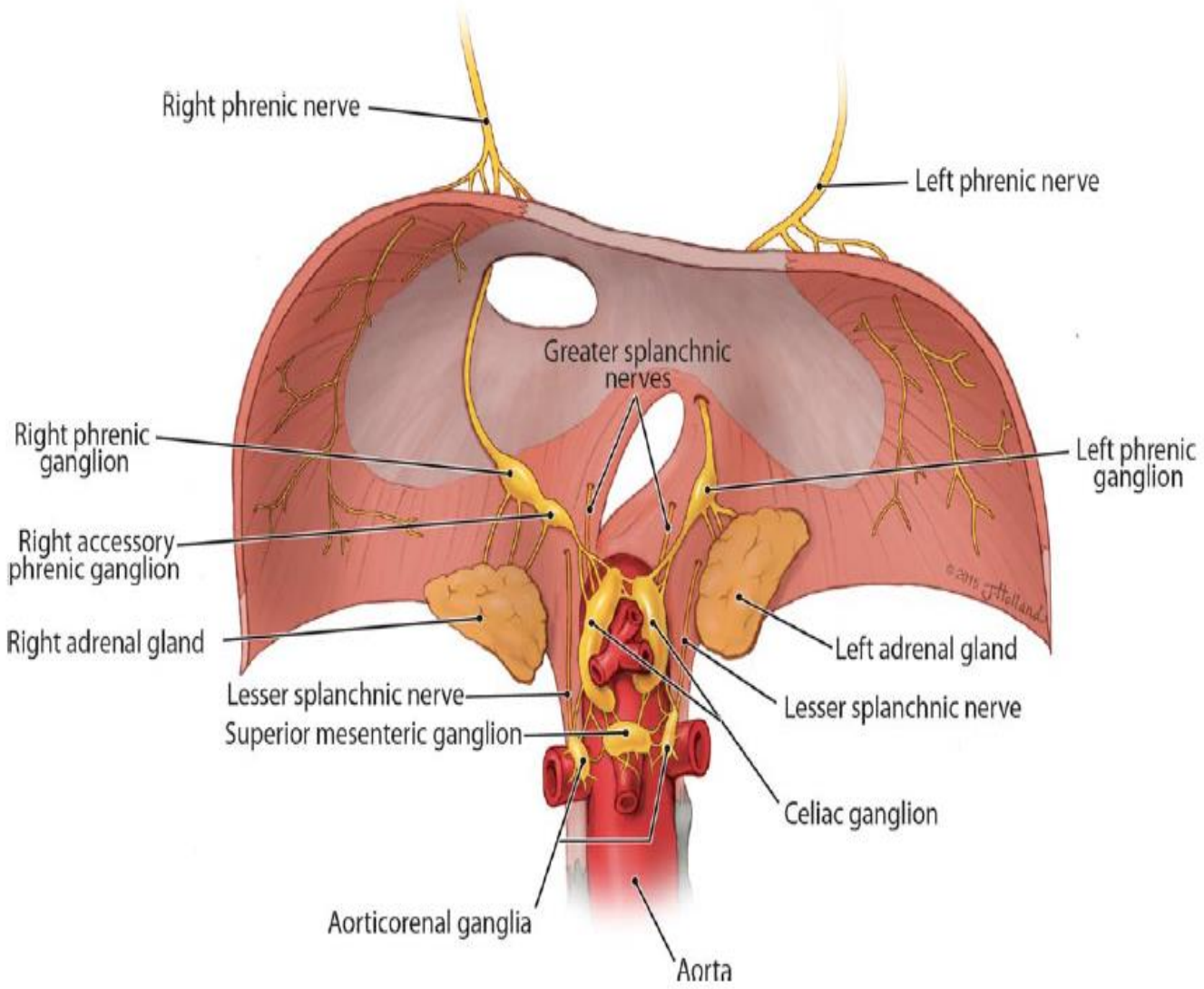

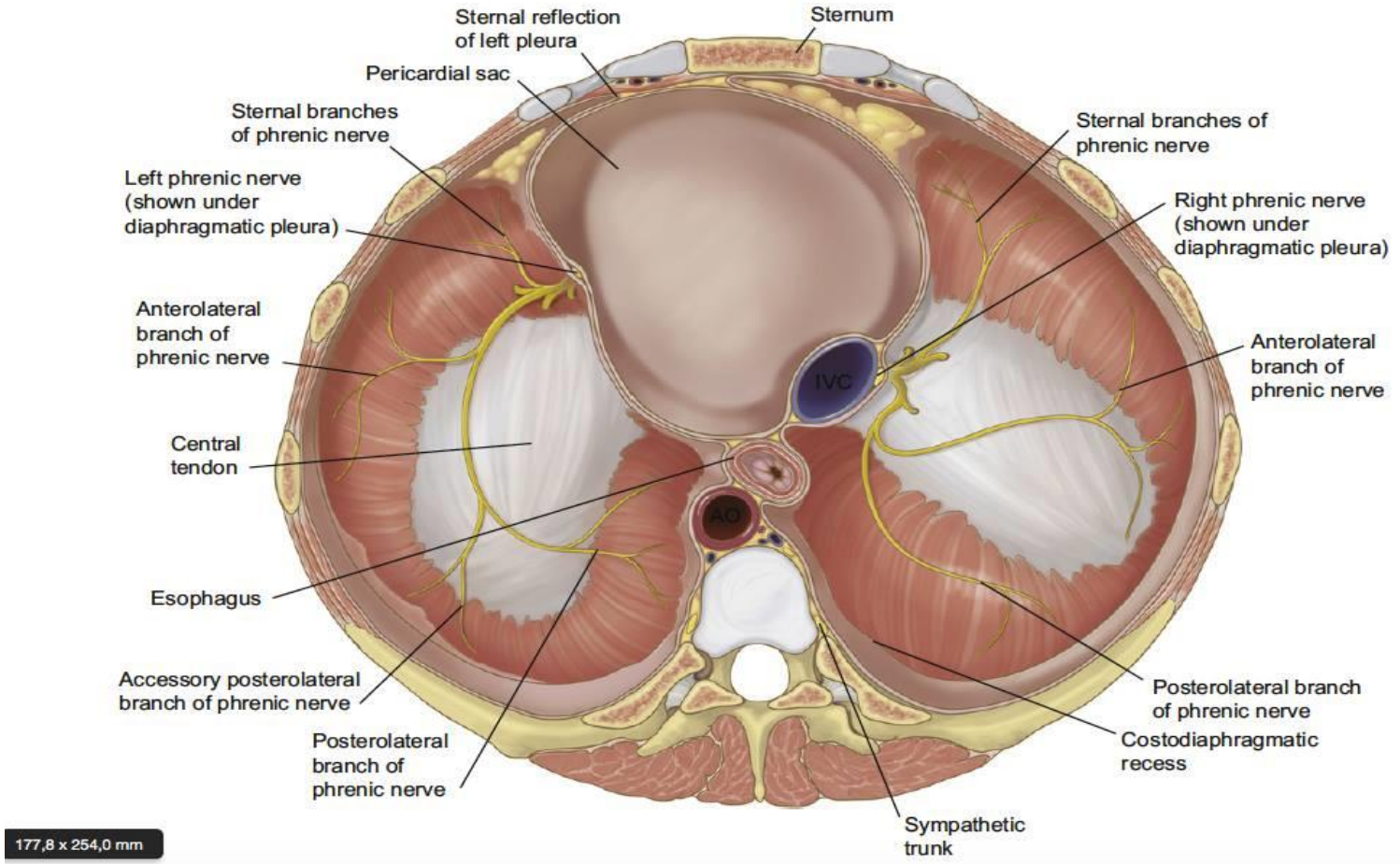

El septum transversal es el motor del crecimiento anatómico y embriológico del diafragma dado que acabará formando el tendón central del diafragma

Perry SF, Similowski T, Klein W & Codd JR (2010) The evolutionary origin of the mammalian diaphragm. Respir Physiol Neurobiol171, 1–16

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CONEXIÓN TÓRAX-ABDOMEN

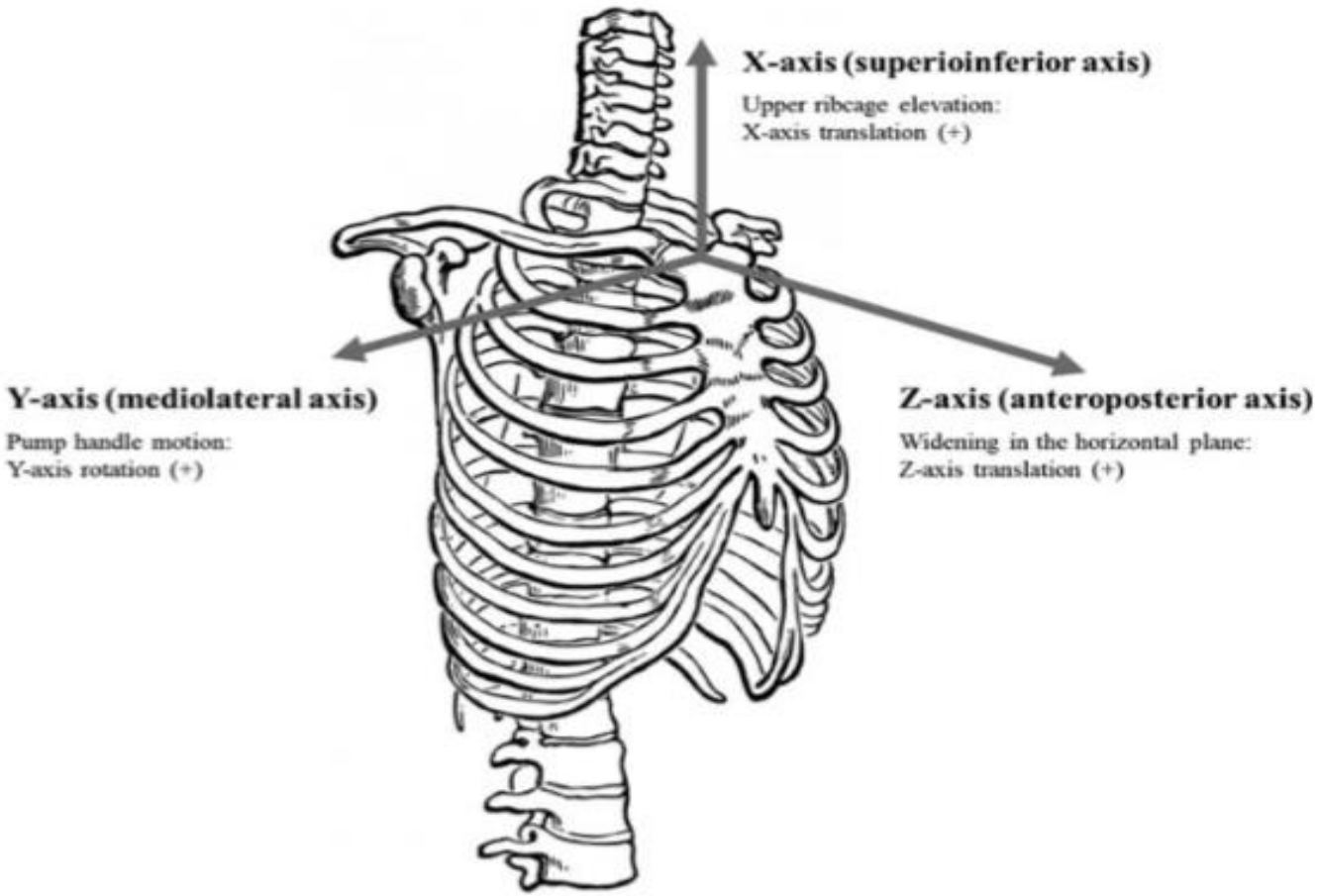
La porción esternal, que posee dos pequeñas porciones, deriva de la región xifoidea delimitando una fisura, **Fisura de Larrey que permite contactar el tejido conjuntivo del pericardio con el tejido conjuntivo del peritoneo**

- INTERCONEXIÓN FASCIAL ENTRE TORAX Y ABDOMEN +++

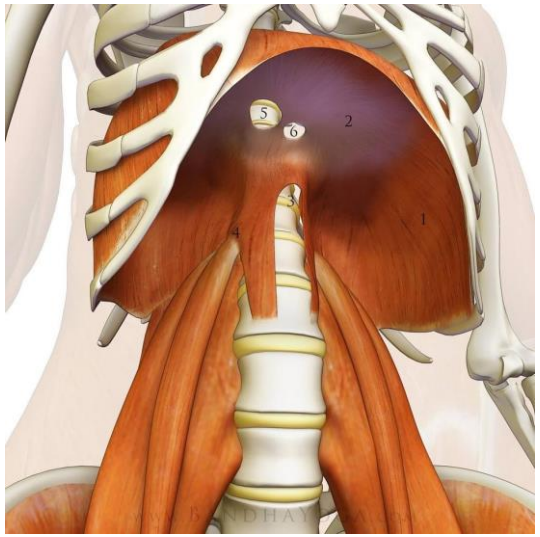
Wang NS. Anatomy of the pleura. *Clin Chest Med*. 1998;19(2): 229–240.

Clugston RD, Greer JJ. Diaphragm development and congenital diaphragmatic hernia. *Semin Pediatr Surg*. 2007;16(2):94–100.

EJES TORÁCICOS



BIOMECÁNICA DIAFRAGMA



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doi:10.1093/ejechocard/jeq157

The effect of breathing manner on inferior vena caval diameter†

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Aims Although the inspiratory 'collapse' of the inferior vena cava (IVC) has been used to signify normal central venous pressure, the effect of the manner of breathing IVC size is incompletely understood. As intra-abdominal pressure rises during descent of the diaphragm, we hypothesized that inspiration through diaphragmatic excursion may have a compressive effect on the IVC.

Methods and results We measured minimal and maximal intrahepatic IVC diameter on echocardiography and popliteal venous return by spectral Doppler during isovolemic inspiratory efforts in 19 healthy non-obese volunteers who were instructed to inhale using either diaphragmatic or chest wall expansion. During inspiration, the maximal diaphragmatic excursion and popliteal vein flow were compared between breathing methods. The IVC 'collapsibility index,' IVCCI, was calculated as $(IVC_{max} - IVC_{min})/IVC_{max}$. The difference in diaphragmatic excursion between diaphragmatic and chest wall breaths in each subject was correlated with the corresponding change in IVCCI. Diaphragmatic breathing resulted in more diaphragmatic excursion than chest wall breathing (median 3.4 cm, range 1.7–5.8 vs. 2.2 cm, range 1.0–5.2, $P = 0.0003$), and was universally associated with decreased popliteal venous return (19/19 vs. 9/19 subjects, $P < 0.004$). The difference in diaphragmatic excursion correlated with the difference in IVCCI (Spearman's rho = 0.53, $P = 0.024$).

Conclusion During inspiration of equivalent tidal volumes, the reduction in IVC diameter and lower extremity venous return was related to diaphragmatic excursion, suggesting that the IVC may be compressed through descent of the diaphragm.

Keywords Inferior vena cava • Echocardiography • Central venous pressures

La inspiración comprime la VCI y reduce su diámetro +++: bombeo venoso.

Fibras aferentes del frénico responden a la presión aplicada sobre las venas hepáticas, parénquima hepático y VCI ++++

Kostreva, D.R.; Pontus, S.P. Hepatic vein, hepatic parenchymal, and inferior vena caval mechanoreceptors with phrenic aerents. Am. J. Physiol. 1993, 265, 15–20.

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Consecuencias:

SÍNTOMAS CLÍNICOS

- Disnea.
- Peor tolerancia al ejercicio físico
- Descenso en la presión intra-abdominal.
- Aumento de la lordosis lumbar
- Aumento de la retracción de los isquiosurales.
- Aumento de la inestabilidad lumbopélvica
- Aumento de la actividad de la musculatura espinal lumbar.
- Dolor lumbar bajo
- Cefalea
- Asma
- Sacroileitis

Boyle KL, Olinick J, Lewis C. The value of blowing up a balloon. N Am J Sports Phys Ther. 2010; 5(3): 179–188.

Kocjan J, Adamek M, Gzik-Zroska B, Czyżewski D, Rydel M. Network of breathing. Multifunctional role of the diaphragm: a review. Adv Respir Med. 2017;85(4):224-232

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DIAFRAGMA Y POSTURA

OPEN ACCESS Freely available online

PLOS ONE

Diaphragm Postural Function Analysis Using Magnetic Resonance Imaging

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Abstract

We present a postural analysis of diaphragm function using magnetic resonance imaging (MRI). The main aim of the study was to identify changes in diaphragm motion and shape when postural demands on the body were increased (loading applied to a distal part of the extended lower extremities against the flexion of the hips was used). Sixteen healthy subjects were compared with 17 subjects suffering from chronic low back pain and in whom structural spine disorders had been identified. Two sets of features were calculated from MRI recordings: dynamic parameters reflecting diaphragm action, and static parameters reflecting diaphragm anatomic characteristics. A statistical analysis showed that the diaphragm respiratory and postural changes were significantly slower, bigger in size and better balanced in the control group. When a load was applied to the lower limbs, the pathological subjects were mostly not able to maintain the respiratory diaphragm function, which was lowered significantly. Subjects from the control group showed more stable parameters of both respiratory and postural function. Our findings consistently affirmed worse muscle cooperation in the low back pain population subgroup. A clear relation with spinal findings and with low back pain remains undecided, but various findings in the literature were confirmed. The most important finding is the need to further address various mechanisms used by patients to compensate deep muscle insufficiency.

Podemos confirmar la influencia del diafragma **en la estabilidad de la columna vertebral y la respiración.**

Observamos que los valores posturales y respiratorios están más equilibrados.

El factor más relevante es la obtención de una **buena presión intra-abdominal que ayuda a dar un soporte anterior a la columna.**

Esto proporciona un rol clave en el tratamiento de hernias discales y dolor lumbar

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RESPIRACIÓN-FUNCION CARDIACA

- La respiración diafragmática como método de rehabilitación en pacientes con afecciones cardiacas debería ser instaurada en los protocolos de rehabilitación cardiaca dado que mejora:

- La tensión arterial: Paced Breathing

- Presión aórtica.

- Presión arterial pulmonar.

- Oxigenación tisular corporal.

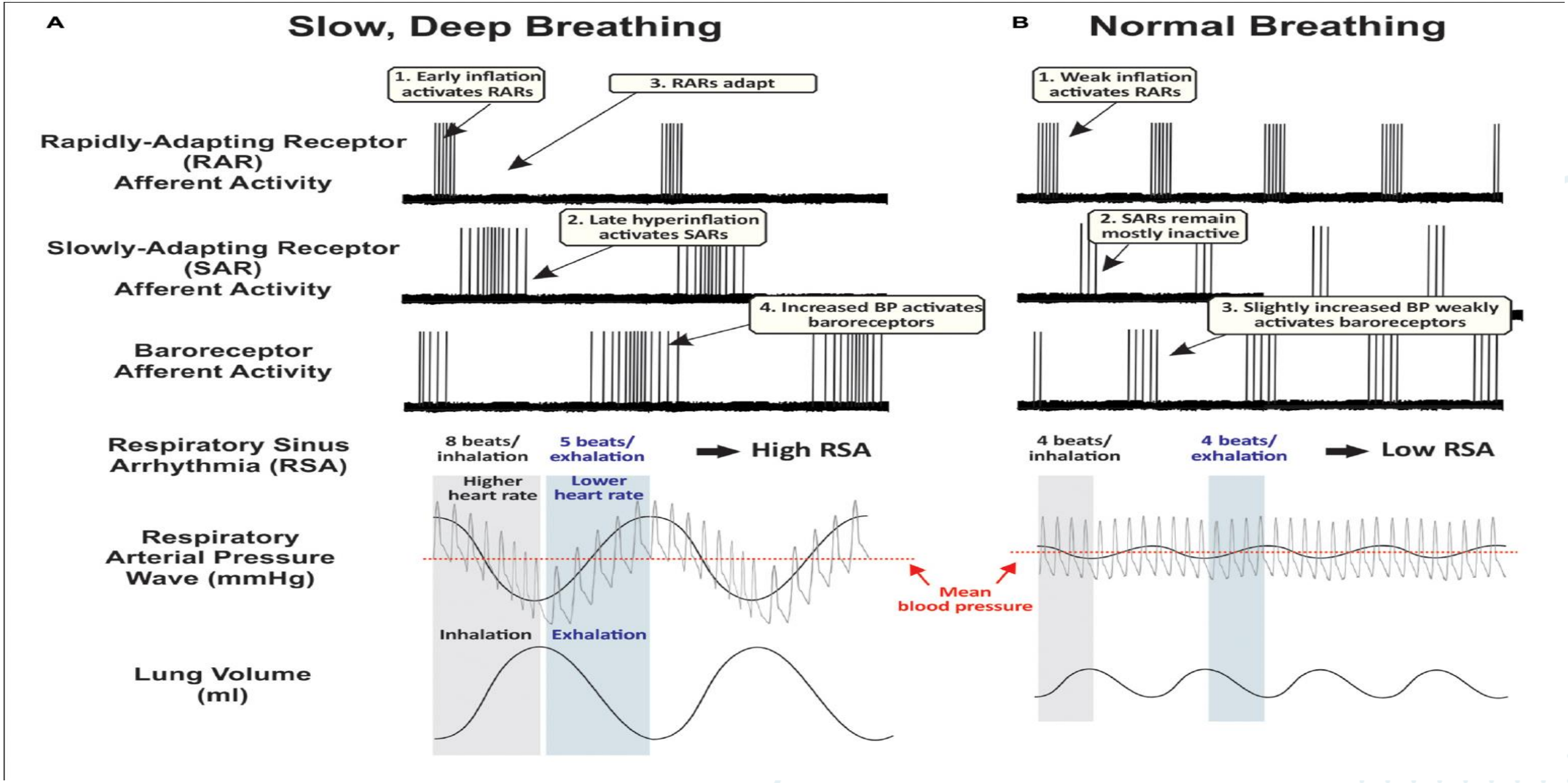
Van Dixhoorn J. [Favorable effects of breathing and relaxation instructions in heart rehabilitation: a randomized 5-year follow-up study]. Ned Tijdschr Geneeskd. 1997; 141(11): 530–534,

RESPIRACIÓN

- El ratio normal es de 12-15 respiraciones por minuto.
- Ratio 6 respiraciones por minuto +++
- Podría inducir cambios en el sistema cardiorrespiratorio que pudiera generar esa respuesta de relajación?

Hamasaki H. Effects of Diaphragmatic Breathing on Health: A Narrative Review. Medicines (Basel). 2020 Oct 15;7(10):65

Chin MS, Kales SN. Understanding mind-body disciplines: A pilot study of paced breathing and dynamic muscle contraction on autonomic nervous system reactivity. Stress Health. 2019 Oct;35(4):542-548.



Schwerdtfeger, A.R et al. Heart Rate Variability (HRV): From brain death to resonance breathing at 6 breaths/minute. Clinical Neurophysiology (2019),

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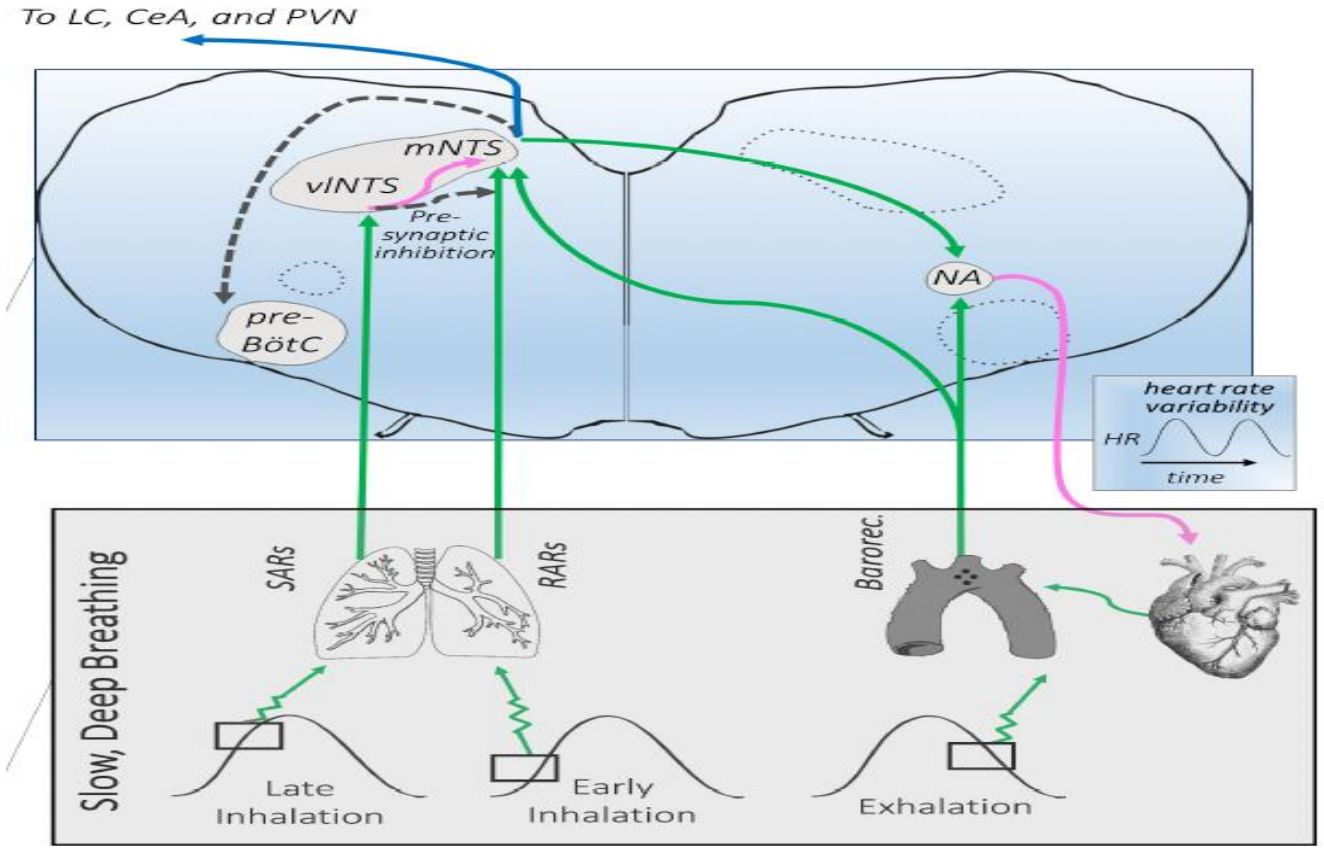
LC: reducción estado de alerta
y aumento de la flexibilidad en el carácter

CeA: regulación endocrina (reducción estrés) y sistema límbico



-Malpas, S. C. (2002). Neural influences on cardiovascular variability: possibilities and pitfalls. Am. J. Physiol. Heart Circ. Physiol. 282, H6–H20.
-Schelegle, E. S. (2003). Functional morphology and physiology of slowly adapting pulmonary stretch receptors. Anat. Rec. A Discov. Mol. Cell Evol. Biol. 270, 11–16.
-Wehrwein, E. A., Orer, H. S., and Barman, S. M. (2016). Overview of the anatomy, physiology, and pharmacology of the autonomic nervous system. Comp. Physiol. 6, 1239–1278.

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REGULACIÓN

- Las neuronas del NTS activan el circuito del SNC que engloba las emociones y la regulación interna incluyendo, de forma significativa, la amígdala y el núcleo para-ventricular del Hipotálamo

Porges, S. W. (2007). The polyvagal perspective. Biol. Psychol. 74, 116–143.

Chin MS, Kales SN. Understanding mind-body disciplines: A pilot study of paced breathing and dynamic muscle contraction on autonomic nervous system reactivity. Stress Health. 2019 Oct;35(4):542-548

RELAJACIÓN VÍA NTS

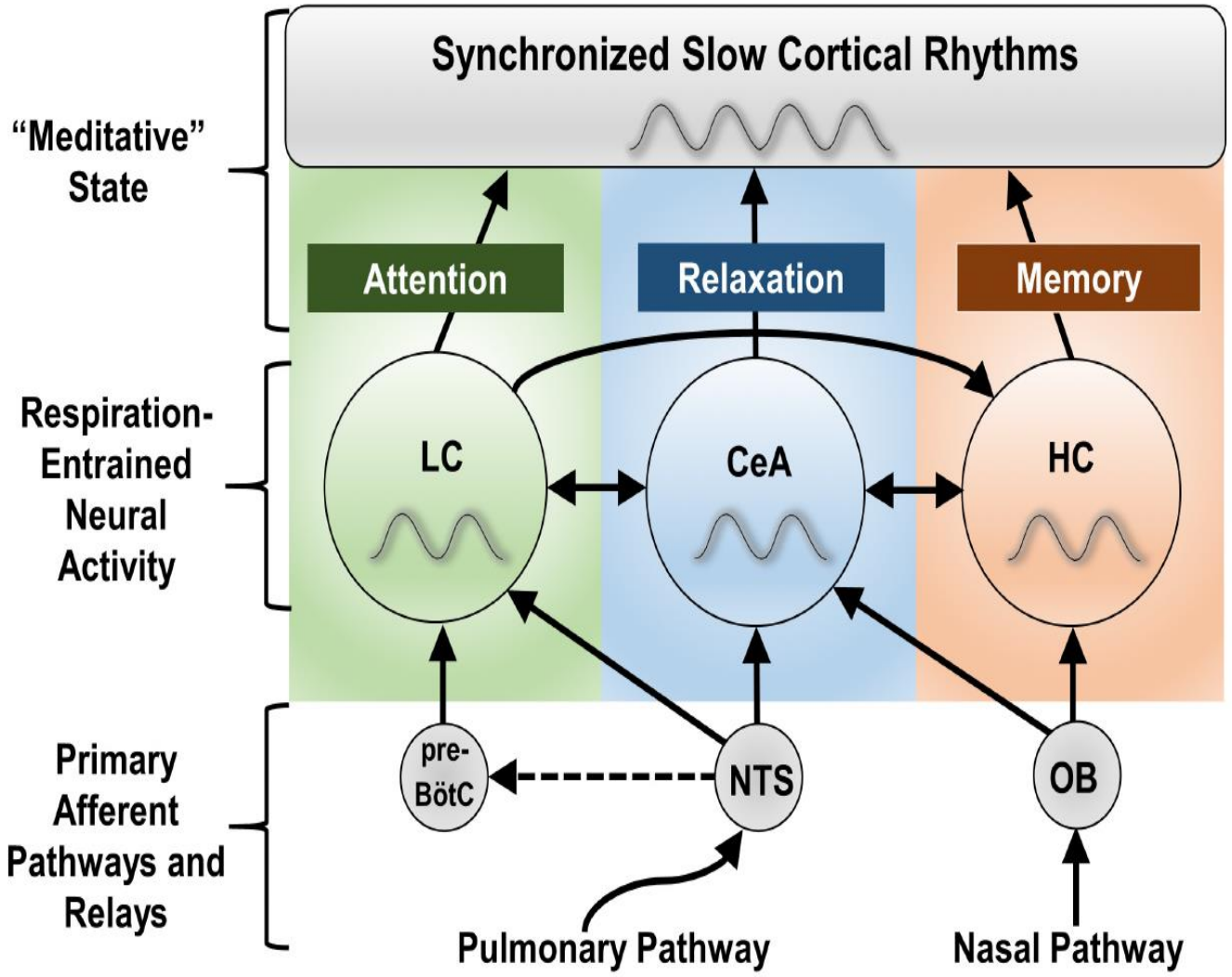
La activación de neuronas adrenérgicas Hoxb1-NE reduce la actividad neuronal del LC y la amígdala modulándola.

El núcleo central de la amígdala (CeA) es el principal regulador de la producción de cortisol a través del Hipotálamo +++

Disminución de la producción de cortisol

Chen,et al. (2018). Genetic identification of a population of noradrenergic neurons implicated in attenuation of stress-related responses. Mol. Psychiatry
24, 710–725.

Ressler, K. J. (2010). Amygdala activity, fear, and anxiety: modulation by stress. Biol. Psychiatry 67, 1117–1119.



Respiración nasal vía bulbo olfatorio activa ondas hipocampo coordinarán actividad talámica y cortical generando ondas corticales durante la meditación.

Herrero, J. L., Khuvis, S., Yeagle, E., Cerf, M., and Mehta, A. D. (2018). Breathing above the brain stem: volitional control and attentional modulation in humans. J. Neurophysiol. 119, 145–159.

RESPIRACIÓN Y EMOCIÓN

El sistema límbico está conectado por vías aferentes y eferentes a los centros respiratorios.

Esto influye en la función del diafragma

Bordoni B, Marelli F, Bordoni G. A review of analgesic and emotive breathing: a multidisciplinary approach. J Multidiscip Healthc. 2016; 9: 97–102.

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