

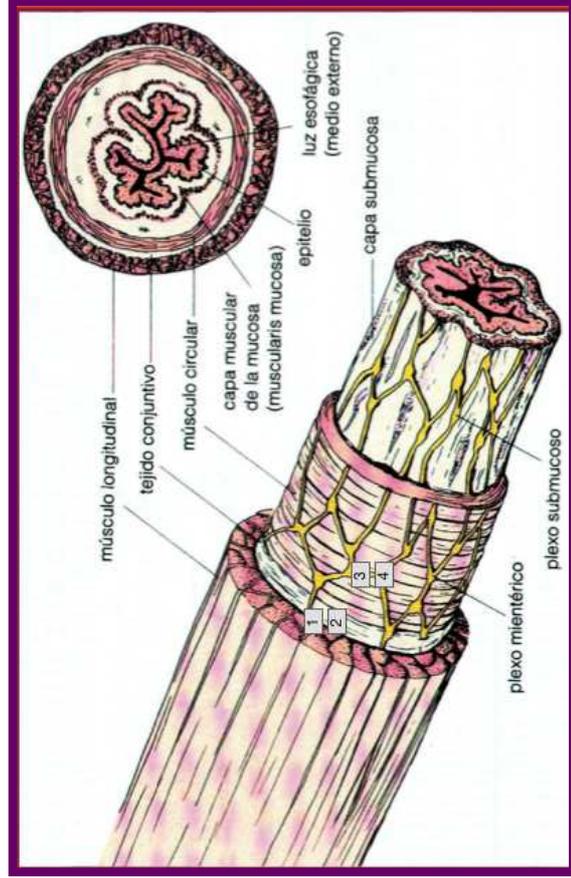
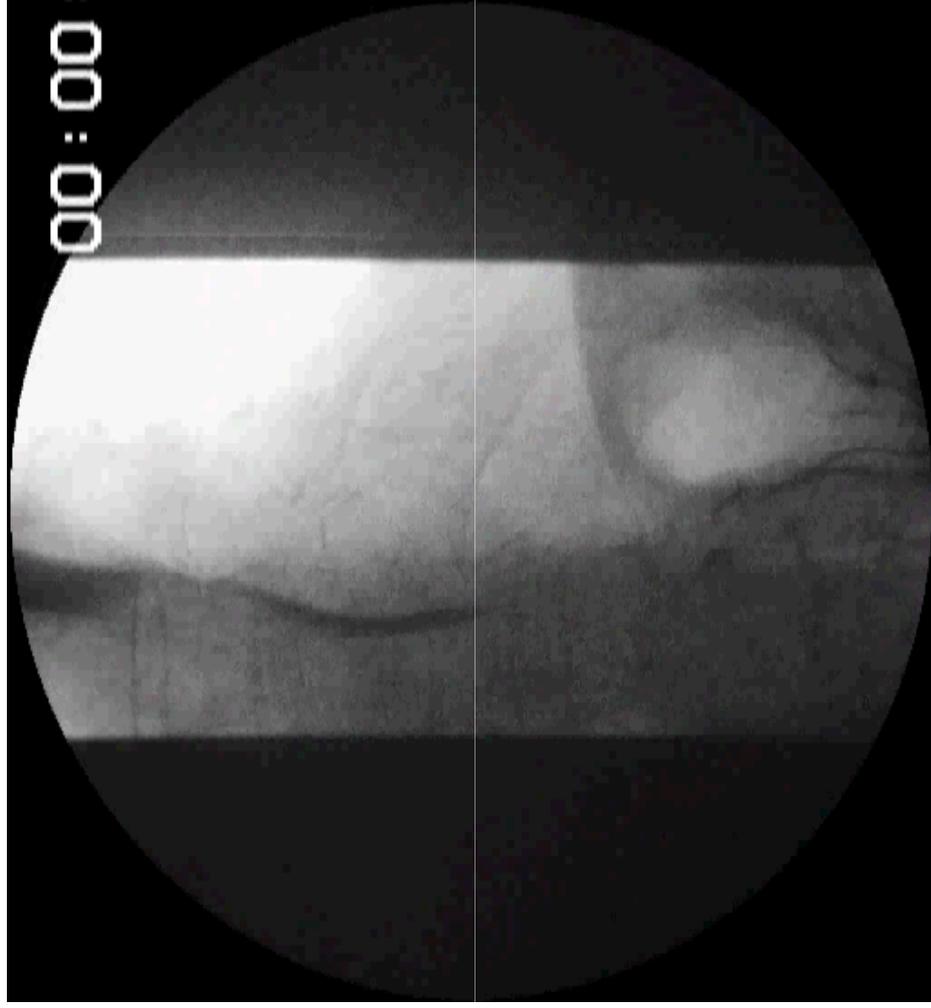
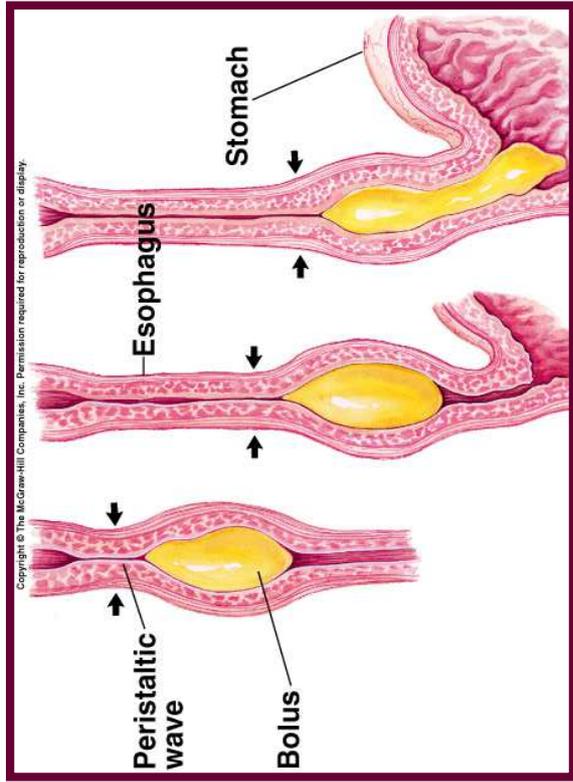
Normal esophageal smooth muscle physiology and pathophysiology

Daniel Sifrim



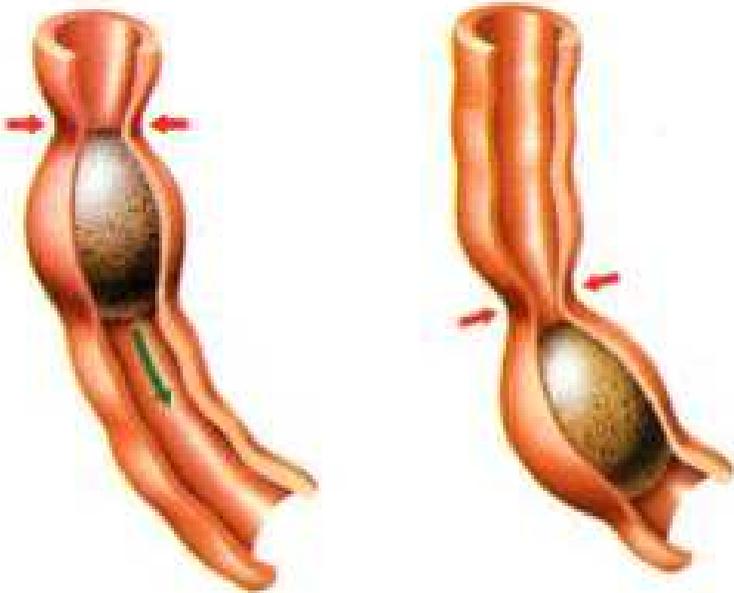
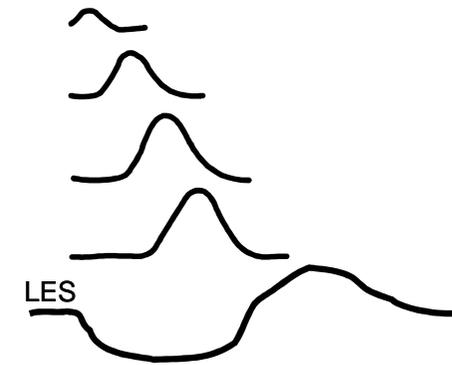
Barts and The London
School of Medicine and Dentistry

Neurogastroenterology
Group

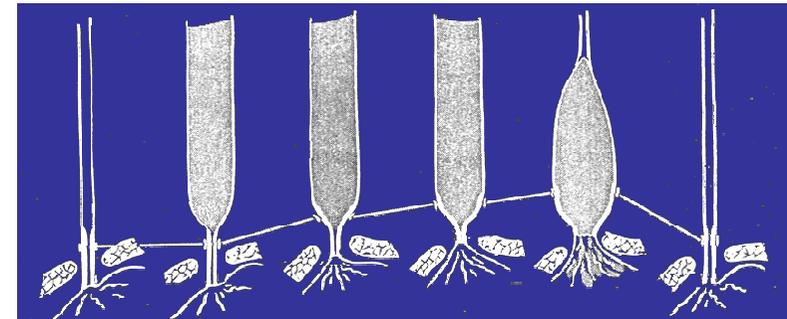


Esophageal motor patterns

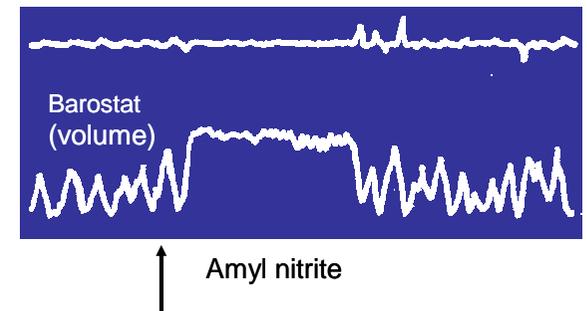
PERISTALSIS



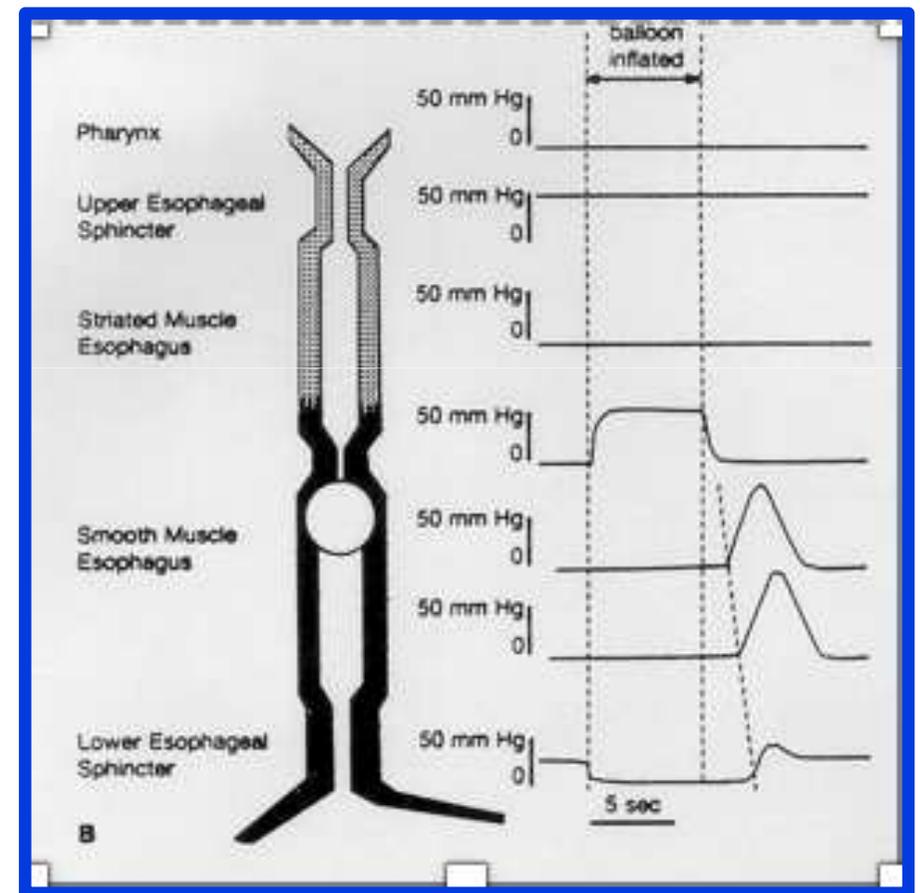
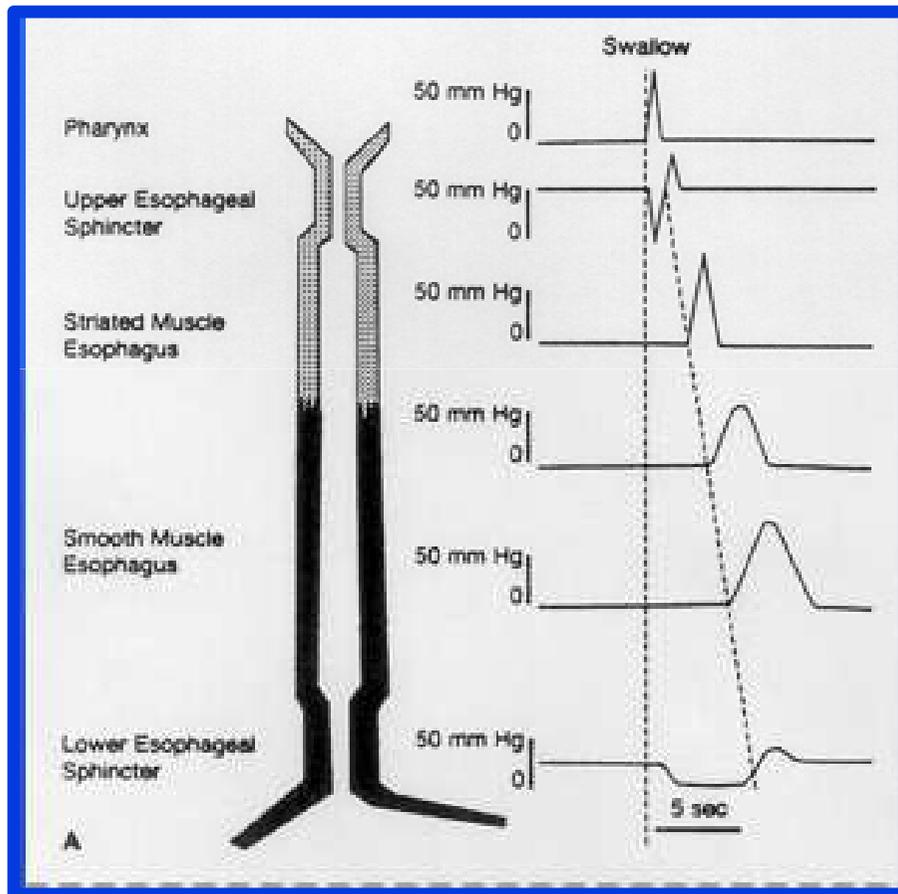
SHORTENING



STONE

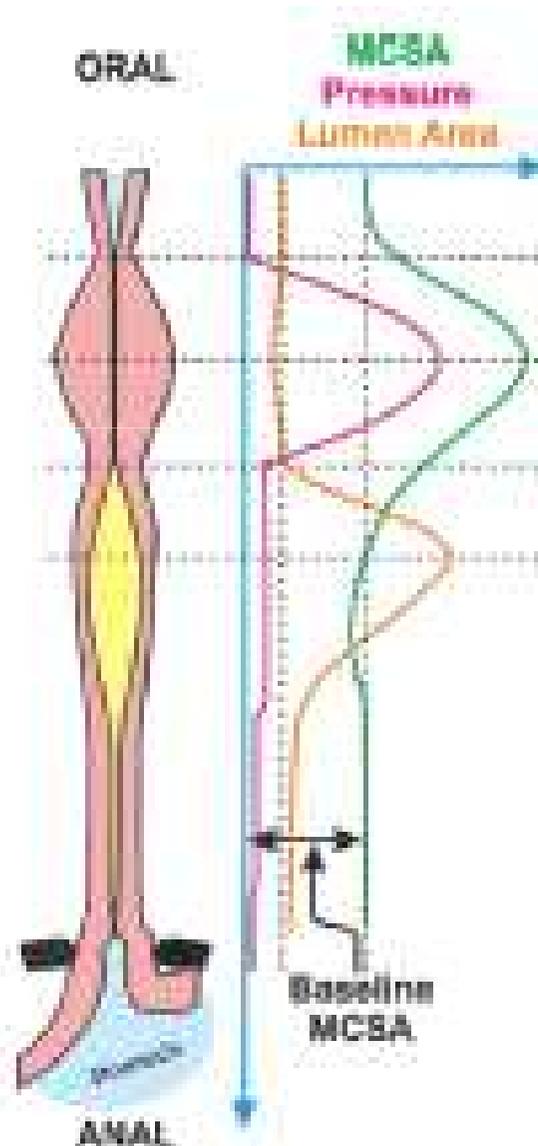


ESOPHAGEAL PERISTALSIS



Regulation and dysregulation of esophageal peristalsis by the integrated function of circular and longitudinal muscle layers in health and disease

Ravinder K. Mittal



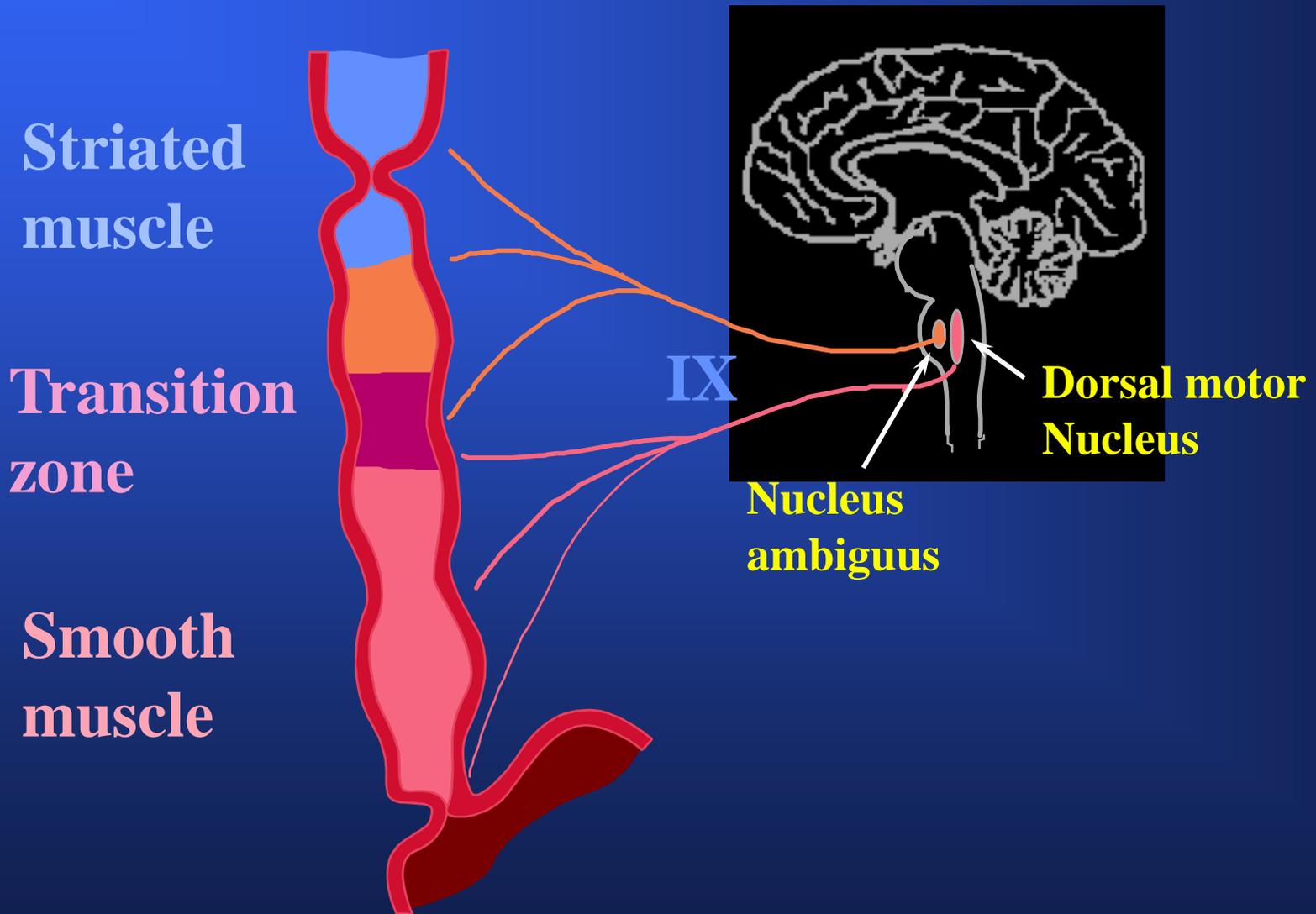
The CM and LM layers contract and relax together during the ascending contraction and descending relaxation of the peristaltic reflex, respectively. The synchrony and asynchrony between the two layers is of fundamental importance to bolus propulsion in the antegrade and retrograde directions, respectively.

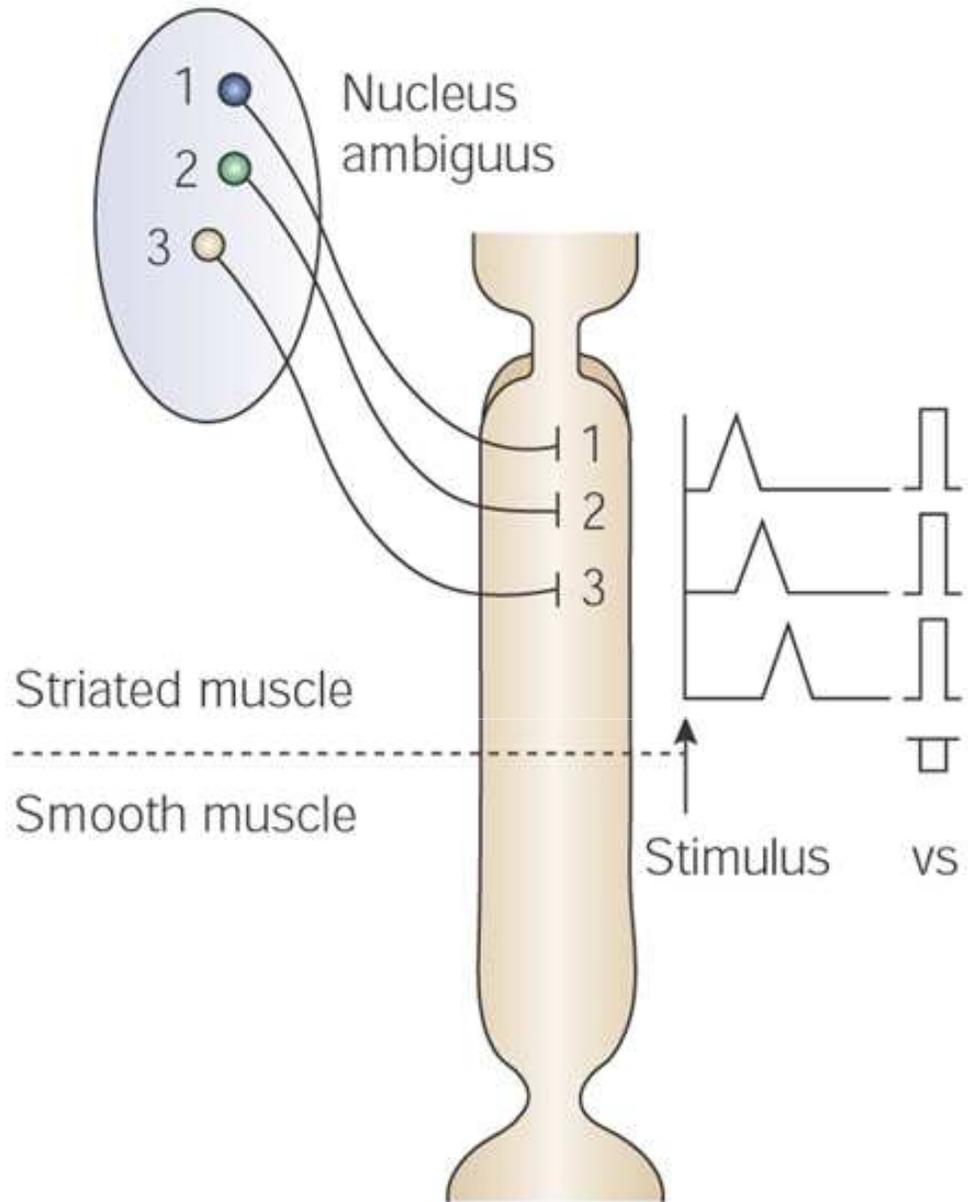
Control of esophageal peristalsis

Levels of control

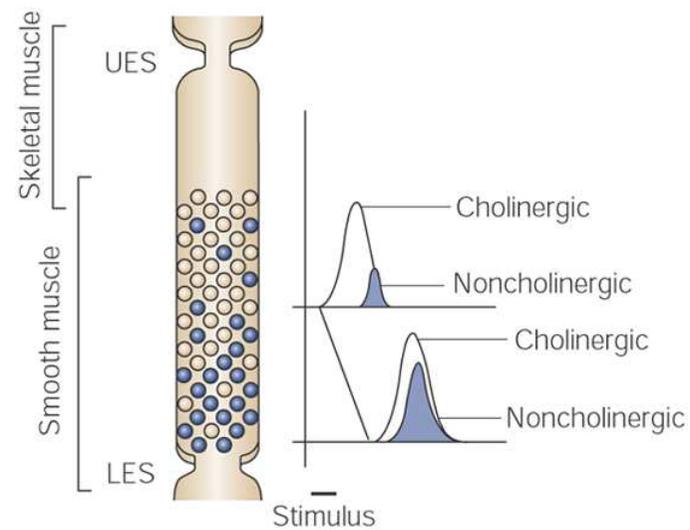
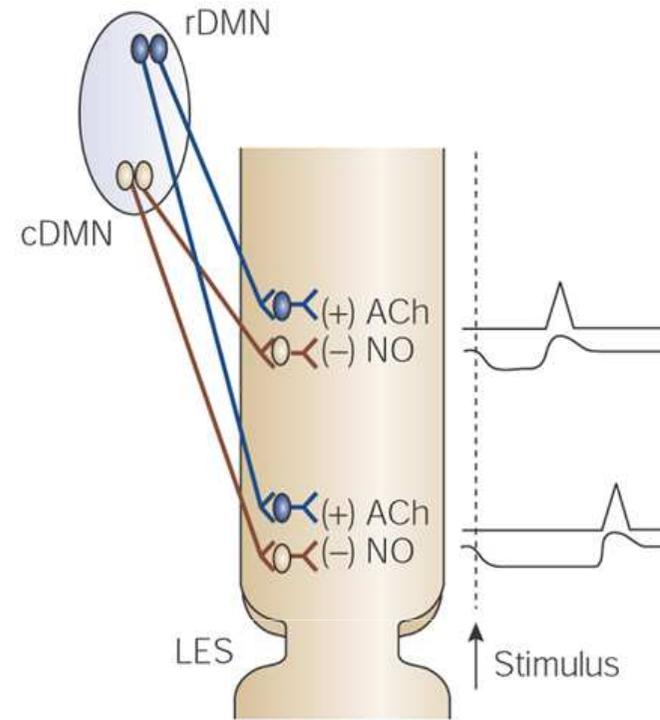
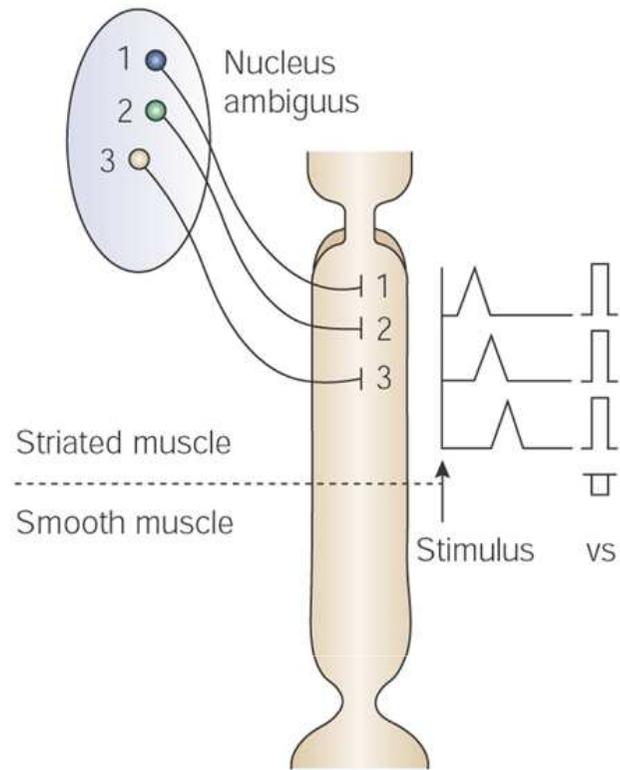
- **Central (striated and smooth muscle)**
 - » Cortical - voluntary
 - » Brain stem - central pattern generator (CPG)
- **Peripheral (smooth muscle)**
 - » Neural - excitation and inhibition
 - » Myogenic
 - » Interstitial cells of Cajal (ICC)
- **Central-peripheral connection (brain-gut-brain)**

Central Neural Control of Esophageal Motor Function

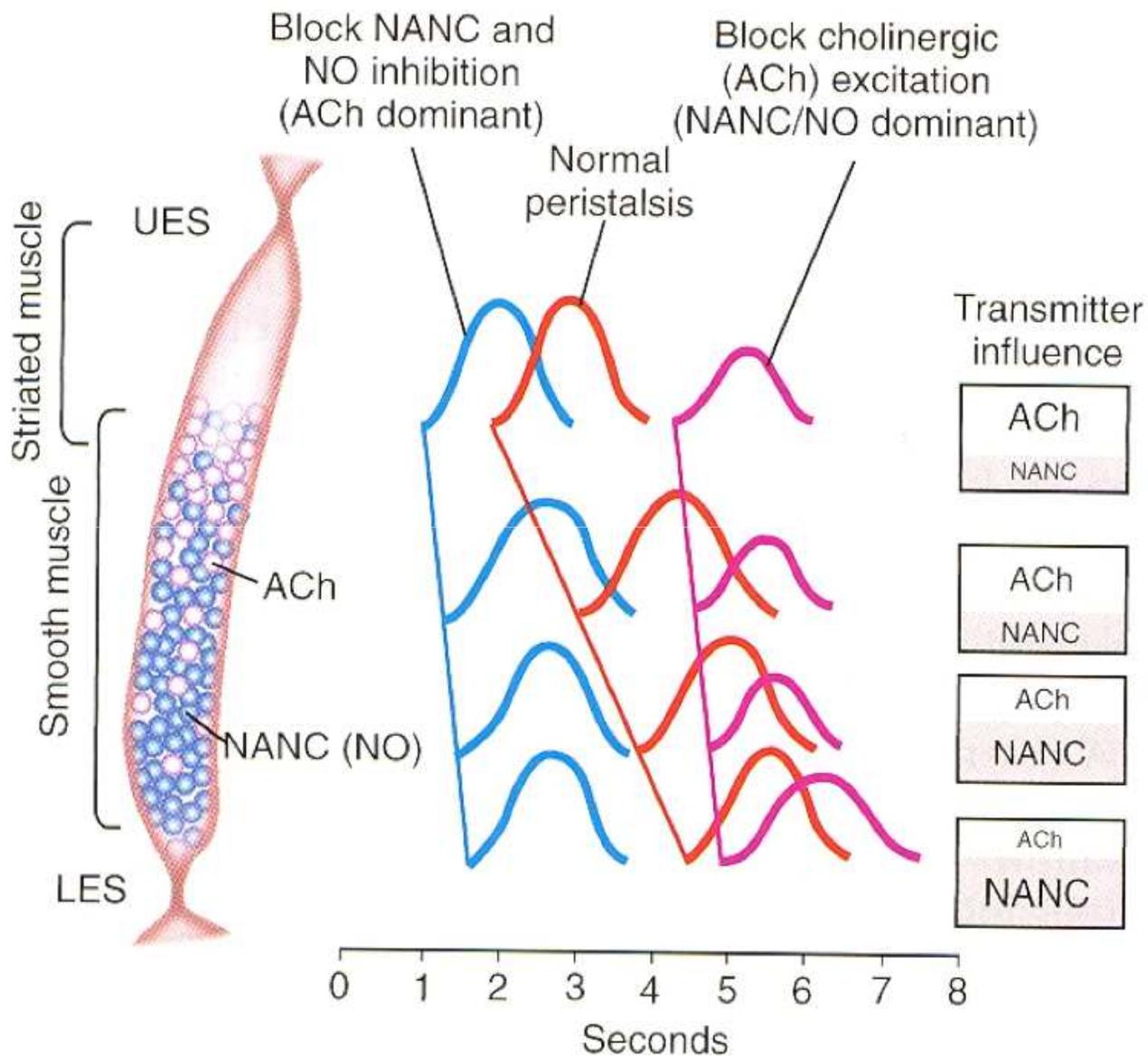




What is the role of the myenteric neurons in the proximal esophagus?



Mashimo GI motility on Line



Control of esophageal peristalsis

Smooth Muscle

■ Central

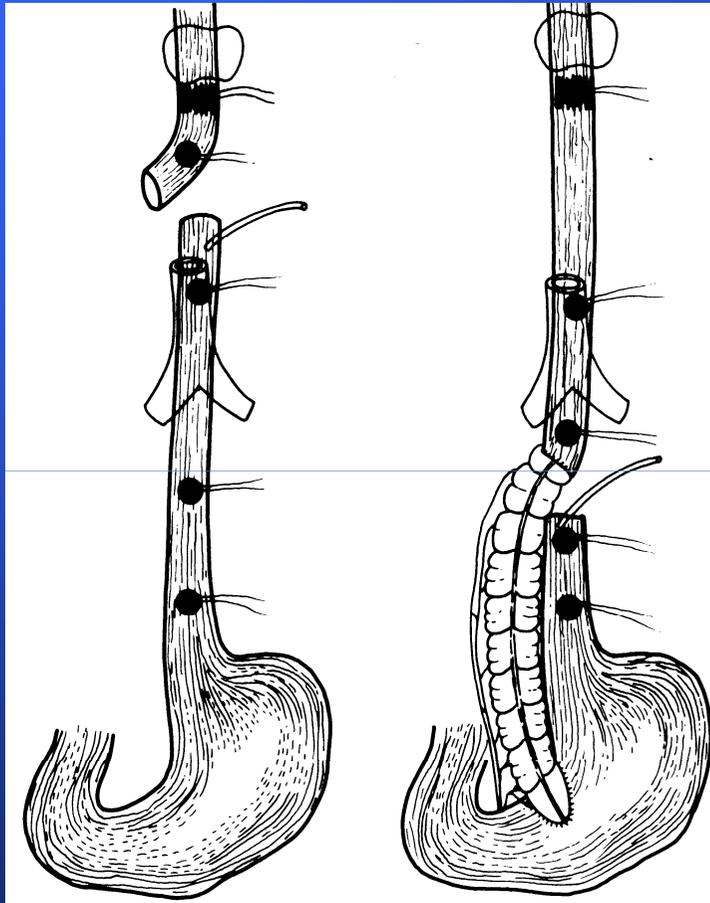
- » programmed vagal excitation
- » programmed vagal inhibition?

■ Peripheral (smooth muscle)

- » Neural - excitation and inhibition with regional variation
- » Myogenic-oscillator properties
- » Interstitial cells of Cajal (ICC) transducer; pacemaker?

■ **Amplitude** - central > peripheral

■ **Velocity** - peripheral > central

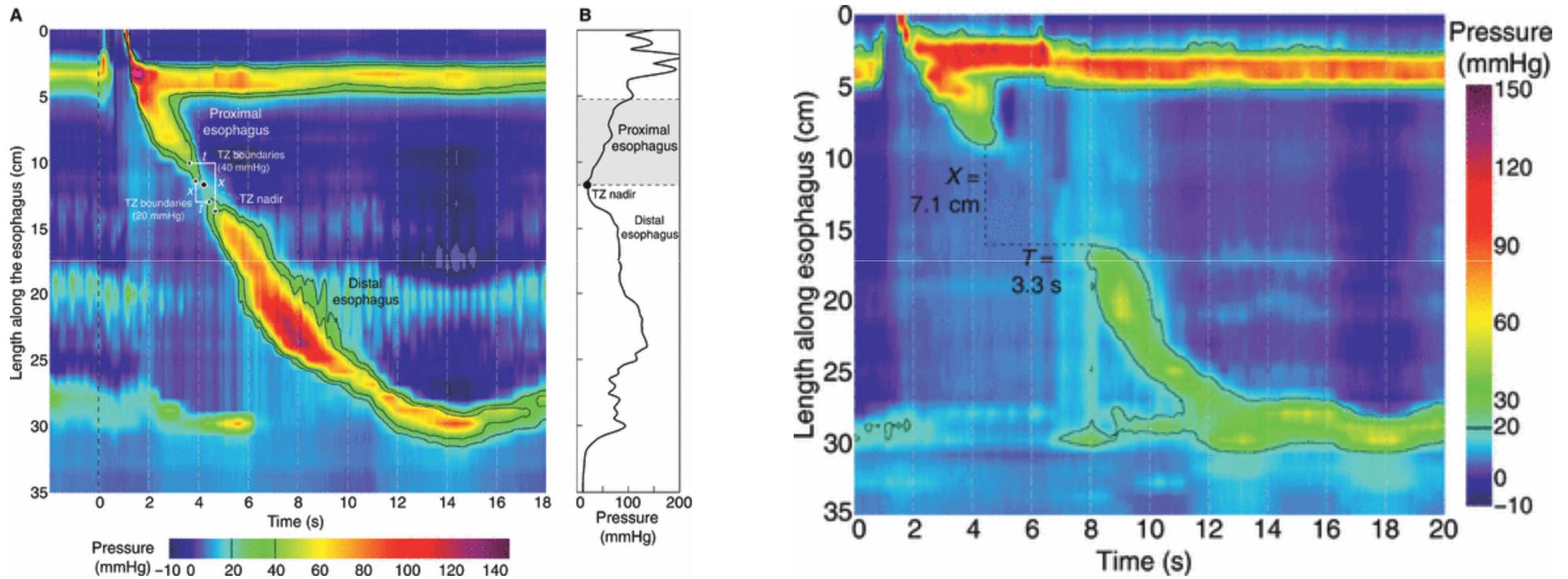


Central Neural Control

- » Coordinates the peristaltic activity between striated and smooth muscle portion
- » Can initiate the activity in the smooth muscle portion

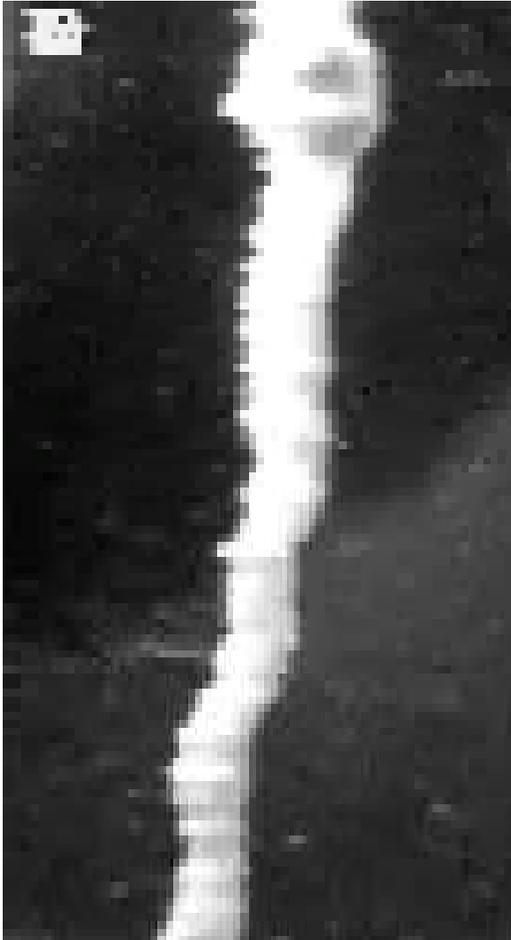
Janssens et al 1976

Transition between striated muscle and smooth muscle contractile activity



Ghosh et al 2008

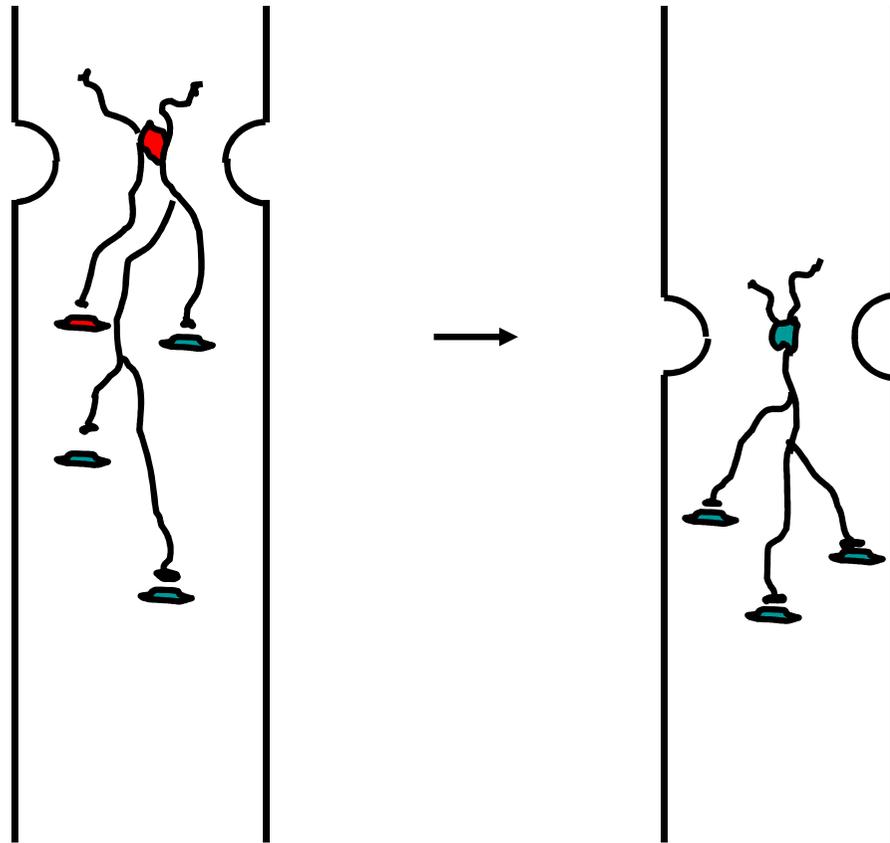
Peripheral control of peristalsis



- ✓ Neural - excitation and inhibition with regional variation
- ✓ Myogenic-oscillator properties
- ✓ Interstitial cells of Cajal (ICC) transducer; pacemaker?
- ✓ Neuronal stretch activation

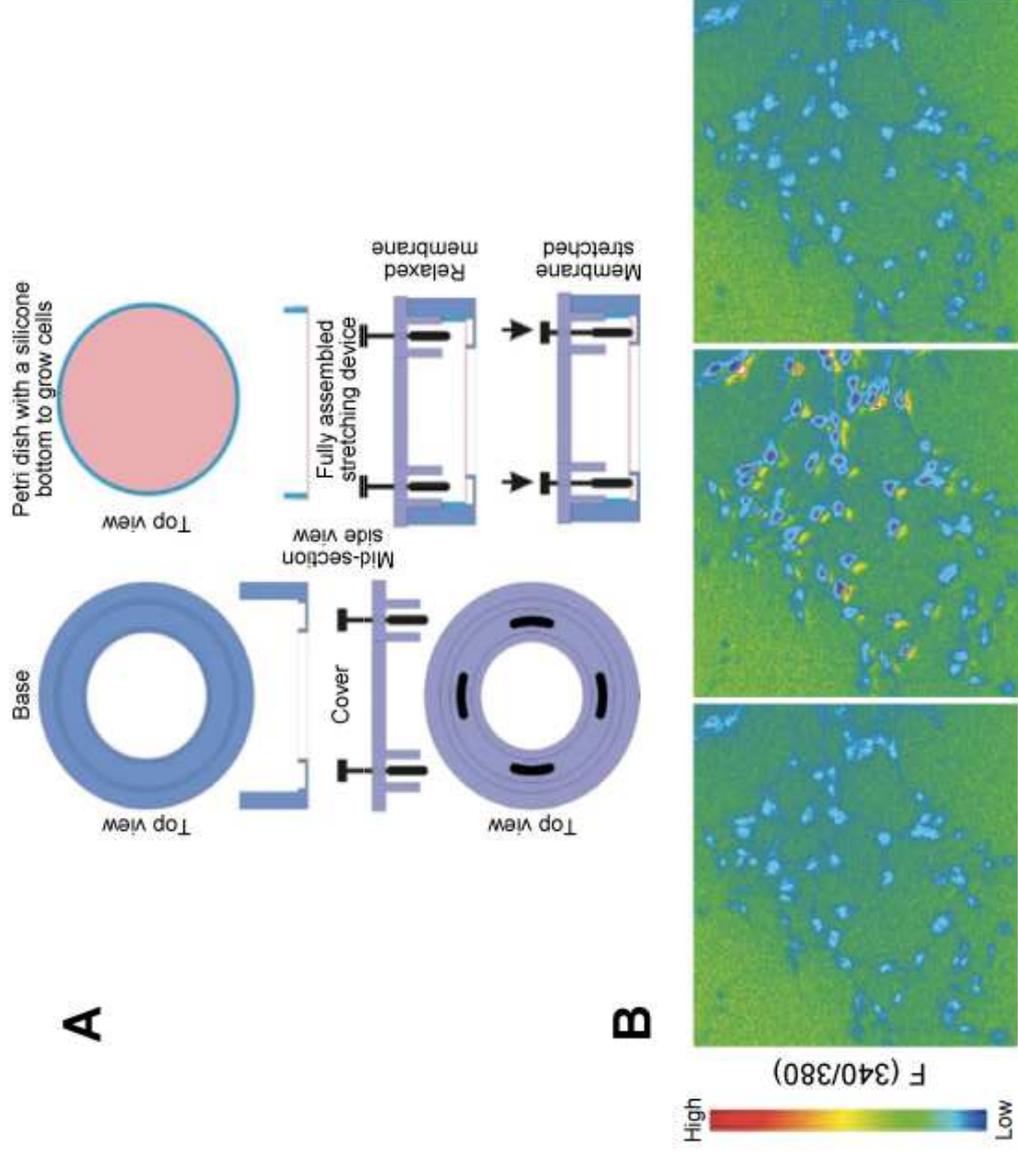
Continuous reactivation of descending inhibitory pathway by proximal contraction / bolus distention

Latency gradient is due to continuous reactivation of descending inhibitory pathway by proximal contraction / bolus distention

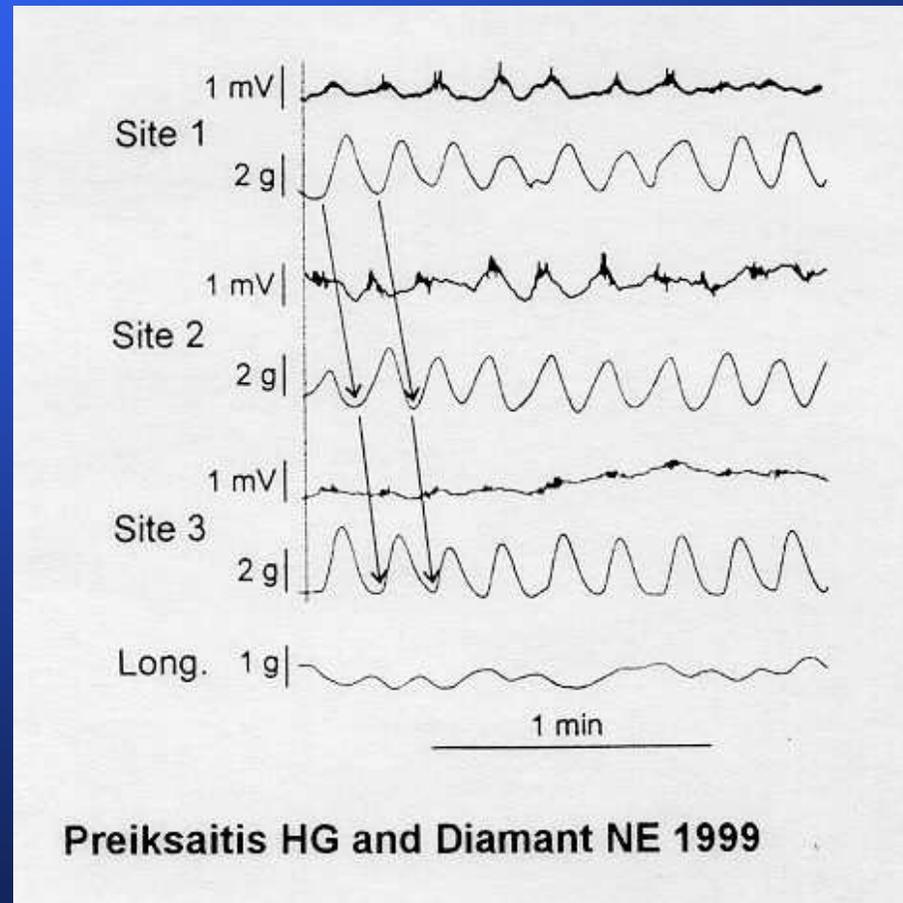


Inhibitory motor neurons of the esophageal myenteric plexus are mechanosensitive

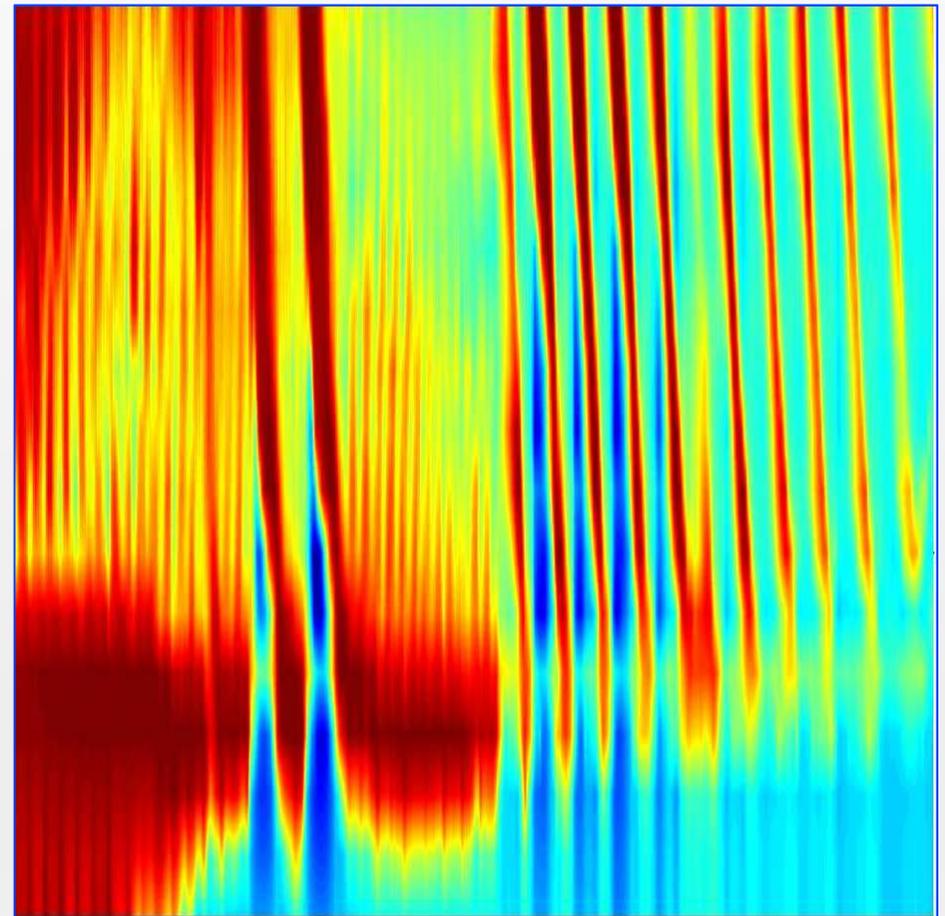
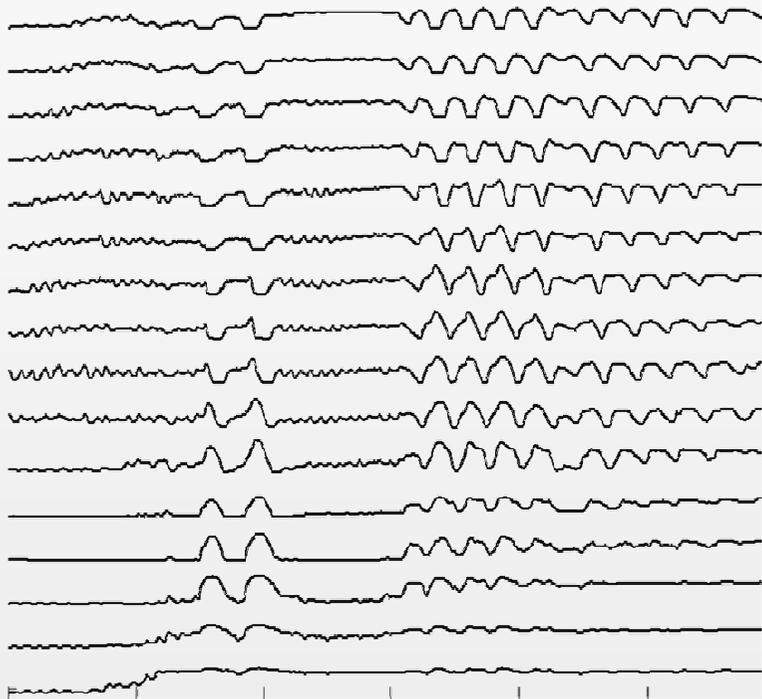
Hui Dong,* Yanfen Jiang,* Jane Dong, and Ravinder K. Mittal



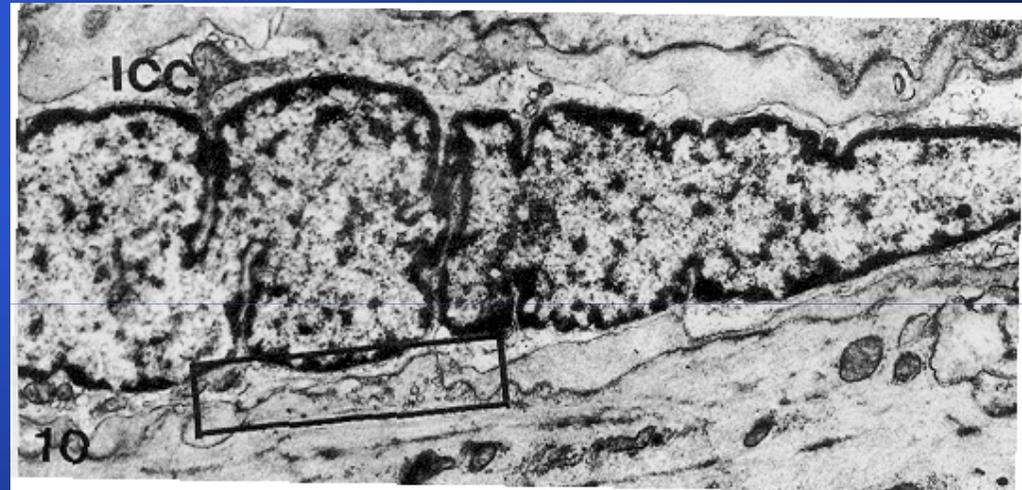
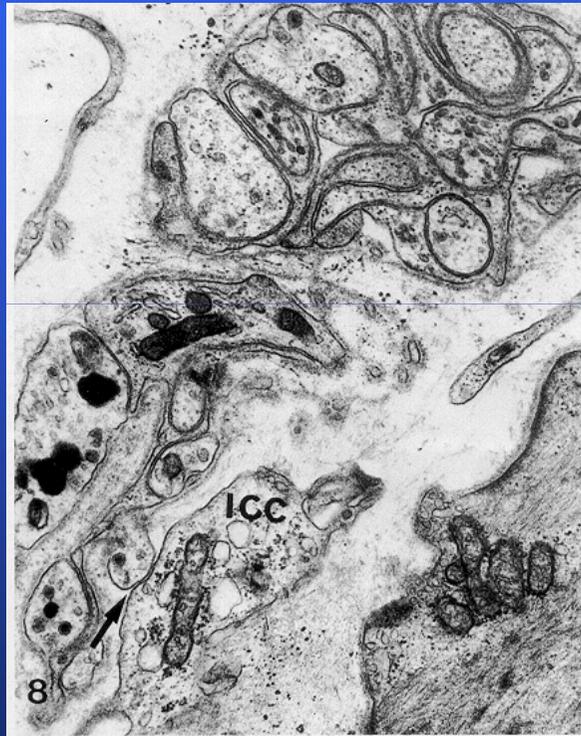
Myogenic control of esophageal peristalsis



Endoflip RACS

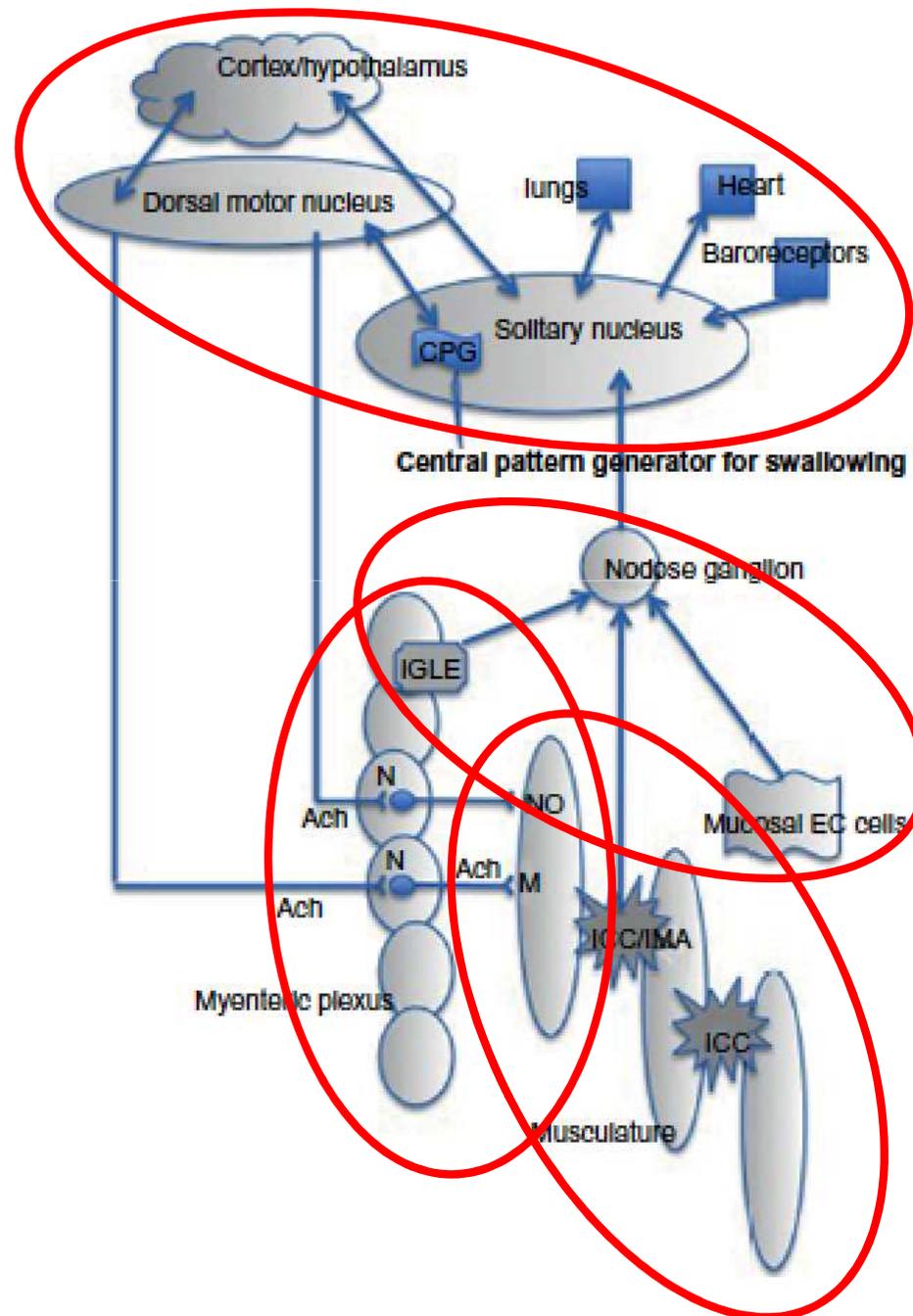


Interstitial cells of Cajal (ICC)



Faussone-Pelegrini and Cortesini 1985

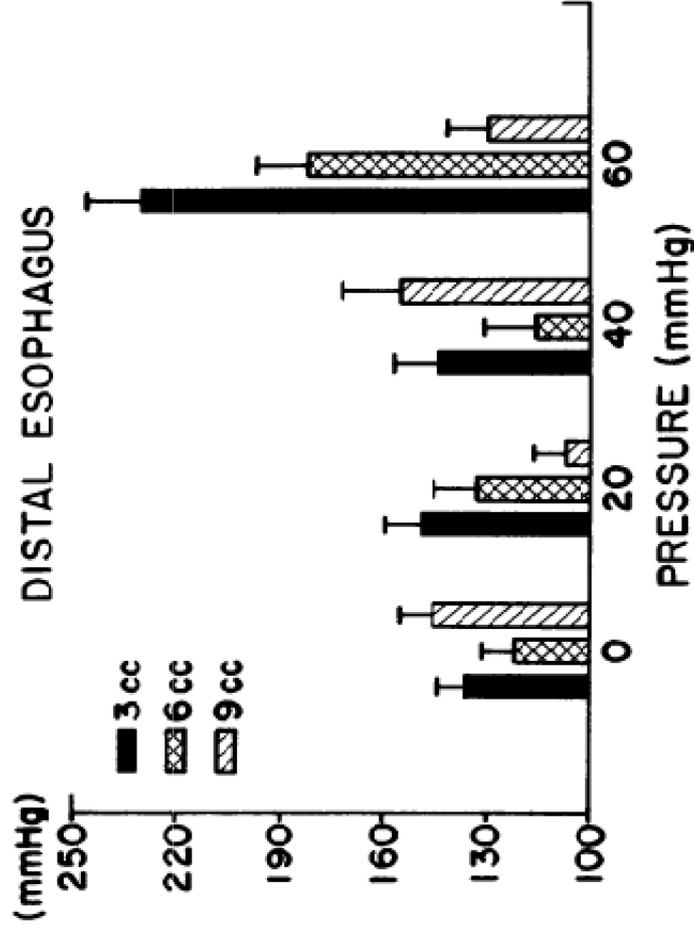
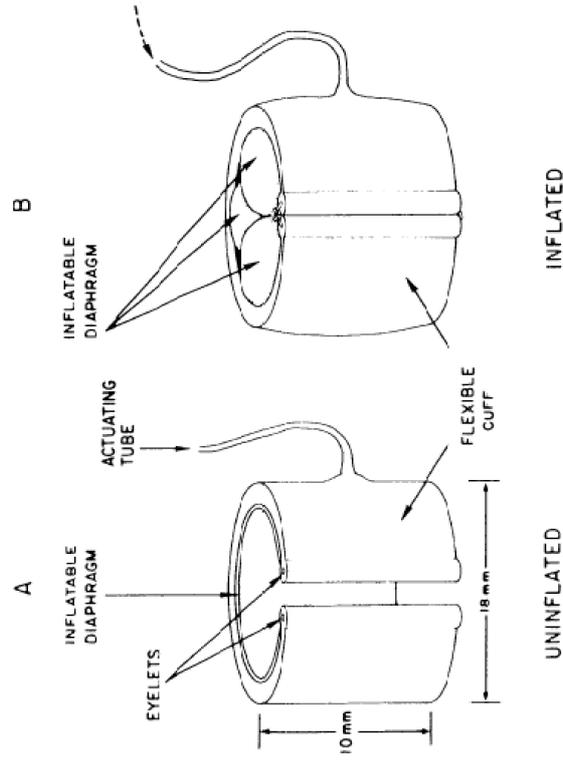
central and peripheral vagal control



Modulation of feline esophageal contractions by bolus volume and outflow obstruction

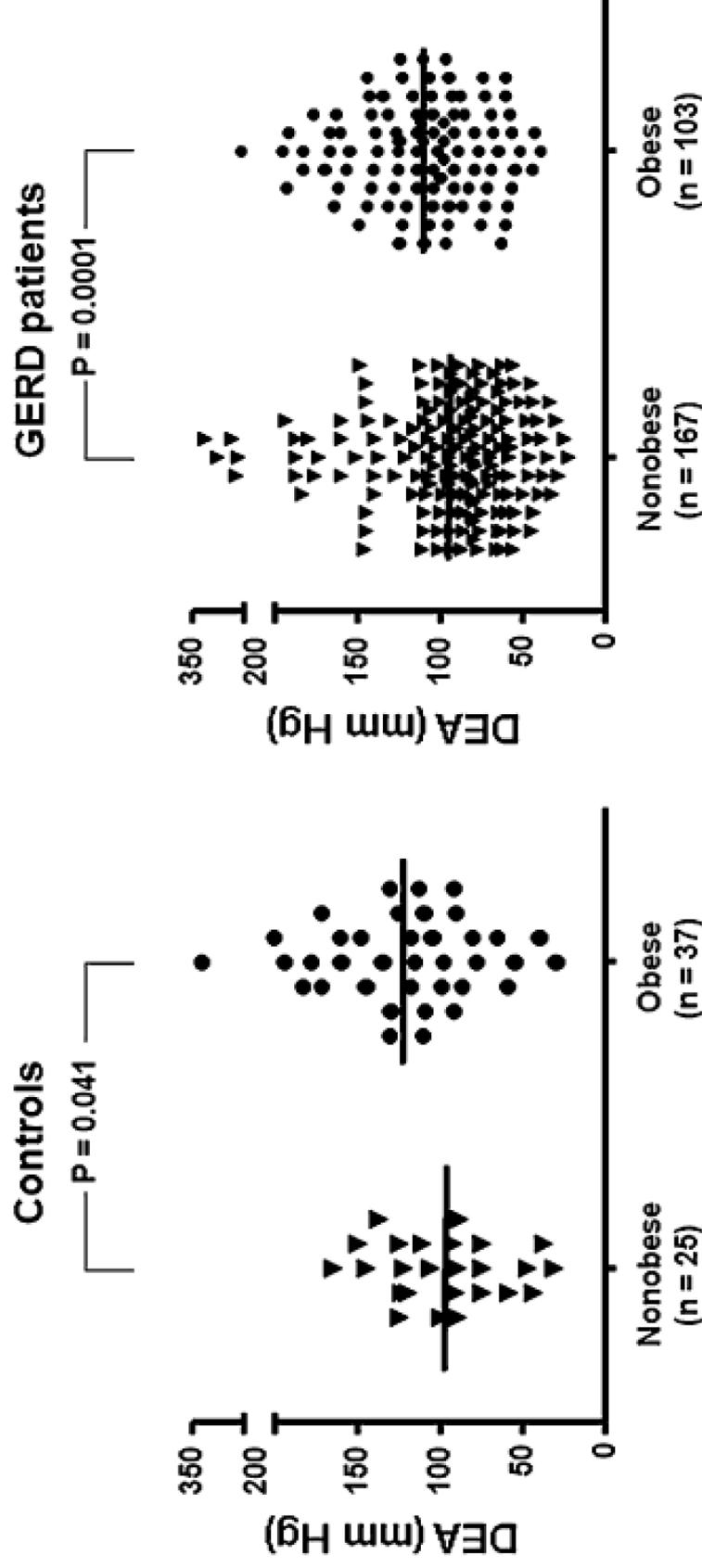
RAVINDER K. MITTAL, JUNLONG REN, RICHARD W. McCALLUM, HUBERT A. SHAFFER, JR., AND JULIA SLUSS

Departments of Internal Medicine and Radiology, University of Virginia, Charlottesville, Virginia 22908



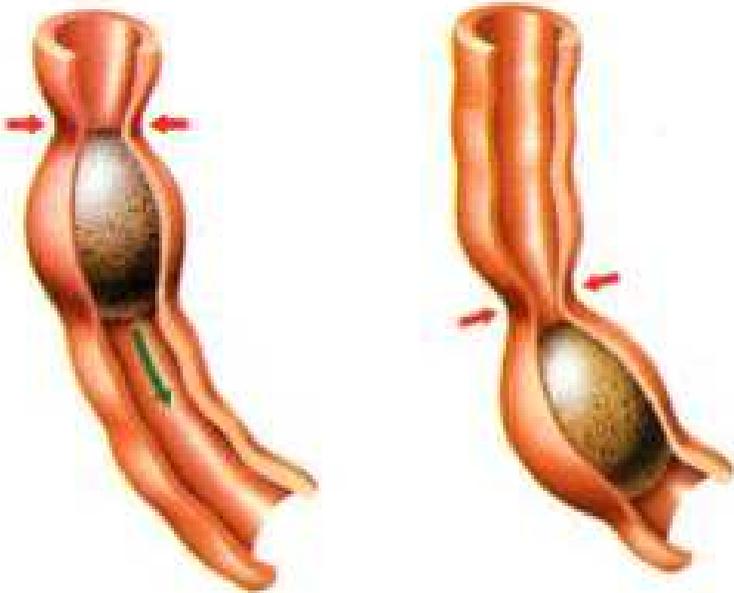
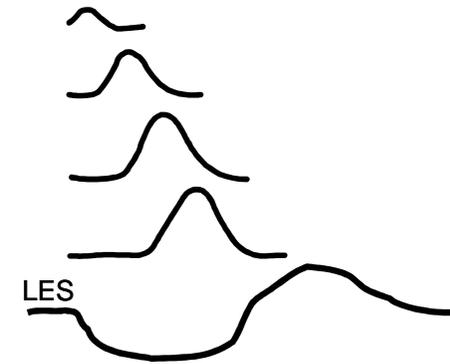
Obese Patients Have Stronger Peristalsis and Increased Acid Exposure in the Esophagus

Fernando Fornari • Sidia M. Callegari-Jacques •
Roberto Oliveira Dantas • Ana Lúcia Scarsi •
Liana Ortiz Ruas • Sérgio Gabriel Silva de Barros

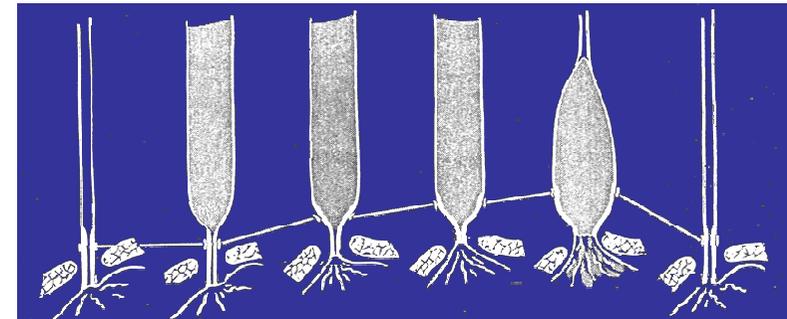


Esophageal motor patterns

PERISTALSIS



SHORTENING



STONE

