

Demystifying the Physiologic and Structural Defects in Hiatal Hernia

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Multidisciplinary Collaboration. Personalized Treatment Strategies. Patient Advocacy.



Disclosures

- Paid Consultant for Ethicon
- Paid Consultant for CDX

Hiatal Hernia

- A common finding in patients with GERD.
- 50% of patients with a hiatal hernia had esophagitis, whereas the vast majority (84%) of patients with esophagitis had a concomitant hiatal hernia. The association between esophagitis and hiatal hernia was highly significant ($P < 0.0001$).
- Endoscopic and radiographic studies suggest that 50 to 94 percent of patients with GERD have a hiatal hernia as compared with 13 to 59 percent of controls

Dig Dis Sci. 1979;24(4):311.

Two-Sphincter Hypothesis

SCIENTIFIC REPORTS

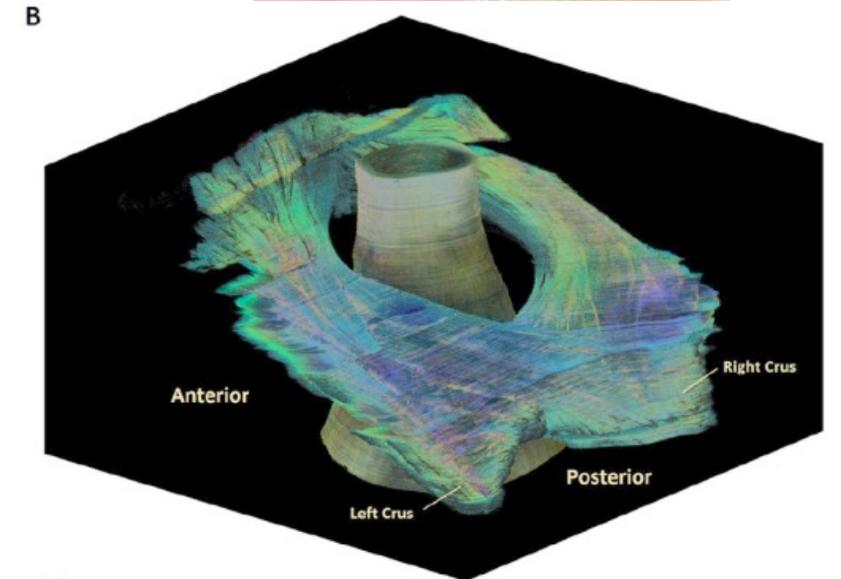
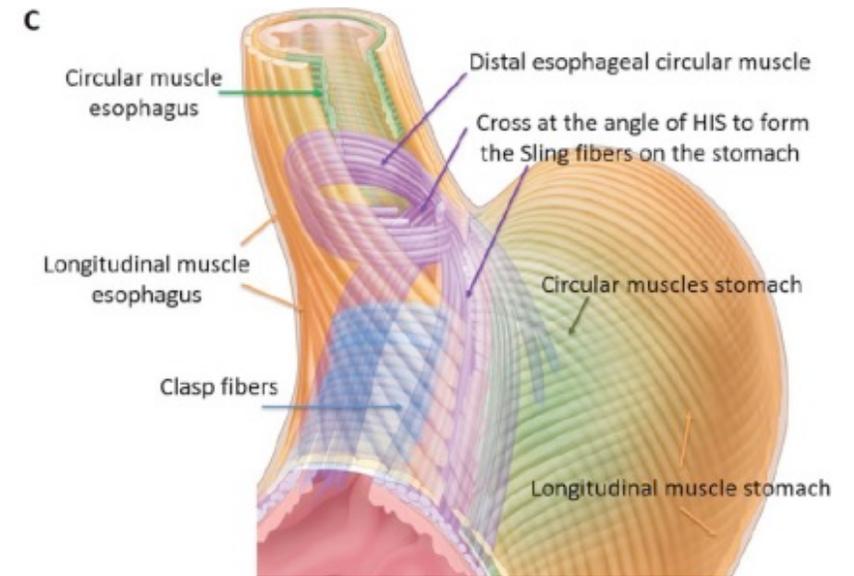
OPEN

Three-Dimensional Myoarchitecture of the Lower Esophageal Sphincter and Esophageal Hiatus Using Optical Sectioning Microscopy

Received: 3 July 2017
Accepted: 21 September 2017
Published online: 13 October 2017

Ali Zifan¹, Dushyant Kumar¹, Leo K. Cheng² & Ravinder K. Mittal¹

- HD Cross Sectional Imaging of Fresh Cadaver
- 3D Reconstruction
- Pair of Nooses
 - **LES**: Circular Muscle Cross at Angle of His to form Sling
 - **CD**: Right Crus Major Component



Scientific Reports Oct 2017

Two-Sphincter Hypothesis

J Gastrointest Surg (2013) 17:236–243
DOI 10.1007/s11605-012-2074-4

2012 SSAT POSTER PRESENTATION

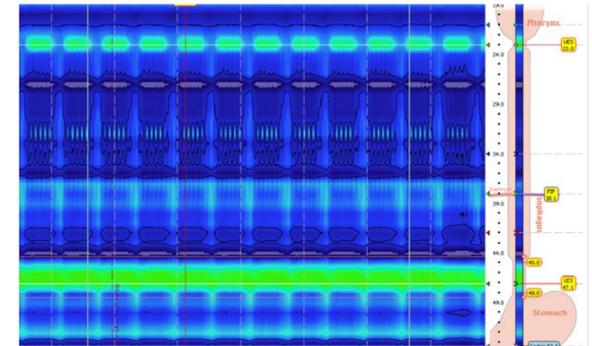


Length and Pressure of the Reconstructed Lower Esophageal Sphincter is Determined by Both Crural Closure and Nissen Fundoplication

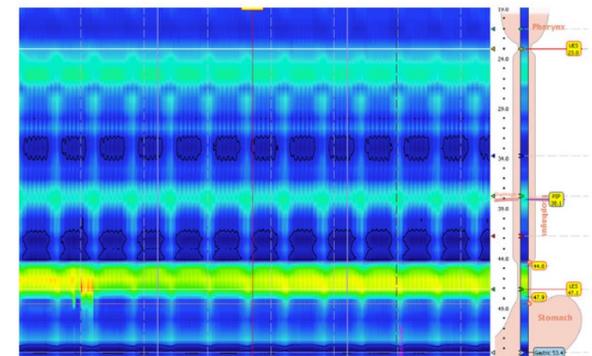
Brian E. Louie • Seema Kapur • Maurice Blitz •
Alexander S. Farivar • Eric Vallières • Ralph W. Aye

- Intraop HRM after Full Hiatal Dissection
 - 18pts
- Increase in Length
 - 0.54 cm Crural Closure
 - 0.72 cm Nissen
 - P = 0.7
- Increase in Barrier Pressure
 - 10.2 mmHg Crural Closure
 - 3.5 mmHg Nissen
 - P = 0.07

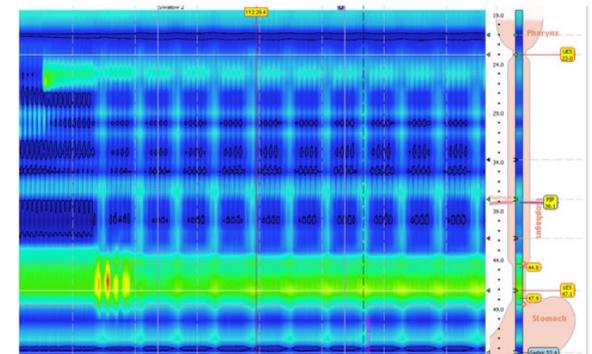
a Manometry after complete hiatal dissection



b Manometry of completion of component 1



c Manometry of completion of component 2



Barrier Is More Than The LES. . . .

Quantifying Factors Essential to the Integrity of the Esophagogastric Junction During Antireflux Procedures

Dessislava I. Stefanova, MD, Jessica N. Limberg, MD,* Timothy M. Ullmann, MD,* Mengyuan Liu, MD,* Jessica W. Thiesmeyer, MD,* Toni Beninato, MD, MS,* Brendan M. Finnerty, MD,* Felice H. Schnoll-Sussman, MD,† Philip O. Katz, MD,† Thomas J. Fahey III, MD,* and Rasa Zarnegar, MD*✉*

- 100 Consecutive GERD Pts
 - 45 Nissen, 44 Toupet, 11 LINX
- Intraop EndoFlip
 - DI, CSA, Balloon Pressure & HPZ Length
- HH Repair Vast Majority of Change to EGJ Barrier
 - 80% CSA & DI
 - 60% HPZ Length
- No Difference Between Nissen, Linx, Toupet
- Conclusion: Overall HH Accounted for 80% Repair

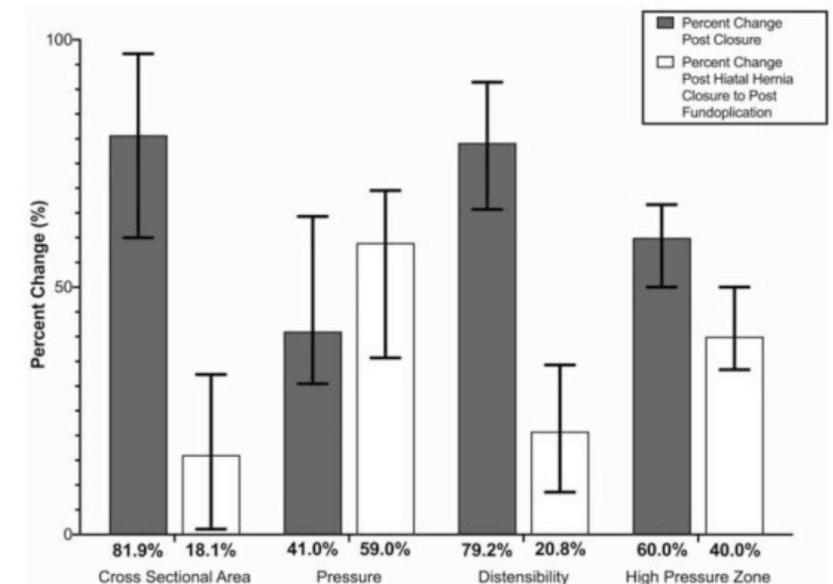


FIGURE 2. Percent changes in LES parameters during surgery. LES indicates lower esophageal sphincter.

Annals of Surgery Sept 2020

What Goes Bad in GERD Patients??

Are the Crura Abnormal??

ORIGINAL ARTICLE

WILEY 

Anatomical and functional deficiencies of the crural diaphragm in patients with esophagitis

M. Â. N. e Souza¹ | R. A. Nobre² | P. C. Bezerra¹ | A. A. dos Santos³ |
D. Sifrim⁴

- 20 GERD / Esophagitis Pts
 - 7 LA Grade A
 - 13 LA Grade B
 - 9 HH (1.2-5.8cm)
 - 11 NO HH
- 43 Controls
- HRM & EUS
- Measured R Crural Thickness & Crural Contribution to the Barrier

Neurogastroenterol Motil June 2016

What Goes Bad in GERD Patients??

Are the Crura Abnormal??

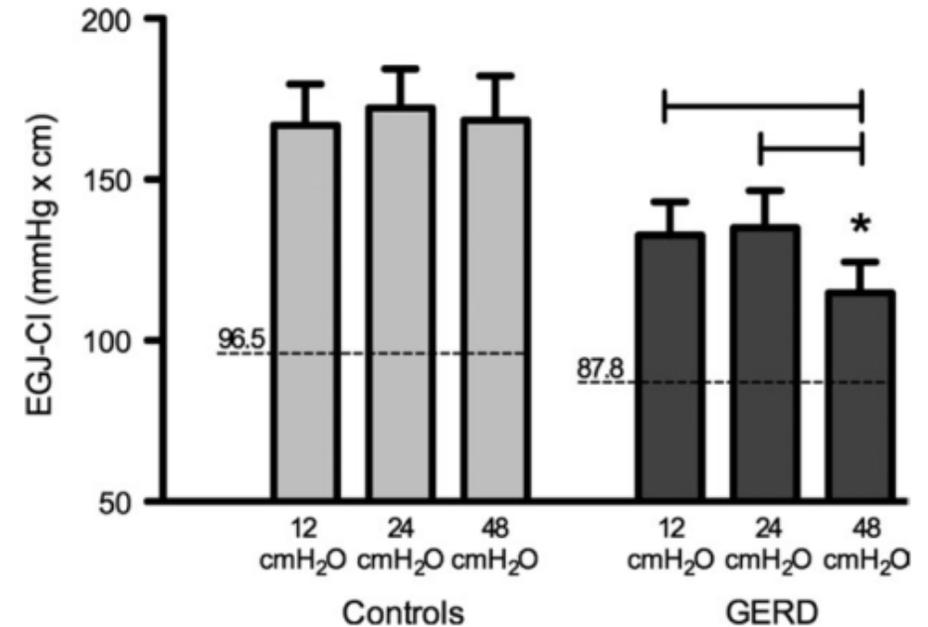
Anatomical and functional deficiencies of the crural diaphragm in patients with esophagitis

M. Â. N. e Souza¹ | R. A. Nobre² | P. C. Bezerra¹ | A. A. dos Santos³ | D. Sifrim⁴

- Results

- Crural Contribution Lower in GERD pts (P=0.011)
 - EGJ CI
 - R Crura Thinner
 - 0.37 cm vs 0.49 (P<.02)

- Functional Deficiency of the Crura in GERD Pts



Structural Defect in the Crural Muscle?

ORIGINAL ARTICLE

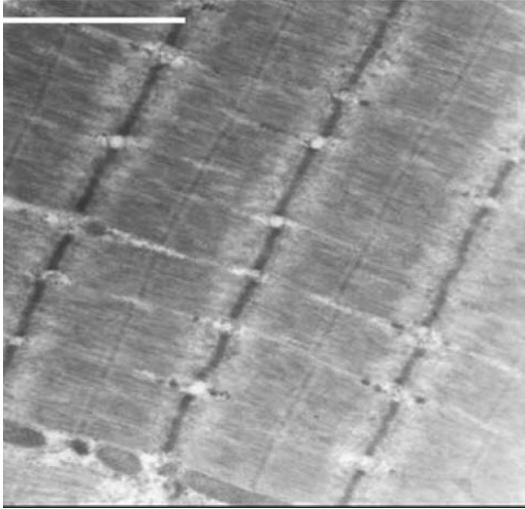
Hiatal Hernia Recurrence: Surgical Complication or Disease? Electron Microscope Findings of the Diaphragmatic Pillars

Landino Fei • Gianmattia del Genio • Gianluca Rossetti •
Simone Sampaolo • Francesco Moccia • Vincenzo Trapani •
Marco Cimmino • Alberto del Genio

- Laparoscopic Samples from PEL & Crura
 - Analyzed by transmission electron microscopy.
- 33 pts with GERD & HH
 - pH +
 - Small HH 1-4cm
 - Excluded PEH, HH \geq 5cm, Recurrent HH
- 15 Controls (No GERD)
 - Lap Chole pts

J Gastrointest Surg (2009) 13:459–464

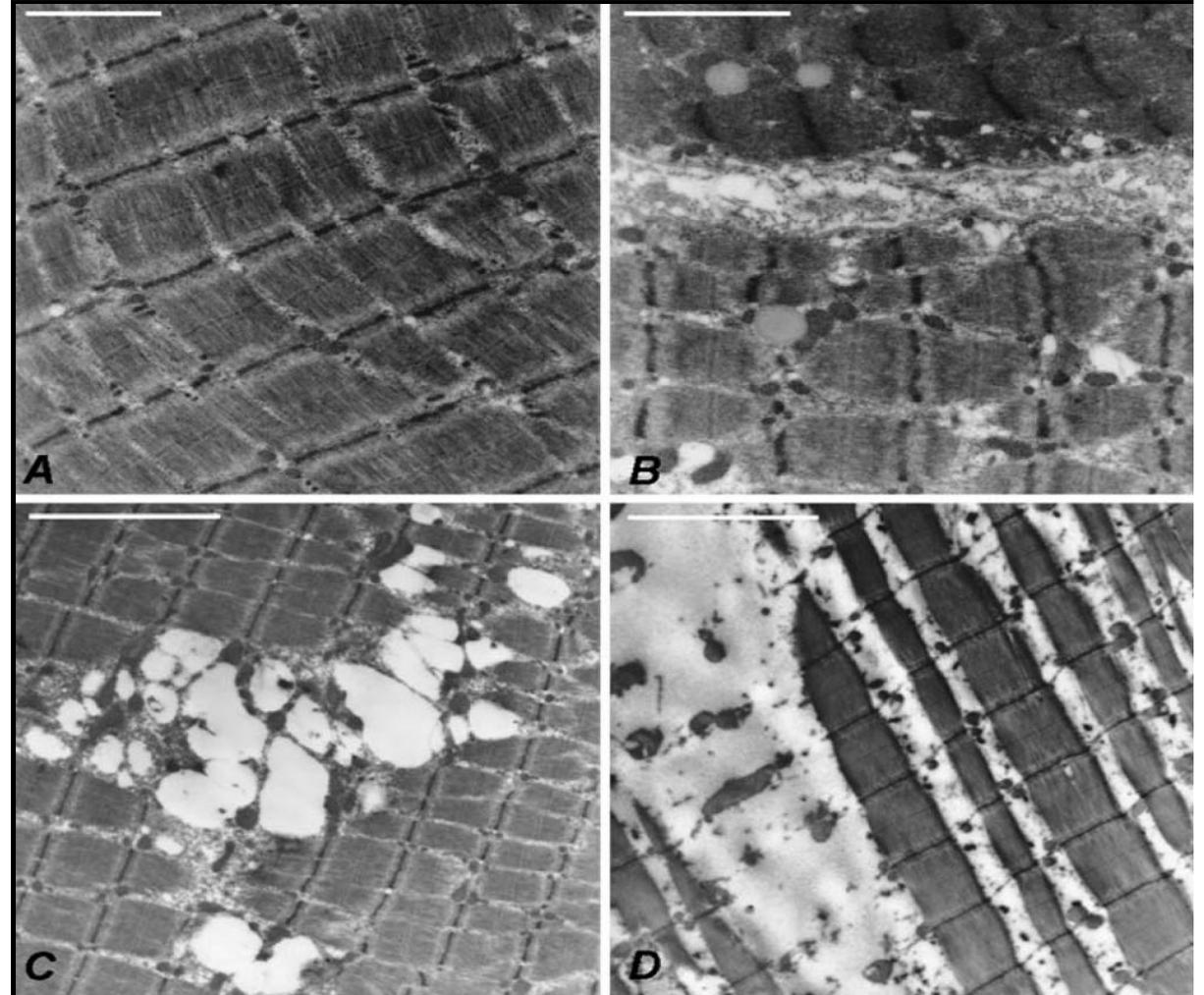
Structural Defect in the Crural Muscle?



Normal TEM of crura

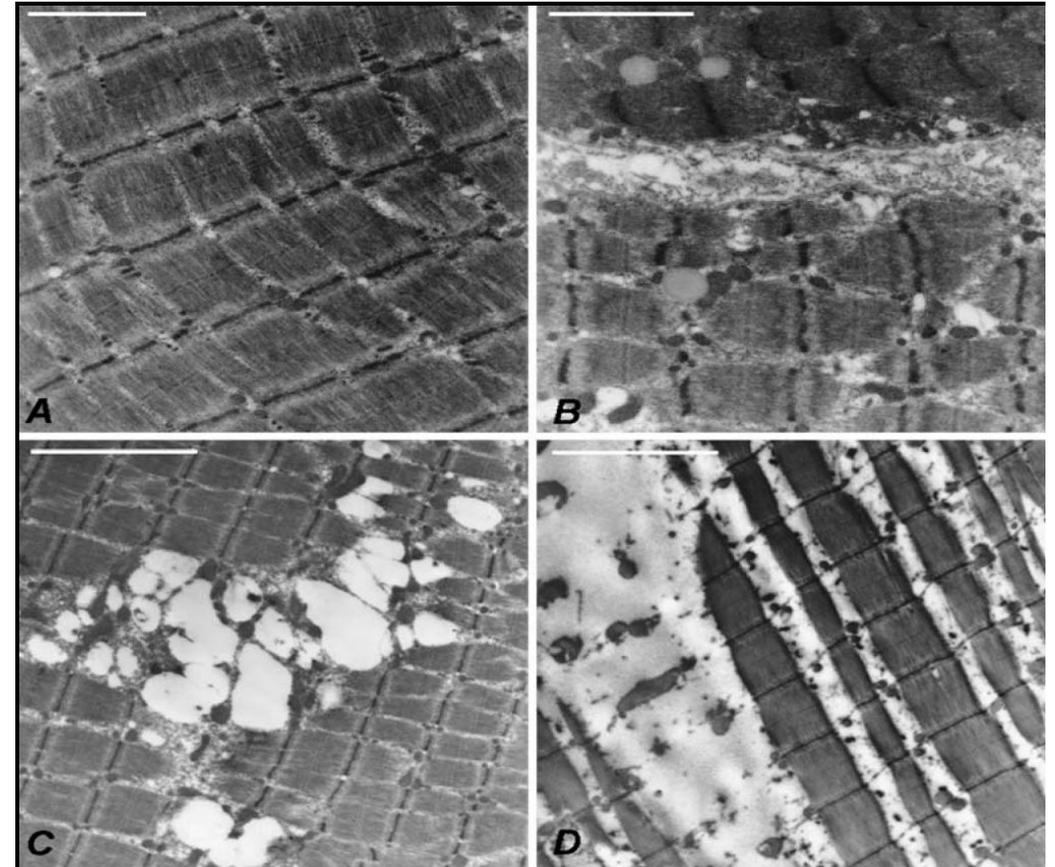
Table 1 Grading of the Electron Microscope Pillar Changes

Grade	Ultrastructural findings
I	Dilation of the intermyofibrillar spaces
II	Swelling of sarcotubular structures
III	Focal degeneration of myofibrils
IV	Extended disruption–degeneration of the muscle architecture



Structural Defect in the Crural Muscle?

GERD / HH Pts
94% Muscular Abnormalities of the Crura
75% Had Severe Abnormalities
No Abnormalities of the PEL
Controls
No Abnormalities of Crura or PEL



J Gastrointest Surg (2009) 13:459–464

Structural Defect in the Crural Muscle?

Laparoscopic hiatal hernia repair
Is the mesh hiatoplasty justified?



Ann. Ital. Chir., 2014 85: 38-45

51 GERD/HH Pts
30 Controls (Chole, Appy, Splenic Cyst)

90.2% Alteration in Crural Architecture
75% Severe
Lap Chole, Appy, Spleen had no abnormalities

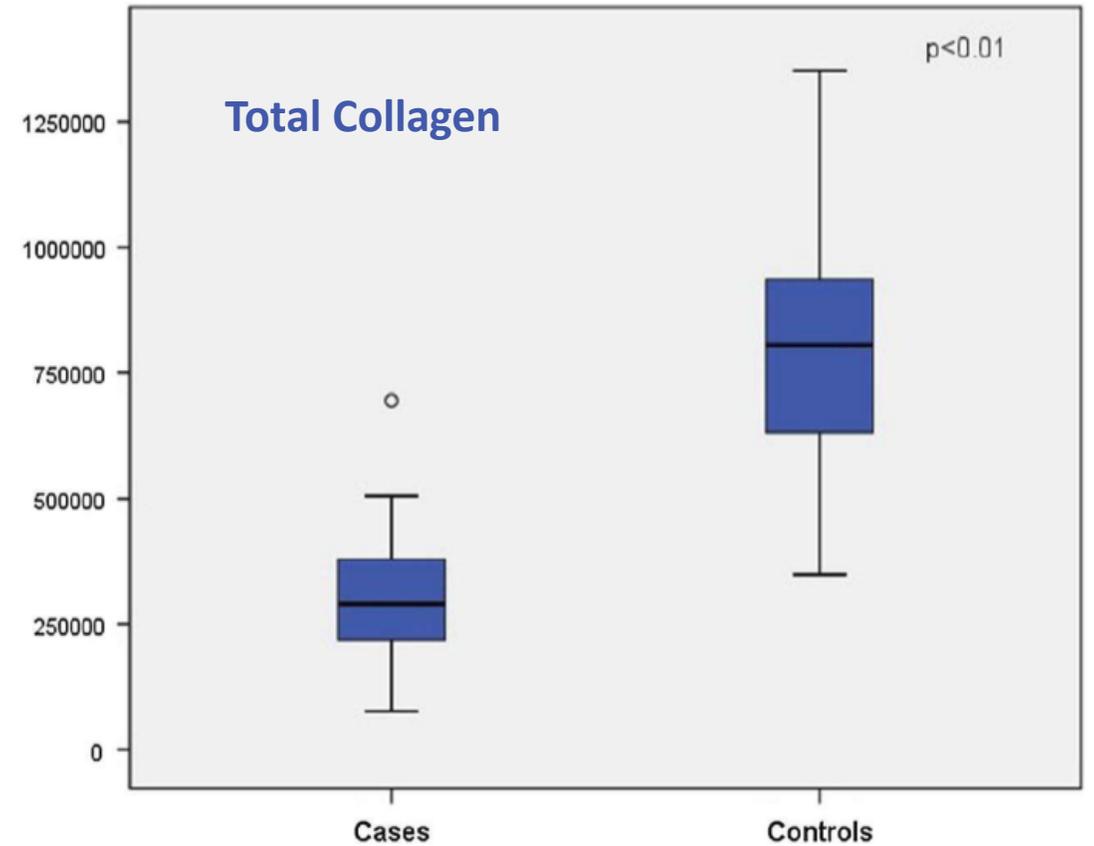
Anal. Ital. Chir., 85,1, 2014

GERD: Connective Tissue Disease?

Hiatal hernia and gastroesophageal reflux: Study of collagen in the phrenoesophageal ligament

V. von Diemen¹ · E. N. Trindade¹ · M. R. M. Trindade²

- Samples of POL
 - 29 Pts with Hiatal Hernia
 - 32 Cadavers without HH
- Quantified
 - Total, Type I & Type III Collagen
- Results:
 - 60% Lower in Hiatal Hernia Pts



Surg Endosc March 2016

Genetic Defect of Collagen?

Oesophagus

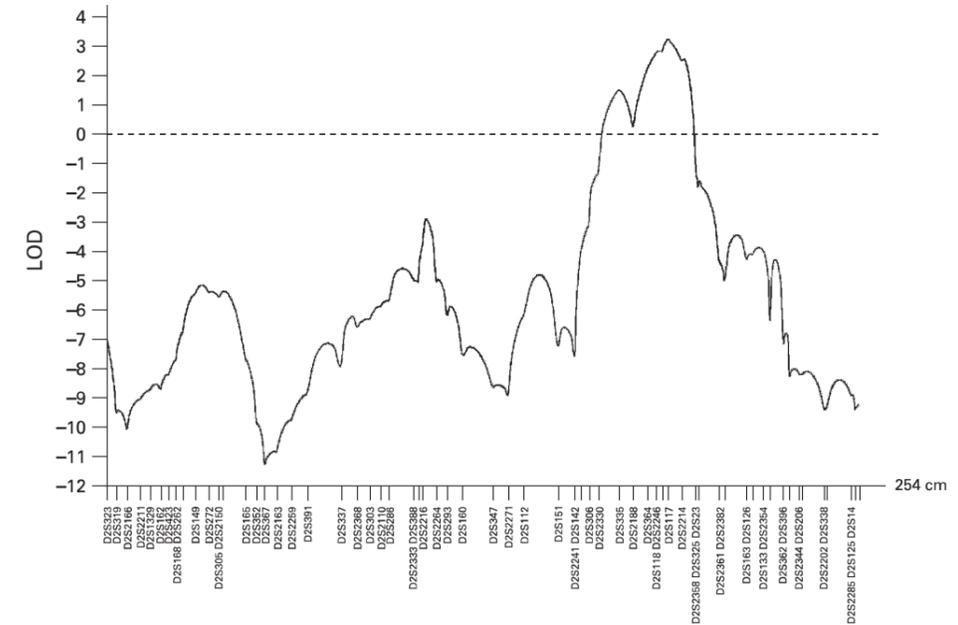


Collagen type III alpha I is a gastro-oesophageal reflux disease susceptibility gene and a male risk factor for hiatus hernia

B Åsling,¹ J Jirholt,¹ P Hammond,² M Knutsson,¹ A Walentinsson,¹ G Davidson,² L Agreus,³ A Lehmann,¹ M Lagerström-Fermer¹

- Genetic Analysis on 4 Patient Cohorts
 - 36 Familial Clustering (>800 patients)
 - Controls
 - Pediatric & Adult

- Connective Tissue/Genetic Etiology to GERD
 - Additional Protein Expression Analysis
- COL3A1
 - Chromosome 2
 - Collagen Type III



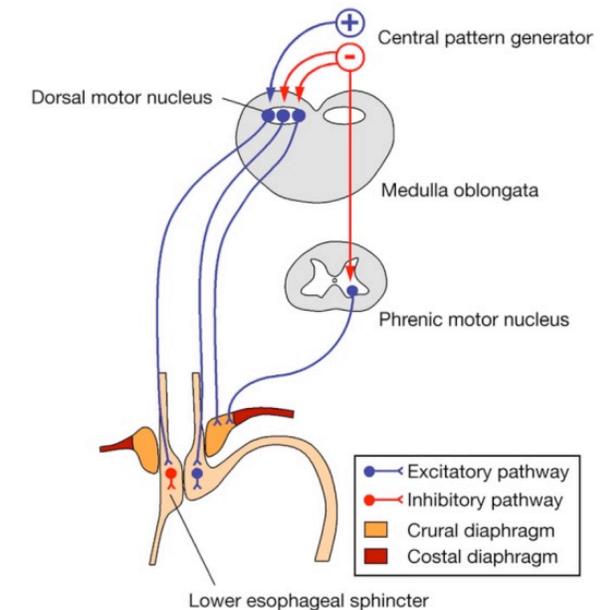
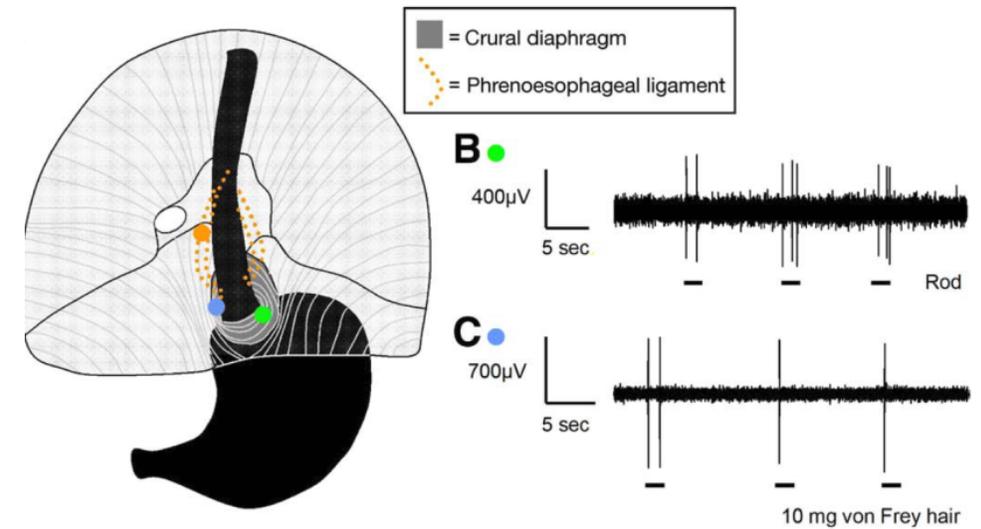
Gut 2009; 58: 1063-1069

Neuro Modulation of Crura?

Sensory and Motor Innervation of the Crural Diaphragm by the Vagus Nerves

RICHARD L. YOUNG,^{*,‡} AMANDA J. PAGE,^{*,‡,§} NICOLE J. COOPER,^{*} CLAUDINE L. FRISBY,^{*} and L. ASHLEY BLACKSHAW^{*,‡,§}

- Vagal Sensory and Motor Neurons Functionally Innervate the Crura
- Vagal Motor Neurons Innervate Both Crura and Distal Esophagus



GASTROENTEROLOGY 2010;138:1091-1101

Why Does Any of this Matter?

Why Does AntiReflux Surgery Fail?

Temporal patterns of hiatus hernia recurrence and hiatal failure: quality of life and recurrence after revision surgery

A. Suppiah,¹ P. Sirimanna,^{1,2} S. J. Vivian,³ H. O'Donnell,³ G. Lee,³ G. L. Falk^{1,2,3}

¹Concord Repatriation General Hospital, Sydney, Australia, ²The University of Sydney, NSW2006, Australia, and

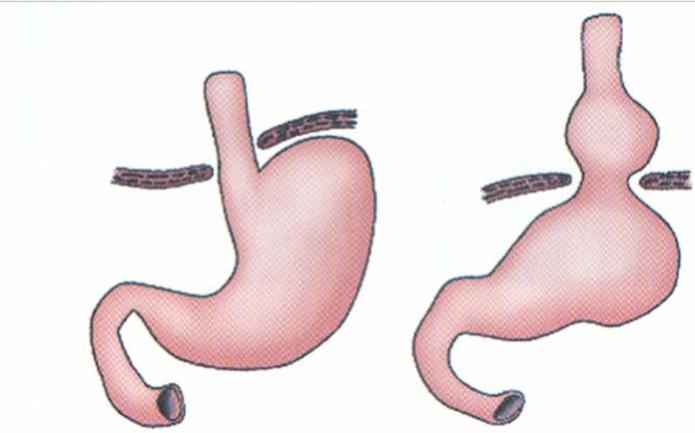
³Sydney Heartburn Clinic, Lindfield, Australia, 2070

- 284 pts with Recurrent GERD
 - Median F/U 10yrs
- Reasons for Failure
 - Intact Crura?
 - Type of Hernia
- Achilles Heel: HH Recurrence
 - 14.1% Intact Hiatus
 - 85.9% HH Recurrence

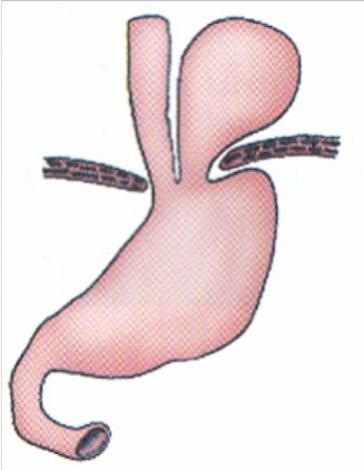
Dis Esophagus. 2017 Apr 1;30(4):1-8

Types of Hiatal Hernias

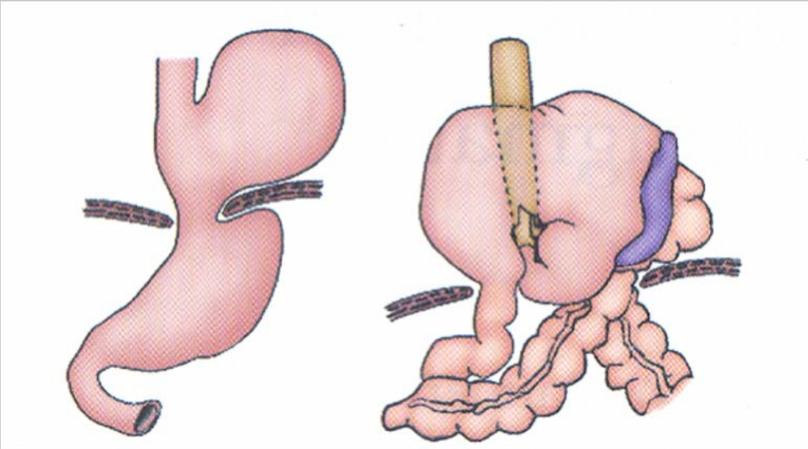
Type 1



Type 2



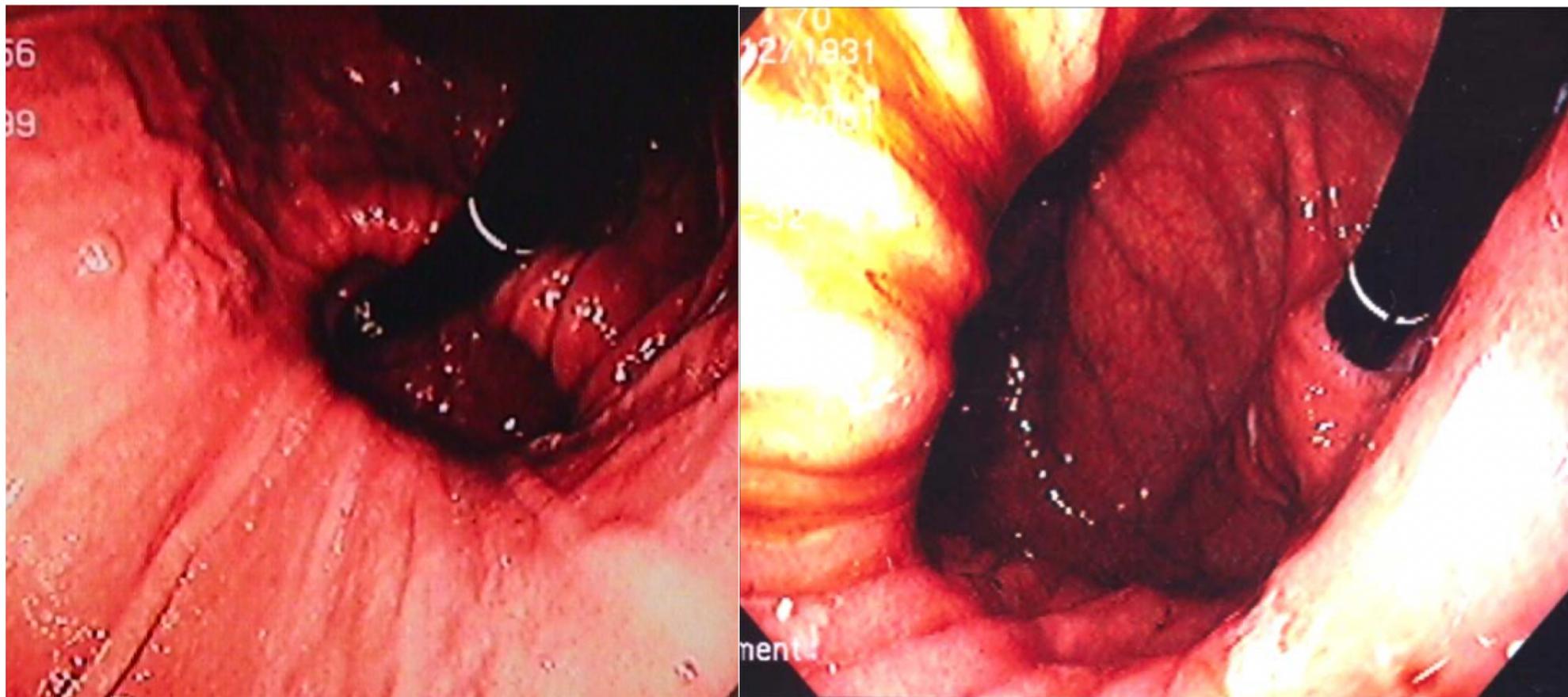
Type 3



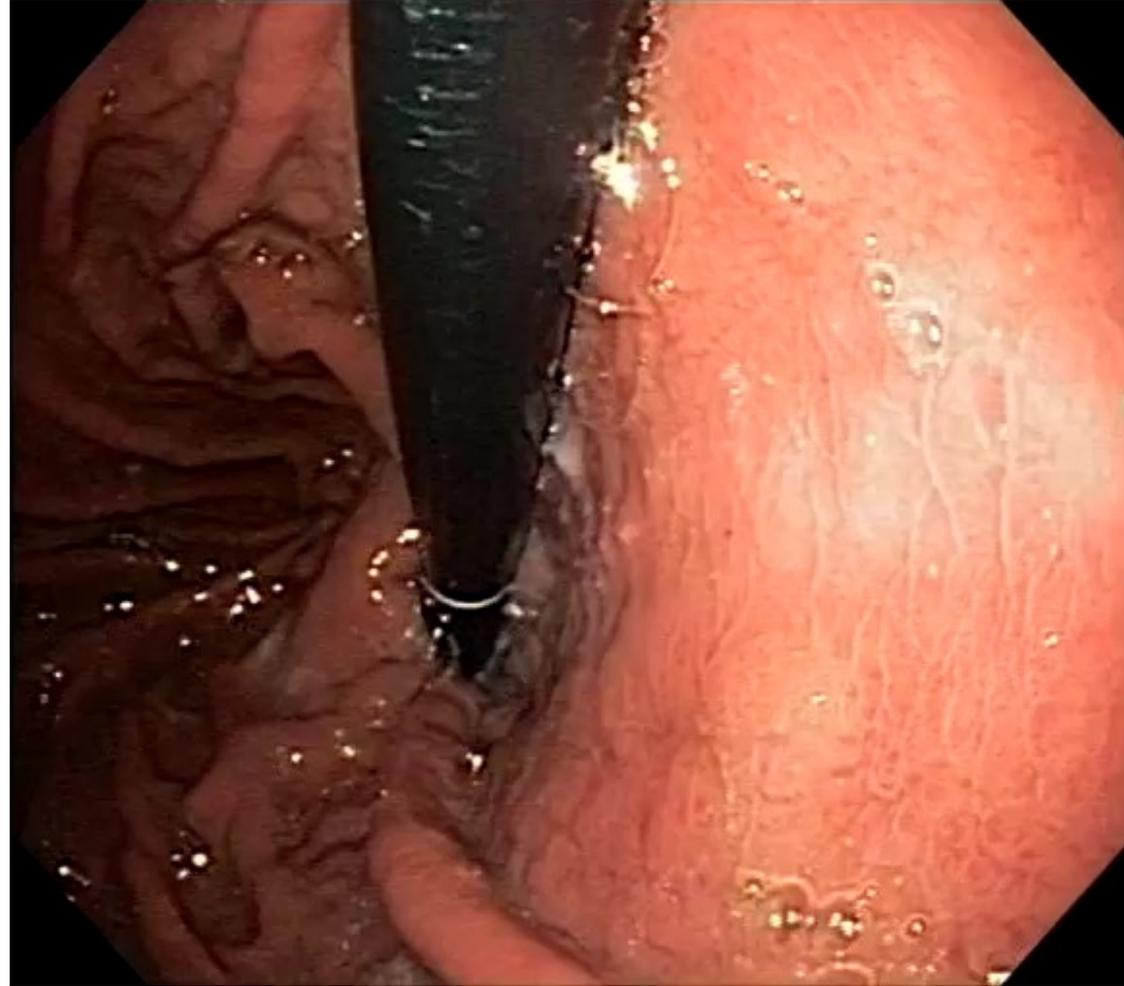
Type 4

Hutter M and Ratner DW. Shackelford's 6th Ed

Correct identification of hiatal hernias.



Endoscopy for the evaluation of GERD



Summary

- Hiatal hernias are extremely common.
- Crura plays a key role in the antireflux barrier
- Connective Tissue / Genetic Component
- Failure of Anti-Reflux Procedures
 - Failure of the Crural Repair (HH)
- Take time to identify hiatal hernias on endoscopy prior to embarking on endoscopic therapies
- Accurately characterize hiatal hernias in the endoscopy report.

Thank you!



Multidisciplinary Collaboration. Personalized Treatment Strategies. Patient Advocacy.

