

# An approach to Functional abdominal pain in children

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# Objectives

- To learn about the diagnostic criteria for Functional Gastrointestinal Disorders (FGIDs)
- To understand the underlying basis of abdominal pain, with special emphasis on functional abdominal pain (FAP)
- To know the clinical presentation, diagnostic evaluation and therapeutic approach to children with FAP
- To know prognostic factors

# Functional GI Disorders

Definition, Diagnostic Criteria and Epidemiology

# Organic vs. Functional disorders

	Organic disease	Functional disease
History	Clear symptoms	Vague symptoms
Physical	Abnormal signs	Normal exam
Lab Tests	Abnormal	Normal
Radiology	Abnormal	Normal
Special Tests	Abnormal	Normal
Medications	Effective	Poor benefit
Family Involvement	Little	Intense

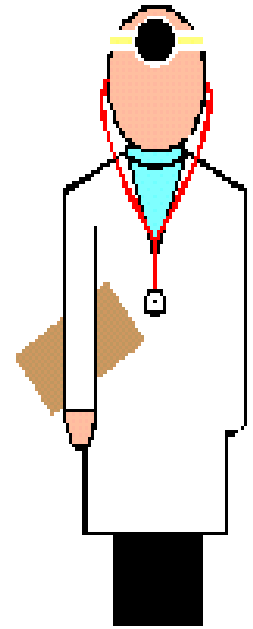
# FGIDs: Genetic or Environmental

## Genetic Susceptibility and the Role of Environment

- Some infants inherit a temperament characterized by GI reactivity to stress, which constitutes a genetic susceptibility to FGIDs
- A temperament-sensitive reactivity in infants has been suggested in association with three other biological systems: cardiovascular, neuroendocrine, and immunologic
- Conversely, environmental factors during early life clearly play a role in the development of FGIDs
- Plasticity of neonatal brain allows early life events to program physiologic responses to stress during infancy, and
- These responses may be perpetuated later into life

# FGIDs: Role of Environment

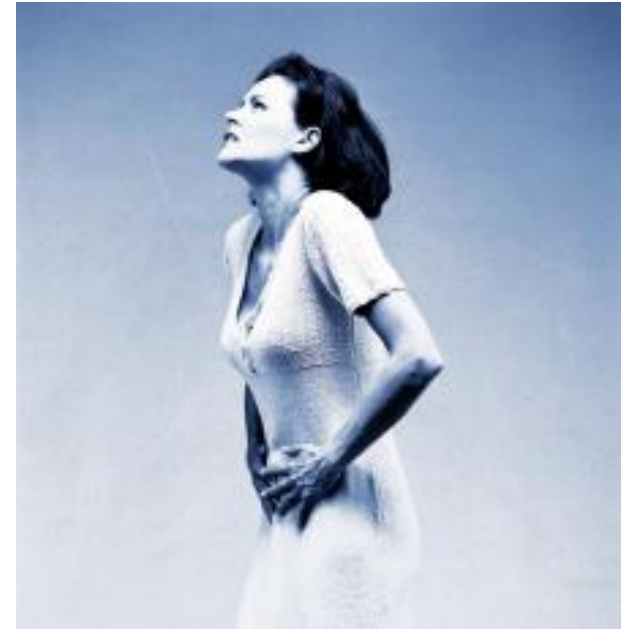
- Children learn illness-related attitudes and behaviors from their parents and caretakers (including physicians)
- Healthcare utilization by children closely resembles that of their parents<sup>1</sup>
- Thus, not only should treatment for children include their parents, but the family should be taught about the role that psychosocial factors play in the development and perpetuation of FGIDs



Med Care 1987;25:616-26

# FGIDs: Rome-III Criteria

- A. Esophageal Disorders
- B. Gastroduodenal Disorders
- C. Bowel Disorders
- D. Functional Abdominal Pain
- E. Biliary Disorders
- F. Anorectal Disorders
- G. Childhood FGIDs: Infants and Toddlers
- H. Childhood FGIDs: Children and Adolescents



Gastroenterology 2006;130:1519-1526

# H. Childhood Functional GI Disorders:

## Child/Adolescent

### Rome-III Diagnostic Categories

- **H1. Vomiting and Aerophagia**
  - H1a. Adolescent Rumination Syndrome
  - H1b. Cyclic Vomiting Syndrome
  - H1c. Aerophagia
- **H2. Abdominal Pain-related Functional GI Disorders**
  - H2a. Functional Dyspepsia
  - H2b. Irritable Bowel Syndrome
  - H2c. Abdominal Migraine
  - H2d. Childhood Functional Abdominal Pain
  - H2d1. Childhood Functional Abdominal Pain Syndrome
- **H3. Constipation and Incontinence**
  - H3a. Functional Constipation
  - H3b. Non-retentive Fecal Incontinence





# Functional abdominal pain

Definition, Diagnostic Criteria and Epidemiology

# FAP: Definition

- Definition of chronic/recurrent (functional) abdominal pain is derived from Apley's pioneering study of 1000 children in late 1950s
- He characterized abdominal pain as chronic or recurrent if at least one episode of pain occurs every month for 3 consecutive months and is severe enough to interfere with routine functioning



# H. Childhood Functional GI Disorders

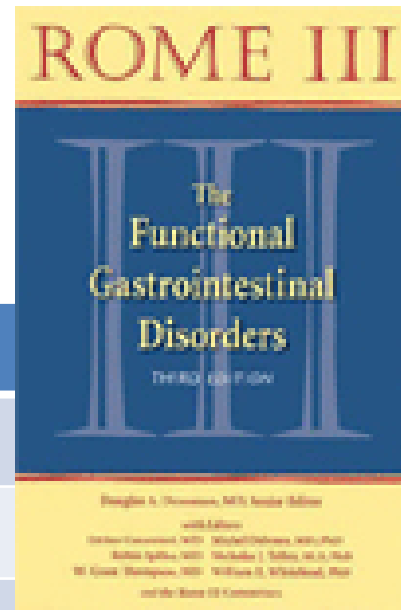
## Child/Adolescent

### H2d. Diagnostic Criteria\* for Childhood Functional Abdominal Pain

Must include *all* of the following:

1. Episodic or continuous abdominal pain
2. Insufficient criteria for other FGIDs
3. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subject's symptoms

*\*Criteria fulfilled at least once per week for at least 2 months before diagnosis*



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# H. Childhood Functional GI Disorders

## Child/Adolescent

### H2d1. Diagnostic Criteria\* for Childhood Functional Abdominal Pain Syndrome

Must include childhood functional abdominal pain at least 25% of the time, and 1 or more of the following:

1. Some loss of daily functioning
2. Additional somatic symptoms such as headache, limb pain or difficulty sleeping

*\*Criteria fulfilled at least once per week for at least 2 months before diagnosis*



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# Epidemiology



- Initial studies indicated chronic abdominal pain affects 10-15% of school-age children<sup>1</sup>
- More recent data suggest that approximately 20% of middle and high school students experience abdominal pain on a daily to weekly basis<sup>2</sup>
- Early on, an organic cause for FAP in only 5-10% of patients with chronic abdominal pain
- Progressive development of endoscopic techniques, manometries and imaging have enhanced the ability to identify organic etiologies
- In the Hyams study of 227 children 33% were found to have definable causes of FAP<sup>2</sup>

# Functional abdominal pain

## Neurophysiology of Abdominal Pain

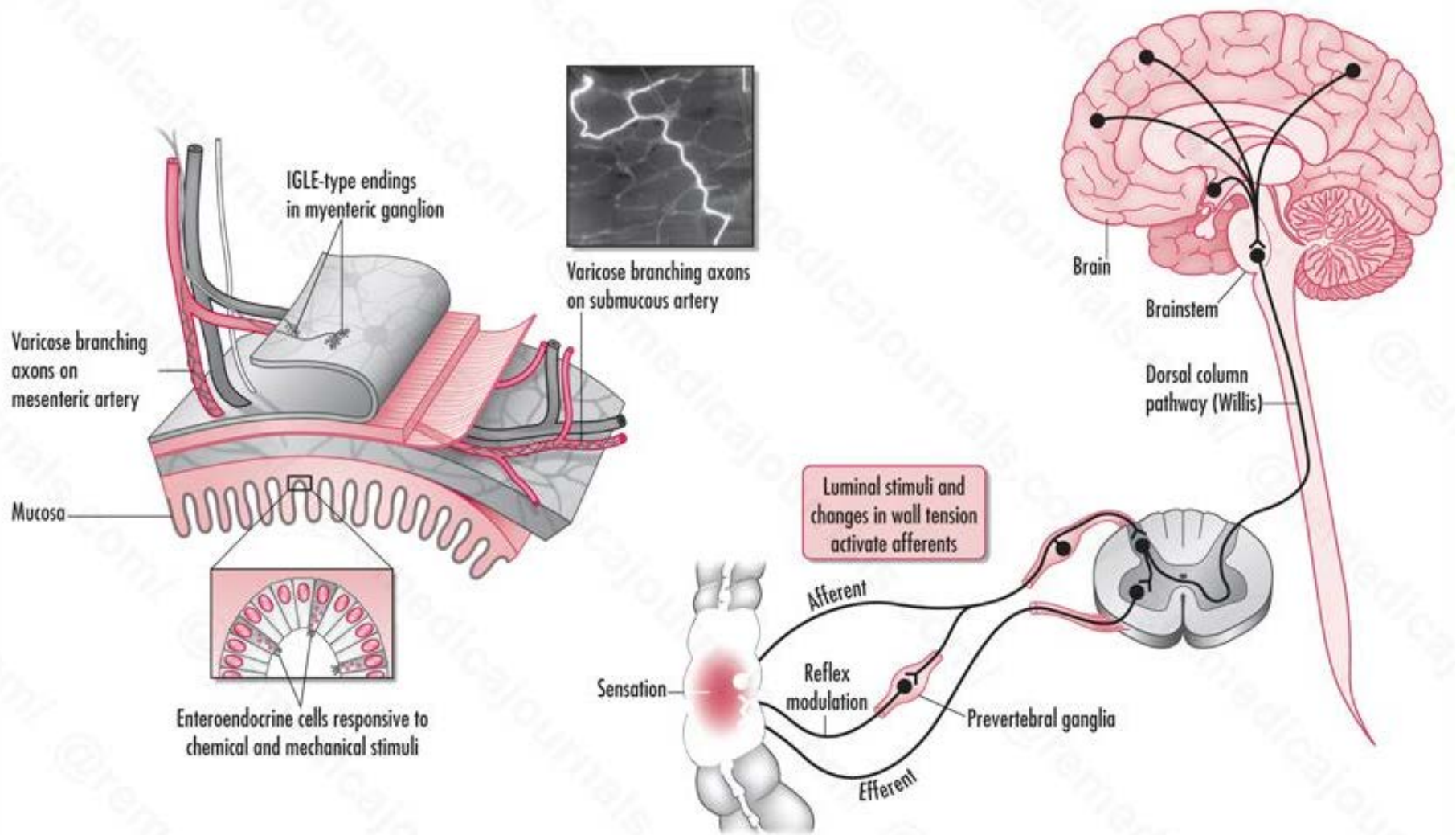


# Neurophysiology of Abdominal Pain

- Viscera is unique (2 sets of innervations):
  - Vagal and splanchnic nerves, or
  - Pelvic and splanchnic spinal nerves
- Both systems participate in reflex control of the gut, but their involvement in sensation differs
  - Pain and discomfort from the GI tract are conveyed to the CNS principally by the spinal afferents
  - Vagal afferent activation usually does not convey pain sensation, but may modulate spinal visceral (and somatic) pain



# Pathways in Visceral Sensation





# Neurophysiology of Abdominal Pain

- Neurons in the supraspinal sites also exhibit increases in excitability, especially in brain areas associated with descending modulation of spinal sensory transmission
- These circuits can be influenced by
  - Cognitive
  - Affective, and
  - Stressful influences
  - Also by expectation, and
  - Prior experience



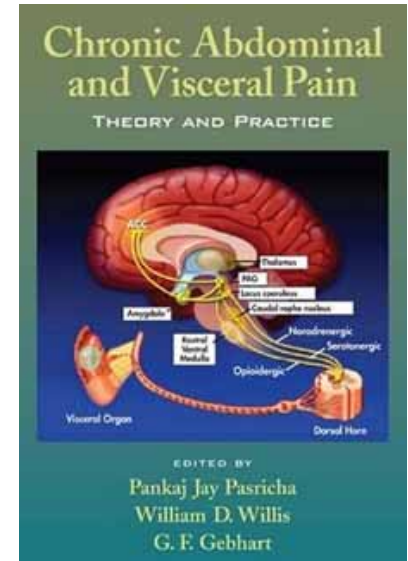
# Neurophysiology of abdominal pain

## Visceral Pain

Originates from the  
viscera

## Parietal Pain

Originates from the  
more superficial  
structures

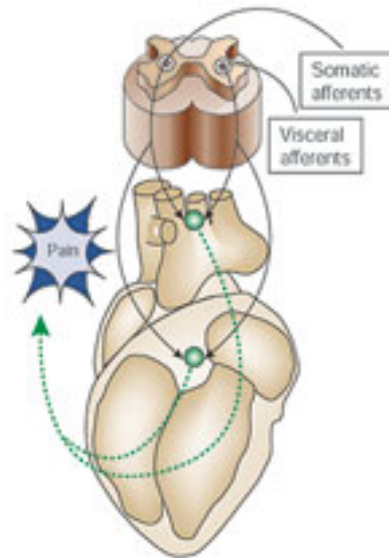
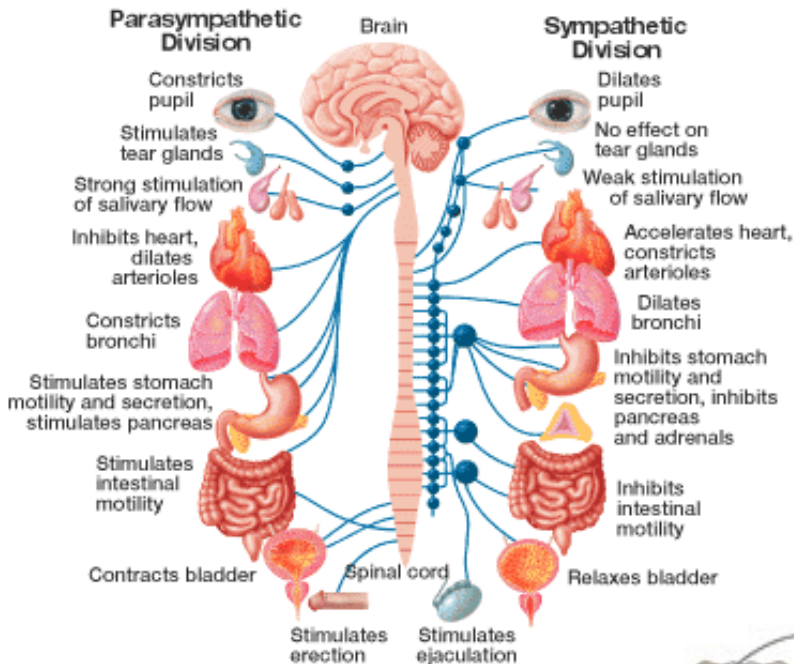


Nociceptors are present throughout the GI tract, including viscera and supporting structures. Basic understanding of the differences between the two are vital to determine the cause of patient's complaints.

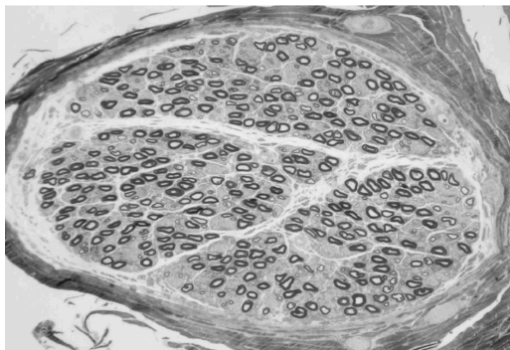


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# Visceral Pain



- Originates from afferent nerve fibers located within the walls or tissues of abdominal viscera
- The pain impulse is carried by small, unmyelinated, slow conducting C fibers
- The termination of these fibers within the spinal column occurs over 4-5 spinal segments
- The pain is therefore poorly localized



C-Fibers

# Location of abdominal pain

The location is determined by the level at which the afferent nerve fibers from the viscera enter the spinal cord.

## T<sub>5</sub> – T<sub>9</sub> Foregut Structures

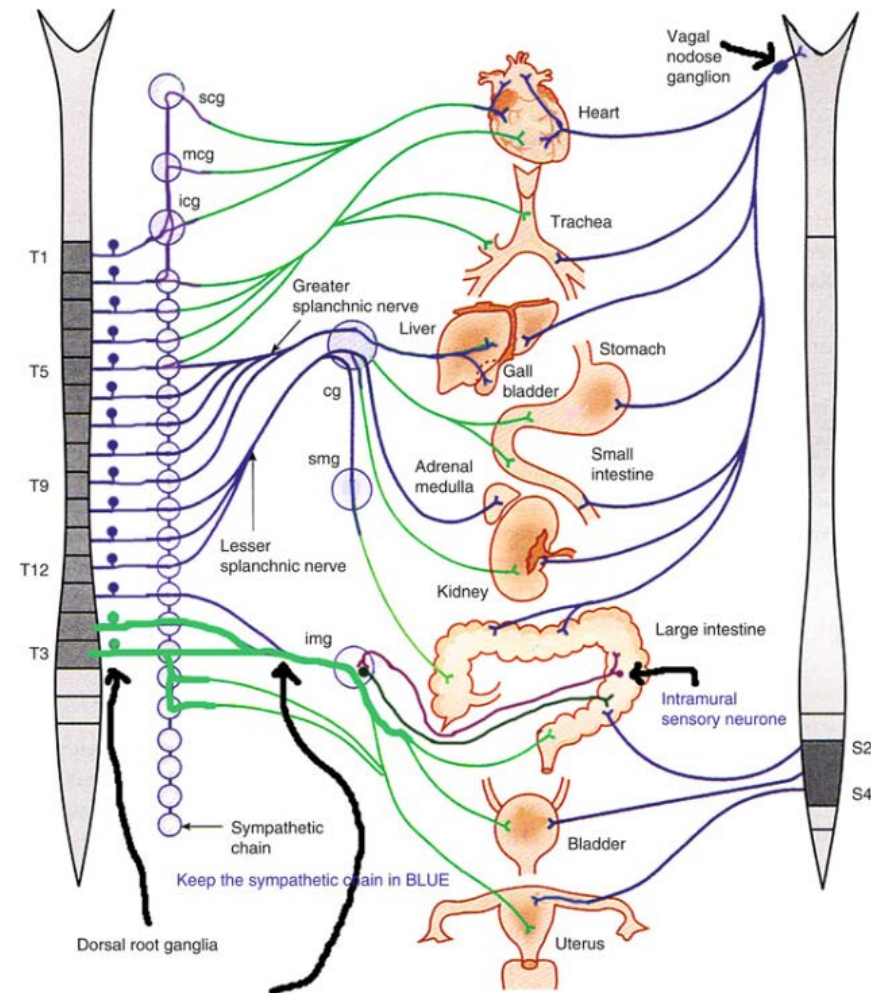
Distal Esophagus  
Stomach  
Duodenum  
Liver, Biliary Tree, Pancreas

## T<sub>8</sub> – L<sub>1</sub> Midgut Structures

Most of small intestine  
Appendix  
Cecum/Ascending  
Proximal 2/3<sup>rd</sup>s of Transverse colon

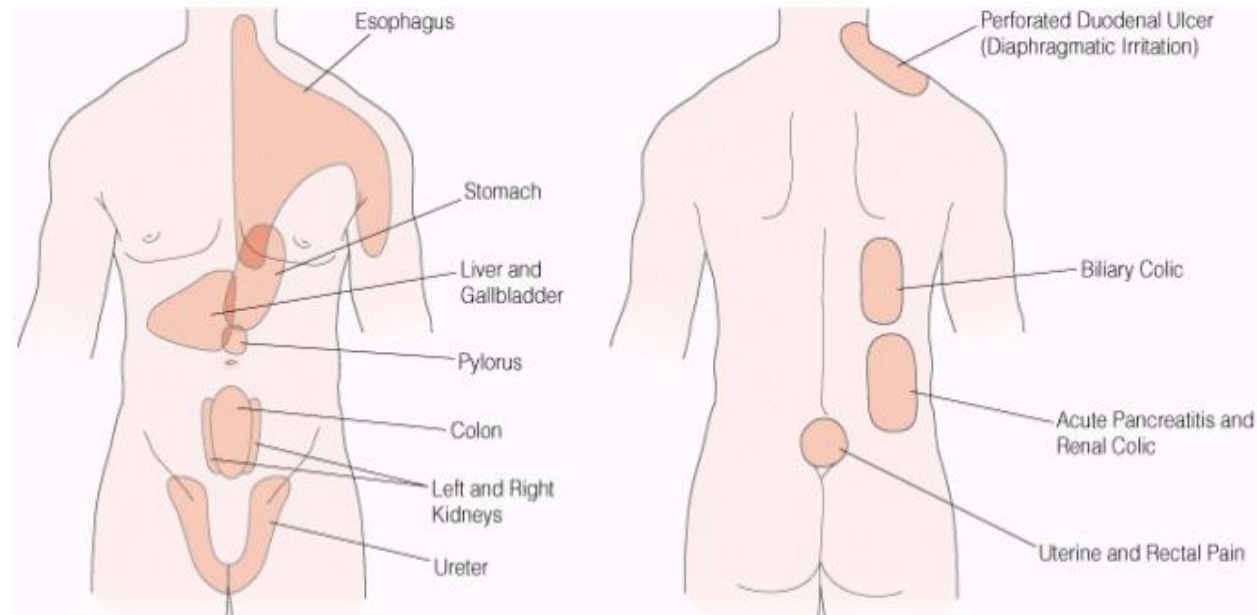
## T<sub>11</sub>-L<sub>1</sub> Hindgut Structures

Distal 1/3<sup>rd</sup>s of Transverse colon  
Descending  
Rectosigmoid



# Parietal pain

- Conducted by both C-fibers as well as large, thinly myelinated, rapid conducting A-delta fibers
- The A-delta fibers respond to tactile, thermal and chemical stimulation



- They convey discriminatory information, including the location and intensity of the stimuli
- Most parietal nociceptors are located in the peritoneum and supporting tissues; pain is therefore often aggravated by movement.

# Functional Abdominal Pain

## Pathophysiology

### Three Main mechanisms:

1. Autonomic Nervous System (ANS) Function
2. Gastrointestinal motility
3. Altered intestinal permeability



# Functional Abdominal Pain

## Pathophysiology

### Autonomic Nervous System Abnormalities:

- ANS is considered to be a biological anlage for internal emotional responses
- 13 children with FAP were studied, using pupillary responses as a measure of ANS responsivity
  - At rest or under stress, no difference between healthy children and children with RAP
  - Following stress, a significant difference was noted, as a small initial decrement in the pupillary children with FAP
  - The mechanism of drive reduction in children with FAP is aberrant.

# Functional Abdominal Pain

## Pathophysiology

### Autonomic Nervous System Abnormalities:

- Children with FAP were more likely to have unstable ANS recovery from stress<sup>1</sup>
- Increased rectosigmoid activity was noted after sub-Q injection of prostigmine in children with FAP compared to controls
- Patients with FAP have increased sensitivity to parasympathetic stimulation, indicating a generalized autonomic imbalance<sup>2</sup>



# Functional Abdominal Pain

## Pathophysiology

### Effect of GI Motility:

- Major function of motility
  - Accomplish propulsion
  - Mix gut contents with digestive juices
  - Expose the fluids to the absorptive surface
  - Facilitate temporary storage in certain regions
  - Prevent retrograde movement of contents
  - Dispose off residues
- Motility is controlled by (central and peripheral) reflexes, and descending modulation from the brain-gut axis
- Communication between regions is achieved by neurogenic and myogenic signals longitudinally along the gut

# Functional Abdominal Pain

## Pathophysiology

### Effect of GI Motility:

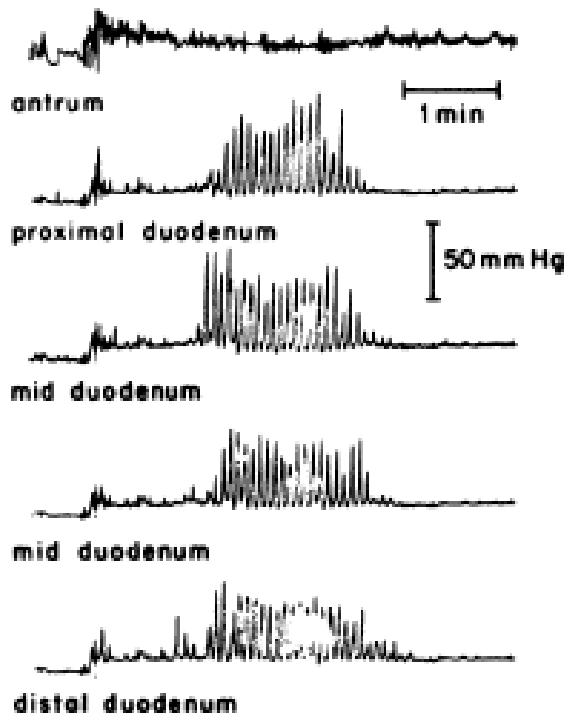
- Patients with FAP had more frequent MMCs (Migrating Motor Complexes), with slower propagation velocities compared to healthy controls
- They also had high amplitude duodenal contractions associated with events of abdominal pain

# Functional Abdominal Pain

## Pathophysiology

### Effect of GI Motility:

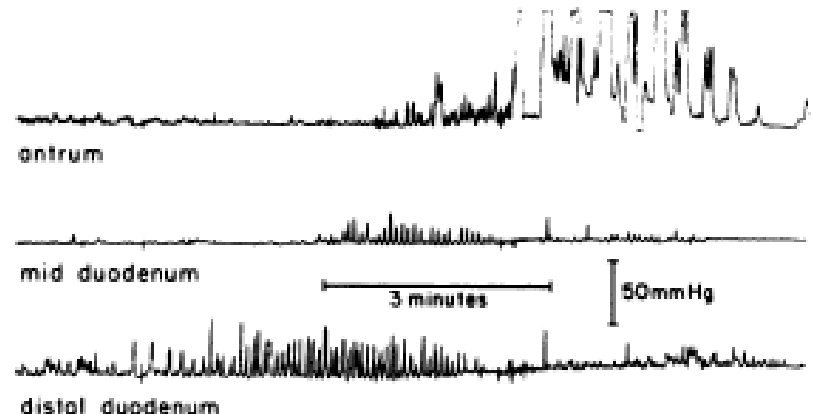
Abnormalities of antroduodenal motility were found in 39/44 (89%) children with RAP



Non propagated burst of phasic duodenal contractions



Tonic, non propagated duodenal contractions



Retrograde propagation



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# Functional Abdominal Pain

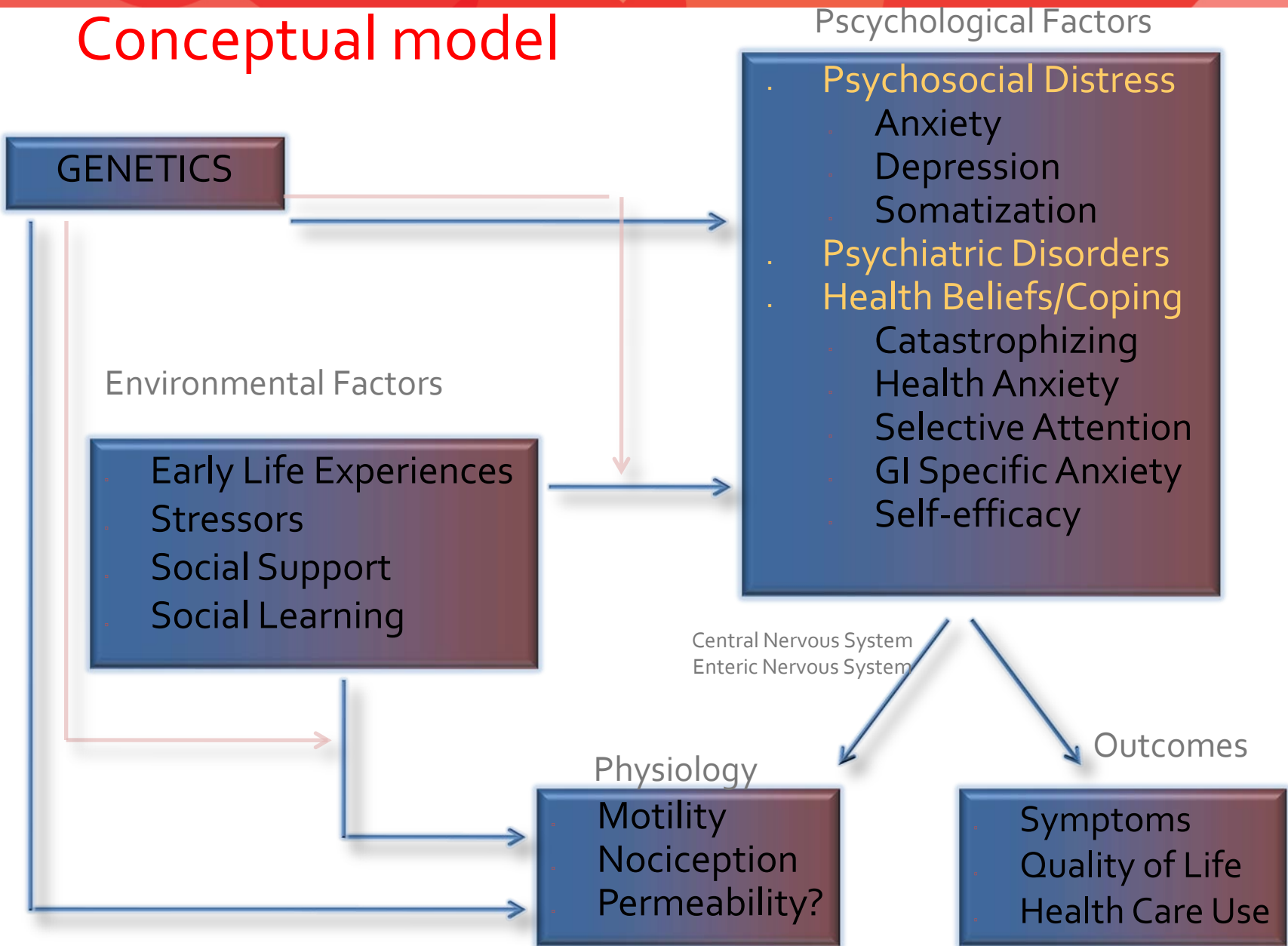
## Pathophysiology

### Altered Intestinal Permeability:

- Small bowel permeability by measuring 24-hour urinary excretion of oral  $^{51}\text{Cr}$  EDTA showed significantly higher excretion in children with FAP
- Indicating increased intestinal permeability
- Also correlated with histologic evidence of abnormalities in a subsequent study



# Conceptual model



# Functional abdominal pain

Clinical Presentation, Evaluation, and Differential Diagnosis

# Functional Abdominal Pain



- Patient age: >6 years
- Paroxysmal abdominal pain
- Pain location: epigastric, periumbilical or infraumbilical
- Pain characterization: dull, sharp or cramping, non-radiating
- Symptom duration: 3 or more episodes in 3 months
- Symptom free intervals
- No temporal correlation of pain with activity, meals or bowel patterns
- Pain interferes with normal activity
- Normal PE and laboratory studies

# Organic Abdominal Pain

- Age <5 years
- Constitutional symptoms:
  - fever, wt. Loss, growth retardation, joint symptoms
- Emesis: esp. bile or blood stained
- Pain awakens the child from sleep
- Well localized, away from the umbilicus
- Referred pain to back, shoulders or extremities
- Dysuria, hematuria or flank pain
- Family h/o IBD, PUD, etc.
- Perianal disease: tag, fissure or fistula
- Occult or gross blood in stool
- Abnormal screening laboratory studies: ↑ WBC/ESR, ↓ protein/albumin, anemia





## Symptom-Related Behaviors Often Seen in Patients with FAPS

***Expressing pain of varying intensity through verbal and non verbal methods***, may diminish when the patient is engaged in distracting activities, but increase when discussing in a psychologically distressing issue or during examination

***Urgent reporting of intense symptoms*** disproportionate to available clinical and laboratory data (eg, always rating the pain as “10” on a scale from 1 to 10)

***Minimizing or denying a role for psychosocial contributors***, or of evident anxiety or depression, or attributing them to the presence of the pain rather than to understandable life circumstances

***Requesting diagnostic studies*** or even exploratory surgery to validate the condition as “organic”

***Focusing attention on complete relief of symptoms*** rather than adaptation to a chronic disorder

***Seeking health care frequently***

***Taking limited personal responsibility for self-management***, while placing high expectations on the physician to achieve symptom relief

***Making requests for narcotic analgesics*** when other treatment options have been implemented

Gastroenterology  
2006;130:1492-1497



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# Clinical evaluation

- A comprehensive interview with the child and parents, a thorough PE, and specific laboratory studies
- Convey genuine concerns
- Establish a trusting and supportive environment
- Ensure adequate time is allotted for this process



# History

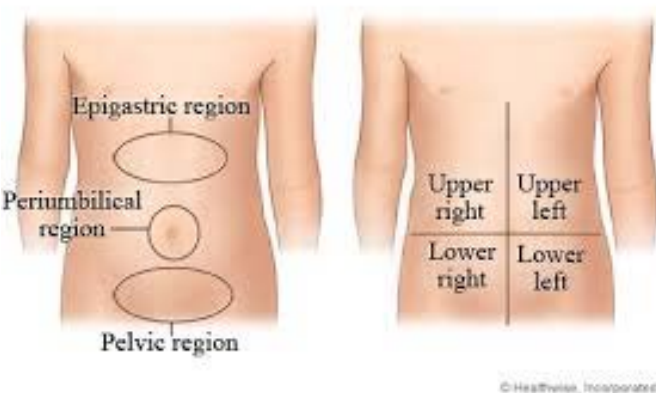
- Important to hear from patient, minimizing parental influence
- Pain: quality, intensity, duration, timing,
- Sleep quality and duration
- Temporal connection of pain with other symptoms: nausea, emesis, diarrhea, constipation, fever
- Relationship of pain to food consumption and kind, activity or posture

# History

- Medications: prescriptions, OTCs
- Effects of prior medications
- Effects of prior therapies



Abdominal pain diaries: detailing time, location, intensity and character of pain, time and content of meals, daily activities and stooling pattern



# Physical Examination

- Begin during history gathering
- Carefully note patient's expressions, respiratory pattern, body positioning, and movements, or how he gets up or down from the examination table
- Note interactions of the child with family
- Meticulous PE cannot be overemphasized
- All clothing should be removed (gown)



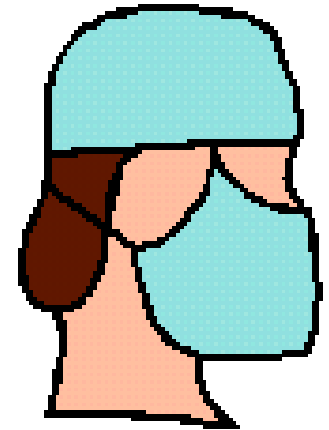
# Physical Examination

- Perform PE with parents in the room
- Ask the patient about their preference in case of older adolescents
- Careful review of growth parameters

Abdominal examination: inspection, character of bowel sounds, detailed palpation of entire abdomen, flanks, perianal region, digital rectal examination

# Laboratory and Imaging Studies

- Initial screening: CBC/Diff, UA and culture, serum transaminases, ESR, serum proteins, fecal leukocytes and O&Ps
- These may R/O 95% organic etiologies<sup>1</sup>
- Non invasive studies: Lactose breath H<sub>2</sub>
- Abdominal ultrasound: ?Utility, ?Detrimental value
- Endoscopy/Specialized tests



# Differential Diagnosis

<b><u>Malabsorptive Conditions</u></b> Post surgery gastrectomy Intestinal disease sprue Pancreatic insufficiency	<b><u>Inflammatory Bowel Disease</u></b> Crohn's Disease Ulcerative Colitis Other microscopic colitis Collagenous colitis Mast Cell Disease
<b><u>Dietary Factors</u></b> Lactose intolerance Caffeine Alcohol Fat containing, gas producing foods cruciferous vegetables	<b><u>Psychiatric Conditions</u></b> Panic Disorder Depression Somatization Disorders
<b><u>Infections</u></b> Bacteria Campylobacter, Salmonella, Yersinia Parasites Giardia lamblia	<b><u>Miscellaneous Conditions</u></b> Endometriosis Endocrine Tumors Carcinoid Zollinger-Ellison Syndrome VIPoma HIV Disease



# Functional abdominal pain

## Therapeutic Approach and Prognosis

# FAP: Therapy

- Directed to the family as a unit
- Education, reassurance and ongoing support for patient and family members
- Important to clearly review with the child and parents how the diagnosis was reached often going through history, exams, and tests
- Stress to the family it is a common condition affecting 20% of school aged children

# Therapy

- Goal of therapy is to decrease stress for child, while promoting normal school attendance and activities
- Pain is GENUINE and not imagined
- Express this is similar to headache
- Stress: research clearly indicates that abnormal GI motility and autonomic activity is related to stress

## Factors contributing to an effective patient-physician relationship include

Empathy towards the patient

Patient education

Validation of the illness

Reassurance

Treatment negotiation

Establishment of reasonable limits in time and effort

## General aspects of care to consider: (before implementing specific therapy such as antidepressants, or anticonvulsants)

Setting of treatment goals

Helping the patient take responsibility

Basing treatment on symptom severity and degree of disability

Referral to mental health professional

Referral to multidisciplinary pain treatment center, if available



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# Therapy

- Rapid return to school
- Acknowledgment of pain without encouraging it should be emphasized to the parents
- Secondary gains should be discussed clearly
- Specific rules should be set (negative feedback)
- No/harmful role of sedative/analgesic use

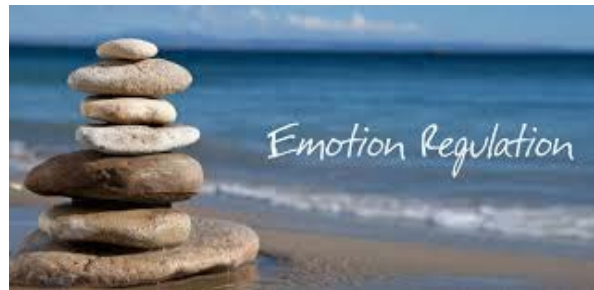
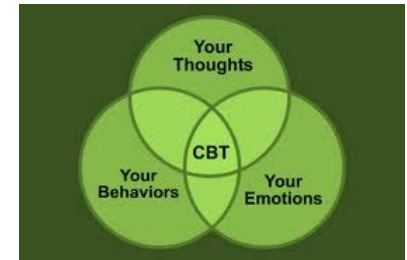
# Pharmacological Therapies

Agents	Comments
TCAs	Low daily doses
	No evidence of efficacy in RCTs
	Less effective than SNRIs in other chronic pain conditions
SSRI+SNRI combined agents	Venlafaxine, duloxetine
SSRIs	Useful when anxiety or depression co-exist
Analgesics	Offer limited benefit
Narcotic analgesics	Should be avoided
Anticonvulsants	Gabapentin, carbamazepine and lamotrigine
	Not specifically studied in FAPS
	Relatively safe and non-habituating
	May interrupt the cycle between pain and depression



# Psychological Therapy

- Potentially beneficial interventions include:
  - CBT
  - Dynamic or interpersonal behavioral therapy
  - Hypnotherapy
  - Stress management therapy
- Treatments have shown to improve
  - Mood
  - Coping
  - QOL
  - Healthcare costs
- Less demonstrable impact on specific visceral or somatic symptoms



# Complementary Therapies

## Commonly used therapies include:

- Spinal manipulation
- Massage therapy
- Accupuncture
- Data supporting their use is limited



## TENS (Transcutaneous Electrical Nerve Stimulation)

- Few reports
- Uncontrolled results are indeterminant

## Laparoscopy +/- adhesion lysis

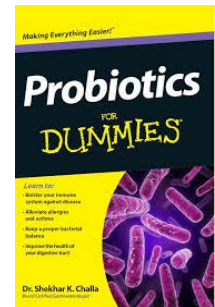
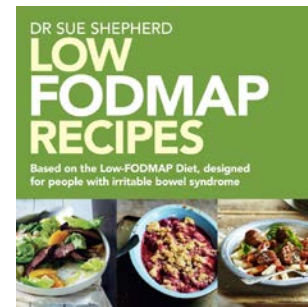
- Uncontrolled studies suggest benefit
- Outcome may be placebo related
- Unsuspected diagnoses are rare
- Laparoscopic adhesiolysis or diagnostic laparoscopy alone have similar outcomes suggesting no additional advantage of the adhesiolysis
- Spontaneous improvement in 6 months?





# Dietary Therapy

- Food allergies and intolerances
  - Milk
  - Gluten
  - FODMAPs
  - Other allergies and intolerances
- Functional foods for FAP
  - Fiber
  - Peppermint Oil
  - Probiotics
- Diet content vs. dietary habits



# Prognosis

## Worse Prognosis

- Male
- < 6 years
- Family “painful”
- Duration >6 months
- Education < HS
- SES: Lower
- Operations: frequent (Appendix, Tonsils)

## Better Prognosis

- Female
- >6 years
- Family normal
- Duration < 6 months
- Education  $\geq$  HS
- SES: middle upper
- Operations: infrequent

# Summary

- Functional GI Disorders are common and varied
- Abdominal Pain is very common in childhood and can be functional and organic
- It is important to understand the differences in the underlying mechanisms
- Clinical markers may indicate functional vs. organic abdominal pain
- A detailed and careful evaluation is necessary to diagnose FAP
- Specific laboratory and imaging studies are indicated for the diagnosis

# Summary

- Differential diagnosis of FAP should be carefully considered
- Goal of therapy is reduction of stress and anxiety in the child and the family
- Multidisciplinary approach is needed in therapy of FAP
- Good rapport with the patient and the family is useful in FAP therapy
- Prognosis of FAP may be identifiable based on the presenting features

# Thank you

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# FGIDs: Definition

- (Non organic) Functional GI disorders refer to those GI disorders where the clinical features cannot be explained on the basis of structural or biochemical abnormalities.
- FGID is not synonymous with Psychogenic or imaginary disorders
- Diagnostic Criteria-
  - Manning Criteria 1978
  - Rome Criteria 1989
  - Rome-II Criteria 1999
  - Rome-III Criteria 2006

# FGIDs: Definition

- Childhood FGIDs include a variable combination of often age-dependent, chronic, or recurrent symptoms not explained by structural or biochemical abnormalities
- They accompany normal development, or may be triggered by age-appropriate but maladaptive behavioral responses to internal or external stimuli

# FGIDs: Definition

- The diagnosis of some FGIDs depends on the child's ability to report symptoms.
- Some diagnoses are therefore not seen in children below a certain age, this does not mean that it is not present in that age group.
- Therefore childhood FGIDs are classified based on main complaints reported by children or their parents.