Functional GI Disorders

Infant Colic

Prof Tony Catto-Smith
Paediatric Gastroenterologist

Conflicts of Interest
Consultancies, Honoraria

Danone Nutricia	Astra Zeneca
Nestle	Glaxo Smith Kline
Mead Johnson	Janssen
Abbvie	Ferring
Johnson and Johnson	Merck

Infant colic - take home messages

Infant colic

- Common
- Almost always resolves by 4 mo
- It can severely damage family function
- Needs POSITIVE diagnosis
- Usually diagnosed by careful history and examination without lab tests, imaging or specialist referral

Management

- EDUCATE, REASSURE AND SUPPORT
- Soothing and feeding techniques
- Feeding and nutrition
- Brief dairy restriction, hydrolysed formula, probiotics - marginal benefit, temporizing
- Medications
- Unproven and potentially dangerous
- Supportive follow-up by GP
- General Paed - not specialist unless red flag features

Outcome

- Dysfunction - short and long-term (years)

Functional GI Disorders

- Describes a range of problems eg
  - Irritable bowel syndrome
  - Functional dyspepsia
  - Functional constipation
- Thought to be related to gut function
  - No obvious structural or biochemical cause
  - Motility, Sensation and Brain-Gut dysfunction
- Common worldwide
- Occur at any age - adults and children

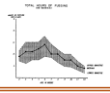
- Neonate and Toddlers (Rome IV 2016)
  - Infant regurgitation 30-67%
  - Infant colic 8-40%
  - Functional constipation 3-27%
  - Functional diarrhoea 7%
  - Cyclic vomiting syndrome 4%
  - Infant dyschezia 3%
  - Rumination syndrome 2%
- 50% infants signs or symptoms of > 1 FGID

INFANT COLIC = "cry-fuss behaviour", "unsettled behaviour" or "PURPLE crying"

Infant Colic
Persistent or excessive crying in an otherwise healthy infant

- Clinical and Research Definitions
  - Crying - No apparent reason (otherwise healthy)
    - ≥3 hr per day
    - ≥ 3 days per week
    - (≥ 3 weeks)
    - Infant less than 5 mo
    - Unable to be prevented or resolved by caregivers

Normal crying curve Brazelton 1962



- Epidemiology
  - Prevalence 8-40%
  - M=F
  - Breast=formula
  - Full term=preterm
  - ↑1st born and siblings?
  - ↑ Industrialized countries?
  - ↑Caucasian infants?

- Quality of Crying
  - Paroxysmal, Long-Lasting, Evening Peak
  - Qualitatively different from normal crying (louder, higher or more variable pitch, more dysphonic)
  - Associated with hypertonia
  - Inconsolable
- Family perceptions differ
  - 35% "colicky" babies met diagnostic criteria (Barr 1992)
  - Presentations differ dependent on family support and ease of access to medical care
  - Context and Quality rather than duration of crying
  - Is it abnormal for this FAMILY

Importance

- Infant
  - No physical harm short or long-term
  - Long term behavioural problems
  - At 3-4 yr (if colic >4mo)
    - Temper tantrums
    - "easily upset"
    - "more difficult" for parent but not child
  - At 10 yr – "fussy, aggressive, feelings of supremacy"
- Parents
  - Huge and immediate impact emotionally on parents individually, relationships between parents and also with infant
  - Risk of hurting infant to try to stop crying (3% report smother, slap or shaking. Reijneveld 2004). Related to parental perception and NOT to amount of crying
  - Stress, fatigue, guilt, depression, dissatisfaction with birth
  - At 1 yr – Persisting problems in marital communication, unresolved conflicts, dissatisfaction, affect, lack of empathy and flexibility (not at 3yr) – causal??

- Organic disease (history and physical)

Virtually any illness or condition can present with crying

- Paroxysmal unexplained crying + normal growth + normal development + normal physical findings = COLIC (probably)

vs

- Poor weight gain, abnormal development, abnormal physical examination = ORGANIC DISEASE?

Medical causes of infantile colic

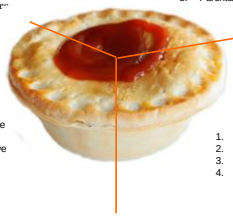
- Urinary tract infection
- Food protein allergy
- Reflux oesophagitis
- Other infection (otitis media, meningitis)
- Intestinal obstruction
- Corneal abrasion

<5% of cases

Freedman SB et al., Pediatrics 2009; 123:841-8

Colic is real. But what causes it?

- Cause unknown – theories
- Extreme normal spectrum OR a discrete entity?
- Sum of a number of factors



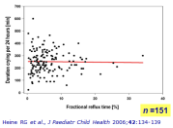
Psychosocial
1. Temperament and parents
2. Hypersensitivity to stimuli
3. Parental anxiety

Gastrointestinal
1. Faulty feeding
2. Cow milk protein intolerance
3. Lactose intolerance
4. Gastrointestinal fermentative immaturity
5. Intestinal hypermotility
6. Intestinal microflora and inflammation

Biological
1. Immature motor regulation
2. Increased serotonin
3. Tobacco and nicotine
4. Early form of migraine

Infant colic - NOT due to GOR

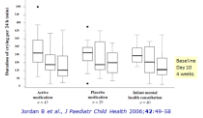
Crying duration and GOR



Heine RG et al., J Paediatr Child Health 2006;42:134-139

Acid reflux time NOT related to crying

Antireflux medications *vs* infant mental health intervention in infants with persistent crying



Jordan B et al., J Paediatr Child Health 2006;42:49-58

Time improves crying as much as PPI's and infant mental health intervention

Evaluation

- Diagnosed on history but confirmed in retrospect
- Behavioural tips
  - Schedule exam for peak crying if possible
  - Observe crying behaviour
  - Parental soothing/interactions
  - Infant's response
- History
  - Feed, stooling, sleep and vomiting
  - Risk for sepsis
  - Psychosocial factors
- Specific questions
  - When? (evening)
  - How long? (difficult – perception)
  - What do you do?
  - How do you feed baby?
  - How do you feel?
  - Impact on family?
- Examination
  - Observation during crying
  - Temperament
  - Growth
  - Full physical exam (differential very wide)
    - Pulse, perfusion, bruising, hypotonia, painful limb, fontanelle, FTT, abdominal distension, pain or mass, bilious or bloody vomiting, bloody stool

Management

- Confirm diagnosis
  - Education and reassurance
- Decrease crying
  - Feeding problems
  - Soothing techniques
  - Decrease stimuli
- Family support
  - Help parents cope
  - Prevent adverse sequelae
- Education and support
  - Colic common, resolves by 3-4 mo
  - Child not sick
  - Colic not "caused" by someone or something
  - Not a sign of rejection
  - Acknowledge difficulty in soothing
  - Seek help (babysit or a rescue plan if overwhelmed)
  - Frustration, anger, exhaustion, guilt and helplessness NORMAL

Evidence for Reassurance/Counseling

- Parents of colicky infants counselled regarding effective responses to crying – crying decreased from 2.6 to 0.8hr/day (controlled, Taubman 1984)
- Parental counselling more effective than dietary changes (3.2→1.1hr/day vs 3.2→2.0hr/day) (randomized, Taubman 1988)
- Home-based nursing intervention/contact with other "colic" parents (reduction by 1.7hr/day vs standard care)(4 wk, reassurance, empathy, support and time out) (randomized, Keefe 2006)
- Specific care advice from trained lay counsellor vs empathetic counselling vs no treatment (crying↓51% vs 37% vs 35%) (Wolke 1994)

Drugs and colic – opium first do no harm

- "Capsules of the poppy plant and wasp droppings from the wall shall be mixed and sieved, and given on four days. The infant's crying ceases immediately." *Egyptian papyrus Ebers (16th century BCE)*
- "One of the most injurious of these patent medicines is a drink prepared with opiates, chiefly laudanum, under the name Godfrey's Cordial. Women who work at home, and have their own and other people's children to take care of, give them this drink to keep them quiet, and, as many believe, to strengthen them. They often begin to give this medicine to newly-born children, and continue, without knowing the effects of this 'heart's-ease', until the children die." *Engels. Manchester 1845*
- "Every phenomenon of the factory districts is here reproduced (..in London..), including, but to a greater extent, ill-disguised infanticide, and dosing children with opiates." *Marx. Das Kapital 1867*
- 1907 - 15,000 infant deaths/yr from proprietary medicines in Australia. *The Royal Commission on secret drugs, cures and foods.* https://trove.nla.gov.au/work/16421136
- Well recognized mortality persisted through to end of mid 20th century (Dover's powder 10% opium till 1960)

First line interventions – what NOT to do (and what to do)

- **What NOT to do**
  - NO good evidence for any drug
    - alcohol, phenobarbitone, diazepam,
    - atropine, "gripe water", cisapride
    - dicyclomine (Merbentyl), proton pump inhibitors, simethicone
  - Spinal/Cervical manipulation
- **What to do**

  These interventions have limited evidence but unlikely to be harmful and provide a time for spontaneous improvement
  - Feeding technique
  - Soothing techniques

Feeding Techniques

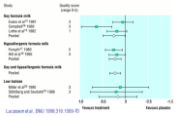
- Under/overfeeding
- Burping
  - (doesn't stop colic but does increase regurgitation Kaur 2015)
- Vertical bottle feeding
- Collapsible bottle
- Lactation specialist

Soothing techniques

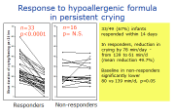
- Try one or more to sooth infant, decrease sensory stimulation
- Continue those that work, stop those that don't
- Try one for a few minutes and move to another if needed
- Vary techniques
- None effective in randomized trials, but many effective individually

- Pacifier (dummy)
- Car ride or a walk
- Front carrier
- Rocking infant
- Changing the scenery
- Infant swing
- Warm bath
- Rubbing the abdomen
- Hip healthy swaddling
- Heartbeats
- White noise – low/high volume
- "Sounds for silence"
  https://www.youtube.com/watch?v=b8095J_Xw4tQ

Dietary changes – second line if feed technique + soothing don't work

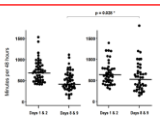


- Bottle-fed: Extensively hydrolyzed formula
  - If it doesn't work – go back to previous formula
  - Soy? Fibre-enriched formula?



Heine RG et al., *J Allergy Clin Immunol*, 2003; **111**: 5102

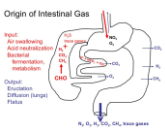
- Breast-fed: Reduce maternal / allergen intake
  - Time-limited in breast-fed
  - Milk, eggs, nuts, wheat



Hill et al., *Pediatrics* 2005; **116**:e709-715

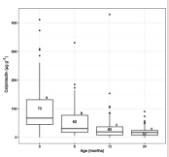
Dietary changes – second line if feed technique + soothing don't work

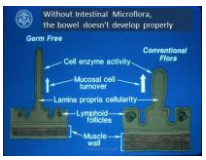
- Probiotics – why?
  - Fermentation and Flatulence
    https://physics.stackexchange.com

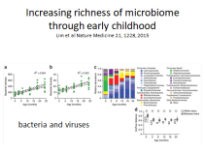


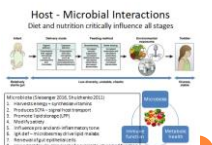
- Inflammation is "normal" in infants

Faecal calprotectin is "elevated" in normal infants (Peura 2017)





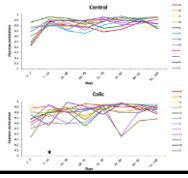




Different Microbiome in colicky infants

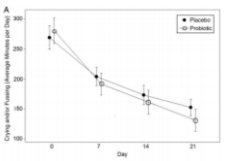
↑(pathogenic bacteria)
+
↓(lactobacilli, bifidobacteria and butyrate-producing bacteria)
=
gut inflammation, pain and distress

- ↑C difficile colonization till 3 mo (Lehtonen 1994)
- ↑Coliforms and ↓Lactobacilli (Savino 2004, 2009)
- ↑L brevis, ↑L lactis; ↓L acidophilus (Savino 2005)
- ↑Klebsiella; ↓Enterobacter ↑Calprotectin (Rhoads 2009)
- ↓Bifidobacterium (Parety 2012)
- ↑Escherichia, Klebsiella, Serratia, Vibrio, Yersinia, Pseudomonas. ↓Bacteroidetes, firmicutes (lactate and butyrate producers) (de Weerth 2013)
- ↑Gas forming coliforms - inhibited by some Lactobacilli and Bifidobacteria (Parety 2012, Savino 2011)
- ↓Overall microbial diversity and stability (Rajilic 2009)



Lactobacillus reuteri

- Most ubiquitous of naturally occurring gut bacteria
- Present in nearly all animal species
- Each host has specific strain
- Marketed by BioGaia (patented)
- Antimicrobial properties
  - reuterin, reutericin, reutericyclin
  - Inhibits growth of G-neg and G-pos bacteria, yeasts, fungi and protozoa
- Produces small but significant reduction in crying time - meta-analysis (Sung 2018)



When to refer and to whom?

- If in doubt about the diagnosis or "red flag" features
  - General paediatrician
- Extreme anxiety or mental health support
  - Is the baby at risk of harm?
  - "Colic clinics"
  - Allied health support – type depends on resources and local expertise

Infant colic - take home messages

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- Almost always resolves by 4 mo
- It can severely damage family function
- Needs POSITIVE diagnosis
- Usually diagnosed by careful history and examination without lab tests, imaging or specialist referral

Management

- EDUCATE, REASSURE AND SUPPORT
  - Soothing and feeding techniques
- Feeding and nutrition
  - Brief dairy restriction, hydrolysed formula, probiotics - marginal benefit, temporizing
- Medications
  - Unproven and potentially dangerous
- Supportive followup by GP
  - General Paed - not specialist unless red flag feature

Outcome

- Dysfunction - short and long (years)

Further reading and material/handouts

- NSW Health Guideline. http://www1.health.nsw.gov.au/pds/ActivePDSDocuments/GL2016_010.pdf
- UpToDate (handouts)
- National Childbirth Trust https://www.nct.org.uk
- National Library of Medicine https://medlineplus.gov/commoninfantandnewbornproblems.html
- Better Health channel (Victoria) https://www.betterhealth.vic.gov.au
- RCH Melbourne https://www.rch.org.au/kidsinfo/fact_sheets

Prof. Catto-Smith - HealthEd Sydney Video Interviews Feb 17th 2018

1) What are the current theories about colic?
2) How does the microbiome affect colic?
3) What is the effect of pre and probiotics on colic?
4) Does infant colic lead on to Irritable Bowel Syndrome in adult life?
5) What evidence is there that diet change for mum or bub makes any difference?
6) What is the risk of non-accidental injury for an infant with colic?