

Questions and Answers
April 2015 JPGN CME

Intestinal Inflammation and Impact on Growth in Children with Cystic Fibrosis

Q1. All of the following affect the gastrointestinal tract in CF except:

- A. Alterations in the gut microbiota**
- B. Thick and sticky mucus**
- C. Maldigestion from pancreatic exocrine insufficiency**
- D. Alkaline pH**
- E. Intestinal inflammation**

Answer: D. Dysfunction in the CFTR protein results in the loss of bicarbonate secretions predisposing to an acidic intestinal environment. The acidic environment may be contributing to the underlying dysbiosis and intestinal inflammation. An abnormally acidic environment also impacts on various normal physiological processes in the gut e.g. digestive enzyme function.

A. Intestinal dysbiosis has been described in CF patients, with administration of probiotics/antibiotics in both animal and human studies resulting in partial restoration in intestinal inflammation.

B. Murine models of CF have shown abnormal mucus accumulation. The abnormal CFTR proteins results in the loss of transepithelial bicarbonate secretion from the pancreaticobiliary tree, resulting in the thick inspissated mucus.

C. Pancreatic exocrine insufficiency prior to the usage of PERT therapy was responsible for malabsorption in CF patients.

E. Animal and human studies have both shown evidence of intestinal inflammation in CF. Calprotectin, a non-invasive marker of intestinal inflammation, has been elevated in the stools of the majority of PI CF patients and a capsule endoscopy study has further supported this by finding endoscopic evidence of mucosal inflammation.

Q2. A 15 year old girl with pancreatic insufficient (PI) CF has been gaining weight poorly over the last 6 months. You consider all of the following except:

- A. Poor compliance with pancreatic enzyme replacement therapy.**
- B. Pulmonary exacerbations and/or reduced pulmonary function.**
- C. Insufficient caloric intake due to nausea and poor appetite from recurrent or chronic pancreatitis.**
- D. Malabsorption due to other diseases, such as celiac disease.**
- E. Intestinal inflammation.**

ANSWER: C. *Although inadequate caloric intake is a common cause of poor growth, it is rare for patients with PI CF to develop symptoms of recurrent or chronic pancreatitis.*

A. Common in adolescents with CF.

B. Common cause for deterioration in clinical status.

D. Other gastrointestinal conditions which can cause malabsorption and poor growth can also affect patients with CF.

E. Inflammation of the intestines may contribute to poor growth.

Q3) A 14 year old girl with PI CF was admitted to hospital following recurrent respiratory exacerbations for intravenous antibiotics. She also suffers from intermittent abdominal pain and faecal calprotectin levels were found to be raised. She is compliant with her medications including pancreatic enzyme supplementation at 5,000 units/kg/day. Your next step is:

- A. Start treatment for intestinal inflammation with probiotics**
- B. Perform endoscopy and colonoscopy**
- C. Increase pancreatic enzyme supplementation**
- D. No further action is required**
- E. Rule out common associated gastrointestinal conditions such as constipation and gastroesophageal reflux.**

Answer is E: *The intestinal inflammation in CF is “silent” in the majority of cases. Fecal calprotectin can be also falsely raised following acute respiratory exacerbations, as a result of ingested inflamed airway secretions. It is important to assess for common gastrointestinal conditions that affect patients with CF, such as gastroesophageal reflux disease and constipation.).*

A) In recent trials in CF, probiotics has been shown to be beneficial in partially restoring the normal patterns of intestinal microbiota and reduce intestinal inflammation. The translational significance and clinical application of probiotics requires further investigation by large multi-centre studies.

B) A colonoscopy and endoscopy may be indicated if a non-CF disease such as celiac disease or Crohn’s disease is suspected. In patients with CF, particularly those with pancreatic insufficiency, elevations in faecal calprotectin is not uncommon.

C) The dose of pancreatic enzyme therapy (PERT) should always be reviewed. In the majority of cases, increasing doses of PERT beyond 5,000 units/kg/day is not associated with clinical benefit, and may be associated with risks of fibrosing colonopathy.

D) Patient is symptomatic.

Q4) Which of the following has NOT been reported as a feature of intestinal inflammation in patients with CF?

- A. Mucosal ulceration on capsule endoscopy**
- B. Elevation in stool calprotectin concentrations**
- C. Elevation in stool S100A12 concentrations**
- D. Poor weight gain**
- E. Poor height gain**

Answer is C: Although S100A12 is a biomarker of intestinal inflammation for diseases such as inflammatory bowel disease, S100A12 was not elevated in CF.

A) Small intestinal mucosal ulcerations are seen on capsule endoscopy in CF patients. .

B) In this study 77% of PI CF patients had elevated fecal calprotectin levels.

D and E) Both weight and height z-scores were significantly correlated with severity of intestinal inflammation.

Management of Ingested Foreign Bodies in Children: A Clinical Report of the NASPGHAN Endoscopy Committee

1. A 3 year old male is brought to the Emergency Department for chronic cough over the last 3 weeks and is found on chest X-ray to have a 20 mm button battery present in the upper esophagus. His vital signs are significant for mild tachycardia but he is in no distress. Parents deny any vomiting but they “may” have seen some melena. The most appropriate next step in his management is:
 - a. Immediate endoscopic removal in the GI suite with airway intubation
 - b. Scheduled endoscopic removal within the next 8 hours, after an appropriate NPO period, using the most experienced GI team possible.
 - c. Inpatient admission, followed by MRI of the chest to evaluate the proximity of the battery to vascular structures
 - d. Endoscopic removal within 24 hours, with follow-up dependent on the degree of injury seen at the time of endoscopy.
 - e. Emergent endoscopic removal in the operating room with surgery/CV surgery present.

Correct answer: e. With his age less than 5 and battery size of 20 mm, this case represents the highest risk for severe injury, including fatal aorto-esophageal fistula. This risk is compounded by the suspicion for a prolonged period of impaction, as his presenting complaint of cough has been present for 3 weeks. An esophageal button battery under any circumstances requires emergent removal, but in this case, with the tachycardia and questionable melena, the removal is most prudently performed in the OR setting, with surgeons ready to intervene immediately if bleeding occurs. Alternatively, removal in an interventional Cardiology suite with the potential to perform an aortogram immediately prior to removal and intervene if necessary would be a consideration in some centers.

Incorrect answers:

- a. Incorrect because the GI suite is not the most appropriate location in this very high risk patient and without the presence of surgeons ready to intervene.
 - b. While an 8 hour time delay with an appropriate NPO period is acceptable for an asymptomatic esophageal coin, this delay is not acceptable in the case of an impacted button battery, where caustic injury to the esophagus occurs very rapidly due to increases in tissue pH.
 - c. While MRI to assess the proximity of the injury to vascular structures can be an important tool in assessing ongoing risk for AEF or other vascular injury, it cannot precede removal of the battery. It is obviously contraindicated to perform MRI with a metal FB in place and the first priority must be to remove the battery in a controlled environment.
 - d. Endoscopic removal of a button battery from the esophagus is always to be performed emergently, even on an asymptomatic patient. If this patient were to present with the BB in the stomach, given his age and the size of the battery, endoscopic assessment for esophageal injury and (incidental) removal of the battery from the stomach may be considered within 8 hours of presentation.
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2. A six year-old female had a witnessed ingestion of several small neodymium magnets 18 hours ago, before presenting to a rural ED 12 hours ago. She was then transferred to your tertiary care center for further management after her initial abdominal films showed multiple magnets adherent together in the small bowel. She is asymptomatic at the time she arrives at your center and repeat abdominal films suggest that the magnets are still adherent to each other and are unchanged in location from the last film. The next most appropriate step in her management would be:
 - a. Initiation of a polyethylene glycol cleanout and discharge home with close follow-up with her primary are physician.

- b. Emergent upper and lower endoscopy to determine if the magnets are removable with conventional endoscopy and survey the mucosa for signs of injury that may have occurred during passage.
- c. Admission for observation with polyethylene glycol cleanout and serial abdominal films every 6-12 hours, with plan for surgical removal if she develops symptoms or if non-progression on multiple films.
- d. Observation in the ED for 6-12 hours and discharge home if films suggest magnets are progressing and she remains asymptomatic.
- e. CT scan of the abdomen to pinpoint the position of the magnets and determine if they are in the small or large intestine.

Correct answer: c. Despite the asymptomatic condition of the patient and the apparent adhesion of the magnets together, this patient is at high risk of perforation. These patients are often asymptomatic until late in the course of perforation and the strength of the magnets may make them appear to be adherent even when there is bowel trapped between them. For this reason, close observation and aggressive intervention if there is serial nonprogression is recommended. In centers that have small bowel enteroscopy available, this may be a reasonable alternative to surgical removal in the case of nonprogression.

Incorrect answers:

- a. This answer is incorrect because the risk of significant injury and perforation is too great to allow her to be discharged, despite the asymptomatic status. As noted above, these patients may remain asymptomatic until relatively late into the course.
 - b. This answer is incorrect because plain films should be able to distinguish between large and small bowel position of the magnets in most cases. In addition, surveillance of the mucosa already traversed by the magnets, in absence of clinical symptoms of perforation, is not necessary. Thus, with low likelihood of being able to retrieve the magnets at that time, conventional endoscopic intervention is not warranted.
 - d. Incorrect, again due to the risk of injury and the distance the patient lives from the tertiary care center in the case of development of symptoms. Even with the reassuring films showing progression of the magnets, there needs to remain clear "ownership" of the patient and the ability to intervene quickly in the event that her clinical status changes.
 - e. Although a CT scan may be helpful in more accurately identifying the position of the magnets and determining if they are adhering together across separate loops of bowel, generally this is not necessary to determine if they are amenable to endoscopic removal.
3. A 20 month old is found "chewing" on a small glass Christmas ornament and is brought to the ED for evaluation. His oropharynx is atraumatic and he is asymptomatic. He last ate food 5 hours ago. Foreign body series shows no identified foreign objects. The most appropriate management strategy in this scenario is:
- a. Upper GI series with water-soluble contrast to look for evidence of a foreign body. If none seen then may follow clinically and only intervene if symptoms develop.
 - b. Keep NPO for another 3 hours and then perform an upper endoscopy to evaluate for any ingested glass.
 - c. Perform an urgent upper endoscopy to evaluate for any ingested glass before the pieces pass beyond the ligament of Treitz.
 - d. Follow clinically with serial X-ray. Enteroscopy or surgical removal considered if develops symptoms or > 3 days without passage
 - e. Consultation with pediatric surgery and plans for surgical removal.

Correct answer: a. In the case of an asymptomatic ingestion of a radiolucent sharp foreign body, such as the glass shards in this case, radiographic studies to try to confirm the presence of the FB is recommended before considering endoscopic intervention. The preferred radiologic study may depend on the type of object suspected, so Radiology consultation may be helpful. If there is no evidence of significant FB ingestion and the patient remains asymptomatic, then clinical observation alone is reasonable.

Incorrect answers:

- b. Incorrect. Without definitive evidence that there was an ingestion of glass, in an otherwise asymptomatic patient, endoscopic evaluation is not necessary.
 - c. Incorrect. As above, endoscopic intervention is not necessary without more evidence, and circumventing advised anesthesia NPO times is not advisable.
 - d. This is incorrect, as there is little value to serial X-rays with radiolucent objects that did not show up on the initial X-ray.
 - e. This is incorrect as well, since surgical removal is not indicated in an asymptomatic patient, where ingestion is not even confirmed.
4. A 4 year-old female admits to swallowing a coin 4 hours ago. She presented in the ED with drooling and dysphagia, where an AP film shows a radio-opaque disk in the upper esophagus, just below the thoracic inlet. Her last PO intake of solids was 6 hours ago. GI is consulted by the ED and your first recommendation is:
- a. Administration of glucagon to determine if endoscopic intervention can be avoided.
 - b. Mobilization of Anesthesia and OR staff to arrange for endoscopy immediately after she has been NPO for 8 hours.
 - c. Consultation with Radiology to determine if they can attempt removal by pulling out the object with a Foley catheter.
 - d. Attempt to “push” the object into the stomach using a bougie catheter.
 - e. At least one additional lateral film to ensure that the object is a coin and not a button battery.

Correct Answer: e. Suspected coin ingestions should be confirmed by AP and lateral films to ensure that there is no “step-off” that would indicate a disc battery ingestion. In either case, with symptoms of dysphagia and inability to manage her own secretions, the next step would be immediate endoscopic removal, but in the case of an esophageal button battery, this would be best performed in the OR setting, with general or cardiovascular surgery present. If this is confirmed to be a coin ingestion, then endoscopic removal can be performed without the involvement of surgeons.

Incorrect Answers:

- a. Glucagon is not generally recommended for coin ingestions if endoscopic removal is available, especially if the coin is in the upper esophagus.
- b. This is incorrect because of the dysphagia and drooling, indicating that this object should be removed without delay to comply with usual NPO guidelines.
- c. Though some centers have the capacity to perform removal of coins from the upper esophagus by Radiology, using a Foley catheter to pull the coin back into the oropharynx, this is generally reserved for asymptomatic cases and would be less appropriate than endoscopic removal in this situation. In addition, this disc-shaped object must still be confirmed to be a coin rather than a button battery before this should be attempted.
- d. Incorrect. Use of the “push technique” is to be avoided due to the danger of an underlying stricture or injury of the esophagus, which would be further traumatized by trying to push the object beyond the narrowing. Additionally, this technique does not allow the underlying mucosa to be examined or the coin to be retrieved.