

# diarrhoea in critical illness [created 25/10/07 by Paul Young]

- Diarrhoea is a common finding in critically ill patients, whatever the initial cause of admission into the intensive care unit (ICU).
- Reported incidences of diarrhoea may vary over a very wide range because of the lack of standardisation in the definition of diarrhoea.

Secretory	Reduced absorption or increased secretion of electrolytes. Bright stools and reduction in osmotic gap
Motor	Reduced area of contact or gut hypermotility with decreased time of contact between gut content and intestinal mucosa
Exudative	Release of collicids, liquids, electrolytes, desquamated cells (mainly polymorphonuclear neutrophil) and necrotic membranes
Osmotic	Reduced water absorption due to luminal non-absorbable molecules. Bright stools with increased osmotic gap

Infectious	Bacterial Mainly Clostridium difficile Anaerobes Other causes
Non-infectious	Gut ischaemia or hypoperfusion Hypoalbuminaemia Drug-associated Gut dysmotility

## General

- The commonly reported presence of diarrhoea during the enteral infusion of feeds can be explained by the composition of enteral formulas, as well as by the characteristics of administration, including the site and the mode of infusion.
- Enteral feeding is sometimes interrupted or its infusion rate is decreased, in contradiction with current recommendations and with the available evidence.
- Many experimental and clinical studies have demonstrated that, in comparison with total parenteral nutrition, enteral nutrition can actually reduce the incidence of diarrhea via a better preservation of the gastrointestinal mucosal structure and function.

## Site of infusion

- In a large multicentre prospective randomized study, Montejo et al. compared the efficacy and rate of complications associated with the early gastric versus the early jejunal route in 101 patients. The incidence of diarrhoea was identical (14%) in both groups, although the total number of gastrointestinal complications (mainly high gastric residues) was lower in the group fed in the jejunum than in the group fed in the stomach.
- These findings somewhat challenge previous beliefs that intragastric infusion favours diarrhoea via the stimulation of fluid secretion into the ascending colon, or of intrajejunal infusion favouring diarrhoea via hyperosmolarity (> 400 mosm/l) in the small intestine or via a neurohumoral reflex.

## Mode of administration

- The administration of enteral feeding can be pump-driven or controlled by gravity, continuous or intermittent. These aspects also affect the incidence of diarrhoea.
- For example, the use of pump-assisted infusion dramatically reduced the incidence of diarrhoea compared with gravity-controlled infusion
- Similarly, new data recently recorded in trauma and elderly patients confirmed a better prevention of diarrhoea with the use of continuous rather than intermittent enteral infusion of feeds, although the advantage of the continuous mode was no longer observed during diarrhoea

## Composition of enteral formulas

- Several characteristics of enteral formulas have been associated with an increased incidence of diarrhoea, including the amount of carbohydrates, fat, high osmolality and bacterial contamination.

- Although the changes in gut microflora are not specific and the associated diarrhoea usually resolves spontaneously, only the finding of C. difficile requires a specific therapy.

- C. difficile is an anaerobic toxin-producing Gram-positive bacillus. The toxin triggers inflammation, necrosis of the bowel mucosa, and even colon dilatation up to perforation.
- The diagnosis of C. difficile colitis is confirmed by the presence of the toxin in the stools.
- C. difficile is the most common cause of infectious nosocomial diarrhoea,
- Clostridial colitis actually occurs when the equilibrium of gut flora is severely perturbed, thereby allowing the growth of C. difficile.
- Risk factors for the development of C. difficile-related diarrhoea include:
  - (i) recent or current antibiotic therapy,
  - (ii) a prolonged stay in the ICU
  - (iii) treatment with a proton pump inhibitor
  - (iv) female gender
  - (v) enteral nutrition
- Among antibiotic agents, there are striking differences in the prevalence of Clostridium-associated diarrhoea. In particular, the use of quinolones and Cephalosporins are commonly associated with an increased risk, whereas the use of macrolides was found to be less risky
- Once diagnosed, if symptoms are mild, no specific treatment is required in addition to the discontinuation of antibiotic therapy. Metronidazole is presently recommended in moderate to severe C. difficile-associated diarrhoea.
- In the case of failure of metronidazole treatment, oral vancomycin can be given; other potential therapy includes fucidic acid, vancomycin and teicoplanin.

## pathophysiology

## aetiology

## other risk factors

- In a multicentre study published in 1997, Bleichner and colleagues identified the following risk factors for diarrhoea:
  - (i) fever or hypothermia,
  - (ii) the presence of an infection site,
  - (iii) malnutrition, & hypoalbuminaemia (< 26 g/l),
  - (iv) sepsis syndrome,
  - (v) multiple organ failures,
  - (vi) open feed container, and
  - (vii) previous total parenteral nutrition.

## effects

- In adult ICUs in western countries, diarrhoea is more often a cause than a consequence of malnutrition, in contrast to less developed areas, where the opposite holds true
- If left untreated, diarrhoea-induced malnutrition can increase morbidity. The management of diarrhoea-induced malnutrition can be complicated by the poor absorption of nutrients given enterally; in this case the adjunction of parenteral support may be justified.
- Besides malnutrition, critically ill patients presenting with severe diarrhoea are particularly at risk of haemodynamic instability, as a result of sudden shifts in the blood circulating volume related to diarrhoea itself.
- Similarly, metabolic acidosis is often observed as a consequence of massive digestive losses of electrolytes and bicarbonate ions. Not surprisingly, the mineral balance is always altered when diarrhoea persists over a few hours; accordingly, the stores of potassium, magnesium and zinc can be significantly depleted and must be compensated, because of their roles in the prevention of arrhythmias, membrane stability, and wound healing.

## General:

- In addition to generous hydration with sodium and sugar-containing solutions, oral opioids or anticholinergic medications can be considered.
- NB: the use of opioids including loperamide can induce a paralytic ileus when used with other drugs, impairing gut motility.

## preventive & therapeutic measures

### 1. Composition of enteral formulas

- Enteral feeding formulas of low osmolality and enriched with fibres should be preferred.
- Dietary fibres have been added to enteral nutrition formulas to normalise bowel function. The beneficial effect on bowel function results from the release of short chain fatty acids (SCFAs) after the fermentation of carbohydrates of fibres in the colon. SCFAs (butyrate, propionate and acetate) play an important role in salt and water absorption in the colon, with butyrate being the main energetic fuel for colonocytes.
- Soy polysaccharides, which contain 94% insoluble fibre, are the most common source of fibre in enteral formulas, but can be less efficient for the prevention of diarrhoea than water soluble fibres.
- Water-soluble fibres, such as pectin and guar gum, have better potential trophic effects, increase the viscosity of the solutions, can delay gastric emptying and absorption in the small intestine, and reduce luminal flow by causing resistance to the propulsive action of intestinal contractions.

### 2. Modulation of gut microflora

- (i) probiotics: a preparation or a product containing viable defined microorganisms in sufficient numbers, which alter the microflora by implantation or colonization in a compartment of the host and that exert beneficial effects in the host),
- (ii) prebiotics: a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth or activity of one or a limited number of bacteria in the colon, and thus improving host health
- (iii) synbiotics: a combination of prebiotics and probiotics able to modulate gut immunity and facilitate nutrient/factor interaction necessary for gut recovery

### 3. antimotility drugs:

- Antimotility drugs may be of symptomatic benefit in adults with mild or moderate acute diarrhoea.
- They are contraindicated in patients with severe or bloody diarrhoea, where there is a possibility of invasive organisms, and in patients with severe inflammatory bowel disease because of the risk of toxic megacolon.
- If an antimotility drug is considered appropriate, it is reasonable to use:
  - loperamide 4 mg orally, initially, followed by 2 mg orally, after each unformed stool, up to 16 mg per day
  - OR
  - diphenoxylate+atropine 5+0.05 mg orally, 3 to 4 times daily initially, reducing dose as soon as symptoms improve
  - OR
  - codeine 30 to 60 mg orally, up to 4 times daily.