Splanchnic Hypoperfusion and Enteral Feeding

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ABSTRACT

Hypoperfusion or decrease in blood flow is may cause organ failure. When the body experiences hypoperfusion, body perfusion is prioritized to brain and heart, which may cause the hypoperfusion of splanchnic organ. Splanchnic hypoperfusion will cause ischemia of the mucosa, disturbance in the barrier, and increased splanchnic permeability, which in further level mayl cause bacterial and endotoxin translocation to systemic circulation.

Enteral feeding in hypoperfusion is beneficial to prevent splanchnic hypoperfusion. However, method of enteral feeding needs to be considered, so that it does not cause harmful adverse effects. Early enteral feeding by slow continuous drip method can prevent splanchnic failure in critically ill patients with high risk of hypoperfusion.

Keywords: *splanchnic hypoperfusion, enteral feeding, continuous slow drip method*

ABSTRAK

Hipoperfusi atau penurunan aliran darah sangat berisiko menyebabkan gagal organ. Pada saat tubuh mengalami hipoperfusi, prioritas perfusi tubuh adalah organ tertentu yaitu otak dan jantung, yang berakibat saluran cerna mengalami hipoperfusi. Hipoperfusi saluran cerna akan menyebabkan iskemia mukosa, gangguan sawar dan peningkatan permeabilitas saluran cerna, yang pada tahap selanjutnya berakibat translokasi bakteri dan endotoksin ke sirkulasi sistemik.

Pemberian nutrisi enteral pada hipoperfusi bermanfaat mencegah hipoperfusi saluran cerna. Meskipun demikian cara pemberian nutrisi enteral tetap perlu diperhatikan agar tidak menimbulkan efek samping yang merugikan. Pemberian nutrisi enteral dini dengan cara kontinyu tetesan lambat dapat mencegah kegagalan saluran cerna pada pasien sakit kritis dengan resiko tinggi hipoperfusi.

Kata kunci: *hipoperfusi saluran cerna, nutrisi enteral, metode tetesan lambat*

INTRODUCTION

Splanchnic hypoperfusion is commonly found in critically ill patients, which are: trauma, sepsis, burn wound. Hypoperfusion may cause ischemia of the mucosa, disturbance of gut barrier, and splanchnic permeability increased, which may further induce bacterial translocation. Bacterial translocation may cause sepsis. Hypoperfusion alone or which is followed by sepsis may cause multiple organ failure. Splanchnic hypoperfusion is one of the factors which is related to morbidity and mortality in critically ill patients.[1]

Enteral feeding is preferable in nutritional support of critically ill patients because it gives more benefit physiologically compared to parenteral.[2] The aim of this review article is to discuss one of the enteral feeding roles, which is to prevent splanchnic hypoperfusion and fatal consequences which may happen to critically ill patients.

SPLANCHNIC HYPOPERFUSION

Splanchnic perfusion or blood flow is supplied by three branches of the aorta, which are: celiac artery,

superior mesenteric artery, and inferior mesenteric artery.[3,4] Celiac artery supplies blood to the stomach, liver, and spleen. Superior mesenteric artery supplies blood to the intestine, proximal colon, and pancreas. Inferior mesenteric artery supplies blood to distal colon. The entire splanchnic blood perfusion comes from 20-25% of cardiac output. In the resting state, 70% blood which flow to the splanchnic, flow to the mucosal lining, 15-25% to the muscular and serousal layer, also 5% to submucosa. Blood flow to the mucosa is divided into 2 parts, which are 60% supplies the epithelial cells on the vili and 40% supplies the crypts and goblet cells. This splanchnic perfusion need to be maintained to fulfil the need of oxygen and nutrition to the tissue, also to excrete metabolic waste products.[3,5]

Decreased perfusion or hypoperfusion can be caused by heart failure, haemorrhage, dehydration, infection, allergic reaction, and vasoactive drugs administration. In the cell, as a consequence of hypoperfusion, cell may experience oxygen deprivation (hypoxia), then may further experience injury (ischemia), and finally may experience death (necrosis). In splanchnic organs, hypoperfusion can be caused by shock condition as a body mechanism of compensation to maintain blood flow to the brain.[3]

Splanchnic hypoperfusion may cause mucosal ischemia.[6-9] Mucosal ischemia marks the presence of disturbance in splanchnic barrier. Splanchnic barrier is a defence mechanism which functions to maintain splanchnic permeability. Disturbance in splanchnic barrier causes splanchnic permeability increase and enables bacterial and endotoxin translocation to systemic tissue.[6-9] Bacterial and endotoxin translocation to the systemic circulation causes the release of pro-inflammatory mediators which cause the occurrence of sepsis and if continues, may lead to organ failure, or even multiple organ failure. The occurrence of multiple organ failure, which is related to splanchnic hypoperfusion in critically ill patients, showed important role of the splanchnic. Therefore, this role has to be maintained, one of the ways is through enteral feeding.[2,7-8,10]

ENTERAL FEEDING

Definition, Form, and Method of Administration

Enteral feeding, according to the definition by the European legal regulation of the commission directive is all form of nutritional support which use food for particular therapy purpose.[11] Enteral feeding, based on the way of presentation, can be in the form of clear or thick liquid, depending on its content. Indications of enteral feeding for patients are: (1) good splanchnic function; (2) in ongoing or predicted to experience malnutrition; (3) cannot reach optimal nutritional status by using oral intake alone.[11] Based on method of administration, enteral feeding can be given as oral nutritional supplement (ONS) or administered through pipe. Based on the nutritional content, enteral feeding may contain complete nutrition as main nutritional source or incomplete nutritional source, which is not as main nutritional source. Based on the composition, standard enteral feeding, which contains appropriate composition to the average need of a healthy population, or special enteral feeding, which is tailored according to particular need of a disease.[12]

Enteral feeding based on its form is divided into polymer and monomer enteral feeding. Polymer enteral feeding contains macronutrients in the form of whole protein, triglycerides, and carbohydrate polymer. Monomer enteral feeding contains protein in the form of peptides or amino acid, long chain or combination of long and medium chain fatty acid, also partially hydrolyzed starch maltodextrin or glucose oligosaccharides.[12] Other characteristic of enteral feeding which needs to be considered is osmolarity, which generally ranges between 300 and 500 mOsm, nearing body fluid osmolarity (300 mOsm).[13]

There are three choices in administration method of enteral feeding through pipes, which are bolus, intermittent drip, and continuous drip.[13] Bolus method is administering enteral feeding in the amount between 240-480 mL with 10-20 minutes duration of administration and bolus frequency according to patient's need, usually every 4-6 hours per day. Intermittent drip method is administering enteral feeding based on principle of gravitation, volume to be achieved is approximately 240-720 mL in 20-60 minutes. Similar to bolus method, frequency of administration in intermittent method is also every 4 to 6 hours/day. Last method is continuous drip, which is administering enteral feeding dropwise continuously. The administration needs pump to administer enteral feeding with constant volume per unit time.[14]

Installation of enteral feeding access can be performed manually, with the help of endoscopy, or with surgical technique. The choice is based on the presence or absence of splanchnic obstruction and administration duration. Locating the end of enteral feeding pipe in the stomach or jejunum, is based on the presence of aspiration risk.[13]

ADMINISTRATION OF ENTERAL FEEDING IN SPLANCHNIC HYPOPERFUSION

Presence of nutrition in the splanchnic will increase blood flow, which is known as postprandial hyperaemia mechanism.[3] Someya et al, stated that increased blood flow after meal which happened in the splanchnic was approximately 58-250%.[15] This increase of blood flow would persist for 2-3 hours, reaching the peak within 5-60 minutes after administration. Different enteral feeding would give different effect in the increase and duration of postprandial hyperaemia to occur.[15] Studies to know the effect of each glucose, amino acid, and fat to increase of splanchnic blood flow has been performed by Brundin et al and Gielkens et al. The highest increased velocity of splanchnic blood flow happens in glucose administration followed by amino acid and fat.[16-18]

Mechanism of increased blood flow in splanchnic due to enteral feeding is the basic idea that enteral feeding can prevent splanchnic hypoperfusion. Study conducted by Hadfield et al, concluded that splanchnic dysfunction in critically ill patient could be corrected with enteral feeding.[19] Kompan et al, in their study showed that early enteral feeding (< 6 hours intensive care unit (ICU) hospitalization) in multiple trauma patients could maintain splanchnic permeability and prevent more severe multiple organ dysfunction.[20] Study performed by Fukatsu et al, stated that early enteral feeding might prevent increased of splanchnic permeability and further decrease mortality rate.[21] These three studies showed that enteral feeding is proved to improve absorption ability and decrease splanchnic permeability in splanchnic hypoperfusion.[19-21] Presence of side effects of enteral feeding in critically ill patients has been reported in a study by Marvin et al, in which it was obtained that splanchnic necrotic incidence was approximately 0.3-8.5%.[22] Therefore, enteral feeding in patients with high risk of splanchnic ischemia need to consider many matters (Table 1).[23]

Table 1. Matters need to be considered in enteral feeding for patients with high risk of Splanchnic ischemia[23]

Monitor closely splanchnic intolerance signs
Choosing enteral formula
Iso osmolar
Low residue without addition of fibre
Stable hemodynamic
Mean arterial pressure ≥ 70 mmHg
Required dose of vasopressor drugs persist or decreased
Need of ventilator persist or decreased

In the European Society for Parental and Enteral Nutrition (ESPEN) guidelines, early enteral feeding is < 24 hours to prevent splanchnic function failure in critically ill patients. The success of early enteral feeding is influenced by dose.[24] Administration of enteral feeding with continuous slow drip method (trickle or trophic feeds), which is approximately 10-20 ml/hour can prevent splanchnic mucosal atrophy.[25]

CONCLUSION

One way to prevent splanchnic hypoperfusion and its fatal consequences is by administering enteral feeding. Enteral feeding in splanchnic hypoperfusion may improve decreased absorption ability, prevent increase splanchnic permeability, and prevent more severe multiple organ failure. Recommended method of enteral feeding to prevent splanchnic hypoperfusion and its consequences is by continuous slow drip method.

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