Management of Nutrition in Gastric Emptying Preparation before Medical Procedures

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ABSTRACT

Patient preparation before medical procedures, for example in elective surgery, abdominal ultrasonograhy (USG), endoscopy, intubation, etc., is by emptying the stomach. Attempt in emptying stomach is by fasting since the night before medical procedure with the intention to decrease the risk of aspiration.

Management of nutrition guidelines in preparation of medical procedures currently refers to pre-surgery fasting which is recommended by American Society of Anaesthesiologist (ASA) and the Canadian Anaesthetists Society (CAS). In Indonesia, pre-surgery fasting guideline is suggested by Indonesia Society of Anesthesiology and Intensive Care. However, in various unit of service, fasting the patient since the night before is still performed.

Development of nutrition management in medical procedures has experienced many changes, such as surgery which is aimed to restore organ normal function and to accelerate the healing of patients. Various studies on nutrition are developed in conjunction with the programs development to optimize pre-surgery preparation.

Keywords: *nutrition management, pre-surgery nutrition, aspiration*

ABSTRAK

Persiapan pasien yang menjalani tindakan medis seperti pembedahan elektif, USG abdomen, endoskopi, intubasi dan tindakan lainnya yaitu dengan mengosongkan lambung. Upaya pengosongan lambung dilakukan dengan memuasakan pasien sejak semalam sebelum tindakan dengan tujuan mengurangi risiko terjadinya aspirasi.

Pedoman tatalaksana nutrisi untuk persiapan tindakan medis saat ini mengacu pada pedoman puasa pra-bedah yang direkomendasikan American Society of Anaeshesiologist (ASA) dan The Canadian Anaesthetists Society (CAS). Di Indonesia, pedoman puasa prabedah dianjurkan oleh Perkumpulan Dokter Spesialis Anastesiologi dan Terapi Intensif (PERDATIN). Meskipun demikian, pada berbagai unit layanan masih memuasakan pasien sejak semalam sebelum tindakan medis dilakukan.

Perkembangan tatalaksana nutrisi pada tidakan medis telah mengalami banyak perubahan seperti pembedahan yang bertujuan mengembalikan fungsi normal organ dan mempercepat penyembuhan pasien. Berbagai penelitian mengenai nutrisi dikembangkan bersamaan dengan pengembangan program untuk mengoptimalkan persiapan pra-bedah.

Kata kunci: *tata laksana nutrisi, nutrisi pra-bedah, aspirasi*

INTRODUCTION

Pre-surgery fasting has been performed since two years after general anesthesia was introduced in the year 1850, when a mortality case due to aspiration in anesthetized patient was found. Aspiration which happened due to increase in gastric contents is frequently feared in nutrition administration before a medical procedure.[1]

Fasting patient since the night before is actually not appropriate with body physiology because stomach is always filled with gastric fluid which is secreted continuously up to 2,500 mL/day. Even though in fasting condition, stomach always secreted fluid as much as 50 mL/hour.[2,3] Fasting patient since the night before the medical procedure also has negative impact to body metabolism, particularly breaking down of body reserve through glycolysis and gluconeogenesis. A good pre-surgical preparation may reduce stress response occurred during surgery and further minimize post surgery risk which may be happened to patients.[1,4]

PHYSIOLOGY OF STOMACH

Stomach is a part of the gastrointestinal system, entry part of food and liquid which will be digested in the body.[2] Stomach produces gastric enzymes approximately 2 L/day, which is secreted by gastric surface cells.[2,3]

Digestion process of carbohydrates and protein occurred in the stomach but the digestion process happened in separated location and has not occurred entirely. Digestion of carbohydrates occurred in the corpus part, while digestion of protein happened in the gastric antrum. HCl and pepsin only reach the food surface, so the protein digestion is minimal.[2,3]

Gastric Motility

Gastric motility includes four factors, which are gastric filling, gastric storage, gastric mixing, and gastric emptying. Gastric motility is indirectly influenced by emotion through autonomic nerve, which stimulates smooth muscle excitability.[2,3]

When filled with food, stomach can expand till the capacity reaches approximately 1 L during meal, if compared with empty stomach volume < 80 mL.[5] Upon filling, stomach will expand but did not cause tension on stomach wall and increase of pressure in the stomach due to plasticity effect of gastric muscle and receptive relaxation.

Gastric Emptying

Gastric emptying velocity is basically influenced by factors in the stomach, duodenum, and outside digestive tract. Factors in the duodenum are more affecting gastric emptying velocity compared with gastric factors due to nerve and hormone responses.[2,3] Nerve response through intrinsic plexus and autonomic nerve is called enterogastric reflex, while hormone response occurs on the duodenal mucosa causing secretion of hormones or enterogastrones, such as secretin, cholecystokinin, and gastric inhibitory peptides.[2]

Table 1. Factors influencing in gastric emptying[2]

Factors	Way of influencing	Gastric emptying effect
Gastric factors		
Chyme volume	Distension has direct effect to the increase of smooth muscle contraction, vagus nerve, and gastrin	Increase of volume stimulate gastric motility and emptying
Fluid level	Only liquid food can pass the stomach	More liquid the food , the gastric emptying is faster
Duodenal factors		
Presence of fat, acid, hypertonicity, or distension	Causing enterogastric reflex, thus secreting enterogastrones (cholecystokinin, secretin)	Duodenal factors inhibit gastric motility and emptying until duodenal factors are completed
Factors outside digestive tract		
Emotion	Influencing autonomic balance	Increase or decrease gastric motility and emptying
Pain	Increase sympathetic activity	Inhibit gastric motility and emptying

Measurement of Gastric Emptying

Various gastric emptying velocity measurement techniques have been summarized by Petring et al, which include radiology, intubation-aspiration, radioisotopes, ultrasound, absorption kinetics from oral substance administration, ferromagnetic tracer, epigastric impedance, and tomography.[6] Other measurement technique is by using imaging, such as magnetic resonance imaging (MRI), single photon emission computed tomography (SPEC), and ultrasonography (USG) can be used with the advantage of being not invasive.[7]

NUTRITION AND GASTRIC EMPTYING

Nutrition Management

Currently, nutrition management guidelines for medical procedure preparation refer to pre-surgery fasting guidelines recommended by American Society of Anaesthesiologist (ASA) and the Canadian Anaesthetists Society (CAS), which is to drink clear liquid which contains simple carbohydrate or water two hours and light meal six hours before surgery.[8,9] In Indonesia, pre-surgery fasting guidelines by Indonesia Society of Anesthesiology and Intensive Care recommended almost the same, drinking clear liquid three hours and light meal 6-12 hours before surgery.[10]

Table 2. Pre-surgery fasting guidelines[8,9]

Diet	Minimal duration of fasting (all age)
Beverages (plain water, fruit juice, carbonated drinks, tea, coffee)	2 hours
Breastmilk	4 hours
Formula milk	6 hours
Milk other than breastmilk	6 hours
Snacks (toast + drinks) amount and type need to be noted	6 hours

Nutrition and Gastric Emptying Velocity

Studies on measurement of gastric emptying velocity after consuming various kind of food have been conducted, starting from liquid to solid food. Results of those studies are beneficial to be the base of nutrition management before medical procedures.

Studies on measuring gastric emptying velocity after consuming clear fluid were conducted by Maltby et al, Sutherland et al, and Hutchinson et al comparing the residue volume in stomach of group who were assigned to fast since the night before and group who was given clear fluid 2.5 hours before surgery. Results revealed that there was no significant difference of residue volume, which means there was no difference in the gastric emptying volume.[11-13] Maltby et al, also performed a study measuring the velocity gastric emptying clear fluid in overweight patients.[14] Subjects were divided into a group who fasted since the night before surgery and were given 300 mL of clear fluid two hours before surgery. Results obtained exhibited no significant difference in gastric residue volume in both groups. This implicated that overweight patients can follow pre-surgery fasting guidelines as suggested by ASA/CAS, which is to drink clear liquid until two hours before surgery.[8,9]

Several literatures stated that gastric emptying velocity in pregnant women was slower compared to normal adults due to hormonal and mechanical factors.[15,16] Based on the provision, healthy adults could receive clear fluid lastly two hours before anesthetized. Wong et al, studied gastric emptying in healthy pregnant women (37-39 weeks) and not overweight who were fasted since the previous night. Subjects were divided into those who drink 300 mL and 50 mL of water. Results of the study exhibited indifferent gastric emptying.[17] Further studies by Wong et al, study investigated healthy pregnant women (37-39 weeks) as subjects who were overweight with body mass index (BMI) 41 ± 9 kg/m^2 on average.[18] Obtained results showed gastric emptying in overweight pregnant women was not slower after consuming different amount of beverage.

Study on measurement of gastric emptying velocity with different beverages performed by Fried et al, showed that gastric emptying after whey-based formula consumption was faster compared to casein-based formula.[19] A study by Vesa et al, in healthy adults who were given full cream milk and half-skimmed milk, stated that group who consumed full cream milk was significantly slower gastric emptying compared to half-skimmed milk.[20] Study by Maughan et al, in healthy male adults who were given four different solutions in separated time showed that in protein containing solution, the gastric emptying velocity was slower compared to carbohydrates containing solution.[21] Lobo et al, who studied gastric emptying velocity in healthy adults, revealed that gastric emptying after carbohydrate containing drinks (CCD) administration was faster compared to oral nutrition supplement (ONS). Thus, it was recommended that CCD was safe to be given until two hours pre-surgery and ONS was safe to be given around three hours pre-surgery.[22] Gentilcore et al, in their study, compared gastric emptying velocity after consuming drinks with different calories in healthy young adults. In group who consumed beef stock soup (12 kcal) and group who consumed 300 mL of 25% dextrose (314 kcal), gastric emptying velocity was slower compared to group who consumed higher calories food.[23]

Gastric emptying velocity after consuming solid food compared to drinking clear fluid was observed by Berry et al, in healthy elderly subjects who were given drink containing 50 mg glucose + lemon juice 30 mL and consumed 300 g meat revealed gastric emptying velocity after consuming solid food is slower compared to drinking clear fluid.[24] Spiegel et al, studied gastric emptying velocity in 9 healthy female who consumed tomato soup compared to egg sandwich in two different times. Results showed solid food administration would stay in the stomach longer compared to liquid food.[25] A study by Burton et al, in healthy adults who consumed 2 scramble eggs + 2 slices of bread + 240 mL skim milk (320 kcal) resulted in increased gastric volume in the first 2 hours after meal and further decreased to the initial volume in three hours after meal.[26]

The available pre-surgical management recommendation consists of clear water and solid food (ASA, CAS, and Indonesia Society of Anesthesiology and Intensive Care) administration, but has not included enteral nutrition administration, which is expected to become one of the alternatives in pre-surgery nutrition administration.[8,10] Enteral nutrition is various food which is processed for particular therapy

purpose through food pipe or orally as ONS. Based on the completeness of nutrients, enteral nutrition could consist complete nutrients, if given in the needed amount and has fulfilled patients' needs, or incomplete nutrients if could only be given as supplements.[27]

Studies on enteral nutrition consumption and gastric emptying velocity was performed by Sutanto et al, to 9 pregnant women in third trimester who were given 200 mL specific enteral formula nutrition.[28] Measurement of gastric emptying velocity was done by scanning using USG instrument. Obtained results were gastric volume restored to initial condition in less than two hours.

CONCLUSION

Management of nutrition before medical procedure actually could be based on the body physiology, including gastric emptying. Nutrition administration as complete as possible before medical procedure and as close as possible to the schedule procedure is expected to decrease breaking down of body reserve effect. In association with the risk of aspiration, basic physiology of gastric emptying velocity in various type of food type is very important. As an alternative of pre-surgery nutrition is administration of enteral nutrition with complete nutrients content. This is expected to satisfy nutrition needs in order to substitute body reserve which has been broken down during medical procedure. Gastric emptying time after enteral nutrition consumption is faster compared to solid food consumption, thus it could be considered as nutrition management before medical procedure.

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