Preoperative Fasting Guidelines in Paediatric Patients

Introduction

Practice guidelines are recommendations based on evidence, that will help the clinician in making certain decisions. They may be regarded as standard practice, though their use cannot guarantee any specific outcome. They may be modified as per the clinician's judgement or local practices. In addition, they need to be revised periodically in view of the continuous evolution and research in medical science. These guidelines can be applied to healthy paediatric patients including neonates for elective surgery. They are intended to be used by anaesthesiologists before procedures under general anaesthesia, regional anaesthesia or sedation (monitored anaesthesia care).

These guidelines may not apply to or may need to be modified[1] for: patients with coexisting diseases that can affect gastric motility or gastric volume *e.g.,* congenital hypertrophic pyloric stenosis, bowel obstruction, paralytic ileus and children with trauma.[1,2] Patients with difficult airway should be treated as full stomach and appropriate judgement may be used. These conditions can increase the chances of regurgitation and pulmonary aspiration. Additional preventive measures need to be taken in such patients.

During preoperative evaluation, history, physical examination and investigations should be reviewed to rule out increased risk of regurgitation and pulmonary aspiration. The patient and parents or caregivers should be clearly informed of the fasting requirements and reasons behind their strict adherence. It should be verified again in the immediate preoperative period whether the patient has complied with the fasting guidelines.

Definition of Preoperative Fasting

It is defined as a prescribed period of time before a procedure, when patients are not allowed oral intake of liquids or solids.

Purpose of Guidelines

In spite of the presence of various recommendations for preoperative fasting it is commonly observed that children are fasted for much longer than necessary. Long

term fasting can lead to dehydration, hypoglycaemia and distress. In an audit conducted at a tertiary care hospital, the actual time that children were fasted was 11.25 hours for solids and 9.25 hours for water.[3] Simple steps such as education of ward nurses and better coordination between the anaesthesiologists, surgeons and the nurses greatly reduced the actual fasting time .

The purpose of formulating the guidelines is:

1) To improve the quality and efficiency of anaesthesia which results in
   a) Increased patient satisfaction and safety.
   b) Avoidance of delay and cancellations.
   c) Decreased risk of dehydration or hypoglycaemia.
   d) Reduced preoperative morbidity.
2) To promote good clinical practices and formation of protocols.
3) To reduce the severity of complications related to pulmonary aspiration of gastric contents.
4) Cost effective use of drugs to reduce gastric volume and acidity.

Preoperative Fasting for Clear Liquids

Recommendation:

Children should be encouraged to drink clear fluids for up to 2 hours prior to elective procedures requiring general anaesthesia, regional anaesthesia or sedation.

Clear non-particulate fluids include water, glucose water, coconut water, clear apple juice and carbonated beverages. The volume of liquid is less important than the type of liquid.[4]

Scientific Evidence

There is a clear and level 1 evidence to show that the oral intake of clear fluids up to 2 hours before an elective operation is safe.[4-6] Meta-analysis of many randomised controlled trials report higher gastric pH values and comparable gastric volumes in children given clear liquids 2 to 4 hours before a procedure versus those given clear fluids more than 4 hours prior.[7-12] Ingested volume of clear liquids by children varied from 2 $mL.kg^{-1}$ to unrestricted amount.

In one study in healthy school children, the median t1/2 of gastric emptying after ingestion of 7 $mL.kg^{-1}$ of clear fluid was <30 minutes as measured by MRI.[13] But the values had a lot of inter individual variation. Another study found comparable gastric fluid pH and volume after 1 hour and 2 hours of fasting for clear fluids.[14]

Allowing clear fluid before surgery improves the comfort of child and reduces anxiety of parents, decreases thirst and the risk of dehydration in young infants.[15] Clear liquids (sucrose solution) up to 2 hours prior to anaesthesia may maintain electrolyte balance and can provide sugar to replete glycogen stores especially in neonates as they have impaired gluconeogenesis.[16]

According to the European Society of Anaesthesiology fasting guidelines, if small amount (up to $1/5^{th}$) of milk is added to tea or coffee, it is considered as clear liquid.[17]

Preoperative Fasting for Breast Milk

Recommendation

Children including healthy neonates, should be allowed to breast feed at least 4 hours before elective procedures requiring general anaesthesia, regional anaesthesia or sedation.

Scientific evidence

Fasting time for breast milk is controversial, Billeaud C et al. demonstrated that the gastric emptying of 110-200 mL of human milk was 82±11% after 2 hours in neonates and infants, 84±21% after whey-hydrosylated formula, 74±19% after whey-predominant formula, 61±17% after casein predominant formula and 45±19% after cow's milk.[18] Gastric emptying of human milk and whey-predominant formula was significantly faster than casein predominant formula and cow's milk.

Although some studies have demonstrated that human breast milk (HBM) empties within 2-3 hrs gastric emptying time of human breast milk varies from infant to infant and fat content of HBM is not consistent.[19-22] [23] That is why most of the guidelines including the American[1] and the European Society guidelines recommended a fasting of 4 hour for human milk.

Non-nutritive sucking on a pacifier has been shown to comfort the infant and also reduce the gastric volumes in premature infants.[24] Non-nutritive sucking on mother's

breast (in a pre-pumped Breast) should not be allowed within 4 hours as even small amount of breast milk in infant's stomach can have serious consequences if aspirated.

Preoperative Fasting for Infant Formula

Recommendation

It is recommended to fast from intake of infant formula for at least 6 hours before an elective procedure requiring general anaesthesia, regional anaesthesia or sedation (Monitored Anaesthesia Care i.e. MAC)

Scientific evidence

Some studies indicate that acidified formula and casein formula empty from the stomach over 3-4 hours. But some formulas may take up to 6 hours to empty from the stomach.[19,25] The literature is insufficient at present to evaluate the timing of ingestion of infant formula and its effect on preoperative incidence of pulmonary aspiration.

Scandinavian guidelines recommend a 4 hour fast for formula feeds in infants less than 6 months.[5] All others including the American Society of Anesthesiology guidelines, the European Society and the Royal College of Nursing recommend a fast time of 6 hours for infant formula.[1,17,26] This is because of insufficient evidence to change the contemporary best practice. (*i.e.,* infant formula for up to 6 hours)

Preoperative Fasting for Non-human Milk and Solid Food

Recommendation

It is recommended to fast from intake of non-human milk as solid food (light meal) for 6 hours or more before elective procedure requiring general anaesthesia, regional anaesthesia or sedation (MAC). Additional fasting time (8 hours or more) may be required for fatty, fried food or meat containing food. Both the amount and type of food consumed must be considered before determining appropriate fasting interval.

Scientific Evidence

Miller M et al. compared a light breakfast of tea and buttered toast consumed less than 4 hours before elective surgery to that of an overnight fast and found equivocal gastric volume and pH levels.[27]

Sethi AK et al. found that children given non-human milk 4 hours or less before surgery had higher gastric volumes but equivocal pH when compared to those children who fasted for more than 4 hours.[20]

It is widely accepted that fasting for a large meal containing fried food or meat should be 8 hours or more.

Preoperative Chewing Gum

Recommendation

Patients should not have their operation cancelled or delayed just because they are chewing a gum. This recommendation is given by European Society Guidelines and it is solely based on effects of chewing gum on gastric emptying and any gum chewing should be discouraged before elective surgery.[17]

Scientific Evidence

There is an ongoing debate on how to deal with patients chewing gum in the preoperative period. In one study, they found that chewing sugarless gum before surgery did not alter gastric fluid volume or acidity.[28] Another study found that both sugared and sugar free gum chewers had significantly increased gastric volume and pH than non- gum chewers.[29]

Conclusion

The recommended guidelines are summarised below. The ideal guidelines for preoperative fasting should minimise the risk of regurgitation and pulmonary aspiration of residual gastric contents yet allow patient comfort with little risk of dehydration and hypoglycaemia. Most of the studies have examined the change in residual gastric volume and pH of gastric contents at various fasting intervals. It has been assumed that the pH and residual gastric volume are directly proportional to the risk of regurgitation and aspiration.[8,30]

In actual practice it is unlikely that the entire gastric content would be aspirated into the lungs. Therefore, studies using gastric volume as a predictor of risk for aspiration pneumonia may be misleading. It will probably be more useful to conduct audits in patients who have suffered from aspiration. After reviewing the results of such audits

we can eventually formulate the guidelines regarding optimum fasting time with increased patient comfort without increasing the risk of morbidity.[31]

Summary of Fasting Guidelines in Pediatric Patients		
Fasting Interval	**Type of Food**	**Examples**
2 hours	Clear Liquids	Water, Glucose or Sucrose Solution, Clear Apple Juice, Carbonated Beverages, Coconut water 
4 hours	Breast Milk	 Breast Milk
6 hours	Infant Formula / Non- Human Milk /Solid Food (light meal)	Formula Feeds, Powdered Milk, Cow, Buffalo Milk, Light meal, a bowl of Khichadi, Poha, Upama 
8 hours	Solid Food (Heavy Meal)	 Chapati, , Vegetables, Fried Food, Nonveg Food Cheese, Ice-cream

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